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List of Acronyms

ACL	alternate control limit
ACS	American Community Survey
ALARA	as low as reasonably achievable
AML	Abandoned Mine Land (WDEQ)
APD	Application for a Permit to Drill
AQD	Air Quality Division (WDEQ)
AQS	Air Quality System
AU	Assessment unit
BCR	benefit-cost ratio
bgs	below ground surface
BLM	Bureau of Land Management (U.S.)
BMP	best management practices
BOE	barrels of oil equivalent
BPT	Best Practicable Technology
BTU	British thermal unit
Cameco	Cameco Resources (Power Resources, Inc.)
CAP	Corrective Action Plan
CBM	coal bed methane
CDL	Cropland Data Layer
CEQ	Council on Environmental Quality
Cleveland-Cliffs	Cleveland-Cliffs Iron Company
CO	carbon monoxide
CPF	Central Processing Facility
CPP	Central Process Plant
DAC	derived air concentration
dBA	**decibel**
DDE	Deep Dose Equivalent
DOT	Department of Transportation (U.S. / Wyoming)
EA	Environmental Assessment
EAD	Economic Analysis Division (WDAI)
EFD	East Fraser Draw
EIA	**Energy Information Administration**
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency (U.S.)
ER	Environmental Report
Everest	Everest Mineral Corporation
EXREFA	Extended Reference Area
FONSI	Finding of No Significant Impact
GDP	Gross Domestic Product
GHG	**greenhouse gas**
gpm	gallons per minute
GRI	**Global Reporting Initiative**
Highland	Highland Uranium Project
HWA	Hayden-Wing Associates, LLC
I-25	Interstate 25
I-80	Interstate 80
I-90	Interstate 90
IMPROVE	Interagency Monitoring of Protected Visual Environments
ISR	in situ recovery
IX	ion exchange
LQD	Land Quality Division (WDEQ)
LRA	License Renewal Application
LSA	low specific activity
MBHFI	migratory bird of high federal interest

Medicine Bow	**Medicine Bow National Forest**
MLRA	Major Land Resource Area
NAAQS	National Ambient Air Quality Standards
NASS	**National Agricultural Statistics Service**
NB	North Butte
NEPA	National Environmental Policy Act
NH_3	**ammonia**
NLCD	National Land Cover Dataset
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NO_x	**nitrogen oxide**
NRC	U.S. Nuclear Regulatory Commission
NWS	National Weather Service
ORC	Operations Review Committee
PM_{10}	particulate matter smaller than 10 micrometers
$PM_{2.5}$	particulate matter smaller than 2.5 micrometers
PMC	Pathfinder Mines Corporation
PRI	Power Resources, Inc.
PSD	Prevention of Significant Deterioration
PSR-1	Purge Storage Reservoir 1
PSR-2	Purge Storage Reservoir 2
PVC	polyvinyl chloride
PWS	Public Water System
QA	quality assurance
QC	quality control
R&D	Research & Development
RAMC	Rio Algom Mining Corp.
RCRA	Resource Conservation and Recovery Act
Real West	Real West Natural Resources Consulting
RO	reverse osmosis
ROD	**Record of Decision**
RV	recreational vehicle
SERP	Safety and Environmental Review Panel
SHPO	State Historic Preservation Office (Wyoming)
SIA	Special Interest Area
SMC	Solution Mining Corp.
SO_2	sulfuric dioxide
SPCC	Spill Prevention Control and Countermeasures
SUA-1548	Source and Byproduct Materials License SUA-1548
T&E	threatened and endangered
TDS	total dissolved solids
TENORM	**technically enhanced naturally occurring radioactive material**
TLD	Thermoluminescent dosimetry
TPS	Total petroleum system
TR	Technical Report
TSP	total suspended particulate
TVA	Tennessee Valley Authority
U_3O_8	uranium
UBC	Uniform Building Code
UIC	underground injection control
UO_2	uranium dioxide
UPZ	uranium point zone
Uranerz	Uranerz USA, Inc.
USACE	U.S. Army Corps of Engineers
USEIA	U.S. Energy Information Administration
USFS	U.S. Forest Service

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compounds
VRM	Visual Resource Management
WAAQS	**Wyoming Ambient Air Quality Standards**
WDAI	Wyoming Department of Administration & Information
WCC	West Canyon Creek
WDE	**Wyoming Department of Employment**
WDEQ	Wyoming Department of Environmental Quality
WFD	West Fraser Draw
WGFD	Wyoming Game and Fish Department
WHMA	Wildlife Habitat Management Area
WNA	**World Nuclear Association**
WOGCC	Wyoming Oil & Gas Conservation Commission
WQD	Water Quality Division (WDEQ)
WSEO	**Wyoming State Engineer's Office**
WSGS	**Wyoming State Geologic Survey**
WYDOT	Wyoming Department of Transportation
WYPDES	Wyoming Pollutant Discharge Elimination System

1.0 Introduction

1.1 Purpose and Need for the Proposed Action

Power Resources, Inc. (PRI) dba Cameco Resources (Cameco) is requesting that the United States Nuclear Regulatory Commission (NRC) approve the license renewal application (LRA) for Source and Byproduct Materials License SUA-1548 (SUA-1548). The LRA was originally submitted to NRC on August 12, 2010. By letter dated February 4, 2011, NRC Staff provided Cameco with their acceptance review comments. Based on the acceptance review comments as well as comments provided by NRC Staff in meetings dated March 17, 2011 and September 19 and 20, 2011, Cameco is submitting this LRA for NRC review and approval. This submittal supersedes the August 12, 2010 submittal. Approval of this LRA will authorize Cameco to continue uranium in-situ recovery (ISR) operations at the Smith Ranch site and its related satellite facilities for an additional 10-year renewal period. Cameco is also requesting approval of the following items that are either new or have been changed since the last renewal:

1. Operations Plan for the Gas Hills Remote Satellite, including yellowcake slurry production, redesign of Evaporation Ponds 1 and 2, increase in satellite flow rate and the use of underground injection control (UIC) Class I disposal wells, as defined later in this section.
2. Operating Plan for the North Butte Remote Satellite, including redesigned surge ponds and satellite, increased satellite flow rate, use of UIC Class I disposal wells, removal of the slurry and dried product option at the satellite, as defined later in this section.[1]
3. Flow rate increases at the Reynolds Ranch Satellite.
4. Refurbishment of the Highland Central Processing Facility (CPF) to allow processing of up to 1.4 million kilograms (3 million pounds) of dried yellowcake per year (approved into the license through the Operations Review Committee (ORC)/Safety and Environmental Review Panel (SERP) process).
5. Processing of toll shipments of loaded ion exchange (IX) resin and slurried yellowcake from other licensed uranium recovery facilities at the Highland CPF.

Cameco will also be receiving toll shipments of uranium-loaded IX resin from third party uranium recovery licensees to process into dried yellowcake. This material is no different than the material defined in Regulatory Issue Summary 00.23 as equivalent feed and should not require additional authorization from NRC to accept and process this type of material (see Section 1.5 of the Technical Report [TR]).

According to the World Nuclear Association, worldwide demand for uranium totals 62,500 metric tons (138 million pounds) per year (WNA, 2012). U.S. uranium mines produced 1,900 metric tons (4.2 million pounds) U_3O_8 in 2010, 2% more than in 2009. A total of four underground mines produced ore containing uranium during 2010, 10 less than during 2009. A total of four ISR operations produced solutions containing uranium (U.S. EIA, 2011). In 2011, SUA-1548 operations produced a total of 680

[1] **By letter dated October 12, 2011, Cameco notified NRC of North Butte construction plans, including construction of access roads, installation of one UIC deep disposal well and construction of the satellite building. By letter dated February 13, 2012, NRC recommended that Cameco use the SERP process to review the proposed construction activities. These activities were incorporated into the license by SERP on May 5, 2012 and June 13, 2012 (surge ponds). A revised operating plan for the North Butte Remote Satellite was developed and incorporated into the license by SERP in November 2012. Cameco commenced operations at the North Butte Remote Satellite in early 2013.**

metric tons (1.5 million pounds) (Cameco Resources, 2011). As of October 12, 2011, SUA-1548 operations represent one of just 35 major uranium recovery operations in the United States that have submitted either an application for a license or license renewal, or a letter of intent to the NRC through Fiscal Year 2013. These 35 major uranium recovery operations include ISR, heap leach, and conventional extraction methodologies.

1.2 License Renewal Application Nomenclature

This Environmental Report (ER) together with the accompanying TR, provide the required information to allow approval of this LRA. **Figure 1.1, General SUA-1548 Location Map** presents a location map, including transportation routes, for SUA-1548 and consists of:

1. Converse County
   a. Smith Ranch, including all satellites and processing facilities associated with the Smith Ranch properties (**Figure 1.2, Site Map**)
2. Campbell County
   a. North Butte Remote Satellite
3. Fremont and Natrona Counties
   a. Gas Hills Remote Satellite
4. Johnson County
   a. Ruth Remote Satellite

Figure 1.2 presents more detailed information related to Smith Ranch and its contiguous satellite facilities. Smith Ranch incorporates the Converse County properties as individual satellites. The location of each satellite is presented on **Figure 1.2**. Because of the abundance and importance of historical information, this ER addresses three historic named properties that comprise the Converse County property, collectively referred to as Smith Ranch. They are:

a. Smith Ranch
b. Highland (aka The Highland Uranium Project)
c. Reynolds Ranch

The Central Processing Plant (CPP) is located on Smith Ranch. The Highland CPF and the Selenium Treatment Plant are both located within Highland (see **Figure 1.2**).

The typical ISR process is described in both the ER and the TR. Each property and/or remote satellite is comprised of several mine units, which consist of one or more contiguous uranium roll fronts. Injection and recovery wells are drilled and completed within these mine units. These injection and recovery wells are collectively called a well field or mine unit. Uranium is liberated from its natural mineral state and recovered from the groundwater at each recovery well and piped to a header house. Uranium-bearing fluids (pregnant lixiviant) are delivered from each header house to the CPP, a satellite, or remote satellite for further processing. The barren fluids, less a small bleed to maintain hydraulic control within the mine unit, are refortified with lixiviant reagents and returned to the mine unit to recover more uranium.

Each of the satellite facilities and the CPP **contain IX circuits**. The Gas Hills Remote Satellite will also have the capability of producing yellowcake slurry. Uranium laden IX resin and/or slurry produced at the satellite or remote satellite facilities is transported via **U.S.** Department of Transportation (DOT)-approved transport trailers to the CPP and/or the CPF (**Figure 1.2**) for final processing into **dried**

yellowcake. Final processing is accomplished using low **temperature** rotary vacuum dryers. These vacuum dryers do not produce significant particulate emissions that can escape into the environment. Dried yellowcake is the commercial end product for SUA-1548. The CPF is a second processing plant under SUA-1548. It is currently (2011) inactive, but Cameco is in the process of refurbishing and upgrading this processing facility to allow additional capacity for IX and yellowcake production.[2] By letter dated September 15, 2011, Cameco advised NRC of their plans to renovate the Highland CPF. Phase I **includes** the dismantling and disposal of the Highland offices and extraneous equipment and materials outside the CPF building and the modernization of electrical services. Phase II includes the removal and replacement of tanks, vessels and piping within the CPF, and Phase III includes the removal and disposal of the existing calciner dryer and installation of at least two low temperature rotary vacuum dryers. The work has been reviewed and approved through the ORC/SERP process. Phase I started during the fourth quarter of 2011. **When** operational, this facility will receive IX resin and/or slurry from the remote satellites as well as from third party licensed uranium recovery facilities. The CPF will have the capability to produce dried yellowcake, which will be transported by truck to a uranium conversion facility.

When a mine unit or a portion of a mine unit is exhausted of economically recoverable uranium, it is placed into groundwater restoration. This restoration process is described in Section 6.0 of the TR. During the production and restoration processes, a certain amount of liquid waste water is generated. Cameco utilizes several methods to handle and dispose of waste water, including evaporation ponds, UIC Class I disposal wells, and land application. Cameco is currently (January 2012)[3] exploring the option of using UIC Class I disposal wells at the Gas Hills Remote Satellite to augment the planned evaporation methodologies. The Selenium Treatment Plant located at Satellite 2 (**Figure 1.2**) removes selenium and radium from "treated" process and bleed water prior to disposal by land application via a storage reservoir and **center** pivot irrigator.

1.3 Document Format

Per discussions with NRC Staff, Cameco has prepared a comprehensive document that includes both past and current information applicable to this LRA. Cameco received an acceptance review dated February 4, 2011 and has incorporated NRC Staff comments identified as Enclosure 1 into this LRA. In that same letter, the NRC recommended that Cameco consider guidance provided in Regulatory Guide 3.46 (June 1982); NUREG-1748 (August 2003); and NUREG-1569 (June 2003). Cameco has prepared the current document to conform to this regulatory guidance. Since receiving the acceptance review comments, Cameco representatives have attended two public meetings with NRC Staff: a one-day meeting in Washington DC on March 17, 2011 and a two-day meeting and pre-submission license application review in Casper on September 19 and 20, 2011. Meeting minutes and NRC staff comments and recommendations made at these meetings were memorialized in NRC Staff memoranda dated respectively April 26, 2011 and October 28, 2011. Cameco has incorporated these suggestions into the LRA.

As stated above, this LRA consists of a TR and an ER. The TR is a stand-alone document that addresses the guidance provided by NUREG-1569 and NRC Regulatory Guide 3.46. The TR summarizes both new and historical technical information for SUA-1548. Cameco has provided a summary statement at the front of each chapter that describes what information is new and what information has been previously reviewed by the NRC. The TR appendices contain numerous detailed designs, construction specifications, and consultant reports to provide a complete 10-year history of SUA-1548.

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[2] **Refurbishment is 90% complete, but the CPF has not yet (2014) been placed into operation.**
[3] **As of 2014, Cameco is still evaluating the potential for using deep disposal wells at Gas Hills.**

This ER provides environmental baseline information and environmental assessments of the actions proposed in the LRA. The ER addresses the guidance provided in NUREG-1748 and contains cross references to a series of appendices that are part of the Wyoming Department of Environmental Quality (WDEQ) Permit to Mine for each facility within SUA-1548. Specifically, Cameco presents detailed baseline information to the WDEQ as part of their State of Wyoming permitting process. In recognition of the NRC's regulations at 10 CFR 51 implementing the National Environmental Policy Act (NEPA) for baseline data as they pertain to the ER, Cameco has summarized this information in Section 3.0, Description of the Affected Environment and has referenced the detailed baseline reports as well as federal and state concurrences, which are part of the WDEQ application. To ensure that this supplemental information is available to the public and the NRC Staff, Cameco has incorporated one hard copy and one electronic copy of these documents as part of this LRA submittal.

1.4 2011 Historical Development and Current Status of Smith Ranch SUA-1548

Tables 10-1 through **10-4** in Section 10.0 of the TR summarize the federal and state permitting/licensing status of SUA-1548 **authorized facilities**. SUA-1548 is currently **(July 2014)** in timely renewal. All Smith Ranch satellites and the Highland Satellites 2 and 3 (**Figure 1.2**) are fully operational and deliver uranium-laden IX resin to the CPP. The CPP processes the IX resin and produces dried yellowcake in accordance with the conditions and requirements of SUA-1548. The dried yellowcake is transported to uranium conversion **facilities, such as the Blind River Refinery** located in Port Hope, Ontario, Canada, for further processing.

1.4.1 NRC License History

The previous SUA-1548 LRA was approved by the NRC in May 2001. The Licensee at that time was Rio Algom Mining Corp. (RAMC). In 2002, PRI entered into a Purchase Agreement to acquire the Smith Ranch Facility (SUA-1548) from RAMC and requested a direct transfer of control of SUA-1548 from RAMC to PRI in June 2002. The NRC approved the license transfer on July 11, 2002, as Amendment 3 to SUA-1548.

In March 2003, PRI requested that SUA-1511 (Highland) be combined with SUA-1548 (Smith Ranch) and that the surviving License be SUA-1548. At the same time, PRI requested that the Ruth/North Butte License SUA-1540 and the pending Gas Hills License Amendment to SUA-1511 also be added to the combined License SUA-1548. On August 18, 2003, the NRC issued Amendment 5 to SUA-1548 approving the consolidation of the Highland, Ruth and North Butte licenses into SUA-1548. The NRC disallowed inclusion of the Gas Hills facility on the premise that it would be premature since the NRC Staff had not yet completed their review of the amendment request. Once approved, the Gas Hills Remote Satellite would be amended into SUA-1548. The NRC subsequently approved the Gas Hills Remote Satellite as Amendment 6 to SUA-1548 on January 29, 2004.

In January 2005, PRI requested a license amendment to incorporate the Reynolds Ranch Satellite into SUA-1548. The NRC approved the request and issued Amendment 11 to SUA-1548 on January 31, 2007.

In October 2006, PRI requested a license amendment to allow construction and operation of the Smith Ranch Satellite SR-2. The NRC Staff approved the license amendment request and issued Amendment 12 to SUA-1548 on January 10, 2008.

In response to a Notice of Violation (NOV), PRI submitted a license amendment request dated March 20, 2008 requesting changes to Chapter 9 of the license application related to management organization and administrative procedures. The NRC Staff approved the license amendment request and issued Amendment 13 to SUA-1548 on August 18, 2008.

On June 19, 2008, PRI requested an amendment to allow processing of third party uranium loaded IX resin at the Smith Ranch CPP. The NRC Staff approved the amendment request and issued Amendment 15 to SUA-1548 to allow a maximum of 365 toll shipments of third party uranium loaded IX resin to be delivered and processed at the Smith Ranch CPP each calendar year.

On December 31, 2008, PRI submitted a request for annual surety update approval for the Gas Hills, Ruth and North Butte Remote Satellite facilities. Additionally, this amendment requested approval for the addition of UIC Class I disposal well SR-HUP No. 10 (December 4, 2009). NRC Staff approved the amendment request and issued Amendment 16 on March 11, 2010.

On March 12, 2009, NRC Staff issued Amendment 14 to SUA-1548 approving the financial surety update for the Gas Hills Remote Satellite.

These amendments are described in more detail in **Table 1-1** in Section 1.4 of the TR.

1.4.2 State of Wyoming Permitting History

Within the State of Wyoming, a separate mining and reclamation permit is required for each property. Historically Smith Ranch held a mining permit under WDEQ Permit No. 633 and Highland held a mining permit under WDEQ Permit No. 603. These permits are still active.[4] In March of 2010, Cameco submitted to WDEQ a Combined Permit Application for Smith Ranch and Highland. Cameco received Completeness Review comments from the WDEQ and addressed these comments in May of 2011. As part of the May resubmission, Cameco incorporated the Reynolds Ranch property. Prior to this resubmission, the US Department of the Interior, Bureau of Land Management (BLM) approved Cameco's Plan of Operations and completed an Environmental Assessment (EA) of the proposed satellite and associated well fields at Reynolds Ranch. The BLM approved the Reynolds Ranch Plan of Operations and published their Finding of No Significant Impact (FONSI) in January 2011. The updated WDEQ permit application combining Permits 633 and 603 (Smith Ranch, Highland and Reynolds Ranch) into WDEQ Permit 633 is currently (January 2012) under technical review by the WDEQ.[5]

SUA-1548 incorporates several remote satellite facilities, each of which is separately permitted by the State of Wyoming. The North Butte Remote Satellite WDEQ Permit to Mine 632 was originally issued to Uranerz USA, Inc. (Uranerz) in 1991. This permit was transferred from Uranerz to Pathfinder Mines Corporation (PMC) (aka Cogema) in 1992 and subsequently transferred to PRI in 2001. Cameco submitted updated baseline, operational and restoration information related to North Butte to WDEQ in April 2011.[6] The permit update is currently in technical review. Cameco anticipates having the North Butte Remote Satellite in operation (pending NRC license condition approval and WDEQ Permit to Mine update approval) by 2013.[7]

The Gas Hills Remote Satellite Permit to Mine was initially approved by the WDEQ in 2001 (Permit No. 687). Cameco submitted a permit update to WDEQ in 2009. The permit update is currently (December 2011) in the final stages of technical review.[8] Additionally, BLM is preparing an Environmental Impact

[4] **With the approval of the permit application, Permit 603 was terminated; Permit 633 now includes Permit 603.**
[5] **The Smith Ranch-Highland combined permit application was approved by WDEQ on March 10, 2014.**
[6] **The North Butte WDEQ permit update application was approved by WDEQ on August 15, 2012.**
[7] **The North Butte Remote Satellite commenced operations in 2013.**
[8] **The Gas Hills WDEQ permit update application was approved by WDEQ on January 6, 2014.**

Statement (EIS) to address the ISR impacts to the land and water resources of the Gas Hills in accordance with NEPA regulations at 40 CFR 1500-1508 and BLM's Departmental Manual 516. It is anticipated that the EIS process will be completed in April 2012.[9] Cameco anticipates that the Gas Hills Remote Satellite will be operational (pending NRC license condition approval, WDEQ Permit to Mine update approval, and BLM approval) by 2014.[10] The Ruth Remote Satellite Permit to Mine was initially approved by the WDEQ in 1990 as Permit No. 631 (Uranerz). This permit was first transferred to PMC and was later transferred to PRI in 2001. Cameco is not actively pursuing development of the Ruth Remote Satellite at the time of this LRA (January 2012). Prior to commencement of ISR activities, baseline environmental data, environmental impact analyses, and the operations and reclamation plans will be updated and provided to NRC.

1.5 Proposed Action: All SUA-1548 Licensed Facilities

Cameco is requesting that NRC Staff approve this LRA. This LRA includes updated technical information, detailed new technical information, a summary of SERPs, which have been subjected to numerous NRC inspections, updated MILDOS calculations and updated and new discussion on environmental resources, impacts and mitigative actions.

License Condition 10.2.1 of SUA-1548 requires that before engaging in any commercial ISR activity *not previously assessed* by the NRC at the North Butte and Ruth Remote Satellites, Cameco must prepare a new *Operating Plan* in accordance with the guidance in NUREG-1569, for NRC review and approval and must also prepare and record an environmental evaluation of such activity.

On August 18, 2003, the NRC issued Amendment No. 5 to SUA-1548 approving the consolidation of the Highland, Ruth and North Butte licenses into SUA-1548. NRC had performed an environmental evaluation for North Butte in its 1990 EA, which covered both the North Butte and Ruth facilities. Cameco may initiate operations of the North Butte remote satellite within the operating envelope previously reviewed and approved by the NRC Staff. Changes to plans at North Butte requiring additional evaluation include updated design plans for North Butte surge ponds and satellite facility as well as flow rate increases at the North Butte facility from the current approved flow rate of **15,139** to **22,709** liters/minute (**4,000** to 6,000 gallons/minute). The MILDOS model has been revised to take into consideration the increased flow rate, and that there will be no slurried or dried yellowcake produced at the North Butte Remote Satellite. Finally, the primary method for process waste water disposal will be UIC Class I disposal wells only rather than the previously assessed combination of disposal wells and solar evaporation ponds. The ponds at North Butte will be used only to temporarily hold water to provide surge capacity for the disposal wells. All other aspects of the North Butte Remote Satellite Plan have not changed from the 1990 NRC Staff evaluation and EA. The above referenced changes are described within Sections 3.0, 4.0 and 6.0 of the TR and comprise Cameco's Operating Plan for the North Butte Remote Satellite. Cameco's EA of these changes is provided in **this** ER.

License Condition 10.3.2 of SUA-1548 requires that prior to the onset of commercial ISR activities at the Gas Hills Remote Satellite, Cameco must prepare a new Operations Plan in accordance with the guidance in NUREG-1569 for NRC review and approval. This requirement differs from the requirement for North Butte and Ruth in that it does not limit the submittal to *"those activities not previously assessed by the NRC"*.

[9] **BLM issued their final EIS on the Gas Hills Project in October 2013.**
[10] **NRC approval will occur with approval of this LRA.**

NUREG-1569 provides guidance for the content of new license applications, renewals, and amendments. Figure 2 from NUREG-1569 describes the Operations plan as "Details on how a facility will be operated, and the basis for performance-based licenses." Several of the sections prescribed by the guidance and included in this LRA are useful for evaluating the overall context of Cameco's facilities within the affected environment. However, the *details on how the facilities will be operated and the basis for the performance-based license* are reflected in Sections 3 through 6 of NUREG-1569. These four sections require a description of the proposed facility, effluent control systems, operations, and restoration/decommissioning. Cameco therefore is defining Sections 3.0 through 6.0 **of the TR** as its updated Operations Plan for the Gas Hills Remote Satellite. The updated environmental evaluations encompassing these plans are provided in this ER.

Since Cameco is not actively developing the Ruth Remote Satellite at this time (January 2012) and available data for Ruth are limited, Cameco will defer submittal of an operating plan and updated environmental evaluation for Ruth until closer to the time of commencing operations. At that time, Cameco will satisfy the outstanding requirement for the Ruth Remote Satellite in License Condition 10.2.1.

With this LRA, Cameco is also requesting authorization to increase the approved flow rate for the Reynolds Ranch Satellite from **17,032** to **22,709** liters/minute (4,500 to 6,000 gallons/minute).

Under the framework of this ER, Cameco has presented baseline data and information relating to the affected environment as well as a summary of potential impacts from the proposed action, and an evaluation of alternatives to the proposed action in accordance with NRC guidance provided in NUREG-1748. Cameco has completed an environmental evaluation of the proposed action and reasonable alternatives and is requesting that the NRC approve the proposed action.

SUA-1548 currently allows Cameco to receive and process up to 365 third party shipments of loaded IX resin at the CPP per calendar year. Within the framework of NRC's Equivalent Feed Policy (NRC-2011-0217), Cameco plans to receive third party shipments of loaded IX resin from other licensees at the **Smith Ranch CPP and/or the** refurbished Highland CPF. The loaded IX resin is no different than "equivalent feed" as defined in the Equivalent Feed Policy and should not require a license amendment to receive and process the material at the CPF or the CPP. Cameco is requesting that the NRC reauthorize the refurbished Highland CPF to receive slurried source material from third party licensees (toll processing) for the purpose of drying, packaging, and transporting the material to a uranium conversion facility on their behalf. This action was previously evaluated by the NRC Staff and subsequently approved on March 15, 1993 as Amendment No. 46 to NRC License SUA-1511 for the Highland Uranium Project (NRC, 1993).

1.6 Applicable Regulatory Requirements, Permits and Required Consultations

Prior to commencing operation at an ISR project in Wyoming, the operator must obtain a permit to mine, or an amendment to an existing permit, from the WDEQ. Additionally, because Wyoming is not a NRC Agreement state, a Source Material License or an amendment to an existing license must also be obtained from that agency. The Source Material License is a performance-based license and is valid for a 10-year period. Other State of Wyoming permits such as an Air Quality Permit, a Wyoming Pollutant Discharge Elimination System (WYPDES) Storm Water Discharge Permit, deep disposal well permit, etc., are also required and must be obtained prior to project start-up. Smith Ranch is an operating facility and has received all necessary state, local and federal permits and licenses. **Table 1-1, Smith Ranch Required**

Permits as of May 2014 lists the permits and licenses acquired for Smith Ranch. A listing of all state and federal permits and licenses required for the North Butte, Gas Hills and Ruth Remote Satellites are provided in Table 1-2, North Butte Required Permits as of May 2014, Table 1-3, Gas Hills Required Permits as of May 2014, and Table 1-4, Ruth Required Permits as of May 2014.

During the Reynolds Ranch amendment process, a Plan of Operations was submitted to the BLM in June 2009 in accordance with 43 CFR 3809. BLM approved the Plan of Operations on January 11, 2011. BLM performed an EA of the proposed amendment action, which was issued on January 7, 2011. NRC received the Reynolds Ranch amendment request in January 2005 and approved the amendment on January 31, 2007. Approval of the amendment request by WDEQ is pending.[11]

There have been numerous official consultations held with the following agencies during the course of obtaining approval to operate and continuing to operate Wyoming ISR facilities: US Fish and Wildlife Service (USFWS), Wyoming Game and Fish Department (WGFD), Wyoming State Historic Preservation Office (SHPO), BLM, and the US Army Corps of Engineers (USACE). A record of these consultations is provided in **Table 1-5, Agency Consultations.**

1.7 References

Cameco Resources. 2011. Permit to Mine 633, Cameco Resources, Smith Ranch-Highland Uranium Project, 2010-2011 Annual Report.

U.S. Department of Energy, Energy Information Administration (EIA), 2011. Domestic Uranium Production Report, Data for 2010, report date June 2011. Available from website on the Internet as of January 2012: http://www.eia.gov/cneaf/nuclear/dupr/dupr.html.

U.S. Nuclear Regulatory Commission. 1993. Approval of Amendment No. 46 to SUA-1511 to allow receipt and processing of third party yellowcake slurry at the Highland Central Processing Facility, March 15, 1993.

U.S. Nuclear Regulatory Commission. 2011. Draft Regulatory Issue Summary, *Policy Regarding Submittal of Amendments for Processing of Equivalent Feed at Licensed Uranium Recovery Facilities;* Federal Register Notice NRC-2011-0217, Page 60941, September 30, 2011.

World Nuclear Association (WNA). 2012. World Nuclear Power Reactors and Uranium Requirements. Report date January 1, 2012. Available from website on the Internet as of January 2012: http://www.world-nuclear.org/info/reactors.html.

[11] Approval was received with the approval of the WDEQ Smith Ranch-Highland Combo Permit Update application on March 10, 2014.

2.0 Alternatives

2.1 Detailed Description of the Alternatives

2.1.1 Proposed Action

As described in Section 1.0 **of this ER**, the proposed action is to renew SUA-1548 for an additional 10-year period. Approval of this proposed action will allow Cameco to continue ISR uranium recovery operations at Smith Ranch and commence construction and operation of the North Butte, Gas Hills and Ruth Remote Satellites.

As presented in Section 3.3 of the TR, the identified uranium ore bodies at Smith Ranch and the North Butte, Gas Hills, and Ruth Remote Satellites have been shown to be amenable to the ISR process. The ISR process involves the circulation of a recovery solution (lixiviant) consisting of native groundwater infused with oxidizing and complexing agents, which is pumped into the ore zone through injection wells. **The** uranium dissolves into the recovery solution and is pumped to the surface using recovery wells. The recovered solution is passed through pressurized, down-flow IX columns where the uranium attaches to synthetic IX resin **beads. The uranium** is **then** removed from the resin using a strong brine solution **and is concentrated in a pregnant eluate solution. The** uranium is then precipitated, washed, **dewatered** and dried into the final yellowcake **product**.

Once **the** uranium has been removed from the groundwater solution, this groundwater, less a small bleed rate which is treated and disposed, is re-infused with the oxidizing and complexing reagents and re-circulated through the recovery zone in a continuous process until the economically recoverable uranium resource in a given zone **has been depleted**. After uranium recovery is complete, groundwater in that area is restored to meet groundwater protection standards presented in 10 CFR 40, Appendix A, Criterion 5(B)(5) on a parameter-by-parameter basis using best practicable technology (BPT). If restoration activities are unable to achieve the background or maximum contaminant levels (whichever is greater) in Criterion 5(B)(5), a license amendment application request will be submitted to NRC for approval of alternate **concentration** limits (ACL), but only after demonstrating that there are no specific hazards and the restored constituent concentrations are as low as reasonably achievable (ALARA). After successful groundwater restoration has been achieved, all associated surface facilities will be subject to decontamination and decommissioning, and final reclamation requirements such that, ultimately, there will be no visual evidence of site use and the entire disturbance area can be released for "unrestricted use."

As part of this **renewal** application, Cameco is requesting **approval of** the following:

- Operations Plan for the Gas Hills Remote Satellite, including yellowcake slurry production, redesign of Evaporation Ponds 1 and 2, increase in satellite flow rate from 45,**418** to **49,200** liters/minute (12,000 to **13,000** gallons/minute) and the use of UIC Class I disposal wells, as defined later in this section.

- Operating Plan for the North Butte Remote Satellite, including redesigned surge ponds and satellite, increased satellite flow rate from **15,139** to **22,709** liters/minute (4,**000** to 6,000 gallons/minute), use of UIC Class I disposal wells, removal of the slurry and dried product option at the satellite, as defined later in this section.[1]

[1] **By letter dated October 12, 2011, Cameco notified NRC of North Butte construction plans, including construction of access roads, installation of one UIC deep disposal well and construction of the satellite building.**

- Flow rate increases at the Reynolds Ranch Satellite from 17,000 to **22,709** liters/minute (4,500 to 6,000 gallons/minute).

- Refurbishment of the Highland CPF to allow processing of up to **1.4 million** kilograms (**3 million** pounds) of dried yellowcake per year (approved into the license through the ORC/SERP process).

- Processing of toll shipments of slurried yellowcake from other licensed uranium recovery facilities at the **Smith Ranch and/or** Highland CPF. This action was previously evaluated by the NRC and approved on March 15, 1993 as Amendment 46 to Source and Byproduct Materials License SUA-1511 for the Highland Uranium Project.

With this ER, Cameco is presenting affected environment baseline data, a summary of potential impacts from the proposed action, and an evaluation of alternatives to the proposed action in accordance with NRC guidance provided in NUREG-1748. An environmental evaluation has also been completed. Cameco is requesting that the NRC approve the proposed action and environmental information and analysis for SUA-1548.

2.1.2 No-Action Alternative

10 CFR Part 51, as adopted by the NRC under NEPA, requires that Cameco assess the no-action alternative. If the NRC chooses to deny the renewal of SUA-1548, Cameco would be forced to cease recovery operations at Smith Ranch and complete groundwater restoration, decontamination and decommissioning, and reclamation in a timely manner, leaving a valuable mineral commodity undeveloped. This denial would also affect the continued development of mineral resources at the North Butte, Gas Hills, and Ruth Remote Satellites. Each of these three remote satellites would go into immediate reclamation. Cameco currently has contracts for the sale of SUA-1548 uranium to be used as fuel in nuclear reactors. Denial of the LRA will impair Cameco's ability to deliver on these contracts and will have an impact on both national and international efforts to become independent of fossil fuels as a power generation source. Finally, denial of this LRA would result in significant adverse financial and economic growth impacts to Converse, Campbell, Fremont, Johnson, and Natrona Counties, where the sites are located, due to loss of tax revenue and jobs.

2.1.3 Alternative Action

In contrast to the ISR process, alternative extraction methods would most likely follow a more conventional open pit or underground mining extraction system. Conventional mining practices have been historically employed within portions of the SUA-1548 license area, specifically: Smith Ranch (including Highland) and the Gas Hills. Conventional resource extraction would require creating an open pit or underground mine that extends down to the ore stratum. The uranium ore would be removed, loaded and transported to processing facilities. Historically, an open pit was used to develop a highwall face and underground techniques were employed to remove additional ore. Overburden is generally removed by heavy equipment through the processes of ripping, loading and hauling. Conversely, drilling and blasting techniques may also be used to further expose the ore body. Removed material, such as topsoil and overburden would need to be stockpiled adjacent to the mine pit and by so doing enlarge

By letter dated February 13, 2012, NRC recommended that Cameco use the Safety Environmental Review Panel (SERP) process to review the proposed construction activities. These activities were incorporated into the license by SERP on May 5, 2012 and June 13, 2012 (surge ponds). A revised operating plan for the North Butte Remote Satellite was developed and incorporated into the license by SERP in November 2012. Cameco commenced operations at the North Butte Remote Satellite in early 2013.

the disturbance footprint. Potential groundwater infiltration to the open pit will require this water be pumped from the pit area **and disposed** to maintain access to the desired ore stratum.

Conventional open pit extraction often incorporates the need for conventional processing facilities to upgrade the raw ore into a concentrated form. A conventional mill will include all operations required to accomplish this concentration process including crushers, solution tanks, and concentration facilities. Sulfuric acid and an organic solvent are the typical reagents used to remove the uranium from the sand **in a conventional milling process**. Mill waste is delivered to a tailings pond located near the conventional mill. The heap leach process is a technology that is considered to be part of the conventional mining and milling industry (NRC, 2009). Heap leaching includes placing ore in a heap and **percolating** the heap with an acid solution that separates the uranium from the ore. The uranium rich solution is then collected and transported to an IX or solvent extraction facility. Heap leaching requires some crushing and grading to build up the ore pile. Uranium recovery from heap leaching is expected to range from 50 to 80%, resulting in a final tailings material of around 0.01% U_3O_8 content. Once heap leaching is completed, the depleted materials are, **by regulatory definition**, 11e.(2) byproduct material that must be **disposed** in a tailings impoundment unless NRC grants an exemption for disposal in place. While impacts from heap leaching may be less than those from conventional milling, impacts from heap leaching are still greater than those associated with ISR processing. This type of alternative would increase potential environmental impacts and would increase the required effort needed to extract the ore content.

If uranium deposits exist at a depth too far below the surface for open pit extraction, underground mining techniques might be employed. These techniques would include a deep vertical shaft, cross cuts and drifts to provide access to the uranium ore. Typically, ventilation shafts, manways and haulage ways would be required. The nature of the process and depth of mining would require dewatering and surface discharge of the dewatered groundwater. Although this process would produce less waste material compared to open pit, worker safety, cost and the environmental effects of dewatering must be addressed.

From an environmental perspective, conventional underground and open pit production and the associated mills generate higher risks to employees, the public, and the environment. Radiological exposure to personnel in these processes is increased not only from the extraction process, but also from milling and the resultant mill tailings. Moreover, the personnel injury rate is traditionally much higher in open pit and underground extraction processes than has been the experience at ISR operations.

This ER compares the anticipated environmental impacts of the no-action alternative, the proposed action, and the alternative action as described above for all resource groups: land use, transportation, geology and soils, water resources, ecological resources, air quality, noise, historic and cultural resources, visual resources, socioeconomics, public and occupational health, and waste management. Section 4.0 **of this ER** presents the anticipated environmental impacts.

2.1.4 Reasonable Alternative Actions Considered but not Carried Forward for Detailed Analysis

2.1.4.1 Lixiviant Alternatives

A total of 24 years of operational experience at Smith Ranch and familiarity with several pilot programs prior to the commercial phase has shown that sodium carbonate/carbon dioxide lixiviant is very efficient at removing the uranium from the sandstone host rock with very little adverse environmental impact. At the North Butte Remote Satellite facility, the geology and mineralogy is similar to what is found at Smith

Ranch. Initial laboratory testing at the Cameco Research Center in Port Hope, Ontario suggests that the cores tested can achieve recovery rates as high as 80% with a standard 1.0 g/L sodium carbonate lixiviant utilizing gaseous oxygen or liquid hydrogen peroxide as an oxidant. Alternatively, native groundwater can be fortified with a carbonate complexing agent of sodium bicarbonate and/or gaseous carbon dioxide to which the oxidant is added. Specific ratios of carbonate and oxidant concentrations are determined and modified as necessary during production.

Alternate **lixiviants may** include ammonium carbonate solutions **or** strong acidic solutions. Both of these **lixiviant types** have been used in **previous** ISR operations, but are now rarely used because of the difficulties in restoring and stabilizing the affected ore zone aquifers. As discussed in the final Supplemental EIS for the Moore Ranch ISR Project (NRC, 2010a), acid-based lixiviants such as sulfuric acid dissolve heavy metals and other solids associated with uranium in the host rock creating chemical compounds that require additional remediation effort and have greater adverse environmental impacts. Strong acid lixiviants are now not considered to be viable options.

Ammonia-based lixiviants have been used in the past at ISR projects in Wyoming and other states. Operational experience has however, shown that ammonia adsorbs onto clay minerals associated with the uranium host rock and then slowly desorbs from the clay fractions during aquifer restoration (NRC, 2010a). At the **Willow Creek** ISR Project in Johnson County, Wyoming and ISR projects in other states, traces of the ammonium bicarbonate lixiviant have been shown to remain in the aquifer even after extensive aquifer restoration attempts. Because of this and the great consumptive use of groundwater needed to restore an ammoniated mine unit, an ammonia-based lixiviant is now not considered to be a viable option.

2.1.4.2 Waste Management Alternatives

The primary liquid waste management methodology for Smith Ranch **and the** remote satellite locations is via UIC Class I disposal wells in conjunction with storage/surge ponds and/or tanks to temporarily store the process liquid wastes prior to disposal. Geologic strata receiving these types of wastes are approximately 3,000 to 3,500 meters (9,000 to 10,000 feet) below the ground surface and are authorized by the State of Wyoming UIC Program and the US Environmental Protection Agency (EPA). An additional waste water disposal method at Smith Ranch consists of land application. Treated mine unit purge water is stored in a surface reservoir and land applied during the non-freezing months of the year. Deep well disposal is the only waste water disposal method proposed for the North Butte and Ruth Remote Satellite facilities. Evaporation ponds employing both conventional and enhanced evaporation are proposed at the Gas Hills Remote Satellite. Cameco is exploring the option of installing disposal wells at the Gas Hills Remote Satellite to augment the evaporation disposal method. Should a receiver formation be identified, a UIC permit will be obtained and the wells will be installed prior to ISR operations.

All radioactive solid wastes are transported off site and disposed at an NRC-licensed disposal facility. Cameco **maintains a disposal agreement** with **a minimum of one licensed disposal facility for the disposal of solid 11.e(2) byproduct materials. Should Cameco contract with a new disposal facility, NRC will be notified in accordance with License Condition 9.6 of SUA-1548.**

2.2 Cumulative Impacts

The assessment of cumulative impacts in NEPA documents is required by regulations initially established by the Council on Environmental Quality (CEQ). Cumulative impacts; however, are not often fully addressed in NEPA documents due to the difficulty in understanding the complexities of these impacts, a lack of available information on their consequences, and the desire to limit the scope of environmental analysis. Completing an exhaustive analysis of all impacts to all resource groups is neither practical nor required by regulations. The CEQ indicates that an analysis of cumulative impacts should instead focus on 'meaningful impacts'.

Section 4.0 **of this ER** contains the anticipated environmental impacts associated with the alternatives described above for all resource groups: land use, transportation, geology and soils, water resources, ecological resources, air quality, noise, historical and cultural resources, visual resources, socioeconomics, public and occupational health, and waste management. In addition, this section evaluates the impacts of the proposed project on low-income and minority populations. The cumulative impacts analysis discusses in greater detail those impacts that are considered to be meaningful. Meaningful cumulative impacts are discussed in relation to land use (Section 4.1), transportation (Section 4.2), **geology and soils (Section 4.3),** water resources (Section 4.4), air quality (Section 4.6), noise (Section 4.7), and socioeconomics (Section 4.10). The following sections describe development and activities in the vicinity of SUA-1548 and presents predictive estimates of development in the area as made by state and federal agencies.

With the exception of the Gas Hills Remote Satellite, all SUA-1548 license areas are located in the southern portion of the Powder River Basin (**Figure 2.1, Powder and Wind River Basins**). The Powder River Basin is primarily rural in nature with abundant reserves of natural resources. Development of these natural resources, including coal, oil and gas, coal bed methane (CBM), wind energy, and uranium, drive the economic growth of the region now and presumably in the near future. Along with the energy industry, agriculture, manufacturing, and tourism also contribute to the economy of this part of Wyoming.

The Gas Hills Remote Satellite is located approximately 145 kilometers (90 miles) west-southwest of the Smith Ranch CPP and is located in the Wind River Basin. The Powder River Basin and Wind River Basin are separated by the Casper Arch, a large, northwest trending asymmetric anticlinal structure that connects the Bighorn Mountains with the Laramie Mountains (WSGS, 2011). This region is differentiated from the Powder River Basin in several respects. Energy development in the Wind River Basin is limited to uranium mining, and oil and gas production. **The** dominant vegetation type also shifts from herbaceous grasslands to brushland. Because of the distance and physiographic differences between the Gas Hills Remote Satellite and all other SUA-1548 sites, the cumulative impact analysis separately addresses the Powder River and Wind River Basins.

2.2.1 Powder River Basin

The Powder River Basin of Wyoming and Montana is a major energy development area with diverse **ecological assets**. The Powder River Basin is the largest coal-producing region in the United States, and coal mined in this basin is used to generate electricity both within and outside the region. The Powder River Basin also has produced, and continues to produce large quantities of oil and natural gas resources. Within the last decade, this region has also experienced nationally significant development of CBM. Smith Ranch, the North Butte and Ruth Remote Satellites are all in the Powder River Basin, and the cumulative impacts associated with these sites are addressed in the following sections.

2.2.1.1 Uranium Production

Wyoming has been the nation's leading producer of uranium since 1995, and also hosts the nation's largest uranium reserves (WSGS, 2011). Numerous uranium recovery sites, both potential and existing, are present in the Powder River Basin. Three additional uranium recovery operations are currently licensed in the Powder River Basin. The Willow Creek ISR facility, formerly known as the

Christensen/Irigaray facility, is located in southeast Johnson County, approximately 145 kilometers (90 miles) north-northeast of Casper (**Figure 2.2, Regional Uranium Mining**). The Willow Creek facility is 16 kilometers (10 miles) northwest of the North Butte Remote Satellite. The NRC recently issued a license for the Moore Ranch ISR project, owned by Uranium One (dba Energy Minerals Corporation). The Moore Ranch Project is approximately 19 kilometers (12 miles) east of the Ruth Remote Satellite (SUA-1548). The Nichols Ranch ISR Project, operated by Uranerz, consists of the Nichols Ranch and Hank Unit properties, and is also licensed by NRC. The Nichols Ranch Project is approximately 8 kilometers (5 miles) south of the North Butte Remote Satellite and 18 kilometers (11 miles) north-northeast of the Ruth Remote Satellite.

Due to increased overall demand for energy in recent years, uranium spot prices increased from a low of $7 per pound in 2001 to over $138 per pound in 2007 and are currently (2011) around $52 per pound. Long-term contract prices are typically higher. In response to the increased price of uranium, additional uranium development is anticipated within the Powder River Basin. NRC expects to receive additional applications for new uranium recovery facilities, as well as requests for restarts and expansions of existing facilities. The actual number of the proposed developments that will become operational will depend on several factors, including uranium prices and approval of permits and licenses. A list of all major uranium recovery license applications and their associated status can be found in **Table 2-1, Major Uranium Recovery Licensing Applications**. The information in **Table 2-1** was last updated on October 12, 2011.

Absent any site-specific features that could preclude development of these other sites (e.g., historical and cultural resources), ISR operations at additional sites likely will result in essentially the same potential impacts analyzed in this ER for the proposed action. Development of these sites may produce cumulative effects by increasing or prolonging the impacts analyzed for the proposed action, but the impacts will be distributed proportionately throughout the region of influence and therefore are not expected to significantly increase the severity of any impact. Such impacts will be appropriately addressed through license and permit amendments when any development plans are finalized.

2.2.1.2 Coal Production

BLM recently completed a regional technical study, titled the Powder River Basin Coal Review (Coal Review). The Coal Review assesses cumulative impacts associated with past, present and reasonably foreseeable development in the Powder River Basin. For purposes of this study, the Wyoming portion of the Powder River Basin study area comprises all of Campbell County, all of Sheridan and Johnson Counties less the Bighorn National Forest lands to the west of the Powder River Basin, and the northern portion of Converse County. It includes all of the area administered by the BLM Buffalo Field Office, a portion of the area administered by the BLM High Plains District Office, and a portion of the Thunder Basin National Grasslands, which is administered by the US Forest Service (USFS). The goals of the Coal Review are to:

- Identify existing resource conditions in the Powder River Basin for the baseline year (2003) and, for applicable resources, update the BLM's 1996 status check for coal development in the Powder River Basin.
- Define past and present development activities in the Powder River Basin and their associated development levels as of 2003 and develop a forecast of reasonably foreseeable development in the Powder River Basin through 2020. The reasonably foreseeable activities fall into three broad categories: coal development; oil and gas development, including major

transportation pipelines; and other development, which includes development that is not energy-related as well as other energy-related development.

- Predict cumulative impacts that could be expected to occur to air, water, socioeconomics, and other resources if the development occurs as projected in the forecast developed under the second task.

For the purposes of this cumulative impact analysis, the Coal Review will be the foundation for the discussion of cumulative impacts as they relate to coal, oil and gas, CBM, and wind energy development in the Powder River Basin.

Past, present, and reasonably foreseeable development in the Wyoming Powder River Basin were considered in the Task 1 and Task 2 reports for the Coal Review. The Task 1 report describes the existing situation as of the end of 2003, which reflects the past and present levels of development. The Task 2 report defines the past and present development activities in the Powder River Basin as of the end of 2003 and projects reasonably foreseeable development in the Powder River Basin through 2020. Task 2 was updated based on actual levels of development through 2007 and current development estimates available through year 2009 (BLM, 2009).

There are currently 13 operating coal mines in the Wyoming Powder River Basin. The Coal Review has grouped coal development by subregion. Subregions 2 and 3 are within 80 kilometers (50 miles) of SUA-1548 sites. The coal projects associated with Subregions 2 and 3 are listed below:

- Subregion 2 (South Gillette) – Belle Ayr, Caballo, Coal Creek, and Cordero-Rojo mines.
- Subregion 3 (Wright) – Antelope, North Rochelle/Black Thunder, Jacobs Ranch, and North Antelope/Rochelle mines.

The closest of these coal mines to the SUA-1548 license boundary is Coal Creek, which is located approximately 52 kilometers (31 miles) from the North Butte Remote Satellite. From 1989 to 2008, coal production in the Powder River Basin increased by an average of 6% per year. In 2009, production from the Wyoming Powder River Basin coal mines dropped by about 7% from the 2008 levels, the first drop since the early 1990s. This drop coincided with a national coal production decline due to reduced industrial electricity demand in 2009.

Due to the variables associated with future coal production, two coal production levels (an upper and a lower production level) were projected for the Coal Review to bracket the most likely foreseeable regional coal production level and to provide a basis for quantification of associated impact-causing parameters. The basis for the projected production ranges included: 1) an analysis of historic Powder River Basin production levels in comparison to the gross domestic product (GDP) and national coal demand; 2) an analysis of current Powder River Basin coal market forecasts that model the impact of GDP growth, potential regulatory changes affecting coal fired power plants, and mining and transportation costs on Powder River Basin coal demand; 3) the availability, projected production cost, and quality of future mine-specific coal reserves within the Powder River Basin region; and, 4) the availability of adequate infrastructure for coal transportation. The projected upper and lower production levels subsequently were allocated to coal mine subregions in the Powder River Basin and to individual mines based on past market shares. Individual mine production levels were reviewed relative to potential future production constraints (e.g., loadout capacities), permitted production levels, mining costs, and coal quality.

The projected upper and lower production levels were allocated to individual mines based on past market shares. Then the projected future production was aggregated on a subregion basis. **Figure 2.3, Projected Coal Development in the Powder River Basin – Lower Limit** and **Figure 2.4, Projected Coal Development in the Powder River Basin – Upper Limit** graphically show the expansion of Wyoming coal development at the lower and upper production levels. **Table 2-2, Wyoming Powder River Basin Coal Development by Subregion** lists not only production projections, but also anticipated land disturbance acreage, reclamation status, employment and water consumption, and production associated with coal development in Subregions 2 and 3 (those within 80 kilometers [50 miles] of SUA-1548 sites).

There is no current or reasonably foreseeable coal development (conventional mining) near the SUA-1548 license areas, and therefore it is anticipated that these same uses will remain compatible with ISR uranium production.

2.2.1.3 Oil and Gas Production

According to the Coal Review, early oil exploration in the Powder River Basin was based on direct evidence of surface seeps or drilling anticlinal structures that were exposed on the surface. Oil was first produced from the Powder River Basin in 1887 from the Newcastle Formation on the east side of the Basin near Moorcroft (BLM, 2009). During the 1930s, low prices depressed exploration in the Basin. After World War II, a new round of exploration began with extensive use of seismic surveys to look for structural traps that could not be readily verified from surface mapping. In the 1960s and 1970s, drilling moved into deeper parts of the Basin as new and prolific oil fields were discovered in upper and lower Cretaceous rocks (BLM, 2009).

Within the Powder River Basin study area, conventional oil and gas activity has declined in the last 15 years with only 1,500 new wells over the period from 1990 to 2003. These wells include producing, injection, and wildcat (exploration) wells. The only significant discovery has been the African Swallow Field, discovered in 2000, which produced over a million barrels of oil and **396.5 million cubic meters** (14 billion **cubic** feet) of gas from two wells by the end of 2003 (BLM, 2009). As of the end of 2003, there were approximately 3,500 productive conventional oil and gas wells in the Wyoming Powder River Basin study area plus 1,386 seasonally active wells (BLM, 2009). **Figure 2.5 Regional Coal, CBM, Oil and Gas** shows the location of all wells (producing, non-producing, and plugged and abandoned). Approximately 13 million barrels of oil and 1 billion **cubic** meters (41 billion **cubic** feet) of conventional gas (20.24 million barrels of oil equivalent [BOE]) were produced from these wells in 2003 based on Wyoming Oil and Gas Conservation Commission (WOGCC) (2004) data; Information Handling Services (2004) data report approximately 13 million barrels of oil and approximately 1 billion **cubic** meters (41 billion **cubic** feet) of conventional gas. According to a 2002 estimate by the US Geological Survey (USGS), the mean undiscovered non-coal bed hydrocarbon resource in the Powder River Basin (including Montana) is 1.8 BOE (BLM, 2009).

By the end of 2007, there were approximately 3,857 productive conventional oil and gas wells in the Wyoming Powder River Basin study area plus an estimated 1,500 seasonally active wells (BLM, 2009). Approximately 11 million barrels of oil and 62 million **cubic** meters (22 billion **cubic** feet) of conventional gas were produced from these wells in 2007 based on WOGCC 2008 data (BLM, 2009).

The probability for new oil and gas activities (including CO_2 enhanced oil recovery and associated pipelines) to occur in the future is a certainty; however, the level of activity is uncertain. **Table 2-3, Projection of Conventional Oil and Gas Activity** summarizes the projected production, number of wells, and long-term disturbance associated with conventional oil and gas development through 2020. From 1990 to 2004, a total of approximately 1,500 wells were drilled in the study area (BLM, 2009). Of those, 60% were development wells drilled in established producing areas. The other 40% of wells were classified as wildcat wells or wells drilled outside of producing areas or wells drilled to test non-producing prospective zones in producing areas.

Oil and gas development has always been compatible with the extensive amount of energy development in the Powder River Basin and it is anticipated that these same uses will remain compatible with ISR uranium production.

2.2.1.4 Coal Bed Methane Production

According to the Coal Review, CBM activity began in the 1980s and it took a number of years to become commercially viable. The first commercial gas production directly from coal seams occurred in 1989 at Rawhide Butte north of Gillette (BLM, 2009). Annual submission of Applications for a Permit to Drill (APD) did not exceed 100 until 1992. Commercially viable production was proven in the late 1990s and the number of APD submitted began to soar: 561 in 1996, 808 in 1997, 1,494 in 1998, and 5,101 in 1999 (BLM, 2009). In the 1-year period from June 2003 to May 2004, over 6,700 APDs were received statewide by the WOGCC.

Development moved from the Gillette area and spread to the west and northwest. At the end of 2003, there were 14,758 producing CBM wells in the study area and total production for 2003 was 9.8 billion **cubic** meters (346 billion **cubic** feet), or 88% of the total gas production from the basin (BLM, 2009). From 1987 to 2003, the total cumulative gas production from Powder River Basin coals was over 34 billion **cubic** meters (1.2 trillion **cubic** feet). The total water production for the same time period was approximately 2.3 billion barrels. Annual methane production has increased rapidly since 1999 and as of 2003 appeared to have started to level off or even decrease. Water production decreased slightly; however, it still was more than 500 million barrels during 2003. In 2003, the average CBM production was **25.5** million **cubic** meters/day (900 million **cubic** feet/day) (BLM, 2009). CBM production appeared to have peaked from a high of 28 million **cubic** meters/day (977 million **cubic** feet/day) in October 2003 to **25.5** million cubic meters/day (899 million cubic feet/day) in March 2004 (BLM, 2009). In 2007, the annual CBM production was 12 million **cubic** meters (432 million **cubic** feet). CBM wells in the Wyoming Powder River Basin study area as of the end of 2007 are shown on **Figure 2.5**.

The future of CBM development is highly sensitive to the price of gas. For a number of years, Wyoming natural gas production has been affected by the so-called price differential. The price differential represents a difference in market value resulting from inadequate pipeline capacity to move Rocky Mountain region gas to markets outside of the area. Historically, the differential has been as high as $2.40 per million British thermal units (BTU) (BLM, 2009). Three hundred meters (1,000 feet) is roughly equivalent to 1 million BTU. The differential was somewhat eased in 2003 with the opening of the Kern River Pipeline expansion that moves gas from southwestern Wyoming, northwestern Colorado, and northeastern Utah. At that time, the differential went from $1.86 per million BTU to $0.60 per million BTU (BLM, 2009). However, the addition of the Kern River system capacity did not completely solve the differential problem.

As described in the Coal Review, the impacts to the CBM resource associated with various water disposal methods were evaluated in 2002. The recoverable CBM resource would be in the range of 760-820 billion **cubic** meters (**27**-29 trillion **cubic** feet) if the price differential drops and remains at $28.00 per 1,000 **cubic** meters ($0.80 per thousand **cubic** feet) or less, and gas prices in general remain at reasonable long-term levels ($125.00 per 1,000 **cubic** meters [$3.56 per thousand **cubic** feet or equivalent to crude oil at $25 per barrel]). In spite of recent record highs for crude oil, the forecast for crude oil prices **through 2025** is expected to **range from $87 to $100** per barrel (**World Bank, 2014**). The size of the differential would be dependent upon the magnitude of production capacity in the Wyoming Powder River Basin and available pipeline capacity to deliver the gas to external markets. As a comparison to the ARI estimate, the USGS (2002) estimated that the undiscovered CBM resource in the Powder River Basin is **396** trillion **cubic** meters (14.3 trillion **cubic** feet).

The amount of CBM activity appears to be at a lower rate than was forecast by earlier projections in the Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (BLM, 2009). New CBM well numbers fell from a high of slightly more than 4,600 in 2001 to approximately 2,000 in 2004. It is anticipated that the number of new wells would increase so that between 2010 and 2020 the number of new wells drilled per year basin-wide would range between 2,892 and 3,943. As shown in **Table 2-4, Projection of Coal Bed Methane Activity** there would be 31,943 CBM wells basin-wide by 2010, much lower than the over 40,000 wells predicted for the same time period in the Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (BLM, 2009). It is anticipated that production within the cumulative effects study area would increase from the 12 million **cubic** meters (432 million **cubic** feet) per year observed in 2007 to approximately 29 million **cubic** meters (1,026 million **cubic** feet) per year in 2020.

CBM has always been compatible with other energy development and agriculture, and it is anticipated that this same use will remain compatible with ISR uranium production.

2.2.1.5 Wind Energy Production

At the time of the Coal Review in 2009, no wind energy generating projects were in existence in the Powder River Basin. However, due to increasing concerns over global climate change, there is strong interest from consumers, investor-owned utilities, and environmental and economic sustainability groups in the development of wind energy and other forms of renewable energy projects. The current development interest in wind energy generation is driven in part by mandates for many utilities to increase the use of renewables in their overall energy portfolio, decisions by environmentally conscious firms to use renewable energy sources, and also due to the development of wind energy manufacturing infrastructure in the region.

Wyoming ranks among the top locations in terms of wind energy potential. Although much of the current Wyoming development is in the southern portion of the state, areas in both Converse and Campbell Counties offer sufficient potential to support commercial-scale wind generation projects. One such project currently in operation is a three-phase project in Converse County owned and operated by PacifiCorp. The first two phases, known as the Glenrock Wind Energy Project and the Rolling Hills Wind Energy Project, initiated construction in 2008 and began operations in 2008 and 2009, respectively (BLM, 2009). These projects are immediately adjacent to Smith Ranch (**Figure 2.6, Regional Power Generation**). The third, currently unnamed phase is anticipated to be constructed between 2009 and 2011, depending on market demands and the performance of the first two phases. Each phase consists of 66 wind turbine generators (each rated at 1.5 MW [99-MW total]) mounted on 80-meter (260 foot) tall tubular towers, plus ancillary support facilities (BLM, 2009).

Wind energy production is currently compatible with licensed activities at Smith Ranch and it is anticipated that these same uses will remain compatible with ISR uranium production as defined by this LRA.

2.2.1.6 Other Land Uses

Other land uses in the Powder River Basin include agriculture and recreation. Federal actions regarding land uses in the general region of SUA-1548 have been analyzed for environmental effects in numerous programmatic and project-specific EISs as listed in Tables 5.2-3, 5.2-4 and 5.2-5 of the ISR Generic EIS (**NUREG-1910**). The majority of the lands within 8 kilometers (5 miles) of Smith Ranch, the North Butte Remote Satellite, and the Ruth Remote Satellite are privately owned and recreational activities such as hunting are closely controlled.

Grazing is the primary agricultural land use in and around each of the SUA-1548 license areas in the Powder River Basin. The U.S. Department of Agriculture, National Agricultural Statistics Service (NASS) conducts a Census of Agriculture once every five years, most recently in 2007 (NASS, 2007). The Census of Agriculture collects information concerning all areas of farming and ranching operations including production expenses, market value of products and operator characteristics. **Table 2-5, Powder River Basin Livestock Grazing – 2007** presents data on cattle and calves, sheep and lambs as well as horses and ponies for Converse County (Smith Ranch), Campbell County (North Butte Remote Satellite), and Johnson County (Ruth Remote Satellite). Converse County ranks first among Wyoming's 23 counties for sheep and lamb production but significantly lower for cattle (12^{th}) and horses (18^{th}). Campbell County ranks 6^{th} for cattle and 5^{th} in the state for both sheep and horse production. Johnson County ranks 16^{th} in the state for cattle and 6^{th} and 12^{th} for sheep and horses, respectively (NASS, 2007).

These uses have always been compatible with the extensive amount of energy development and it is anticipated that these same uses will remain compatible with ISR uranium production.

2.2.2 Wind River Basin

The Wind River Basin is a semi-arid intermontane structural basin in central Wyoming. It is bounded by Laramide uplifts on all sides: Wind River Range on the west; Owl Creek Mountains on the North; the Casper Arch on the east; and the Sweetwater Uplift (Granite Range) to the south.

The thick interbasinal sedimentary formations are significant producers of petroleum and natural gas. The basin contains over 60 oil and gas fields mostly as structural traps within 17 different formations. The primary reservoirs include the Pennsylvanian Tensleep Sandstone, the Permian Phosphoria Formation and the Cretaceous Muddy Creek and Frontier Formations.

Unlike the Powder River Basin, there are no significant coal or wind energy projects in the Wind River Basin. The sections below describe current and projected future development in the Wind River Basin in the areas of uranium, oil and gas, and CBM.

The Gas Hills Remote Satellite is the only SUA-1548 satellite in the Wind River Basin (**Figure 2.1**). The discussion of cumulative impacts to follow is limited to impacts associated with the Gas Hills Remote Satellite.

2.2.2.1 Uranium Production

Uranium development within the Wind River Basin began in the early 1950s and continued until the decline in the market in the early 1980s. Nearly all of the historical production was conventional mining and included large surface mine pits, overburden and topsoil stockpiles, some underground mining, conventional milling and uranium heap leach facilities. The majority of these mines have been reclaimed or are in various stages of reclamation or abandonment depending on federal or state reclamation obligations and enforcement actions. The WDEQ Abandoned Mine Land (AML) Division is responsible for reclamation of eligible non-coal (i.e., uranium disturbances) **sites** within the Wind River Basin.

Uranium recovery is not presently active in the Wind River Basin. There are several reasonably foreseeable projects including the Gas Hills Remote Satellite that reflect different stages of the license and permit application process in the region. Major uranium resources and the associated development potential within the Wind River Basin are located in the Gas Hills, Jeffrey City and the Green Mountain areas.

In addition to the Gas Hills Remote Satellite, **Energy Fuels, Inc.** is in the process of permitting and licensing a Gas Hills Project within 10 kilometers (6 miles) **of the Gas Hills Remote Satellite**. A letter of intent for the Project was submitted to the NRC on November 19, 2010 (**Table 2-1**). According to **Table 2-1**, this project is **intended to be** a new conventional surface uranium mining and processing operation, and on February 10, 2011, the concept for a uranium recovery facility using heap leach **was presented** to the NRC at the site of the AML reclaimed Sagebrush Tablestakes Mining Area.

Energy Fuels is **also** in the process of licensing and permitting a heap leach facility in the Green Mountain area called the Sheep Mountain Project, located within 80 kilometers (50 miles) of the Gas Hills Remote Satellite (**Figure 2.2**). This area was previously disturbed by conventional mining and **Energy Fuels** is proposing both conventional surface and underground mining. The BLM Lander Field Office announced their intent to prepare an EIS on August 23, 2011. This announcement marked the beginning of the scoping process to solicit public comments regarding issues and resource information for the proposed Sheep Mountain Uranium Project in Fremont County. The Sheep Mountain Project will reclaim not only the past effects of historic mining, but will reclaim their new disturbance **as well**. The heap will be reclaimed in-place after the ore has been fully leached, rinsed of leachate, and drained. **A** pre-submittal audit meeting **was held** with the NRC in October 2011.

2.2.2.2 Oil and Gas Production

Conventional oil and natural gas as well as liquid natural gas are the primary (non-uranium) energy materials extracted within the Wind River Basin. Oil and gas development across the state is expected to remain stable or increase over the next 20 years with the majority of activity currently occurring, or predicted to occur, in areas open to leasing having very high, high, and moderate potential for future development of oil or gas reserves (BLM, 2009).

The USGS assessed both undiscovered conventional oil and gas and undiscovered continuous (unconventional) oil and gas in the Wind River Basin. The assessment is based on the geologic elements of each total petroleum system (TPS) defined in the province, including hydrocarbon source rocks (source-rock maturation, hydrocarbon generation, and migration), reservoir rocks (sequence stratigraphy and petrophysical properties), and hydrocarbon traps (trap formation and timing). The USGS assessment estimated 68 **billion cubic** meters (2.4 trillion **cubic** feet) of gas, 41 million barrels of oil, and 20.5 million barrels of total natural gas liquids for the three petroleum systems in the Wind River Basin. The majority of the undiscovered gas resource, 81% or 54 billion **cubic** meters (1.9 trillion **cubic** feet) of gas, is interpreted as continuous and is contained within the Cretaceous-Tertiary TPS. The continuous gas is contained within seven assessment units (AU) of the Cretaceous-Tertiary TPS including: Frontier-Muddy Continuous Gas AU **14** billion **cubic** meters (**494 billion cubic** feet of gas), Cody Sandstone Continuous Gas AU 3.4 billion **cubic** meters (**120 billion cubic** feet of gas), Mesaverde Meeteetse Sandstone Gas AU 1.2 trillion **cubic** meters (**42.4** trillion **cubic** feet of gas), Lance-Fort Union Sandstone Gas AU 11 billion **cubic** meters (**388.5 billion cubic** feet of gas), Mesaverde Coalbed Gas AU 3.1 billion **cubic** meters (**106 billion cubic** feet of gas), Meeteetse Coalbed Gas AU 6.1 trillion **cubic** meters (**212** trillion **cubic** feet of gas), and Fort Union Coalbed Gas AU 3.4 billion **cubic** meters (**106 billion cubic** feet of gas) (USGS, 2005).

Conventional oil and gas production occurs within the Gas Hills Uranium Mining District and within 10 kilometers (6 miles) of the Gas Hills Remote Satellite. All of the oil and gas producing formations are present within the mining district (USGS, 2005). The Dutton Anticline arch is located 5 kilometers (3 miles) north of the Gas Hills Remote Satellite. These uses have always been compatible with the extensive amount of conventional uranium mining and it is anticipated that these same uses will remain compatible with ISR uranium production.

2.2.2.3 Coal Bed Methane Production

As discussed in Section 2.2.1.4, the future of CBM development is highly sensitive to the price of gas. For a number of years, Wyoming natural gas production has been affected by the so-called price differential. The price differential represents a difference in market value resulting from inadequate pipeline capacity to move Rocky Mountain region gas to markets outside of the area. Historically, the differential has been as high as $2.40 per million BTU (Holcomb, 2003) (28 **cubic** meters or 1,000 **cubic** feet is roughly equivalent to 1 million BTU). The differential was somewhat eased in 2003 with the opening of the Kern River Pipeline expansion that moves gas from southwestern Wyoming, northwestern Colorado, and northeastern Utah. At that time, the differential went from $1.86 per million BTU to $0.60 per million BTU (BLM, 2009). However, the addition of the Kern River system capacity did not completely solve the differential problem.

As described in the Coal Review, the impacts to the CBM resource associated with various water disposal methods were evaluated in 2002. The recoverable CBM resource would be in the range of **566** to **821 billion cubic** meters (20 to 29 trillion **cubic** feet) if the price differential drops and remains at $28 **per** million **cubic** meters ($0.80 per million **cubic** feet) or less, and gas prices in general remain at reasonable long-term levels $125 per million **cubic** meters ($3.56 per million **cubic** feet). The size of the differential would be dependent upon the magnitude of production capacity in the Wyoming Powder River Basin and available pipeline capacity to deliver the gas to external markets. As a comparison to **this** estimate, the USGS (2002) estimated that the undiscovered CBM resource in the Powder River Basin is **396 billion cubic** meters (14.3 trillion **cubic** feet).

CBM development is currently taking place in the Wind River Basin (**Figure 2.7, CBM in the Wind River Basin**). There are three CBM fields approximately 56 to 72 kilometers (35 to 45 miles) due west of the Gas Hills Remote Satellite. The Beaver Creek field is 56 kilometers (35 miles) west of the Gas Hills Remote Satellite and is extracting CBM from the Mesa Verde Formation. The Riverton Dome and WC Fremont County-1 fields are 61 kilometers (38 miles) and 72 kilometers (45 miles) west of the Gas Hills Remote Satellite respectively. Similar to the Beaver Creek Field, these two fields extract CBM from the Mesa Verde Formation.

While CBM development is present in the Wind River Basin, the proven reserves are a fraction of the total U.S. reserves. Five small basins (Wind River, Illinois, Piceance, Gulf Coast and Forest City) combine to make up 0.3% of the total proven U.S. reserves. By contrast, the Powder River Basin contains 12.3% of the total proven U.S. reserves. The Potential Gas Committee released a report in 2006 entitled "Potential Supply of Natural Gas in the United States" (www.mines.edu/research/pga/index.html) containing recoverable resource estimates for CBM in the U.S. The recoverable resource estimates of CBM are those volumes which are potentially recoverable under existing and foreseen technological conditions. These resources have not yet been developed, and do not include proved reserves or cumulative production shown in the projected recoverable reserves across the U.S. The four north Rocky Mountain Basins (Wind River, North Central, Big Horn, and Williston) together comprise 3% of the projected U.S. reserves. In contrast, the Powder River Basin alone comprises 11% of the projected U.S. reserves. CBM development in the Wind River Basin is anticipated to be significantly less than that in the Powder River Basin.

There is no current or reasonably foreseeable CBM in the Gas Hills Uranium District or within 10 kilometers (6 miles) of the Gas Hills Remote Satellite (SUA-1548).

2.2.2.4 Other Land Uses

Other land uses in the Wind River Basin include agriculture and recreation. Since much of the land is federal surface, there is extensive grazing, hunting, and similar recreational uses. Grazing is the primary agricultural land use in and around the SUA-1548 sites in the Wind River Basin. The U.S. Department of Agriculture, National Agricultural Statistics Service conducts a Census of Agriculture once every 5 years, most recently in 2007 (NASS, 2007). The Census of Agriculture collects information concerning all areas of farming and ranching operations including production expenses, market value of products and operator characteristics. **Table 2-6, Wind River Basin Livestock Grazing – 2007** presents data on cattle and calves, sheep and lambs as well as horses and ponies for Freemont and Natrona Counties (Gas Hills Remote Satellite). Freemont County ranks 1st in the state for horse production, 2nd for cattle production, and 8th for sheep production. Natrona County ranks 4th in the state for sheep production and 10th and 13th in cattle and horse production respectively (NASS, 2007).

No fishing takes place on federal lands within the Gas Hills, and hunting is **typically** confined to antelope, **mule deer, elk,** and small game. These uses have always been compatible with the extensive amount of conventional uranium mining, and it is anticipated that these same uses will remain compatible with ISR uranium production.

2.3 Comparison of the Predicted Environmental Impacts

Table 2-7, Predicted Environmental Impacts provides a summary of the environmental impacts for the no-action alternative (Section 2.1.2), the proposed action (Section 2.1.1), and the alternative action (Section 2.1.3.). Environmental impacts are discussed in greater detail in Section 4.0.

2.4 References

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3.0 Description of Affected Environment

3.1 Land Use

3.1.1 Project Location

SUA-1548 covers all ISR activities at Smith Ranch (Smith Ranch, Highland and the Reynolds Ranch Satellite), the North Butte Remote Satellite, the Gas Hills Remote Satellite and the Ruth Remote Satellite (**Figure 1.1**). The Smith Ranch CPP, Highland CPF and the associated satellites (Satellite 1, Satellite 2, Satellite 3, SR-1, SR-2 and Reynolds Ranch) are located in the southern portion of the Powder River Basin in Converse County. These properties are approximately 40 kilometers (25 miles) north of Douglas and 39 kilometers (24 miles) northeast of Glenrock.

The North Butte Remote Satellite, also in the southern Powder River Basin, is in southwest Campbell County, approximately 80 kilometers (50 miles) north of Smith Ranch. The North Butte Remote Satellite is approximately 8 kilometers (5 miles) north of the Hank and Nichols Ranch uranium projects and approximately 16 kilometers (10 miles) southeast of the **Willow Creek (formerly the** Irigaray and Christenson Ranch) uranium project.

The Gas Hills Remote Satellite is located in Fremont County, and is approximately 150 kilometers (94 miles) west of the CPP at Smith Ranch. The Gas Hills is a historic uranium mining district and was conventionally mined from the early 1950s through the late 1970s. The majority of uranium mine reclamation was completed. Additional AML reclamation will be active through at least 2015. **Energy Fuels, Inc. (formerly** Strathmore Minerals Corp.) has interests **located** approximately 4 kilometers (2.5 miles) north of the Gas Hills Remote Satellite. Other proposed licensed facilities include the Sheep Mountain proposed heap leach and conventional mine (**Energy Fuels, Inc.) located** approximately 45 kilometers (28 miles) to the south-southwest.

The Ruth Remote Satellite is in Johnson County, and is located 23 kilometers (14 miles) south-southwest of the North Butte Remote Satellite, 11 kilometers (7 miles) south-southwest of the **Uranerz** Hank and Nichols Ranch uranium projects, and 19 kilometers (12 miles) west of the Uranium One Moore Ranch uranium project.

3.1.2 Regional Land Use

NRC Regulatory Guide 3.8 suggests that the impacts associated with the proposed action be evaluated for all areas within 80 kilometers (50 miles) of the site, (NRC, 1982). To provide consistency with this analysis, this section evaluates regional existing land use conditions within 80 kilometers (50 miles) of all properties covered under SUA-1548.

With the exception of the Gas Hills Remote Satellite, all properties within SUA-1548 are located in the southern portion of the Powder River Basin. The Powder River Basin is primarily rural with abundant reserves of natural resources. Development of these natural resources, including uranium, coal, oil and gas, CBM, and wind energy, drive the economic growth of the region now and presumably into the future. Along with the energy industry, agriculture, manufacturing and tourism also contribute to the economy of this part of Wyoming.

The Gas Hills Remote Satellite is located approximately 145 kilometers (90 miles) west-southwest of the other facilities, in the Wind River Basin. The Powder River Basin and the Wind River Basin are separated by the Casper Arch, a large, northwest trending asymmetric anticlinal structure that connects the Bighorn Mountains with the Laramie Mountains (WSGS, 2011b). This region is differentiated from the Powder River Basin in several respects. Energy development in the Gas Hills is limited to uranium mining and oil and gas production. Vegetation type also shifts from being dominated by herbaceous grasslands to brushland.

Land ownership was assessed within an 80 kilometer (50 mile) radius around all operations within SUA-1548 (**Figure 3.1.1, Regional Ownership**). In the case of the properties located within the Powder River Basin (Smith Ranch, North Butte Remote Satellite and Ruth Remote Satellite) the majority of the surrounding lands are privately owned (**Table 3.1-1, Regional Ownership**). Seventy percent of the land within 80 kilometers (50 miles) of Smith Ranch is privately owned as is a comparable portion around the North Butte Remote Satellite (71%) and the Ruth Remote Satellite (67%). The BLM and State of Wyoming own the majority of the remaining surrounding lands around these properties (**Table 3.1-1**). The Department of Defense, Bankhead Jones, the USFS and the U.S. Bureau of Reclamation all hold less than 5% of the lands within 80 kilometers (50 miles) of the above mentioned properties. The majority of the lands within 80 kilometers (50 miles) of the Gas Hills Remote Satellite are public lands administered by the BLM (63%) followed by private (25%) and the State of Wyoming (9%). The USFWS and Bureau of Indian Affairs each own less than 5% of the lands within 80 kilometers (50 miles) of the Gas Hills Remote Satellite. Smith Ranch (Reynolds Ranch Satellite) has an approved BLM Plan of Operations. **BLM** approval of **a** Plan of Operations, **EIS and associated Record of Decision (ROD)** for activities at the Gas Hills Remote Satellite **has been received by Cameco.**

3.1.3 Managed Lands

There are a series of managed and special use lands within 80 kilometers (50 miles) of properties within SUA-1548 (**Figure 3.1.2, Regional Managed Lands**). Glendo State Park is approximately 64 kilometers (40 miles) southeast of the Smith Ranch operations and is a popular outdoor recreation destination. Boating, water skiing, fishing, and camping are among the most common activities at the park. The Medicine Bow National Forest (Medicine Bow) is approximately 50 kilometers (31 miles) south of the Smith Ranch operations and covers nearly 445,000 hectares (1.1 million acres). Only a portion of the Medicine Bow is shown on **Figure 3.1.2**. A series of designated Special Interest Areas (SIA) occur within the Medicine Bow. The Ashenfelder Basin SIA is the closest SIA in proximity to the Smith Ranch and straddles the Converse and Albany County borders. The Ashenfelder Basin SIA is 834 hectares (2,062 acres) in size and received this designation because of the importance of the area to local plant species.

The Thunder Basin National Grassland (Thunder Basin), located in northeastern Wyoming, is in the Powder River Basin, between the Big Horn Mountains and the Black Hills. The 231,000 hectare (572,000 acre) national grassland is **located** approximately 6.4 kilometers (4 miles) northeast of the Smith Ranch operations and 24 kilometers (15 miles) east of the North Butte and Ruth Remote Satellites (**Figure 3.1.2**). Thunder Basin abounds with wildlife year-round, provides forage for livestock, and is underlain with vast mineral resources. Land patterns are very complex because federal, state, and private lands are intermingled. The Douglas Forest Service Ranger District administers Thunder Basin.

The Ed O. Taylor Wildlife Habitat Management Area (WHMA) is located 72 kilometers (45 miles) due west of the Ruth Remote Satellite. The Ed O. Taylor WHMA is a 4,111 hectare (10,158 acre) area purchased to ensure protection of winter range for elk, which summer in the Bighorn National Forest. In addition, this WHMA provides protection of year-round habitat for mule deer.

The Wind River Indian Reservation is **located** 56 kilometers (35 miles) northwest of the Gas Hills Remote Satellite, spans 890,000 hectares (2.2 million acres), and is home to 2,500 Eastern Shoshone and more than 5,000 Northern Arapaho Indians. Although the two tribes own and govern the reservation jointly, most of the Shoshone live in the western half around Fort Washakie, while the Arapaho are centered near Ethete and Arapahoe.

The Sand Mesa WHMA and Boysen State Park are also approximately 56 kilometers (35 miles) northwest of the Gas Hills Remote Satellite. The Sand Mesa WHMA contains 142 hectares (350 acres) of wetlands that not only serve as habitat for waterfowl, but also filter runoff from surrounding lands. Boysen State Park is surrounded by the Wind River Indian Reservation and offers both day-use and overnight camping facilities. Boysen Reservoir is well-known as one of Wyoming's best walleye and trout fisheries.

The Pathfinder National Wildlife Refuge and Devil's Gate trail landmark are both approximately 43 kilometers (27 miles) southeast of the Gas Hills Remote Satellite. The Pathfinder National Wildlife Refuge consists of four small units totaling 6,801 hectares (16,807 acres) and is an important waterfowl migration stopover on the western edge of the Central Flyway. Devil's Gate is a major trail landmark along the Sweetwater River on both the Mormon and Oregon Trails.

3.1.4 Major Land Resource Area

Major Land Resource Areas (MLRA) are geographically associated land resource units delineated by the Natural Resources Conservation Service and characterized by a particular pattern that combines soils, water, climate, vegetation, land use, and type of farming. There are 204 MLRAs in the United States, ranging in size from less than 202,000 hectares (500,000 acres) to more than 24 million hectares (60 million acres). The majority of the lands within SUA-1548 are within MLRA 58B – the southern part of the Northern Rolling High Plains (**Figure 3.1.3, Regional MLRA**). This includes the Smith Ranch operations and the North Butte and Ruth Remote Satellites. The Gas Hills Remote Satellite is located within MLRA 34A – The Cool Central Desertic Basins and Plateaus.

MLRA 58B spans from Wyoming (95%) into Montana (5%), containing about 5 million hectares (19,300 square miles). Interstate 90 (I-90) crosses the northern third of this area from east to west, and Interstate 25 (I-25) crosses the western third from north to south. Most of the Powder River Basin is in this area. The Powder River Basin contains important coal, CBM, oil, and gas deposits.

Following are the various land use types, land ownership and percentage in MLRA 58B:

- Cropland—private, 4%
- Grassland—private, 76%; federal, 16%
- Forest—federal, 1%
- Urban development—private, 1%
- Other—private, 2%

More than 90% of MLRA 58B supports native grasses and shrubs grazed by cattle and sheep. Approximately 4% is dry-farmed in a wheat-summer fallow rotation. The dry-farmed areas occur mainly on gently sloping hills providing deep soils. Narrow strips of land along the Tongue, Powder, and Platte Rivers and some of their tributaries are irrigated. Alfalfa, other hay crops, and feed grains are the principal crops. Some land tracts are used as tame pasture. Open stands of ponderosa pine grow on the higher buttes and steep slopes that receive higher amounts of precipitation where local wildlife may inhabit.

The Gas Hills Remote Satellite is located within MLRA 34A. MLRA 34A is in Wyoming (85%), Colorado (13%), and Utah (2%) and contains approximately 8.55 million hectares (33,005 square miles). Interstate 80 (I-80) bisects the northern part of this MLRA.

Following are the various land use types, land ownership and percentage in MLRA 34A:

- Cropland—private, 2%
- Grassland—private, 27%; federal, 67%
- Forest—federal, 1%
- Urban development—private, 1%
- Other—private, 1%; federal, 1%

A little more than two-thirds of MLRA 34A consists of federal surface with the remaining being private or state-owned lands. Most of the land is used for grazing by sheep and cattle. Hunting also is an important land use. The rangeland consists of shrubs and cool-season grasses. About 2% of the area is cropland. Areas of irrigated hay and pasture occur mostly along the few large rivers or streams. Non-irrigated small grain crops are grown in small areas near Craig and Meeker, Colorado, where the annual precipitation is more than 0.33 meters (13 inches), the frost-free period is more than 75 days, the soils commonly are deep, and grain marketing facilities are nearby.

3.1.5 Regional Energy Development

With the exception of the Gas Hills Remote Satellite, all SUA-1548 lands are located in the southern portion of the Powder River Basin (**Figure 2.1**). The Powder River Basin is primarily rural in nature with abundant reserves of natural resources. Development of these natural resources, including coal, oil and gas, CBM, wind energy and uranium, drive the economic growth of the region now and presumably in the near future.

The Gas Hills Remote Satellite is located approximately 145 kilometers (90 miles) west-southwest of the other facilities, in the Wind River Basin. The Powder River Basin and Wind River Basin are separated by the Casper Arch, a large, northwest trending asymmetric anticlinal structure that connects the Bighorn Mountains with the Laramie Mountains (WSGS, 2011b). This region is differentiated from the Powder River Basin in several respects. Energy development in the Wind River Basin is limited to uranium mining and oil and gas production. Dominant vegetation type also shifts from herbaceous grasslands to brushland. Section 2.2 describes, in detail, existing and projected energy development in both the Powder River Basin and the Wind River Basin.

3.1.6 Smith Ranch

3.1.6.1 Local Land Use

The Smith Ranch operation consists of Smith Ranch, Highland and the Reynolds Ranch Satellite. Section 2.2 of NRC Regulatory Guide 3.4.6 suggests the evaluation of land use be within 8 kilometers (5 miles) from the center of the site. The majority of the lands within the license boundary of the Smith Ranch operations are private (84%). The remaining 10% and 6% are owned by the State of Wyoming and the BLM, respectively (**Figure 3.1.4, Smith Ranch Ownership**).

Historically, the area was homesteaded and dry-land farmed. Many of these dry farmed areas were ultimately abandoned and left to revegetate by natural processes or were seeded with crested wheatgrass or other grasses for grazing purposes. **Several ranches remain in the area and are within 8 kilometers (5 miles) of Smith Ranch. The legal description for the occupied ranch residences is provided below. The location of the ranch residences is shown on Figure 3.1.4.**

Ranch Name	Ranch PLSS Location
Vollman Ranch	NE, NE, Section 27, T36N, R73W
Fowler Ranch	SE, SE, Section 9, T36N, R72W
Bonner Ranch	SE, SW, Section 17, T37N, R72W
Duck Creek Ranch	SW, NW, Section 2, T37N, R74W
Sundquist Ranch	NW, NE, Section 27, T36N, R73W
Lenzen Ranch	NE, SW, Section 12, T35N, R74W
Manning Ranch	SE, SW, Section 17, T37N, R72W
Layton Ranch	SE, SE, Section 13, T34N, R74W
Negley Ranch	SE, NE, Section 11, T34N, R74W
Keenen Ranch	NE, SE, Section 9, T34N, R74W
Hylton Ranch	SE, NE, Section 14, T34N, R75W
W Reynolds Ranch	SE, NE, Section 22, T37N, R73W

Today the area remains remote and contains a low population density, primarily dominated by agricultural pursuits (Figure D1-1 and Plate D1-1 in Appendix D1 of the Smith Ranch WDEQ Permit). The majority of people living in the area reside on dispersed ranches. Sheep and cattle grazing comprise the major past and present land use in the area and at the project site. According to the 2007 Census of Agriculture, agricultural uses of 960,000 hectares (2.37 million acres) account for 86.4% of the total surface area and grazing is the dominant use. Per the Wyoming Department of State Lands records, grazing leases are limited to one animal unit month per 1.6 hectares (4 acres) of land surface.

The National Agricultural Statistics Service released a crop-specific land cover classification dataset encompassing the entire conterminous United States. The Cropland Data Layer (CDL) depicts type and location for crops planted during the summer 2009 growing season. The GIS-based dataset reports both agricultural and non-agricultural land use via a 56-meter resolution raster and merges non-agricultural land use types from the National Land Cover Dataset (NLCD) with a crop-specific raster analysis of agricultural production. **Figure 3.1.5, Smith Ranch Cropland Data Layer**, presents the CDL data for the Smith Ranch operations and an **8** kilometer (**5** mile) radius around each. The majority of the site and surrounding areas contain shrublands, described in the NLCD as shrub/scrub and herbaceous grasslands. There are areas identified as fallow or idle cropland, hay and alfalfa production in isolated pockets in both the northeast and southern portion of the license area (**Figure 3.1.5**).

Due to the potential for harsh winter conditions at the site most livestock are moved off the area and closer to the Platte River for wintering. Although sheep and cattle are the primary domestic stock in the area, many varieties of native wildlife also utilize the area. Thus, the present use is periodic grazing by domestic livestock and concurrent use by wildlife. See Section 3.5.2 for a more detailed discussion of native wildlife.

Several oil and gas companies have begun enhanced oil recovery programs at existing oil fields in Converse County. After receiving environmental approval, Australia-based Linc Energy will start enhanced oil recovery at its Wyoming oil fields by injecting carbon dioxide into the South Glenrock B Unit 34 in the Powder River Basin.

Exploration for gas production from the Niobrara Shale is occurring near Smith Ranch. The target formation (Niobrara Shale) for drilling is significantly deeper than the uranium-bearing zone (Wastach Formation) where the ISR operations are producing. The Cretaceous Age Niobrara is separated from the Tertiary Wasatch by the thick, marine Pierre Shale. Finally, although the Niobrara play has been successful in the Colorado Denver-Julesburg Basin, the oil and gas production potential from the Niobrara in the Powder River Basin is still debatable.

Surface disturbances at Smith Ranch are detailed in Section 3.3.4.1. Total surface disturbance as of 2010 is 571 hectares (1,410 acres) and is comprised of disturbance associated with buildings, roads, ponds, irrigation areas, and mine units.

3.1.6.2 Past Development Activities

From the 1970s to the early 1980s, areas within and adjacent to Smith Ranch were extensively mined for uranium. Both surface and underground mining methods were employed in the area, with the majority of uranium ore being recovered by surface mining methods. From the early 1970s through the mid-1980s, companies such as Bear Creek Uranium, Kerr McGee Nuclear, RAMC, The Tennessee Valley Authority (TVA), and Exxon Minerals produced uranium from the sandstone deposits within or near the license boundary. Most of these mines were shut down and/or reclaimed by 1985 because of poor uranium market conditions. Past mining disturbance areas are presented on Plate D1-3 in the Smith Ranch WDEQ Permit.

There were two open pit mines located north of Smith Ranch. These mines were in Sections 3, 28 and 33, T37N, R73W, and were mined under Permit to Mine 304-C. The mined areas were reclaimed and revegetation was completed and verified. A release request for the reclaimed areas was included in the March 25, 1994 annual report/bond submittal for Permit 304-C.

Highland is located adjacent to portions of the reclaimed Exxon Highland Uranium Mine, which used conventional open pit and underground mining methods, and was in operation from 1971 to 1984. The underground mine was shut down and the shaft sealed by 1985. In 1985, Exxon sold their remaining uranium reserves to Everest Minerals Corp. (Everest) who developed the Highland ISR project, which began commercial ISR uranium production in 1988.

Also during this time period, Silver King Mines, Inc. operated an underground uranium mine for the TVA in the Section 14 area of the Highland property (North Morton Ranch mine) during the late 1970s and early 1980s. The mine was shut down and the shaft sealed in the mid-1980s. Everest acquired the reclaimed property from the TVA, which allowed expansion of the Highland operation to the west in 1989. Between 1989 and 2000, Highland produced approximately 450,000 kilograms (1 million pounds) of uranium per year. Cameco acquired PRI and Highland in 1997. Cameco subsequently acquired Smith Ranch in 2002 and received NRC authorization to combine the two licenses in 2003.

The Reynolds Ranch Satellite area was previously owned by Solution Mining Corporation (SMC). During 1980 to 1990, SMC installed wells, collected water quality data and performed two aquifer tests within the Reynolds Ranch Satellite. SMC never permitted the property, which was subsequently purchased by RAMC and then PRI. The property was amended into SUA-1548 in 2007. The regional groundwater data collected by SMC is provided in Appendix D6, Addendum C of the WDEQ Permit. Recent well installation and groundwater quality information are also included in Appendix D6, Addendum C of the WDEQ Permit.

3.1.7 North Butte

3.1.7.1 Local Land Use

The area immediately surrounding the North Butte Remote Satellite includes predominantly private land, although there are parcels of state- and federal (BLM)-owned land. Lands within 8 kilometers (5 miles) of the project are 2% BLM, 6% State of Wyoming, and 92% private **(Figure 3.1.6, North Butte**

Ownership). Even with federal ownership of land within the surrounding area, recreational use is limited. Private landowners control access to the federal and state parcels of land and therefore limit access for recreational purposes. Hunting of antelope and mule deer is permitted by landowner consent only. Sage grouse are also hunted to a limited extent. Fishing activity within the area is non-existent as there are no lakes, streams, or rivers that provide adequate habitat.

The initial settlement of the Pumpkin Butte area began in the late 1870s after the tribes were relocated on their respective reservations. The area was homesteaded and many small cattle ranches operated in the area, but today the majority of the smaller land holdings have been consolidated into large ranches, e.g., Christensen Ranch and T-Chair. Currently, only three ranches are within 8 kilometers (5 miles) of the license boundary. The Pfister Ranch residence (T44N, R75W, Section 19 SESW) is located just south of the southern license boundary. The Christensen Ranch residence (T44N, R76W, Section 21, NWSE) is located west of North Butte. The Pumpkin Butte Ranch residence (T43N, R75W, Section 4, NENW) is located southeast of the North Butte Satellite and east of North Middle Butte. All of the ranch residences are occupied. The location of the ranch residences is shown on Figure 3.1.6.

The National Agricultural Statistics Service CDL for this area depicts type and location for crops planted during the summer 2009 growing season. For a more detailed explanation of the CDL dataset, see Section 3.1.6.1. Similar to Smith Ranch, the majority of the lands in and around the North Butte Remote Satellite are shrublands, described in the NLCD as shrub/scrub and herbaceous grasslands. There are pockets of fallow or idle cropland and other hay lands to the east. Woodlands are located both northwest and southeast of the North Butte Remote Satellite (**Figure 3.1.7, North Butte Cropland Data Layer**).

Cattle and sheep ranching is the major land use in the region surrounding the North Butte Remote Satellite. Approximately 94% of the land in the Powder River Basin is classified as rangeland. Native rangeland vegetation provides the majority of the livestock forage in the region. Major native forage species are blue grama grass (*Bouteloua gracilis*), western wheatgrass (*Agropyron smithii*), needlegrasses (*Stipa* spp.), prairie junegrass (*Koeleria cristata*), and numerous forbs.

Livestock production was the leading industry of Campbell County prior to the mineral and mining development. Grazing of livestock is still a major industry as Campbell County is ranked fifth in the state for all cattle and for breeding sheep with a livestock inventory value of $99.9M in 2006 (Campbell County Natural Resource and Land Use Plan, 2007).

Proven methods of livestock grazing continue to maintain the health and productivity of grazing lands and provide improved wildlife habitat, healthy watersheds, and soil erosion control. A large part of Campbell County's present and future economic viability is strongly tied to the land and its productivity. There is no prime farmland located within the North Butte Remote Satellite.

Surface disturbances at the North Butte Remote Satellite are detailed in Section 3.3.4.2. Total surface disturbance as of 2010 is 12.3 hectares (30.5 acres) and is comprised of disturbance associated with an on-site single-wide trailer and several monitor wells.

In 2007, the Powder River Basin CBM field produced 12.5 billion cubic meters (442 billion cubic feet) of gas, making the field the third largest source of natural gas in the United States. In the vicinity of the North Butte Remote Satellite, CBM groundwater production generally began in 2008. The closest CBM wells to the project area are located within the Anadarko Petroleum Corporation's Dry Willow Phase I, II, and III Plan of Development areas. The North Butte Remote Satellite area includes portions of the Dry Willow Phase I and II developments. The future Dry Willow III development is located immediately south and west of the North Butte Remote Satellite permit boundary. The CBM industry does not discharge nor impound byproduct water to surface drainages that pass through the North Butte license area. A total of 119 existing and planned CBM wells were identified and included as part of an impact assessment prepared by Aqui-Ver, Inc. (2011). This assessment is presented in Section 4.4.

When the Atomic Energy Commission began looking in 1946 for domestic sources of uranium, it guaranteed a market and tempted prospectors with bonuses. Since uranium had been known in Wyoming since 1918, people bought Geiger counters and went hunting. The uranium they found varied from high-grade in eastern Fremont County to low-grade in the Pumpkin Buttes area of Campbell County and what they found was 35% of this nation's known uranium reserves. Several uranium projects are ongoing in the Powder River Basin and in the vicinity of the North Butte Remote Satellite. Nichols Ranch facility is located southwest of the project site and the Willow Creek Project (Christensen Ranch and Irigary) is located northwest of the site. The Moore Ranch ISR uranium project is southeast of the North Butte Remote Satellite.

3.1.8 Gas Hills

3.1.8.1 Local Land Use

The Gas Hills Remote Satellite and the surrounding area are composed of predominantly public lands administered by the BLM, although there are parcels of state- and private-owned land. Lands within 8 kilometers (5 miles) of this satellite are 85% BLM, 7% State of Wyoming, and 8% private (**Figure 3.1.8, Gas Hills Ownership**). The BLM currently authorizes grazing on public land for sheep and cattle. Other small parcels of privately and state-owned land are also located within the Gas Hills Remote Satellite license area.

The Gas Hills region was never extensively settled as indicated by the above cited percentage of public land in the area. The nearest occupied residence is the JE Ranch (T34N, R88W, Section 32, NENW). The location of the ranch residence is shown on Figure 3.1.8.

In addition to agriculture, the area surrounding the Gas Hills Remote Satellite has been used for a number of purposes including conventional uranium mining, oil and gas, and recreational hunting. Mine reclamation activities (heavy construction) are ongoing within the Gas Hills District. The area has also seen production of oil and gas, although there is currently no production of oil and gas within 3 kilometers (2 miles) of the proposed satellite license boundary. The area is also used for recreational activities, including hunting, and is an important wildlife habitat for mule deer and pronghorn antelope.

The National Agricultural Statistics Service CDL for this area depicts type and location for crops planted during the summer 2009 growing season. For a more detailed explanation of the CDL dataset, see Section 3.1.6.1. The majority of the lands in and around the Gas Hills Remote Satellite are shrublands. There are pockets of herbaceous grasslands, evergreen forests and barren land intermixed. Woodlands are located along the southern boundary of the Gas Hills Remote Satellite property (**Figure 3.1.9, Gas Hills Cropland Data Layer**).

Surface disturbances at the Gas Hills Remote Satellite are detailed in Section 3.3.4.3. Total surface disturbance as of 2010 is 40 hectares (97.9 acres) and is comprised of disturbance associated with buildings, roads and monitor wells.

3.1.8.2 Past Development Activities

The Gas Hills Uranium District has been exploited for its uranium reserves by a number of companies, and has produced more than **45,400 metric tons** (50,000 tons) of ore over the last 40 years. Most of the mines and processing facilities involved in these activities have been, or are being, decommissioned and reclaimed. In summary, the District's current and previously exploited uranium reserves account for approximately 12% of the Nation's reserves. The District is remotely located, being near the geographical center of Wyoming in eastern Fremont and western Natrona Counties. The mineralized subsurface encompasses an area of approximately 260 square kilometers (100 square miles).

Of the approximately 3,458 hectares (8,538 acres) within the Gas Hills Satellite license boundary, approximately 15%, or 518 hectares (1,281 acres), have been previously disturbed by underground and/or surface mining activities. Additionally, exploration drilling (at least 14,000 exploration drillholes) and associated access road construction has previously disturbed an additional 105 hectares (260 acres) within the license boundary. In summary approximately 624 hectares (1,541 acres) (18%) within the license boundary has been previously disturbed by past mining and exploration efforts. Many of the historical drilling roads remain unreclaimed.

The former Umetco Minerals Corporation (Umetco) Gas Hills Project facility is located on the border between Fremont and Natrona Counties, near proposed Mine Unit 5. The site, including the tailings disposal and heap leach areas, covers approximately 777 hectares (1,920 acres), of which Umetco owns 113 hectares (280 acres) and the remaining area is under the jurisdiction of the BLM. The facility was constructed in 1959, and operations began in 1960. Additionally, heap leach activities at the site began in 1963. Mill operations were put into standby status in 1984 and later shut down in 1987. Reclamation was completed in 2006. Figure 3.1.9.1, Umetco/Mine Unit 5 Location Map shows the Umetco surface features, including monitoring wells, within a 2 kilometer (1.2 miles) radius of Mine Unit 5.

The 14 historical open pit and underground mining operations are further described within Appendix D1 and are illustrated on Plates D1-E and D1-W in the Gas Hills WDEQ Permit. Areas previously disturbed by mining are also discussed in Appendix D6, Table D6-1-1 and outlined on Plate D6-1 of the Gas Hills WDEQ Permit.

3.1.9 Ruth

The Ruth Remote Satellite is located 19 kilometers (12 miles) south-southwest of the North Butte Remote Satellite. The majority of the surrounding lands are privately owned. Lands within 8 kilometers (5 miles) of this satellite are 88% private, 6% State of Wyoming, and 6% BLM (**Figure 3.1.10, Ruth Ownership**).

The National Agricultural Statistics Service CDL for this area depicts type and location for crops planted during the summer 2009 growing season. For a more detailed explanation of the CDL dataset, see Section 3.1.6.1. The majority of the lands in and around the Ruth Remote Satellite are herbaceous grasslands. There are pockets of shrubland both within the license boundary and within an 8 kilometer (5 mile) radius. Scattered areas of woody wetlands run along a north-south line through the middle of the license boundary and extend out into the 8 kilometer (5 mile) radius to the southeast (**Figure 3.1.11, Ruth Cropland Data Layer**). Hay production occurs in pockets in the southeast, southwest and northerly directions, but outside of the license boundary.

Surface disturbances at the Ruth Remote Satellite are detailed in Section 3.3.4.4. Total surface disturbance as of 2010 is 1.7 hectares (4.3 acres) and is comprised of disturbance associated with buildings, roads, ponds, and monitor wells.

Local land uses include cattle and sheep grazing, limited hunting, uranium ISR operations and CBM production. Since Ruth and North Butte Remote Satellites are close, please refer to the discussion presented above (Section 3.1.7) for more detail on both historical and current land use within the Ruth Remote Satellite area. Development of the Ruth Remote Satellite is anticipated to begin near the end of the next renewal period.

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3.2 Transportation

The previous SUA-1548 license renewal was approved in 2001 and does not address impacts to transportation resulting from operations at SUA-1548 facilities. The following sections describe the affected environment as it relates to individual site access and regional transportation corridors.

3.2.1 Smith Ranch

The main office complex, CPP and Highland CPF are at Smith Ranch, approximately 27 kilometers (17 miles) by air and 35 kilometers (22 miles) by road northeast of the town of Glenrock and 40 kilometers (25 miles) by road northwest of Douglas. From the intersection of State Highway 93 and State Highway 95 access can be achieved via Converse County Road 31 (Ross Road). **Figure 1.1** shows the general project location in addition to the existing transportation route into Smith Ranch. The two processing facilities are approximately 14 kilometers (9 miles) away.

Shipments of uranium-laden resin or yellowcake slurry will be transported from each of the three remote satellites (North Butte, Gas Hills and Ruth) to the CPP or CPF, where it will be processed into dried yellowcake. **Table 3.2-1, Smith Ranch Material Shipments and Deliveries** details the estimated annual frequency of deliveries and shipments associated with the CPP. All toll milling shipments were included in projected traffic counts. The existing traffic conditions associated with each transportation route to the CPP or CPF are discussed below under the individual satellite location.

According to the Wyoming Department of Transportation (WYDOT) Monthly Automatic Traffic Recorder Report for 2010, State Highway 59 north of Douglas (east of the Smith Ranch Project) sees 1,900 cars per day. State Highway 18/20 east of Orin Junction (southeast of the Smith Ranch Project) sees 2,200 cars per day, and I-25 west of Glenrock (west of the Smith Ranch Project) sees 8,049 cars per day (WYDOT, 2010). **WYDOT's study in 2012 indicated that the junction of Highways 93 and 95 (approximately 13 kilometers [8 miles] southeast of the Smith Ranch entrance) sees 186 cars per day (WYDOT, 2012). According to Converse County Road and Bridge's 2012 traffic study of Ross Road and County Road 31 leading to Ross Road see 967 vehicles per day (Converse County, 2012).** All daily traffic estimates are based on monthly averages.

Yellowcake product shipments will travel from the processing facility to a **uranium** conversion facility **located either** at **Metropolis, Illinois or** Port Hope, Ontario, Canada by common carrier. Major interstate transportation routes are expected to be used for these shipments, which are required to follow NRC packaging and transportation regulations in 10 CFR Part 71 and DOT hazardous material transportation regulations at 49 CFR Parts 171–189. From the CPP or CPF, the distance travelled is approximately 2,736 kilometers (1,700 miles). The preferred route will be determined by the common carrier but most likely would be the Ross Road or the Highland Loop Road to Highway 93; thence Highway 93 to Douglas; thence I-25 to Cheyenne; thence I-80/Highway 94 to Marshall, Michigan; thence I-69 to Lansing, Michigan; thence Highway 402 to London, Ontario; thence Highway 401 to Port Hope, Ontario. Resin and yellowcake slurry shipments are made in accordance with DOT and NRC regulations. Dried yellowcake shipments are made in accordance with DOT, NRC and Transport Canada regulations. All shipments are classified as Low Specific Activity (LSA) material. Mitigation measures designed to reduce transportation risk to a minimum are detailed in Section 5.2.

Operations and support at Smith Ranch are expected to require approximately 170 people to operate the **facility** through the next 15 years of production activity. Currently they employ approximately 150 people. The staffing requirements will start to taper off after 15 years as the activities shift to predominantly groundwater restoration and surface reclamation and less uranium processing activities. **A lower rate of impacts from vehicles has been predicted during final project restoration, and decommissioning phases as fewer employees will be driving to the site each day.** The staff lives in predominantly three communities, Douglas, Glenrock, and Casper. The percentage split among the three communities is approximately 40% each for Douglas and Glenrock with the remaining 20% residing in Casper.

Vehicle transport to the facility will continue to be employee-owned vehicles. Based on site information, one can assume that cars averaging two persons per trip represent 60% of the site trips and pickups, averaging one person per site trip, represent 40% of the site trips.

The transportation route from Douglas will be as follows (see **Figure 3.2.1, Regional Transportation**):

- Highway 93 North to Ross Road (paved road) — 28 kilometers (18 miles)
- Left on Ross Road (County Road #31) (paved road) — 11 kilometers (7 miles)
- Right turn to 762 Ross Road

The transportation route from Glenrock will be as follows:

- Glenrock to the junction of Highway 95 and 93 (paved road) — 27 kilometers (17 miles)
- Left on Highway 93 (paved road) — 0.3 kilometer (0.2 mile)
- Left on Ross Road (County Road #32) (paved road) — 11 kilometers (7 miles)
- Right turn to 762 Ross Road (paved road)

The transportation route from Casper will be as follows:

- Casper to Glenrock I-25 South, Exit 165 (paved road) — 34 kilometers (21 miles)
- Glenrock to the junction of Highway 95 (paved road) — 27 kilometers (17 miles)
- Left on Highway 93 (Paved Road) — 0.3 kilometer (0.2 mile)
- Left on Ross Road (County Road #32) (paved road) — 11 kilometers (7 miles)
- Right turn to 762 Ross Road (paved road)

3.2.2 North Butte Remote Satellite

Primary access to the North Butte Remote Satellite will be via State Highway 387 (east of Pine Tree Junction), to State Highway 50 near Savageton, then west on Van Buggenum Road to Christensen Road.

After approximately 10 kilometers (6 miles) on Christensen Road, primary access to North Butte will be via an existing oil field road owned by T-Chair Ranch (**Figure 1.1**). The Van Buggenum Road is a county maintained gravel road that provides access to several ranches located in the project region. **According to Campbell County's Christensen Road 2012 traffic survey, Van Buggenum Road leading to Christiansen Road (east of the North Butte entrance) sees 57 cars per day (Campbell County, 2012). According to the WYDOT Monthly Automatic Traffic Recorder Report for 2012, Highway 50 leading to the North Butte project saw 11,140 cars per day (WYDOT, 2012).** There will be two main access routes to the North Butte Remote Satellite that will utilize the T-Chair Road. To access the site from the northeast side of the license boundary, travel along the T-Chair Road for approximately 2 kilometers (1.3 miles). At that point turn north onto a graveled CBM road and travel approximately 1.2 kilometers (0.75 miles) and turn west onto the project access road. This road begins at a point located in the NE1/4 NE1/4 of Section 19, T44N, R76W. This access road will be a combination of existing and new roadway that will cover a distance of approximately 2.9 kilometers (1.8 miles) to the proposed satellite IX facility.

The site can also be accessed from the south on the T-Chair Road. One travels past the CBM road turn-off, continues in a westerly direction past the Pfister Ranch and travels north across Willow Creek. This existing gravel road will be used by Cameco to reach the project access road, which starts at a point located in the NE1/4 NW1/4 of Section 25, T44N, R76W. This access road is an existing road built by Cleveland-Cliffs Iron Company (Cleveland-Cliffs) during the initial development of the orebody. Cameco plans to upgrade this road, which is entirely within the permit boundary, for a distance of approximately 1.4 kilometers (0.9 mile) to the proposed satellite IX facility.

The Van Buggenum Road consists of a 7.4 meter (24 foot) wide crowned-and-ditched road that is wide enough to handle two tractor trailers passing one another. The speed limit is posted at 72 kilometers per hour (45 miles per hour). Ranch roads occurring on the T-Chair Livestock Company property are also gravel crowned-and-ditched roads. These roads range from 4.6 to 6.0 meters (15 to 20 feet) wide and are constructed and maintained by the landowner and nearby mining interests. These roads will allow for safe passage of both passenger cars and tractor trailers when travelling to and from the North Butte Remote Satellite. The speed limit for these roads is 40 to 48 kilometers per hour (25 to 30 miles per hour).

The uranium-laden resin will be transported from the North Butte Remote Satellite to the CPP or CPF for processing. **Table 3.2-2, Estimated North Butte Shipments details the estimated shipments associated with the operation of the North Butte Remote Satellite**. Resin and yellowcake slurry shipments are made in accordance with DOT and NRC regulations. All shipments will be handled as LSA material including eluted resin. Trucks will travel west on State Highway 387, south on State Highway 259 which merges with I-25 north of Casper. East of Casper (near Evansville) trucks will leave I-25 and travel east on State Highways 20/26 almost into Glenrock and turn northeast on State Highway 95 then northwest on State Highway 93 to Ross Road then west on Ross Road towards the Smith Ranch CPP or continue on Highway 93 to Highland Loop Road then east on Highland Loop Road to the Highland CPF.

According to the 2010 WYDOT Automatic Traffic Recorder Report, Highway 387 east of Pine Tree Junction (south of the North Butte Remote Satellite) sees approximately 800 cars per day and I-25 south of Buffalo (west of the North Butte Remote Satellite) sees approximately 2,800 cars per day (WYDOT, 2010). All daily traffic estimates are based on monthly averages.

North Butte management, operations, decommissioning and technical personnel will be required. It is anticipated that 75% of the operations staff for the facility will be traveling from the Gillette area, 20%

from the Wright area, and the remaining 5% from the Casper area. The North Butte Remote Satellite facility will utilize an average of 40 personnel throughout the lifecycle of the ISR operation.

3.2.3 Gas Hills Remote Satellite

The uranium-laden resin or yellowcake slurry will be transported from the Gas Hills Remote Satellite to the CPP or CPF at Smith Ranch for processing. All shipments will be made in accordance with DOT and NRC regulations. Shipments will be handled as LSA material, including the eluted resin. From the Gas Hills, the primary route for shipments of resin or slurry will be (see **Figure 1.1**):

- Northwest on the Gas Hills Road (Waltman Road);
- Thence east on Highway 20/26 to Glenrock;
- Thence northeast on Highway 95 to the junction of Highway 93;
- Thence north on Highway 93 to Ross Road;
- Thence northwest on Ross Road to Smith Ranch CPP; or
- Highway 93 to Highland Loop Road;
- Thence Highland Loop Road to Highland CPF.

An alternate transportation route will be:

- West on Dry Creek Road to Gas Hills Road (State Highway 136) ;
- Highway 136 into Riverton;
- Thence north on State Highway 26/County Road 789 to Shoshoni,
- Thence east on State Highway 20/26 to Glenrock;
- Thence northeast on Highway 95 to the junction of Highway 93;
- Thence north on Highway 93 to Ross Road;
- Thence northwest on Ross Road to Smith Ranch CPP; or
- Highway 93 to Highland Loop Road;
- Thence Highland Loop Road to Highland CPF.

The primary traffic impacts from the Gas Hills Satellite will be along the transportation route between the Gas Hills Remote Satellite and the CPP at Smith Ranch. According to the 2010 WYDOT Automatic Traffic Recorder Report, State Highway 20/26 east of Shoshoni sees approximately 2,500 cars per day. The old Glenrock Highway (I-25) east of Casper sees approximately 2,800 cars per day (WYDOT, 2010). All daily traffic estimates are based on monthly averages. **A lower rate of impacts from vehicles has been predicted during final project restoration, and decommissioning phases as fewer employees will be driving to the site each day. According to the WYDOT Monthly Automatic Traffic Recorder Report for 2012, Highway 136 from Riverton leading to the Gas Hills Road (entering the northwest part of the site) sees 207 cars per day (WYDOT 2012).**

The Gas Hills Remote Satellite facility is estimated to require an average of 46 personnel daily throughout the life of operations. The staff will live in predominantly two communities, Riverton and Casper. The percentage split among the two communities is approximately 80% in Riverton with the remaining 20% residing in Casper.

Vehicle transport to the facility will be employee-owned vehicles. Based on site information, one can assume that cars averaging two persons per trip represent 60% of the site trips and pickups averaging one person per site trip represent 40% of the site trips.

The transportation route from Riverton will be as follows:

- Riverton to Highway 136 (paved road) — 74 kilometers (46 miles)
- Gas Hills Road to Gas Hills Facility (unpaved road) — 14 kilometers (9 miles)

The transportation route from Casper will be as follows:

- Casper to US 20/26 (paved road) — 76 kilometers (47 miles)
- US 20/26 to Gas Hills Road (Waltman) (unpaved road) — 40 kilometers (25 miles)
- Gas Hills Road to Gas Hills Facility (unpaved road) — 11 kilometers (7 miles)

3.2.4 Ruth

Access to the Ruth Remote Satellite is via Wyoming State Highway 387 to a turnoff 27 kilometers (17 miles) east of Edgerton (mile post 117). There are 6 kilometers (4 miles) of gravel road between the Highway 387 turnoff and the Ruth Remote Satellite. From the Ruth Remote Satellite uranium-laden resin will be transported by truck down the 6 kilometer (4 mile) gravel road to Highway 387. From here, trucks will travel:

- East on State Highway 387 to Wright;
- South on State Highway 59 to Douglas;
- Then northeast on Highway 93 to Ross Road;
- Then northwest on Ross Road to Smith Ranch CPP; or
- Highway 93 past Ross Road to Highland Loop Road;
- Thence Highland Loop Road to Highland CPF.

The Ruth Remote Satellite is anticipated to employ personnel from Gillette and Casper. Personnel traveling from Casper will predominately travel north on I-25 to Exit 210 and travel northeast on State Highway 259 to State Highway 387. Personnel will travel **27.5 kilometers** (17 miles) east of Edgerton, and an additional 6 kilometers (4 miles) on gravel road to the project site.

Personnel traveling from Gillette to the Ruth Remote Satellite will predominately travel southwest along State Highway 50 to State Highway 387. Staff will travel approximately 23 kilometers (15 miles) along State Highway 387 to the gravel road site entrance.

3.2.5 References

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3.3 Geology and Soils

3.3.1 Regional Geology

3.3.1.1 Powder River Basin

Smith Ranch, and the North Butte and Ruth Remote Satellites are located in the Powder River Basin. The Powder River Basin is a late Cretaceous to early Tertiary structural asymmetrical syncline, with its axis oriented in a general northwest-southeast direction along the western margin of the basin. East of the axis, the sedimentary rock strata exposed at the surface gently dip at approximately 1 to 2 degrees to the west. West of the axis, the strata dip more steeply (as much as 20 degrees) to the east.

The basin incorporates a sedimentary rock sequence that has a maximum thickness of approximately 4,600 meters (15,000 feet) along the synclinal axis. The sediments range in age from Recent (Holocene) to early Paleozoic (Cambrian) (500 million to 600 million years ago) and overlie a basement complex of Precambrian-age (more than a billion years old) igneous and metamorphic rocks. Of particular interest are the Tertiary Formations outcropping within the Powder River Basin including; the Oligocene-age White River Formation (25 to 40 million years ago), the Eocene-age Wasatch Formation, and the Paleocene-age Fort Union Formation (60 to 70 million years ago).

The uranium-bearing sandstones lie within the upper Fort Union and lower Wasatch Formations. These mineralized deposits are in C-shaped rolls, narrow in width and elongated approximately parallel to the axis of the channel. Actually they rarely exhibit a theoretical C shape but are distorted in response to the variable lithology and permeability of the host rock. Both the Wasatch and Fort Union Formations are non-marine fluvial floodplain deposits. The Wasatch Formation consists of approximately 300 meters (1,000 feet) of claystone and siltstone containing widespread discontinuous lenses of coarse cross-bedded arkosic sandstones. The coarsest of these occur in the southwestern portion of the basin and are the host rock for the uranium deposits. Sediments gradually diminish in thickness and aerial extent northward. North of the Pumpkin Buttes, the Wasatch Formation sediments become significantly finer-grained and similar in appearance to the Fort Union Formation sediments. The regional geology addressing the Powder River Basin including Smith Ranch and the North Butte and Ruth Remote Satellite project areas is thoroughly discussed in NUREG-1910 (NRC, 2009) and Appendix D5 of the Smith Ranch and North Butte WDEQ Permits.

3.3.1.2 Wind River Basin

The Gas Hills Remote Satellite is located within the Gas Hills Uranium District of the Wind River Basin. The Wind River Basin is a 21,000 **square** kilometer (8,000 **square** mile), trapezoidal shaped foreland basin. The basin is asymmetric with its synclinal axis located along its northern flank. It is bounded by the Casper Arch (east), Owl Creek Mountains (north), Wind River Mountains (west), and the Granite Mountains (south) and contains up to 9,000 meters (30,000 feet) of sediment across its axis. The sediments range in age from Recent (Holocene) to early Paleozoic (Cambrian) (500 million to 600 million years ago) and overlie a basement complex of Precambrian-age (more than a billion years old) granitic rocks. The uranium-bearing sandstone is hosted in the Eocene-age Wind River Formation. Regionally the Wind River Formation is comprised of dark gray to greenish-gray medium to granulated arkosic channel sandstone with interbedded granitic pebble to boulder conglomerates, claystones, and siltstones. The sandstone and conglomerates were deposited along the axes of alluvial fans and form massive coarse-grained units. These alluvial fan deposits are the host for the Gas Hills uranium deposits. The ore deposits occur as roll fronts along these margins and are typically 5 meters (15 feet) thick and can be traced for hundreds of meters. Along the boundary of the fans are alternating sand and shale sequences. Sandstones and conglomerates are typically confined vertically by siltstones and claystones. Detailed regional geology of the Gas Hills Remote Satellite is discussed in the 2004 Gas Hills EA and Appendix D5 of the Gas Hills WDEQ Permit.

3.3.2 Site Geology

3.3.2.1 Smith Ranch Geology

The *Safety Evaluation Report for Renewal of Rio Algom Mining Corp. Smith Ranch In-Situ Leaching Facility Converse County, Wyoming (2001)* states that the NRC has reviewed and accepted the geologic and seismic site characterization contained in the Environmental Assessment for Renewal of Source Material License No. SUA-1548 Rio Algom Mining Corporation Smith Ranch Uranium Project Converse, County (2001). The approved site characterization for Smith Ranch is summarized in the following sections. Cameco has been operating under SUA-1548 since 2002 and has expanded the geologic knowledge of the ore body. An updated site conceptual model of the ore zone is also included in this report.

The site-specific geology for each site within the entire SUA-1548 license area has been previously reviewed and evaluated by NRC Staff during the 1999 LRA and is presented in detail in the appropriate sections of Appendix D5 of the WDEQ Permits. Summaries of the site-specific geology for Smith Ranch and the remote satellites are provided below. Since the last renewal, additional delineation drilling at Smith Ranch and the remote satellites has not identified any information that would change the geological conclusions made in past NRC reviews.

3.3.2.1.1 Smith Ranch Surficial Geology

A variety of surficial materials mantle the Wasatch Formation at Smith Ranch. They include residual soils, slopewash formed by the downslope movement of soil and weathered rock fragments, playa deposits, and stream-deposited alluvium. The residual soils and slope wash range in thickness from a few centimeters on the steep slopes to 3 meters (10 feet) or more on the upland areas and lower valley slopes. The boundary between the surficial material and the bedrock typically occurs 1 meter (3 feet) or more beneath the ground surface. The surficial materials commonly are sandy to clayey silt, but a range of textures is found from silty clay in the upland areas to clayey sand on the lower slopes.

Playa deposits are similar compositionally to the alluvium but more alkaline. These deposits occur in closed depressions in the upland areas. These depressions appear to have formed where loosely cemented sandstone has been eroded, probably by wind, and are underlain by more resistant shales or mudstones.

The alluvial deposits that form the floor of Sage Creek and the Dry Fork of the Cheyenne River and their tributaries typically include clays, silts, and sands with local gravel lenses. The material is poorly stratified, unconsolidated, and commonly 2 to 5 meters (5 to 15 feet) thick. As much as 12 meters (40 feet) of alluvium is estimated to occur locally.

3.3.2.1.2 Smith Ranch Ore Zone Geology

The Wasatch Formation is the youngest unit present within Smith Ranch including Highland and the Reynolds Ranch Satellite. The Wasatch Formation consists of interbedded and highly lenticular silty claystones, sandy siltstone, and relatively clean sandstones. The Wasatch Formation is generally less than 150 meters (500 feet) thick in the central and eastern portions of Smith Ranch, and less than 90 meters (300 feet) in the northern portion. It is absent in the western and southwestern portions of Smith Ranch. The contact between the Wasatch and the underlying Fort Union Formation passes through the southern portion of Smith Ranch. The School Coal Seam delineates the contact between the two formations.

The Fort Union Formation is lithologically similar to the Wasatch Formation and includes interbedded silty claystones, sandy siltstones, relatively clean sandstones, arkosic sandstone, and claystones with a few thin limestone and coal beds occurring locally. The sandstone units within the upper Fort Union and lower Wasatch Formations can be correlated across Smith Ranch. As many as 10 separate potentially uranium-bearing sandstone units have been identified within the Smith Ranch property. Within individual mine units, sandstone units may be discontinuous in some areas or merge with over or underlying sandstone units. Historically, the sandstone units within the Highland area have been identified from bottom to top as the 0, 10, 20, 30 through 120 Sand. Within the western and northern portions (Smith Ranch and Reynolds Ranch) of the site, the same sandstone units are identified from bottom to top as the K, M, O, Q through W Sand. Above the School Coal Seam, the sandstone units are identified from bottom to top as the E and G Sands. The O Sand package at Smith Ranch and Reynolds Ranch correlates directly to the 20 through the 80 Sand packages at Highland. The sandstones range from fine grained to very coarse grained, are sub-angular, and exhibit fair to poor sorting. A schematic cross section of Smith Ranch from the proposed Reynolds Ranch area to the Highland area is presented on **Figure 3.3.1, Smith Ranch Schematic Cross Section**.

3.3.2.1.3 Smith Ranch Update to the Site Conceptual Geologic Model

Cameco has reviewed the drill logs and geologic data obtained from the hydrologic data packages developed at Smith Ranch since the last renewal and has refined the site conceptual geologic model. The K Sand is the deepest uranium ore zone sand member at Smith Ranch. Commercial uranium deposits in the K Sand occur in the southwest portion of Smith Ranch and consist of stacked, braided, fluvial sandstone units. The K Sand is irregular as indicated by variable sand thickness, grain size, and shale content. The K Sand is composed of an upper and lower unit in the southwest and ranges in thickness from 23 to 41 meters (75 to 135 feet). The K Sand is bounded by confining layers above and below. The J Shale is the underlying confining unit that separates the K Sand from the underlying I Sand and ranges in thickness from 2 meters (8 feet) to upwards of 46 meters (150 feet). The L Shale confining unit separates the K Sand from the overlying M Sand. Where the M Sand is present, the L Shale thins to less than 3 meters (10 feet). The L Shale is up to 27.4 meters (90 feet) thick locally.

The O Sand is the principal uranium ore zone sand member at Smith Ranch and ranges in thickness locally from 12 meters (40 feet) to more than 91 meters (300 feet). The O Sand is divided into four separate segments, mostly due to interbedded shale lenses. The O Sand is bounded above and below by confining layers. The N Shale is the underlying confining layer for the O Sand. The N Shale thickness ranges from less than 1.5 meters (5 feet) to as much as 34 meters (110 feet).

The P Shale is the overlying confining layer for the O Sand. It is composed of highly bentonitic claystones and siltstones with some discontinuous sandstone lenses and minor lignitic stringers. This shale often merges with the R Shale where the Q Sand is absent. Locally, the P/R Shale thins to less than 3 meters (10 feet) but may be as much as 67 meters (220 feet) thick.

Overlying the P Shale is the Q Sand which contains little in the way of economic mineralization. Some mineralization is encountered where the overlying S Sand was deposited in channels scoured into the Q Sand resulting in preferential, oxidized, mineralized groundwater flow. The Q Sand is discontinuous across Smith Ranch, occurring mainly in isolated sand channels. Where present the Q Sand thickness ranges from 0 to nearly 24 meters (80 feet).

The R Shale is the upper confining layer for the Q Sand, where present, and is the lower confining layer for the overlying S Sand. It is similar in composition to the P Shale. Where the Q and S Sands are present, the R Shale can be as thick as 30 meters (100 feet). In other areas the S Sand is also "shaled out" completely and does not exist. The resulting shale is then continuous from the top of the Q Sand to the base of the U Sand. This is referred to as the P/R/T Shale.

In the northern portion of Smith Ranch, the S and U Sands are continuous where significant channel sand deposition has occurred. Individually, these sand units range in thickness from 0 to 21 meters (70 feet) but when combined can be as thick as 46 meters (150 feet). Over much of Smith Ranch, these two sands are referred to jointly as the U/S Sand. Where the S and U Sands are separated, the T Shale is present. The T Shale ranges in thickness from nearly non-existent to as much as 46 meters (150 feet). The upper confining layer for the U/S Sand is the V Shale which is composed of siltstones and claystones which are highly bentonitic. It ranges in thickness from 6 to 21 meters (20 to 70 feet).

The W Sand is stratigraphically the highest continuous sand unit of the Fort Union Formation within Smith Ranch. It varies in thickness from non-existent to 26 meters (85 feet), pinches out in the northwestern portion and is completely eroded away in the east.

Separating the Fort Union Formation from the overlying lower Wasatch Formation is the School Coal Seam, which varies in thickness from non-existent to 6 meters (20 feet) pinching out to the north and east. The shallowest mineralized sand units of interest in the northern portion of Smith Ranch near the Reynolds Ranch Satellite occur in the lowermost section of the Wasatch Formation. These sands are designated the "E" and "G" Sands (stratigraphically moving upward). These sands are relatively shallow, with the base of the "E" at an average depth of 107 meters (350 feet) below the ground surface. Much of the uranium mineralization in this sand occurs near, or above, the water table and is therefore not recoverable with current ISR technology. Uranium deposits within these unsaturated sandstones located north of Smith Ranch have been previously mined by conventional open pit methods.

Below the surficial material, clay rich shale and sandstones are present. Measured permeability of the claystone-shale interbeds has been found to be less than 1E-11 **square** centimeters (2E-12 **square** inches) which is in sharp contrast to the permeability of the sandstone units which typically average between 5E-6 and 2E-6 **square** centimeters (8E-7 to 3E-7 **square** inches). Depending on the specific location within Smith Ranch, sandstone or claystone will be present beneath the surficial material. The sandstone units are typically separated by at least 6 to 14 meters (20 to 45 feet) of low permeability claystone and shale except where channel scour has removed the interbeds bringing two sandstone units into communication. The geologic cross sections provided in Addendum D-5 A2 and Addendum D-5 B2 of the Smith Ranch WDEQ Permit show the relationship between the different sand packages and interbedded confining units across Smith Ranch. Copies of the geophysical logs used to construct the cross sections are included in the above referenced Addenda.

3.3.2.1.4 Smith Ranch Structural Geology

Smith Ranch lies across the northwest-southeast-trending synclinal axis of the Powder River Basin. Within the central portion of Smith Ranch, the Wasatch and Fort Union Formations dip gently northwestward, reflecting the general axial plunge in that direction. At the western and eastern boundaries of Smith Ranch, the strata dip generally toward the axis some 2 to 5 degrees to the west and east, respectively.

No major faults or folds in the bedrock within Smith Ranch have been detected by exploration programs conducted by Cameco and their predecessors. However, a series of subparallel anticlines and synclines relief ranging from 3 to 6 meters (10 to 20 feet) were identified in the Highland area.

3.3.2.2 North Butte Geology

3.3.2.2.1 North Butte Surficial Geology

The overall surface of the North Butte Remote Satellite is that of flat to gently sloping terrain with two moderate to large drainages in the western portion and three moderate to small drainages in the east. All the drainages generally trend from the north to the south, eventually forming tributaries to Willow Creek which runs from east to west, crossing the southern tip of the North Butte site. In the western portion of the site the terrain is more steeply sloped with the drainages more incised. The surface consists of alternating sands and sandy shales in a repeating Wasatch facies environment. Colluvial wash is minor except in the northwest portion where there is extensive slide material present from the erosion of North Butte. This material consists of upper Wasatch Formation and lower White River Formation materials which form the walls and cap rock of North Butte, respectively.

Cameco has drilled and defined the alluvial deposits of Willow Creek. These deposits consist of clays, silts, and fine sands with local gravel lenses. The gravel is poorly stratified, unconsolidated, and approximately 0 to 2 meters (6 feet) thick within Willow Creek.

3.3.2.2.2 North Butte Ore Zone Geology

To characterize the ore zone geology of the North Butte Remote Satellite, isopach maps were generated for the geologic units of interest. The target sands are units of the Eocene Wasatch Formation. Beginning with the uppermost sand unit, the units of interest are the F Sand, F-C Shale, CB and BA interbedded shales within the C-B-A Sands, A-1 Shale, and the 1 Sand. Individual isopachs were also generated for each of the C, B, and A Sands. The isopach maps are presented as Plates D5-1.2 through D5-1.10 in Appendix D-5 of the North Butte WDEQ Permit. A stratigraphic column of the North Butte Remote Satellite is also included as Figure D5-3 in the North Butte WDEQ Permit.

A subsurface geologic investigation was conducted in November 2011 to determine the presence or absence of saturated alluvium within Willow Creek and the potential for saturated sand units between the surface and the uppermost F Sand. Two boreholes (WC #1 and WC #2) were drilled inside the floodplain of Willow Creek. The locations of the boreholes are included on **Figure 3.3.2, Shallow Aquifer Investigation Well Location Map**. Borehole WC #1 was drilled to a depth of 32 meters (105 feet) below ground surface and encountered interbedded silty clay with thin lenses of fine grained sand. No alluvium was encountered in WC #1. Borehole WC #2 was drilled to a depth of 24 meters (80 feet) below ground surface and encountered mostly interbedded silty clay with lenses of fine grained sand. Approximately 1 meter (4 feet) of dry sandy alluvial gravel was encountered in WC #2. Other than the thin lenses of fine grained sand encountered in WC #1 and WC #2, no other sand units were present between the surface and the F Sand.

The F Sand is the uppermost non-mineralized, saturated sand unit within the North Butte Remote Satellite. The F Sand is stratigraphically continuous in the west but ranges in thickness from 0 to approximately 31 meters (100 feet) over the entire North Butte area. Where present the F Sand ranges in thickness from 7 to 31 meters (22 to 99 feet). Detailed evaluation of geophysical logs from the area, indicate that the F Sand does shale out in the north central portion of the North Butte area.

The FC Shale is stratigraphically continuous over the North Butte Remote Satellite area. The FC Shale separates the F Sand from the underlying C Sand. The thickness of the FC Shale ranges from approximately 15 to 55 meters (50 to 180 feet). The unit thickness is fairly uniform across the entire project. There are two locations where the FC Shale thins to approximately 15 meters (50 feet); one is located in the far north and the other is located along the south end of the site.

The C, B, and A Sands are the primary mineralized members and comprise the North Butte mining sand. The C Sand is the uppermost unit of the C-B-A Sand package. The C Sand ranges in thickness from 0 to 40 meters (130 feet). The unit is stratigraphically continuous over most of the North Butte Remote Satellite, except for the east end of the project where the C Sand shales-out. The C Sand isopach and cross sections included in Appendix D5 of the North Butte WDEQ Permit illustrate the C Sand shale-out. The C Sand overlies the B Sand. In portions of the site these sands are distinct members separated by inter-bedded shale identified as the CB Shale. Locally due to deposition or erosion, the CB Shale is not present. In these areas the C and B Sands are in vertical contact resulting in a vertically continuous thick sand package.

The CB Shale ranges in thickness from approximately 0 to 18 meters (60 feet). The shale is discontinuous across large areas of the project, but especially in the central portion of the North Butte Remote Satellite. The absence of the CB Shale is most likely due to the paleo-depositional setting and not a result of erosion. The thickest occurrence of the CB Shale is on the east end of the North Butte Remote Satellite which results in the greatest amount of separation between the C and B Sands.

The B Sand is the middle unit and primary ore-bearing member of the C-B-A ore Sand. The B Sand ranges in thickness from approximately 15 to 49 meters (50 to 160 feet). The thickness of the unit is variable but stratigraphically continuous across the project. Where the CB Shale is absent, the top of the B Sand is in contact with the base of the C Sand. The B Sand is separated from the A Sand by the underlying BA Shale.

The BA Shale ranges in thickness from approximately 3 to 31 meters (10 to 100 feet). The unit is continuous across the North Butte Remote Satellite, but does demonstrate some variability in thickness. On the east and south ends of the project, the BA Shale thins to approximately 3 meters (10 feet).

The A Sand is the lower most unit of the C-B-A Sand package. The A Sand ranges in thickness from approximately 6 to 46 meters (20 to 150 feet). The thickness of the unit is fairly uniform; however on the northwest and south ends of the project locally the unit does thicken. Locally the A Sand splits into an upper and lower unit. The A Sand is separated from the underlying 1 Sand by the A-1 Shale.

Data presented in Appendix D5 of the North Butte WDEQ Permit indicate that the A-1 Shale is approximately 21 to 43 meters (70 to 140 feet) thick and is a continuous unit across the project. The 1 Sand is 0 to 12 meters (0 to 40 feet) thick and shales-out on the southeast side of the project. Across large portions of the North Butte Remote Satellite the 1 Sand is estimated to be less than 5 meters (15 feet) thick.

During future development at North Butte, delineation drill holes will be completed to penetrate the A-1 Shale and 1 Sands to better characterize the stratigraphy of these units. It is anticipated that future drilling will confirm that the A-1 Shale is laterally continuous across the North Butte Remote Satellite with a minimum thickness of approximately 21 meters (70 feet). It is also anticipated that additional drilling will show that the 1 Sand is even more discontinuous than currently modeled and will confirm the modeled thickness of 0 to 12 meters (40 feet).

3.3.2.2.3 North Butte Structural Geology

The structural attitude of the beds beneath the North Butte Site is nearly horizontal with only a slight dip of 0.5 to 1.5 degrees to the northwest. Evidence of structural instability at the North Butte site such as faulting has not been observed either by field observations or through drill hole correlation. The closest known faulting and/or significant folding are present approximately 26 kilometers (16 miles) to the west of the site along Pine Ridge.

3.3.2.3 Gas Hills Geology

3.3.2.3.1 Gas Hills Remote Satellite Site Geology

The *Safety Evaluation Report for Operation of the Gas Hills Project In Situ Leach Uranium Recovery Facility in Fremont and Natrona Counties, Wyoming (2004)* states that the NRC has reviewed and accepted the hydrologic site characterization contained in the Environmental Assessment for the Operation of the Gas Hills Project Satellite In Situ Leach Uranium Recovery Facility (2004). The approved geologic and seismic site characterization for the Gas Hills is summarized in the following sections.

3.3.2.3.2 Gas Hills Surficial Geology

The surface of the Gas Hills Remote Satellite is that of relatively steep slopes originating from the Beaver Divide which trends along the southern boundary of the site. West Canyon Creek, Fraser Draw and their tributaries generally flow to the north and dissect previous surface and underground mining activities. These disturbances include total blockage of channels by spoils piles, stream capture by mine pits, and surface disturbances by exploration activities. Gully erosion and headcutting are actively occurring throughout the area. Natural channel development (watershed elaboration) processes are enhanced by badland topography near the Beaver Rim. Disturbance-enhanced erosion and sedimentation has occurred to the past effects of historic mining practices.

Formations that crop out within the Gas Hills Remote Satellite include the Quaternary Alluvium and Colluvium, Miocene Split Rock Formation, Oligocene White River, Eocene Wagon Bed and the uranium-bearing members of the Eocene-Age Wind River Formations. Quaternary alluvium occurs along not only the tributaries but the mainstem of Fraser Draw and West Canyon Creek and consists of unconsolidated sand, silt and clay. The Miocene Split Rock Formation crops out along the south and caps the Beaver Divide. The Split Rock Formation is both stratigraphically and topographically higher than the White River and Wind River Formations and consists of arkosic sands and conglomerates. The White River Formation consists of tuffaceous bentonitic mudstone with local lenses of arkosic sandstone and conglomerate. The Eocene Age Wagon Bed Formation consists of variegated mudstone, tuffaceous sandstone, and several ledge forming rhyodacite breccias flows and conglomerates. The underlying Wind River Formation can be locally broken into the Upper Wind River and Lower Wind River Formations and consists of interbedded fluvial derived sandstone, siltstones, mudstones and conglomerates. In the vicinity of the Gas Hills license area, the localized environments of deposition consist of coalesced alluvial fans.

3.3.2.3.3 Gas Hills Ore Zone Geology

To characterize the site geology, cross sections A-A' through O-O' in Appendix D5 of the Gas Hills WDEQ Permit were developed and show detailed stratigraphy and structure for mine units at the Gas Hills Remote Satellite. Addendum D5-2 of the Gas Hills WDEQ Permit contains copies of the geophysical logs used to develop the cross sections. The target sands are units of the Eocene Wind River Formation and have been subdivided into a series of sand and shale units. The sand units are numbered by even increments of ten starting with the lowest defined sand, the 30 Sand, which is overlain by the 40 Sand, and so on. The sand units represent zones of coarser clastic sediments and are dominantly comprised of dark gray to greenish-gray, medium to coarse grained arkosic sandstone with interbedded granitic pebble to boulder conglomerates. The sand units are moderately to poorly sorted sandstone, which locally contain clay and silt fractions as well as clay and siltstone interbeds. The sand units are the zones that contain the ore deposit. The shale units represent zones of finer clastic sediments and consist of dark gray to brownish gray claystone, mudstone, siltstone and minor amounts of fine grained sandstone. The contact between sand and shale units may be sharp or gradational.

Sandstones and conglomerates typically coalesce along the axes of the alluvial fan systems present in the Gas Hills area. Along the margins of the fans, alternating series of coarse channel sands and conglomerates with fine grained overbank deposits are typical. Table D5-2-1 of the Gas Hills WDEQ Permit describes the general stratigraphy of the Gas Hills area. Stratigraphic interpretation within the Gas Hills Remote Satellite is complicated by extensive intertonguing of various strata, members and beds, and by post-depositional faulting. Exploration drilling has focused interpretation of the site geology on a mine unit-by-mine unit basis. The most detailed information has been collected in Mine Units 1 and 2. Additional geologic data will be acquired during delineation drilling and mine unit testing. This information will be **available** to NRC for review as reports are finalized. See Plates D5-1, D5-2, and D5-3 of the Gas Hills WDEQ Permit for mine unit locations.

Mine Unit No. 1 (Muskrat Deposit)

Mine Unit No. 1 is located in the west central part of the Gas Hills Remote Satellite. The production zone is the 70 Sand and consists of medium to very coarse grained arkosic sandstone. The sand is a well-defined single sandstone bed that ranges in thickness from 6 to 24 meters (20 to 80 feet) and is generally underlain and overlain by continuous shale beds.

The confining units consist of shales, claystones, and siltstones. The upper unit overlies the 70 Sand throughout the area and ranges from 17 to 46 meters (55 to 150 feet) in thickness and separates the 70 Sand from several thin discontinuous undifferentiated sandstones. The lower confining unit ranges from 6 to 15 meters (20 to 50 feet) in thickness and separates the 70 Sand from the underlying 50 Sand.

Mine Unit No. 2 (Bountiful Deposit)

Mine Unit No. 2 is located in the east central portion of the Gas Hills Remote Satellite. The production zone is located within the 40-50-60-70-80 Sand horizons. These sands consist of medium to very coarse grained arkosic sandstone with cobble and boulder conglomerate interbeds. The individual sandstones range in thickness from pinch-out to 30 meters (100 feet). The production sands typically are separated vertically by confining units which can range in thickness up to 6 meters (20 feet). These interbedded shale units tend to be continuous within the mine unit but commonly disappear to the east.

The production zone is overlain and underlain by confining beds. The upper confining unit consists of siltstone and claystone and ranges from 23 to 122 meters (75 to 400 feet) in thickness. The lower confining unit is the Triassic Chugwater Formation. The Chugwater Formation is dominantly shale and siltstone and is not considered an aquifer. The total thickness of the Chugwater Formation is approximately 300 meters (1,000 feet) in the region. Within Mine Unit No. 2 interbedded shales typically range from 2 to 6 meters (5 to 20 feet) in thickness.

Mine Unit No. 3 (Peach Deposit)

Mine Unit No. 3 is located in the western portion of the Gas Hills Remote Satellite. The production zone is located within the 30-40-50 Sands. These units consist of medium to very coarse grained arkosic sandstones. The individual sands range in thickness from pinchout to 15 meters (50 feet). The production sands are separated by confining claystones and siltstones which can range up to 9 meters (30 feet) in thickness.

The production zone is overlain and underlain by confining beds. The upper confining unit is a claystone which is contiguous throughout the mine unit and ranges from 2 to 12 meters (5 to 40 feet) in thickness. The confining units immediately underlying Mine Unit No. 3 are **shales,** claystones and mudstones of the Wind River, **Thermopolis, Morrison and Frontier formations. Geologic investigations conducted to date in Mine Unit 3 have found no underlying aquifers within 30.5 meters (100 feet) of the bottom of the 30-Sand. Additional geologic investigations will be performed during Mine Unit 3 development to further define underlying units.**

Mine Unit No. 4 (Buss Deposit)

Mine Unit No. 4 is located in the eastern part of the Gas Hills Remote Satellite. The production zone is located within the 50-60-70-80-90 Sands. These sand units consist of medium to very coarse grained arkosic sandstones with cobble and boulder conglomerate interbeds. The individual sandstones within this area range in thickness from 9 to 30 meters (30 to 100 feet). The sands can be separated vertically by mudstone or siltstone interbeds which range from pinchout to 5 meters (15 feet) in thickness. These confining units are not always continuous and frequently pinchout allowing coalescence of sand units within Mine Unit No. 4

The production zone is overlain and underlain by confining units. An upper confining unit overlies the uppermost 90 Sand throughout the mine unit south of the Buss Fault and ranges from 3 to 30 meters (10 to 100 feet) in thickness. A thinner, 3 to 12 meters (10 to 40 feet), locally continuous confining bed overlies the 80 Sand, south of the Buss Fault. The confining unit north of the Buss Fault overlies the 60 Sand since the 70-80 Sands are generally unconfined at this locale. The shale overlying the 60 Sand ranges in thickness from 3 to 6 meters (10 to 20 feet). The confining unit below the 50 Sand ranges from 2 to 9 meters (5 to 30 feet) thick. This confining unit separates the 50 Sand from the underlying East Canyon Conglomerate.

Mine Unit No. 5 (Pix Deposit)

Mine Unit No. 5 is located in the northeastern part of the Gas Hills Remote Satellite. The production zone is located within the 50 Sand and consists of medium to very coarse grained arkosic sandstone with cobble and boulder conglomerate interbeds. The 50 Sand ranges in thickness from 15 to 21 meters (50 to 70 feet). The 60 Sand may interfinger with the 50 Sand in Mine Unit No. 5 and will represent a single sand unit where it does.

The production zone is overlain and underlain by confining units. The upper confining unit overlies the 50 Sand throughout the mine unit and ranges from 6 to 12 meters (15 to 40 feet) thick. The confining unit below the 50 Sand ranges from 6 to 12 meters (20 to 40 feet) thick. This unit separates the 50 Sand from the underlying East Canyon Conglomerate.

3.3.2.3.4 Gas Hills Structural Geology

Normal faulting that occurred during the late Miocene and early Pliocene is present within the Gas Hills Remote Satellite. Cameco delineation drilling and hydrologic testing is defining the location, characteristics and hydrologic properties of these faults. Plate D5-2 of the Gas Hills WDEQ Permit shows the mapped faults within the site and distinguishes between subsidiary and traceable faults. Subsidiary faults are those which have limited displacement and/or are discontinuous laterally and/or vertically, and would not offset sand units enough to interrupt hydrologic continuity. Traceable faults are defined as continuous, mapable faults which have a significant enough displacement to offset sand units. The impacts of traceable faults are discussed specifically for each mine unit below.

Mine Unit No. 1 (Muskrat Deposit)

The Jasper Fault and the HBow Fault lie south of Mine Unit No. 1. There are no known traceable faults within Mine Unit 1. Delineation drilling will further define local structure, if any within Mine Unit No. 1.

Mine Unit No. 2 (Bountiful Deposit)

Two traceable faults pass through Mine Unit No. 2 and include the Bountiful and UPZ Faults. The Bountiful Fault has 12 to 15 meters (40 to 50 feet) of displacement. The UPZ Fault has up to 15 meters (50 feet) of displacement and is known to be transmissive along part of its length. Hydrologic testing will further define its characteristics.

Mine Unit No. 3 (Peach Deposit)

Three faults pass through or near Mine Unit No. 3. They include the PCH Fault, the Jasper Fault and the Lucky Mc Fault. Additional information regarding the faults in Mine Unit No. 3 will be acquired as delineation drilling and mine unit testing is completed.

Mine Unit No. 4 (Buss Deposit)

Mine Unit No. 4 will intersect one known traceable fault known as the Buss Fault. The Buss Fault has approximately 15 meters (50 feet) of displacement. Delineation drilling will further define local structure, if any within Mine Unit No. 4.

Mine Unit No. 5 (Pix Deposit)

One traceable fault intersects Mine Unit No. 5, marking the southern side of the Thunderbird Graben. The Thunderbird Graben is characterized by two parallel striking faults. The stratigraphic section between these two faults is downthrown by approximately 46 meters (150 feet). Delineation drilling will further define local structure, if any within Mine Unit No. 5.

3.3.2.4 Ruth Geology

3.3.2.4.1 Ruth Surficial Geology

The land surface at the Ruth Remote Satellite is flat to gently sloping terrain with one major drainage (Dry Fork of the Powder River) and two dissecting minor drainages. The Dry Fork flows from southeast to northwest. Crawford Draw is the more important of the two minor drainages and generally flows from southwest to northeast. The local geology consists of Eocene Age sandstones, sandy shales and shales in a repeating facies type environment. Weathered detritus is present on the land surface and includes manganese nodules found on the knolls and high areas. These nodules are less present in the lowland areas.

3.3.2.4.2 Ruth Ore Zone Geology

The target sands at Ruth are units of the Eocene Wasatch Formation and are similar to those present at North Butte Remote Satellite, which is approximately 22 kilometers (14 miles) away. Beginning with the uppermost sand unit, the units of interest are the B Sand, B-A Shale, A Sand, A-1 Shale, and the 1 Sand. The production sand is the A Sand and is a laterally continuous depositional unit. Mineralization occurs throughout the A Sand but variations exist vertically and laterally. The production zone is typically 15 meters (50 feet) thick at an average depth of 163 meters (535 feet) below the surface. The A Sand is primarily arkosic in composition, very friable, and contains moderate to substantial organic debris and carbonaceous stringers. There are some small localized sandy shale intervals but most of the A Sand is relatively free of shale. The production zone is bounded above and below by impermeable shale intervals averaging about 9 meters (30 feet) thick. The upper and lower confining beds are composed of shales, silty shales and shaley lignite interbeds. Cross sections through the ore zone showing the A Sand and its confining layers are presented as Figures 15.2 through 15.10 in Volume II of the Ruth Supplemental Report.

In the confining unit above the A Sand there are zones where sand lenses divide the shale into two or three thinner intervals. Although the confining unit thickness is variable, the shale sequence still provides a continuous, low permeability cap on the production sand. The interbedded sand lenses are discontinuous and are not laterally traceable for any significant distance. In a majority of the production area, the upper confining shale is vertically continuous and not compromised by sand lenses.

The underlying confining unit of the A Sand consists of a shale layer divided by a thin coal seam. A stratigraphic column of the Ruth Remote Satellite is presented on Figure 9.5 (Volume II of the Ruth Supplemental Report).

3.3.2.4.3 Ruth Structural Geology

Evidence of geological structure, such as faulting or folding at the Ruth Remote Satellite has not **been** observed either by field observations or through drill hole correlation. The closest known faulting and/or significant folding of Wasatch rocks occur approximately 7 kilometers (4 miles) to the west of the site along Pine Ridge.

3.3.3 Seismic Activity

3.3.3.1 Smith Ranch, North Butte Remote Satellite, Ruth Remote Satellite

Historic seismic events for Converse, Campbell, Natrona, and Johnson Counties surrounding the license area including Smith Ranch, North Butte and Ruth Remote Satellites have been documented by the USGS (Case and others, 2002, 2003) and are summarized chronologically below.

Converse County

Twelve magnitude 3.0 and greater earthquakes have been recorded in Converse County. The first earthquake recorded in Converse County occurred on April 14, 1947. The earthquake had an intensity of V, and was felt near LaPrele Creek southwest of Douglas.

On August 21, 1952, an intensity IV earthquake occurred approximately 13 kilometers (8 miles) north-northeast of Esterbrook, in Converse County. It was felt by several people in the area, and was reportedly felt 64 kilometers (40 miles) to the southwest of Esterbrook. Three additional earthquakes have occurred in the same location as the August 21, 1952 event. The first, a small magnitude event with no associated magnitude or intensity, occurred on September 2, 1952. The second, an intensity III event, occurred on January 5, 1957. The most recent, an intensity IV event occurred on March 31, 1964. No damage was reported for any of the events.

Only one earthquake was documented in Converse County in the 1970s. On January 15, 1978, a magnitude 3.0, intensity III earthquake occurred approximately 5 kilometers (3 miles) northeast of Esterbrook, in Converse County. No damage was reported.

Two earthquakes occurred in Converse County in the 1980s. On November 15, 1984, a magnitude 3.0, intensity III earthquake occurred approximately 24 kilometers (15 miles) northeast of Casper in western Converse County. No damage was reported. On December 5, 1984, a non-damaging magnitude 2.9 earthquake occurred in the Laramie Range in southern Converse County.

Four earthquakes occurred in Converse County in the 1990s. On June 30, 1993, a magnitude 3.0 earthquake was located approximately 24 kilometers (15 miles) north of Douglas. No damage was reported. On July 23, 1993, a magnitude 3.7, intensity IV earthquake occurred in southern Converse County, approximately 21 kilometers (13 miles) north-northwest of Toltec. This event was felt as far away as Laramie. On December 13, 1993, another earthquake occurred approximately 13 kilometers (8 miles) east of Toltec. This non-damaging event had a magnitude of 3.5. Most recently, on October 19, 1995, a magnitude 4.2 earthquake was recorded approximately 24 kilometers (15 miles) northeast of Casper in western Converse County. No damage was reported, although the event was felt by many Casper residents.

Campbell County

Five magnitude 2.5 and greater earthquakes have been recorded in Campbell County. The first earthquake recorded in the county occurred on May 11, 1967. This magnitude 4.8 earthquake was centered in southwestern Campbell County approximately 11 kilometers (7 miles) west-northwest of Pine Tree Junction. The second event took place on February 18, 1972, when a magnitude 4.3 earthquake occurred approximately 29 kilometers (18 miles) east of Gillette. No damage was reported for either event.

Two earthquakes were recorded in Campbell County during the 1980s. On May 29, 1984, a magnitude 5.0, intensity V earthquake occurred approximately 39 kilometers (24 miles) west-southwest of Gillette. The earthquake was felt in Gillette, Sheridan, Buffalo, Casper, Douglas, Thermopolis, and Sundance. On October 29, 1984, a magnitude 2.5 earthquake occurred approximately 40 kilometers (25 miles) west-northwest of Gillette. No damage was reported.

Most recently, on February 24, 1993, a magnitude 3.6 earthquake occurred in southeastern Campbell County approximately 16 kilometers (10 miles) east-southeast of Reno Junction. No damage was reported.

Natrona County

Twelve magnitude 2.5 or intensity III and greater earthquakes have been recorded in Natrona County. The first earthquake that occurred in Natrona County took place on December 10, 1973, approximately 3 kilometers (2 miles) south of Powder River. People in the area reported feeling the earthquake as an intensity III event. Two of the earliest recorded earthquakes in Wyoming occurred near Casper. On June 25, 1894, an estimated intensity V earthquake was reported approximately 5 kilometers (3 miles) southwest of Evansville. Residents on Casper Mountain reported that dishes rattled to the floor and people were thrown from their beds. Water in the Platte River changed from fairly clear to reddish, and became thick with mud due to the riverbanks slumping into the river during the earthquake. An even larger earthquake was felt in the same area on November 14, 1897. This intensity VI-VII earthquake, one of the largest recorded in central and eastern Wyoming caused considerable damage to a few buildings. On October 25, 1992, an intensity IV-V earthquake was detected approximately 10 kilometers (6 miles) north-northeast of Bar Nunn. The event was felt in Casper; at Salt Creek 80 kilometers (50 miles) north of Casper; and at Bucknum, 35 kilometers (22 miles) west of Casper. No significant damage was reported in Casper.

One of the first earthquakes recorded near Midwest occurred on December 11, 1942. The intensity IV-V event occurred approximately 23 kilometers (14 miles) south of Midwest. Although no damage was reported, the event was felt in Casper, Salt Creek, and Glenrock. On August 27, 1948, another intensity IV earthquake was detected approximately 10 kilometers (6 miles) north-northeast of Bar Nunn. No damage was reported.

In the 1950s, two earthquakes caused some concern among Casper residents. On January 23, 1954, an intensity IV earthquake occurred approximately 11 kilometers (7 miles) northeast of Alcova. No damage was reported. On August 19, 1959, an intensity IV earthquake was recorded north of Casper, approximately 10 kilometers (6 miles) north-northeast of Bar Nunn. People in Casper reported feeling this event; however, it is uncertain if this earthquake actually occurred in the Casper area, as it coincides with the Hebgen Lake, Montana earthquakes that initiated on August 17, 1959.

Only one earthquake was reported in Natrona County in the 1960s. On January 8, 1968, a magnitude 3.8 earthquake occurred approximately 16 kilometers (10 miles) north-northwest of Alcova. No damage was reported.

An earthquake of no specific magnitude or intensity occurred approximately 21 kilometers (13 miles) southeast of Ervay on June 16, 1973. No one felt this earthquake and no damage was reported.

No other earthquakes occurred in Natrona County until March 9, 1993, when a magnitude 3.2 earthquake was recorded 27 kilometers (17 miles) west of Midwest. No damage was reported. A magnitude 3.1 earthquake also occurred in the far northwestern corner of the county on November 9, 1999. No one reported feeling this earthquake that was centered approximately 51 kilometers (32 miles) northwest of Waltman.

Most recently, on February 1, 2003, a magnitude 3.7 earthquake occurred approximately 26 kilometers (16 miles) north-northeast of Casper. Numerous Casper residents felt this event.

Johnson County

Eight magnitude 2.5 and greater earthquakes have been recorded in Johnson County. The first earthquake recorded in the county occurred on October 24, 1922. The location was originally determined to be near Buffalo, and the event was classified as an intensity II earthquake. Based upon a description of the earthquake in the October 27, 1922 edition of the Sheridan Post, however, the location and assigned intensity may be in error. The Sheridan Post reported that at Cat Creek, 13 kilometers (8 miles) east of Sheridan, houses were shaken and dishes were rattled. In addition, the October 26, 1922 edition of the Sheridan Post reports that only a slight earthquake shock was felt in Sheridan. Based upon this information, it seems reasonable to locate the earthquake 13 kilometers (8 miles) east of Sheridan, and to assign an intensity of IV-V to the event.

On September 6, 1943, an intensity IV earthquake was felt in the Sheridan area, although the epicenter was determined to be approximately 5 to 6 kilometers (3 to 4 miles) south-southwest of Buffalo. Beds and chairs were reported "to sway" in the Sheridan area.

Two earthquakes were recorded in Johnson County in the 1960s. A magnitude 4.7 earthquake occurred on June 3, 1965. This event was centered approximately 19 kilometers (12 miles) south of Kaycee. On April 12, 1966, an earthquake of no specified magnitude or intensity was detected approximately 40 kilometers (25 miles) southwest of Buffalo. No one reported feeling these events.

On September 2, 1976, a magnitude 4.8, intensity IV-V earthquake was felt in Kaycee. The event was located approximately 53 kilometers (33 miles) northeast of Kaycee. No damage was reported.

A magnitude 5.1, intensity V earthquake occurred on September 7, 1984, approximately 53 kilometers (33 miles) east-southeast of Buffalo. The earthquake was felt throughout northeastern Wyoming, including Buffalo, Casper, Kaycee, Linch, and Midwest, and in parts of southeastern Montana. No significant damage was reported.

Two earthquakes were detected in Johnson County in 1992. The first occurred on February 22, 1992. This magnitude 2.9 event was recorded approximately 29 kilometers (18 miles) east of Buffalo. As expected with such a small earthquake, no damage was reported. Most recently, a magnitude 3.6, intensity IV earthquake occurred on August 30, 1992. The earthquake was centered near Maynworth, approximately 35 kilometers (22 miles) west-northwest of Kaycee. It was felt in Barnum and Kaycee, but no damage was reported.

There are no known exposed active faults with a surficial expression in the vicinity of Smith Ranch, North Butte, or Ruth. As a result, no fault-specific analysis can be generated for these locations.

3.3.3.2 Gas Hills

The Gas Hills Remote Satellite is located in the south central portion of the Wind River Basin. Historically, central Wyoming has had a moderate level of seismic activity compared to the rest of the state. A discussion on historical earthquakes in the surrounding areas (Atlantic City, Lander, and Sand Draw/Gas Hills Areas,) is presented below. Historic earthquakes that have occurred in Natrona County located east of the Gas Hills Satellite were discussed in Section 3.3.3.1.

Atlantic City Area

The Atlantic City area is located about 100 kilometers (62 miles) southwest of the Gas Hills Satellite. One of the first recorded earthquakes in central Wyoming occurred on December 10, 1873, near Atlantic City in southern Fremont County. It was felt as an intensity III event in nearby Camp Stambaugh (Case, 1996a). An intensity V earthquake was reported from Atlantic City on December 12, 1923; no significant damage was reported (Humphreys, 1924). Non-damaging earthquakes were also reported in the area on October 30, 1925 (intensity III) and on August 22, 1959 (intensity IV). On February 23, 1963, a magnitude 4.3 (Modified Mercalli), intensity V earthquake occurred about 48 kilometers (30 miles) west, northwest of Atlantic City. No damage was reported. On November 3, 1984, a magnitude 5.0, intensity VI earthquake was recorded approximately 16 kilometers (10 miles) northwest of Atlantic City. This earthquake was one of the strongest recorded in this quarter of the state.

Lander Area

The Lander area is located approximately 100 kilometers (62 miles) west of the Gas Hills Satellite. A number of earthquakes have occurred in the Lander area. The first reported earthquake occurred on January 22, 1889, and had an intensity of III-IV (Case, 1993). This event was followed by an intensity IV earthquake on November 21, 1895, which resulted in houses being jarred and dishes being rattled. On November 23, 1934, an intensity V earthquake was centered about 32 kilometers (20 miles) northwest of Lander. Cracks were found in buildings in two business blocks and the brick chimney on the outside of the Fremont County Courthouse was moved 5 centimeters (2 inches) away from the building. There were a series of earthquakes in the Lander area in the 1950s that produced little damage. On August 17, 1950, there was an intensity IV earthquake that caused loose objects to rattle and buildings to creak. On January 12, 1954, there was an intensity II event, and on December 13, 1955, there was an intensity IV event near Lander (Murphy and Cloud, 1957), with no report of damage.

On June 14, 1973, a small earthquake was reported about 13 kilometers (8 miles) east-northeast of Lander. This event has since been interpreted as a probable explosion. On January 31, 1992, a non-damaging magnitude 2.8 earthquake occurred approximately 32 kilometers (20 miles) northwest of Lander (Case, 1994). This event was followed by a magnitude 4.0, intensity III earthquake on October 10, 1992. Its center was approximately 35 kilometers (22 miles) east of Lander (Case, 1994).

Sand Draw/Gas Hills Area

The first earthquake reported in the Gas Hills Area occurred on August 11, 1916, about 10 kilometers (6 miles) south of Jeffrey City (Reagor et al., 1985). No damage was associated with this intensity III event. On April 22, 1973, a magnitude 4.8, intensity IV earthquake was recorded approximately 19 kilometers (12 miles) north of Jeffrey City. On March 25, 1975, there was a magnitude 4.8, intensity III earthquake recorded about 29 kilometers (18 miles) northwest of Jeffrey City. A mobile home 56 kilometers (35 miles) southeast of Riverton was moved 3 centimeters (1 inch) off its foundation. On December 19, 1975, a non-damaging magnitude 3.5 earthquake was recorded approximately 40 kilometers (25 miles) northeast of Jeffrey City (Reagor et al., 1985).

On August 16, 1985, a magnitude 4.3, intensity IV event was recorded about 40 kilometers (25 miles) northwest of Jeffrey City; no damage was reported. On June 1, 1993, a non-damaging magnitude 3.8, intensity III earthquake occurred near Bairoil, about 32 kilometers (20 miles) southeast of Jeffrey City (Case, 1994).

There are three exposed active faults in the vicinity of the Wind River Basin and the Gas Hills Remote Satellite. Of these faults, the Green Mountain segment of the South Granite Mountain Fault System was analyzed deterministically to estimate the ground motion at the Gas Hills Remote Satellite. This fault was the only one analyzed because it is closer to the site than the other faults, its recurrence interval is shorter, and it can produce a maximum credible earthquake for the area. For the site, which is located about 45 kilometers (28 miles) from the nearest segment of the Green Mountain Fault, the expected horizontal ground acceleration at the site would be about 6% g for a magnitude 6.75 earthquake (Campbell, 1987).

3.3.3.3 Earthquake Design Considerations

The Uniform Building Code (UBC) is a document that was prepared by the International Conference of Building Officials. Its stated objective is to provide minimum standards to safeguard life or limb, health, property, and the public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within its jurisdiction. The entire SUA-1548 license area is in Seismic Zone 1 as defined by the UBC. Because effective peak accelerations (90% chance of non-exceedance in 50 years) range from 5 to 10% g in Zone 1, an average peak acceleration of 7.5% g can be applied in designing a non-critical facility near the center of the zone (Case, 1996b).

Within a tectonic province, earthquakes associated with buried faults are assumed to occur randomly. These earthquakes are designated as "floating earthquakes." In a report by Algermissen et al. (1982), the entire area occupied by SUA-1548 was assigned a floating earthquake with a magnitude of 6.1. This value was updated to 6.25 by Bernreuter et al. (1994). In addition, federal or state regulations usually specify if a floating earthquake analysis is required for a facility. For uranium mill tailings sites, the NRC requires analyzing the impacts of a floating earthquake with an epicenter 14 kilometers (9 miles) from the site. A magnitude 6.25 earthquake placed 14 kilometers (9 miles) from the Smith Ranch, North Butte, Gas Hills and Ruth Project sites would generate horizontal accelerations of about 15% (Case, 1996b).

For short-term probabilistic seismic hazard analyses, USGS acceleration maps are frequently used. These maps are for return periods of 500, 1,000, and 2,500 years. Although the maps are subject to change as earthquakes occur, the current 500-year map provides accelerations that are comparable to those derived from the UBC and in the case of the Gas Hills Remote Satellite, from the deterministic analysis for the Green Mountain Segment of the South Granite Mountain Fault System. The estimated acceleration in central Wyoming is 7% g for the 500-year map, and 20% g on the 2,500-year map. For structure design within the SUA-1548 license area, an acceleration of 7.5% g would be adequate for design purposes (Case, 1996b).

Earthquake probability maps that are used in the most current building codes (2,500-year maps) predict a scenario that would result in moderate damage to buildings and their contents, with expected damage increasing from the northeast to the southwest in Converse, Campbell, Natrona, and Johnson Counties. Fremont County experiences more variability in probabilistic earthquake acceleration due to higher acceleration rates predicted in the northwestern and southern portions of the county. The probability-based worst-case scenario however, estimates earthquakes that could result in similar levels of damage at all locations throughout the license area. Smith Ranch and the North Butte, Gas Hills, and Ruth Remote Satellites are all located in intensity VII earthquake areas. In intensity VII earthquakes, predicted damage is negligible in buildings of good design and construction, slight-to-moderate in well-built ordinary structures, considerable in poorly built or badly designed structures such as unreinforced masonry buildings. Some chimneys will be broken.

3.3.4 Soils

3.3.4.1 Smith Ranch Soil Survey and Existing Surface Disturbance Summary

Baseline soil studies were performed at Smith Ranch, Highland and Reynolds Ranch Satellites as part of the licensing process for each property. The results of these studies are provided in Appendix D7 of the Smith Ranch WDEQ Permit.

The soils at Smith Ranch are typical of the semi-arid grasslands of the western United States. Due to prevailing climate and vegetation conditions, organic matter is accumulated slowly and is confined primarily to the surface horizon resulting in light coloration. Subsoil color is usually light brown.

Most of the upland soils are residual and are formed from weathered sedimentary bedrock, mostly sandstone and shale. Most developed soils reflect the character of the bedrock. Areas of sandy and medium textured friable soils are underlain by sandstone and sandy shale. Typical toposequences under such conditions range from Taluce (shallow end) to Bowbac (moderately deep) to Hiland (deep). Heavy clay soils are underlain by clayey shale. A typical toposequence under such conditions ranges from Shingle (shallow) to Cushman (moderately deep) to Forkwood (deep). These soils vary widely in both depth and suitability and reflect the parent material from which the soils have formed.

Major stream channels are characterized by alluvial soils such as the Kishona (formerly Kim) series, Clarkelen series, and Draknab series. These soils are developed from a variety of material washed from the uplands and redeposited along the stream courses. The alluvial soils reflect the character of the weathered, transported material and generally have a dark friable surface that contains a larger amount of organic matter than upland soils.

According to the 2011-2012 surety bond estimate, Smith Ranch (including Highland and Reynolds Ranch Satellite) soils have been affected by past surface disturbances related to existing buildings, existing access roads, settling basin and storage pond construction, irrigation areas, purge storage reservoirs, and surface disturbances from individual mine units. The surety bond estimate indicates there are 36 buildings currently on site that take up a total of 2 hectares (6 acres). There are 13 access roads totaling approximately 27 hectares (66 acres). The total area taken up by storage ponds and settling basins is 3 hectares (8 acres). Irrigation areas and purge storage reservoirs total 85 hectares (210 acres) of surface disturbance. Individual mine unit disturbances consist of production wells, injection wells, monitoring wells, associated header houses, access roads, and wellfield patterns. The total area of disturbed surface related to mine unit development is approximately 453 hectares (1,120 acres). The total existing surface disturbance at Smith Ranch is 570 hectares (1,410 acres). The majority of this surface disturbance (roughly 70 to 75%) consists of well field areas that have been revegetated.

From 1996 through 2010, approximately 7 hectares (17 acres) at Smith Ranch have been impacted by spills from pipeline leaks and leaks from header houses. Cameco keeps detailed records of all spills. Soils impacted by spilled materials will be cleaned up during site decommissioning.

3.3.4.2 North Butte Remote Satellite Soil Survey and Existing Surface Disturbance Summary

For the North Butte Remote Satellite, a soil study was performed by Uranerz in the late 1980s. This survey was supplemented by a confirmatory study in 2010. The results of these studies are provided in Appendix D7 of the North Butte WDEQ Permit, and a summary is provided below.

The soils at North Butte are typical of the semi-arid grasslands of the western United States. Due to prevailing climate and vegetation conditions, organic matter is accumulated slowly, and soils have developed with light-colored surfaces. Subsoil color is usually light brown or yellowish brown.

Most of the upland soils of the survey area are residual (developed in place) and are formed from weathered sedimentary bedrock, mostly sandstone and shale. Most developed soils reflect the character of the bedrock. Areas of sandy and medium-textured friable soils are underlain by sandstone and sandy shale. Heavy clay soils are underlain by clayey shale. These soils vary widely in both depth and suitability of the material for topsoiling depending primarily on the parent material from which the soils have formed.

Stream channels of the survey area are characterized by alluvial soils of the Kishona (Kim) series. These soils are developed from a variety of material washed from the uplands and redeposited along the stream courses. The alluvial soils reflect the character of the weathered, transported material and generally have a dark friable surface that contains a larger amount of organic matter than upland soils.

According to the 2011-2012 surety bond estimate the North Butte Remote Satellite soils have been affected by past surface disturbances related to construction of existing buildings and monitor well drilling. There is one building (trailer) currently on site. The trailer takes up a total of 0.02 hectares (0.04 acres). According to Table 2 (Abandoned Borehole and Monitor Well Surface Reclamation 2010) of the 2010 North Butte Annual Report, there are 61 abandoned borehole or monitor well sites that have yet to see final grading and reseeding. It is estimated that each monitor well, between the pad and access road to the well disturbs approximately 0.2 hectares (0.5 acres) for a total of 12 hectares (31 acres). Therefore the total existing surface disturbance at the North Butte Remote Satellite is approximately 12 hectares (31 acres).

3.3.4.3 Gas Hills Remote Satellite Soil Survey and Existing Surface Disturbance Summary

For the Gas Hills Remote Satellite, a soil study was performed in December 1996 and revised in February 1998. The results of this study are provided in Appendix D7 of the Gas Hills WDEQ Permit.

The soils at the Gas Hills Remote Satellite are typical of the semi-arid areas of the western United States. Most of the upland soils are residual and are formed from weathered sedimentary bedrock. Most developed soils reflect the character of the bedrock. The areas of sandy and medium-textured friable soils are underlain by sandstone and loamstone, while the heavy clay soils are underlain by shale. These soils vary widely in both depth and the suitability of the material for topsoil, which depends primarily on the parent material from which the soils have formed. The ephemeral stream channels are characterized by alluvial soils. These soils are developed from a variety of material washed from the uplands and then redeposited along the stream courses. The soils formed in alluvium reflect the character of the weathered, transported material.

The soils are generally shallow near the Beaver Rim and deepen as one moves north within the license area. Generally, the depth of suitable material can be estimated from the landscape position, e.g., ridge vs. alluvial drainage or pediment. However, sometimes extensive suitable topsoil appears on an atypical landscape position. A more highly dissected landscape was evident in the southwestern portion of the Gas Hills area. The percent of finer material, clay or silt, was generally greater within this area of the site, as is the potential for runoff and subsequent erosion.

According to the 2011-2012 surety bond estimate the Gas Hills Remote Satellite soils have been affected by past surface disturbances. The disturbances are related to existing buildings, access roads, and monitor well installation. The Carol Shop is the only building on site and the associated disturbance area is approximately 9 hectares (21 acres). In addition there are approximately 26 hectares (64 acres) associated with access roads and 5 hectares (13 acres) related to monitoring well installation. The total amount of existing surface disturbances at the Gas Hills Remote Satellite is 40 hectares (98 acres).

3.3.4.4 Ruth Remote Satellite Soil Survey and Existing Surface Disturbance Summary

For the Ruth Remote Satellite, a soil study was performed by Uranerz in the late 1980s. No supplemental study has been conducted since then. The soil survey results for Ruth are provided in the Ruth Supplemental Report and a summary is provided below.

The soil survey was confined to the defined ore body plus a 150 meter (500 feet) buffer. The soils occurring on the Ruth Remote Satellite are typical of the semi-arid grasslands found throughout the SUA-1548 license area. Due to prevailing climate and vegetation conditions, organic matter is accumulated slowly, and soils have developed with light colored surfaces. Subsoil color is usually light brown or reddish brown.

Most of the upland soils of the survey area are residual and are formed from weathered sedimentary bedrock, mostly sandstone and shale. Most developed soils reflect the character of bedrock. Areas of sandy and medium textured friable soils are underlain by sandstone and sandy shale. Heavy clay soils are underlain by clayey shale. Depending on the parent material from which the soils have formed, these soils vary widely in both depth and suitability of the material for topsoil stockpiling.

The major stream channels within the survey area are characterized by alluvial soils including Glenburg, Bankard, and Haverson. These soils are developed from a variety of material washed from the uplands and redeposited along the stream channels. These soils have a generally dark friable surface that contains a fair amount of organic matter.

According to the 2011-2012 surety bond estimate the Ruth Remote Satellite soils have been affected by past surface disturbances related to existing buildings, access roads, evaporation ponds and monitor well access. Currently there are three buildings on site that occupy a total of 0.04 hectares (0.10 acres). In addition there is approximately 0.4 hectares (1 acre) of area associated with haul roads and parking areas. There are two evaporation ponds on site that total approximately 0.4 hectares (1 acre) in size and the existing well field disturbance (including three monitor wells and associated access roads) is 0.9

hectares (2.3 acres). The total amount of existing surface disturbances at the Ruth Remote Satellite is 1.7 hectares (4.3 acres).

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USNRC. 2004. "Environmental Assessment for the Operation of the Gas Hills Project Satellite In Situ Leach Uranium Recovery Facility." January, 2004.

3.4 Water Resources

3.4.1 Regional Water Resources

The Smith Ranch **license area, as well as the** North Butte and Ruth Remote Satellite areas are located in the Powder River Structural Basin in east central Wyoming. The Gas Hills Remote Satellite is located in the Wind River Structural Basin. The geology of these basins has played a key role in the uranium deposition, drainage development, and aquifer characteristics of the SUA-1548 license area including the remote satellites.

3.4.1.1 Powder River Basin

The Powder River Basin covers a large portion of Converse, Campbell, and Johnson Counties and contains the most extensive uranium deposits in Wyoming. The Powder River Basin is bounded on the west by the Bighorn Mountains and the Casper Arch and on the south by the Laramie Range-Hartville Uplift. The northern and eastern margins of the basin are less distinct. The broad Black Hills Uplift forms the eastern demarcation, and the Miles City Arch forms the northern boundary. Principal watersheds within the Powder River Basin are Glendo Reservoir (on the North Platte River), Middle North Platte-Casper, Lightning Creek, Dry Fork of the Cheyenne River, Antelope Creek, Salt Creek, Upper Cheyenne River, Upper Belle Fourche River, and Upper Powder River. Watersheds containing only intermittent and/or ephemeral streams that flow to the Cheyenne River include Lightning Creek, Antelope Creek, Dry Fork of the Cheyenne River, and Upper Cheyenne River. Besides uranium, these watersheds also contain areas of coal, oil and gas, and CBM development. Surface water conditions and streamflow are summarized in Appendix D6 of the WDEQ Permit.

Descriptions of the geologic formations of the Powder River Basin and their hydrologic properties have been discussed in numerous publications (Hodson et al., 1973; Hodson, 1971; Whitcomb et al., 1958; Huntoon, 1976; Davis, 1976) and in Section 3.3 **of this ER**. The hydrologic units beneath the Smith Ranch **license area** and the North Butte and Ruth Remote Satellites include the following: Holocene-age alluvial deposits, the Eocene-age Wasatch Formation, the Paleocene-age Fort Union Formation, and the Cretaceous-age Lance and Fox Hills Formations. Individual sandstones within these units may be classified as aquifers depending on their hydrologic characteristics and potential yield to wells and/or springs.

3.4.1.2 Wind River Basin

The Gas Hills Remote Satellite lies primarily along the south-central flank of the Wind River Basin. The Beaver Divide, which trends along the southeastern side of the site, forms a prominent drainage divide between the Wind River and Sweetwater River Basins. Major drainages within the project area are tributary to the Wind River.

Descriptions of the geologic formations of the Wind River Basin and their hydrologic properties have been summarized in Section 3.3 **of this ER**. The hydrologic units beneath the Gas Hills Remote Satellite and in the general vicinity include the following: Quaternary alluvium, the Miocene-age Split Rock Formation, Oligocene-age White River Formation, the Eocene-age Wind River Formation. Underlying these Tertiary units lie the Late Cretaceous-age Frontier Formation, the Early Cretaceous-age Muddy Sandstone and Cloverly Formations, the Late Jurassic-age Sundance Formation, the Jurassic/Triassic-age Nugget Formation, the Triassic-age Chugwater and Dinwoody Formation, the Permian-age Phosphoria Formation, the Middle Pennsylvanian-age Tensleep Sandstone, the Early Pennsylvanian-age Amsden Formation, and the Early Mississippian-age Madison Limestone. Individual sandstones within these units may be classified as aquifers depending on their hydrologic characteristics and potential yield to wells and/or springs.

3.4.2 Smith Ranch, Highland, and Reynolds Ranch Satellite

The *Safety Evaluation Report for Renewal of Rio Algom Mining Corp. Smith Ranch In-Situ Leaching Facility Converse County, Wyoming (2001)* states that the NRC has reviewed and accepted the hydrologic site characterization contained in the Environmental Assessment for Renewal of Source Material License No. SUA-1548 Rio Algom Mining Corporation Smith Ranch Uranium Project Converse, County (2001). The approved hydrologic site characterization for Smith Ranch is summarized in the following sections. Updated water rights and water quality data and updated potentiometric surface maps are included in this report. There has been no new hydrologic evidence that would alter the findings of the 2001 Safety Evaluation Report.

3.4.2.1 Surface Water

3.4.2.1.1 Hydrology and Stream Flow

Smith Ranch (including Highland and the Reynolds Ranch Satellite) occupies approximately 16,200 hectares (40,000 acres) and is located in the southern portion of the Powder River Basin.

Smith Ranch lies within the Sage Creek drainage of the North Platte River drainage system and includes Box Creek, Duck Creek, Willow Creek, and Brown Springs Creek- all tributary to the Cheyenne River. All streams are ephemeral and flow only in response to snowmelt and heavy thunderstorms. There are no gauging stations within the drainages; therefore flow quantities are not measured. A considerable area encompassed by the project site is internally drained to playas. Smith Ranch receives approximately 31 centimeters (12 inches) of precipitation annually (detailed climatic data are presented in Section 3.6 **of this ER** and Appendix D4 of the WDEQ Permit). Stock ponds constructed in many of the ephemeral streams draining the area collect some runoff for watering livestock; however, these ponds are dry much of the time. There are numerous playas present which hold runoff water during times of abundant precipitation. Tables D6-1 and D6-2 in Addendum D-6 B1 of the WDEQ Permit contain USGS stream flow records for Box Creek, downstream of Smith Ranch. These tables show the lack of runoff and stream flow in the area and the ephemeral nature of the stream system.

Sage Creek runs through the southwest portion of Smith Ranch. The USGS maintained a stream gage near Orpha, approximately 3 kilometers (2 miles) southeast of Smith Ranch (USGS Gage No. 06648780). Peak stream flow values were recorded from 1965 to 1984. The data indicate that Sage Creek is highly variable as annual peak flow rates range from 0 to 6.5 **cubic** meters/second (229 **cubic** feet/second). Sage Creek is also ephemeral, as 5 out of 19 years were dry.

Average annual runoff from Smith Ranch is approximately 0.8 to 1.3 centimeters/year (0.3 to 0.5 inches) with the majority of runoff occurring in response to thunderstorm events. Snowmelt conditions occasionally contribute to surface water flow- but typically in an intermittent fashion.

3.4.2.1.2 Water Use and Quality

Typical surface water use at Smith Ranch is livestock and wildlife watering. The drainages are ephemeral and flow only in response to snowmelt or major precipitation events. Stock ponds and playas impound the water on a seasonal basis. Surface water samples from selected points in the Box Creek drainage were sampled by previous developers during the period of surface mining activities. The data, which historically have been considered to be representative of surface water quality for Smith Ranch, Highland, and Reynolds Ranch Satellite, are included in Table D6-3 in Addendum D-6 B1 of the WDEQ Permit. Sampling locations are shown on Figure D6-1 in Addendum D-6 B2 of the WDEQ Permit. The data indicate that water quality in these surface waters does not meet Wyoming domestic water use suitability standards (Class I) or EPA public health standards for chloride, sulfate, and total dissolved solids (TDS). These waters do however meet Wyoming livestock use suitability standards (Class III) and are suitable for stock and wildlife consumption. **Surface waters at Smith Ranch are not used for any project related production or non-production water usage**.

Sampling for radiological constituents **as required by NRC Regulatory Guide 4.14 (RG 4.14)** has been conducted at select surface water points within Smith Ranch since 2003 and since 1987 from the Highland area. Figure D6-2 of Appendix D6 of the WDEQ Permit show the radiological surface water sampling locations. **Results for both RG 4.14 constituents and WDEQ Guideline 4 and Chapter 11 Regulations** are summarized in Table D6-2 of Appendix D6 of the WDEQ Permit. Surface water samples were collected at Reynolds Ranch between August 17 and 18, 2011. The results are presented in **Table 3.4-1, Reynolds Ranch Surface Water Quality Data**. The sample locations are presented on **Figure 5.7** of the TR.

Sediment samples were collected along ephemeral drainages and impoundments within Reynolds Ranch between August 17 and 18, 2011. **Table 3.4-2, Reynolds Ranch Sediment Quality Data** presents the results of radionuclide analysis completed on all sediment samples. In general, concentrations of radium 226 and lead-210 averaged 2.7 pCi/gram, uranium concentrations averaged 1.3 pCi/gram, and thorium 230 concentrations averaged 0.9 pCi/gram. Sediment sample locations are presented on **Figure 5.7** of the TR.

3.4.2.1.3 Water Rights

A list of all surface water rights within Smith Ranch (including Highland and Reynolds Ranch Satellite) and on adjacent lands, as of November 2011 is included in **Table 3.4-3, Smith Ranch Surface Water Rights**. The locations of the surface water rights are shown on **Figure 3.4.1, Smith Ranch Surface Water and Groundwater Rights**. The majority of surface water rights **is** limited to small stock ponds and associated ditches.

3.4.2.2 Groundwater

The geologic units within Smith Ranch (including Highland and Reynolds Ranch Satellite) were mentioned previously in the regional setting and are summarized in more detail in Section 3.3. The hydrogeologic units are discussed in the following sections and site-specific groundwater hydrology are presented in detail in Appendix D6 of the WDEQ Permit. Baseline aquifer characteristics and water quality were developed for Smith Ranch and Highland beginning in the 1970s and have been updated as additional data have been acquired during hydrologic unit testing of the various ISR mine units. The uranium producing sands are hosted within the Eocene-age Fort Union Formation. A local geology map is presented on Figure D5-3.1 of Appendix D-5 of the WDEQ Permit.

3.4.2.2.1 Hydrogeologic Stratigraphy

Alluvium – Alluvial deposits in the Smith Ranch area consist of thin, unconsolidated, poorly stratified clays, silts, sands, and gravels. The total thickness of these deposits is estimated to range from less than 0.3 to 9 meters (1 to 30 feet). Small amounts of precipitation infiltrate the alluvium during part of the year and intermittent flows across the alluvium may provide some recharge. The water table is typically more than 31 meters (100 feet) below the land surface throughout most of Smith Ranch. Therefore, most of the recharge flows through the lower portion of the alluvium. The potential for future development of alluvial groundwater supplies is considered very poor.

Wasatch Formation - The Wasatch Formation typically is composed of lenticular, fine- to coarse-grained sandstones with interbedded claystones and siltstones. This formation underlies all except the southwestern and extreme western portions of Smith Ranch and ranges in thickness from 0 to approximately 150 meters (500 feet). The Wasatch Formation is one of the more important shallow aquifers in the Powder River Basin.

Properly constructed wells penetrating the Wasatch Formation in the vicinity of the Smith Ranch CPP generally yield from 19 to 57 liters/minute (5 to 15 gallons/minute). A water supply well (WW-103) completed in the Wasatch Formation near the former Bill Smith mine initially produced 530 liters/minute (140 gallons/minute); however, production was from a composite thickness of approximately 37 meters (120 feet) of sandstone including four separate sandstone units commingled within the well. This 145 meter (474 foot) deep well **tapped** the Wasatch Formation in one of its thicker zones. The permit for this well has been cancelled for years; **the well was plugged and abandoned after** the Bill Smith mine shaft was sealed.

For the most part, groundwater as utilized by stock wells from the Wasatch Formation exists under water table (unconfined conditions) and such wells are generally low-yielding. Artesian (aka, confined) zones near the base of the formation are separated from near-surface deposits and from each other by impermeable shale layers. The Wasatch Formation is considered to have good potential for water supply development for livestock.

Fort Union Formation - The Fort Union Formation underlies the Wasatch Formation. The top of the Fort Union Formation is exposed at the surface in the southwestern and western portions of Smith Ranch, but occurs at depths of 150 meters (500 feet) or more in the eastern and northeastern part of Smith Ranch. The formation is as much as 900 meters (3,000 feet) thick beneath the **site**.

The Fort Union Formation is an important aquifer in the Powder River Basin. Nearly all of the Smith Ranch wells are completed in this formation. While most of the wells are designated for limited yields of 19 to 114 liters/minute (5 to 30 gallons/minute), wells completed in the Fort Union Aquifer associated with the former Bill Smith mine dewatering program produced as much as 2,120 liters/minute (560 gallons/minute). Substantial volumes of groundwater can be produced from the Fort Union Formation over extended periods, as demonstrated by the various historical and current ISR operations in the Southern Powder River Basin.

Lance and Fox Hills Formations - The Lance and Fox Hills Formations underlie the Fort Union Formation at depths of approximately 1,067 and 1,676 meters (3,500 and 5,500 feet), respectively beneath the site. The formations are comprised of fine- to medium-grained sandstones, interbedded sandy shales and claystones. Well yields from these formations are not expected to exceed 380 liters/minute (100 gallons/minute), and the associated groundwater reserves may be limited. Little is known of the hydrologic characteristics of the Lance and Fox Hills Formations as no water wells tap these **aquifers within or near the Smith Ranch site**.

3.4.2.2.2 Producing Sands

Previous reports for the individual sandstone units within Smith Ranch and Highland have used different nomenclature **to identify the same** sandstone units. This historic nomenclature is maintained throughout this document in an effort to preserve the sampling, testing and ISR history. For the purposes of correlation, the M Sands, which are present at Smith Ranch, are equivalent to the 10 Sands at Highland; the O1, O2, O3 and O4 Sands at Smith Ranch are equivalent to the 20/30, 40/50, 60/70 and 80 Sands, respectively at Highland. The Q and S Sands at Smith Ranch are equivalent to the 90 and 100 Sands, respectively at Highland. A schematic sandstone correlation chart for Highland, Smith Ranch, and Reynolds Ranch Satellite is presented on **Figure 3.3.1**.

Wells drilled for aquifer tests and/or collecting baseline data for Smith Ranch, including the two Smith Ranch pilot projects, are listed in Table D-6.4 of Addendum D-6 A1, and are located as shown on Figures D-6.4, D-6.5, and D-6.6 of Addendum D-6 A2 of the Smith Ranch WDEQ Permit.

3.4.2.2.3 Confining Unit Characteristics

Before ISR commenced, characterization of the confining layers was completed for the eastern portion of Smith Ranch and is documented in Appendix D6 of the WDEQ Permit. This characterization is considered representative of baseline conditions for the entire Smith Ranch area. Low permeability confining units (aquitards) are present between the various sandstone aquifers. These units are typically 6 to 14 meters (20 to 45 feet) in thickness, but may be thicker in areas where the sandstone pinches out. These siltstone and claystone units are usually continuous over relatively large areas. Where individual sandstone units converge (facies change), the previous overlying claystone is non-existent. Geologic cross-sections which show the thickness and extent of confining units are included in Appendix D-5 of the WDEQ Permit.

Vertical permeability of confining units was determined in the laboratory from actual cored material and from pump test results utilizing the Neuman-Witherspoon Method. Table D6-5 of Addendum D-6 B1 of the WDEQ permit contains estimates of the vertical permeability of the confining units. These vertical permeabilities are considered representative of conditions found throughout Smith Ranch in similar units.

3.4.2.2.4 Aquifer Pump Tests and Analysis

Five baseline pump tests were conducted in the Smith Ranch area to evaluate the baseline hydrologic characteristics of the mineralized zones. The first pump test was conducted in 1974 to evaluate anticipated groundwater inflow associated with the development of the Bill Smith underground mine (Harshbarger and Associates, 1974). It is discussed in Attachment A of Addendum D-6 A3 of the Smith Ranch WDEQ Permit. The second pump test was conducted in 1981 at the Q Sand ISR pilot site to document the suitability of the site for solution mining and is discussed in Attachment B of Addendum D-6 A3 of the WDEQ Permit. The third pump test was conducted in 1983 at the O Sand ISR pilot site and is discussed in Attachment C of Addendum D-6 A3 of the WDEQ Permit. To provide additional aquifer characteristic data, pump tests were also conducted in two additional areas, Sections 25 and 35. A 1988 report including the results and analysis of these pump tests is included as Attachment D of Addendum D-6 A3 of the WDEQ Permit.

Five baseline pump tests were also conducted at Highland. These five pump tests evaluated the aquifer characteristics of the 20, 30, 40 and 50 Sands. A summary of the results are presented in Table D-6.4 of Addendum D-6 B1 of the WDEQ Permit.

Two pump tests were conducted in the Reynolds Ranch Satellite area. The tests were conducted in January 1989 in areas of future potential production. The sand zones that were tested include the U/S Sand and the O Sand. The pump tests conducted at the Reynolds Ranch Satellite are discussed in Addendum D6 C3 of the WDEQ Permit.

Since 1987, more than 17 pump tests have been performed across Smith Ranch as part of the hydrologic testing program for new mine units. All pump tests conducted to date have demonstrated that the mineralized formations have acceptable permeability and transmissivity characteristics suitable for ISR activities at Smith Ranch. Monitoring wells have been completed in hydrologic connection with the mine units, and all confining units tested have proven to be effective aquitards for controlling the vertical movement of leach solutions.

Since the 2001 renewal, hydrologic testing of eight additional mine units has been completed. Mine unit testing has been conducted in Mine Units 2, 9, 15, 15A, I, J, K, and the Southwest Area. Plates OP-1-1 through OP-1-6 of the WDEQ Smith Ranch Permit show mine unit locations. Mine Units 2, 15, 15A, I, and K targeted the well-established O Sand. The Southwest Area, which includes Mine Units 9 through 12 targeted the mineralized K Sand, and Mine Unit J targeted the mineralized Q Sand. Examples of pump test data and mine unit aquifer characteristics determined since 2001 are presented below.

Mine Unit K was pumped in 2006 at a rate of **265** liters/minute (70 gallons/minute) for 73.5 hours. The Lower O Sand was monitored using 55 wells. Drawdown in the monitoring wells ranged between 0.5 and 7 meters (2 and 24 feet). Negligible changes were observed in the overlying and underlying sands. Transmissivity results from the Theis analysis range from 15 to 49 **square** meters/day (157 to 523 **square** feet/day), with an average transmissivity value of 28 **square** meters/day (300 **square** feet/day). Based on an average thickness of 37 meters (120 feet), the average hydraulic conductivity is 0.81 meters/day (2.67 feet/day). Storage coefficients range from 7.9 E-5 to 3.1 E-4. The O Sand multi-well pump tests at OP-2 and Section 25-584 yielded average permeabilities of 1 and 3 meters/day (4 and 10 feet/day) respectively. An average permeability of 2 meters/day (7 feet/day), an average gradient of 0.0015 and an effective porosity of 0.1 indicate that the average velocity in the O Sand is 12 meters/year (38 feet/year).

The Southwest Area which includes Mine Units 9 through 12 was pumped in 2006 at an average rate of **102** liters/minute (27 gallons/minute) for 196 hours. The K Sand was monitored using 11 wells. Drawdown in the monitoring wells ranged between -0.5 and 1.5 meters (-0.2 and 5 feet). Negligible changes were observed in the overlying and underlying sands. Transmissivity results from the Theis analysis range from 5 to 17 **square** meters/day (59 to 185 **square** feet/day), with an average transmissivity value of 12 **square** meters/day (125 **square** feet/day). Based on an average thickness of

27 meters (90 feet), the average hydraulic conductivity is 0.4 meters/day (1.4 feet/day). Storativity values range from 5.4 E-5 to 1.3 E-4.

Mine Unit J was pumped in 2005 at an average rate of **87** liters/minute (23 gallons/minute) for 65.8 hours. The Q Sand was monitored using 36 wells. Drawdown in the monitoring wells ranged between 0.1 and 4.7 meters (0.41 and 15.5 feet). Negligible changes were observed in the overlying and underlying sands. Transmissivity results from the Theis analysis range from 1.3 to 8.1 square meters/day (13.7 to 86.6 square feet/day), with an average transmissivity value of 5.4 square meters/day (58 square feet/day). Based on an average thickness of 12.2 meters (40 feet), the average hydraulic conductivity is 0.4 meters/day (1.45 feet/day). Storativity values range from 1.4 E-5 to 6.8 E-5.

Review of available data indicate that the pump tests for all mine units (post 2001) established hydraulic communication within the production sands and that adequate confinement by the overlying and underlying aquitards exist. Confining unit vertical hydraulic conductivity has been well established in the eastern portion of Smith Ranch and it is possible to correlate many confining units between the eastern and western portions of Smith Ranch. Vertical conductivities calculated from core and pump test results range from 7.9 E-8 to 4.3 E-4 **meters**/day (2.6 E-7 to 1.4 E-3 **feet**/day).

3.4.2.2.5 Aquifer Potentiometric Surfaces

Potentiometric surface contours were constructed for aquifers which could potentially be affected by ISR activities as part of the baseline data collection. These aquifers are the M Sand, O Sand, Q Sand and S Sand (deepest to shallowest) in the western portion of Smith Ranch and the 40, 50, and 60 Sands in the Highland area. A schematic sandstone correlation chart for Smith Ranch, Highland, and the Reynolds Ranch Satellite is presented on **Figure 3.3.1**.

The baseline potentiometric contour map for Smith Ranch was constructed by Hydro-Engineering using available wells and water levels collected during February 1991. In the Highland area maps were constructed with water level data collected on, or near August 15, 1990. Figure D-6.7 of Addendum D-6 A2 of the WDEQ Permit presents the baseline potentiometric surfaces for the M, O, Q and S aquifers at Smith Ranch. The circle, square, triangle and star symbols show locations for the M, O, Q and S wells respectively. Wells TW-1, TW-2, OWD-1, and OWD-4 are completed in both the M and O Sands. Therefore, their symbol is a combination of a square and circle. Some of these wells are completed over only a portion of these sands, and where the sand is very thick, a significant head difference can exist from the top to the bottom of the sand. The contours on the potentiometric surface maps are Hydro-Engineering's interpretation of average head conditions in each of these sands and, therefore, some points are not given as much weight as others. Table D-6.37 of Addendum D-6 A1 of the Smith Ranch WDEQ Permit provides the basic well information used for construction of the potentiometric contours. It should be noted that the shaft, located at the Bill Smith mine site under the present CPP office building, was being pumped at a rate of approximately 757 liters/minute (200 gallons/minute) at the time the baseline water levels were measured. The shaft has since been filled and sealed. Updated potentiometric surface maps based on more recent data from the Hydrologic Unit Testing packages for the M, O, Q, and S Sands are provided on Plates D6-1A through D6-1D of Appendix D6 of the WDEQ Permit.

Water levels from wells M-136, M-421, M-422, M-310, M-295, M-296, M-528, M-736, M-741, M-744, and OMM-1 were used to develop the baseline potentiometric surface contours for the M Sand aquifer in the Smith Ranch area. At the time that map was prepared, groundwater in the M Sand was flowing to the east-northeast and most of it converged to the mine shaft due to pumping at the time of measurement. The average groundwater velocity was estimated to be 0.4 meters/year (1.3 feet/year) based on a permeability of 0.1 meters/day (0.3 feet/day), an average gradient of 0.0012 and an effective porosity of 0.1. The permeability was obtained from the Section 35-739 multi-well pump test and is thought to be low due to the overall flat gradient in this aquifer. An updated potentiometric surface of the M Sand is provided on Plate D6-1A in Appendix D6 of the WDEQ Permit. The potentiometric surface provided on this map blends data collected in 2001 from Mine Unit 2, 2004 from Mine Unit 15, 2006 from Mine Unit 15A with the 1998 and 1999 data collected from Mine Units 4 and 4A.

An updated "concept level" potentiometric surface of the O Sand is provided on Plate D6-1B of Appendix D6 of the WDEQ Permit. This map was developed at the request of WDEQ by blending data collected between 1991 and 2006 from Mine Units 1, 2, 3, 4, 4A, 15, and 15A at Smith Ranch, Mine Unit 27 at Reynolds Ranch, and Mine Units A, C, E, F, H, and I at Highland.

The hydrologic conditions of the Q Sand were originally defined only in Section 36. The small dashed lines on Figure D-6.7 in Addendum D-6 A2 of the WDEQ Permit represent the baseline potentiometric surface of the Q Sand. The contours yield an average gradient of 0.0036. The Section 35-739 multi-well test produced an average permeability of 1.4 meters/day (4.5 feet/day). These properties indicated that groundwater was moving to the north-northwest at 18 meters/year (59 feet/year) in the Q Sand. Additional testing in Mine Units, 1, 2, 3, 15, 15A, J, and K has characterized the Q Sand in other areas of Smith Ranch. An updated potentiometric surface of the Q Sand is provided on Plate D6-1C in Appendix D6 of the Smith Ranch WDEQ Permit.

The baseline S Sand potentiometric contours are represented with the small solid lines on Figure D-6.7 in Addendum D-6 A2 of the WDEQ Permit. These contours indicated a steep gradient of 0.05. The groundwater was estimated to be moving to the north at 54.9 meters/year (180 feet/year) based on that gradient. The estimated permeability of the S Sand is 0.3 meter/day (1 foot/day). An updated potentiometric surface of the S Sand is provided on Plate D6-1D in Appendix D6 of the Smith Ranch WDEQ Permit based on data collected in Mine Units 1, 2, 15, and 15A at Smith Ranch and Mine Unit 27 at Reynolds Ranch.

Individual baseline potentiometric surface maps for the 40, 50, and 60 Sands at Highland are included as Plates D6-1, D6-2 and D6-3 in Addendum D-6 B2 of the WDEQ Permit, respectively. These maps were constructed with water level data collected on, or near August 15, 1990. An updated potentiometric surface for the 30/40/50 sands is correlated with the O Sands on Plate D6-1B in the Smith Ranch WDEQ Permit. The potentiometric surface maps show that in areas unaffected by existing Smith Ranch activities or past underground mine dewatering, the general direction of groundwater flow is from the southwest to the northeast. Unaffected water level gradients are approximately 0.008 for the 40 Sand, 0.003 for the 50 Sand and 0.002 for the 60 Sand.

The baseline potentiometric surfaces for the U/S and O aquifers in the Reynolds Ranch Satellite area are presented as Figures D6-2 and D6-3 in Addendum D-6 C of the Smith Ranch WDEQ Permit. Table D6-4 in Addendum D-6 C of the Smith Ranch WDEQ Permit lists the wells and associated water level monitoring results used to prepare the maps. The water levels were measured on November 6, 2004. Direction of flow is oriented in a more northerly direction.

3.4.2.2.6 Groundwater Quality

Extensive groundwater quality data have been collected from each of the two Smith Ranch pilot projects in the western portion of Smith Ranch. These data were previously submitted to NRC and WDEQ in the NRC License Applications and WDEQ Land Quality Division (LQD) quarterly reports. Baseline water quality data for the production zones in the pilot projects are summarized in Addendum D-6 A1, Tables D6-5 and D6-6 of the WDEQ Permit for the Q Sand and O Sand pilots, respectively.

In addition to sampling at the pilot projects, baseline water quality data was collected from **approximately** 30 other wells. These data are representative of the baseline water quality throughout the western portion of Smith Ranch before ISR operations commenced. Typically five samples were collected from each well over a period of 6 to 9 months and analyzed for the full list of WDEQ approved parameters. These data are included in Tables D-6.7 through D-6.36 of Addendum D-6 A1 to the Smith Ranch WDEQ Permit. In general, the water quality of the Smith Ranch area is similar to that seen at the pilot sites. There are some variations in water quality constituents on a sand-by-sand basis. Water quality data representative of specific sands are collected and analyzed during the Hydrologic Unit Testing program for each new well field.

Baseline groundwater quality data reflective of the Highland area were submitted with the original WDEQ permit application and include:

- four Exxon water supply wells completed in the Highland ore sand aquifer, outside of the ore zones;
- the Numrick livestock well;
- the Fowler Ranch water well; and
- the Vollman Ranch water well.

The latter three wells are completed in the intermediate sand zone which lies stratigraphically above the local ore sand aquifer. The locations of these wells are shown on Figure D6-1 of Addendum D-6 B2 to the WDEQ Permit. A summary of the water quality data are included in Tables D6-6 and D6-7 of Addendum D-6 B1 to the WDEQ Permit. This aquifer has not, nor is it anticipated to be affected by ISR activities.

A vast amount of baseline groundwater quality data have been collected since ISR activities **started** at Highland. Baseline groundwater quality data have been collected from the A, B, C, D, E, F, H, I, and J-well field areas as part of required well field development activities. Numerous water quality samples have been collected from the 10, 20, 30, 40, 50 and 60 Sands to document baseline conditions within these well fields. These data are on file with both the WDEQ and NRC.

In general, the baseline groundwater quality in the Highland area sandstone aquifers meets Class I-Domestic use suitability standards (WDEQ WQD R&R Chapter 8) except in proximity to the ore zones where radium concentrations can greatly exceed the domestic, agriculture and livestock standard of 5 pCi/Liter. Total dissolved solids concentrations sometimes exceed the domestic standard of 500 milligrams/Liter. Tables D6-8 and D6-9 of Addendum D-6 B1 to the WDEQ Permit provide a summary of the baseline water quality data for the 20 and 30 Sands, respectively, in the A and B mine unit areas. This data summary is representative of baseline groundwater quality conditions throughout the Smith Ranch project site.

Extensive groundwater quality data were previously collected by SMC to characterize the Reynolds Ranch Satellite area. The water quality data were collected from the planned production zones and potential potable or existing stock water sources. These baseline water quality data are presented in Attachment D6-2 to Addendum D-6 C3 to the WDEQ Permit. A well location map is also presented in Addendum D-6 C2 to the WDEQ Permit as Figure D6-1. Additional water quality data collected in 2004 from Mine Unit 27 are presented in Tables D-6-5, D6-6, D6-7, and D6-8 of Appendix D6 of the WDEQ Permit.

A baseline water quality comparison was conducted using Smith Ranch, Highland and Reynolds Ranch Satellite historical water quality data. Average concentrations of constituents from Smith Ranch and Highland (Tables D6-5 and D6-6 of Addendum D-6 A1; Tables D6-8 and D6-9 of Addendum D-6 B1 of the Smith Ranch WDEQ Permit) were combined with averages from Reynolds Ranch Satellite Mine Unit 27 to produce Table D6-9 (Appendix D6 of the WDEQ Permit). An average baseline range of parameters were created using Smith Ranch, Highland, and Reynolds Ranch Satellite data and compared to the approved mine unit baseline data. Averages for approved mine unit baseline data were developed from MP wells (i.e., interior production zone wells). A summary of the water quality data mentioned above is presented in Table D6-9 of Appendix D6 of the Smith Ranch WDEQ Permit.

Comparing the approved mine unit data to the baseline average range of parameters, 98 outliers were identified from the hundreds of analyses that were performed. The majority of outliers were just outside the minimum or maximum average. Of note are uranium values for Mine Units C and D which exceed the average range of concentrations with values of 2.1 and 1.1 milligrams/Liter, respectively.

The average water quality results for the approved mine units are similar to the baseline water quality determined for the Smith Ranch, Highland, and Reynolds Ranch Satellite areas. Overall, Smith Ranch water quality is dominated by calcium-sodium-bicarbonate-sulfate water.

3.4.2.2.7 Groundwater Use and Rights

A list of all groundwater rights within Smith Ranch and adjacent lands, as of November 2011 is included in **Table 3.4-4, Smith Ranch Groundwater Rights**. The locations of the groundwater rights are shown on **Figure 3.4.1.**

There are more than 1,400 groundwater rights on file with the Wyoming State Engineer's Office (WSEO) within Smith Ranch and within a 5 kilometer (3 mile) area of the site boundary. The vast majority of these groundwater rights are for wells installed for hydrologic monitoring, dewatering purposes at the decommissioned conventional uranium mining operations, and ISR activities at Smith Ranch. There are 131 wells permitted for miscellaneous use. The majority of these wells are permitted for industrial/miscellaneous dual use associated with ISR activities. There are 162 groundwater rights associated with wells installed for livestock water. There are three wells used for irrigation purposes. There are 32 groundwater rights within 5 kilometers (3 miles) of Smith Ranch permitted for domestic supply. Half of these wells are dual use domestic water rights combined with livestock, industrial, or irrigation purposes. The remaining 16 water rights are permitted strictly for domestic use according to the WSEO.

There are five groundwater rights permitted for domestic supply within the Smith Ranch boundary. Two are permitted for domestic/industrial dual use and one is permitted for domestic/stock dual use. Two groundwater rights are permitted strictly for domestic supply wells. The first well, Mason #1 is located in the northwest area of the Reynolds Ranch Satellite. The well is 36 meters (118 feet) in depth. The second domestic well is associated with the Vollman Ranch house, which is located near the center of Smith Ranch. This well is 55 meters (180 feet) in depth.

There are three public water systems (PWS) in the vicinity of Smith Ranch. They include PRI Smith Ranch (PWS # 5601500), Fort Fetterman State Historical Site (PWS # 56080174), and the Town of Douglas (PWS # 5600137). The first is located on site; the remaining two are 27 kilometers (17 miles) south, and 38 kilometers (23 miles) southeast of the Smith Ranch site, respectively.

Besides the stated industrial uses, Cameco also uses groundwater for project-related non-production purposes. Approximately 3.8 million liters (1 million gallons) of water are utilized each year at the Smith Ranch Project site for non-production uses, which includes sanitary uses, non-process equipment cleaning, office cleaning, etc. The source of the water is groundwater that is obtained from WSEO permitted water wells that are completed in non-uranium bearing sand units within the upper Fort Union or lower Wasatch formations. Water wells used range in depth from 140 meters (460 feet) to 265 meters (865 feet). The quality of the water used meets use suitability for WDEQ/WQD Class III (livestock) quality or better. Drinking water is obtained from a commercial water bottling supplier.

3.4.3 North Butte Remote Satellite

3.4.3.1 Surface Water

3.4.3.1.1 Hydrology and Stream Flow

The North Butte Remote Satellite is located in the Willow Creek drainage which is a tributary to the Powder River and ultimately to the Yellowstone and the Missouri Rivers. The Willow Creek drainage system is shown on Plate D6-1 of Appendix D6 of the North Butte WDEQ Permit. Willow Creek and its tributaries are classified as ephemeral streams and flow generally in response to heavy snow melt and large convective rainstorms. Willow Creek may flow intermittently in the spring and early summer, yet remains dry the remainder of the year except during major thunderstorms in the area. Its drainage basin above the Dry Willow Creek confluence is approximately 35.4 square kilometers (13.6 square miles), and its gradient through the North Butte Remote Satellite is about 0.03 meters/kilometer (99 feet/mile). Active stream channel width averages 4 meters (14 feet) and its length is approximately 660 meters (2,165 feet).

Cameco compared hydrologic model data to empirically derived data calculated from the USGS Water-Supply Paper (WSP, 2056) entitled *"Analysis of Runoff from Small Drainage Basins in Wyoming"* by Craig and Rankl (1978) to establish peak discharge calculations for Willow Creek at the North Butte Remote Satellite. Willow Creek peak discharge calculations can be found in Table D6-1.5 of Addendum D6 to the North Butte WDEQ Permit.

Beginning in 2010, Cameco completed additional hydrologic data collection to characterize peak discharges in the ephemeral tributaries to Willow Creek. The locations of the ephemeral tributaries are presented on Figure D6-1.5 of Addendum D6 to the WDEQ Permit. The majority of the ephemeral tributaries originate at the North Butte itself and flow to the south and southeast. Eventually all of these drainages enter Willow Creek near the south end of the North Butte Remote Satellite boundary. Channel gradients in the tributaries range from 0.012 to 0.068.

Thirteen channel cross sections were surveyed on the ephemeral drainages and Willow Creek. The locations and detailed channel cross sections are presented in Attachment D6-1.3 to Addendum D6 to the WDEQ Permit. In general, the tributary drainage bottoms are grass lined channels, narrower than Willow Creek. The typical tributary draw (drainage) surveyed had side slopes that ranged from 1.5 to 5.0:1 (H:V).

Ephemeral drainage basin hydrology was evaluated with the HydroCAD computer model. The model generates hydrographs for individual basin areas and hydrographs are routed downstream through channels and/or reservoirs. Multiple sub-areas can also be modeled within a given watershed model. The HydroCAD model was used to calculate flood flows throughout the North Butte Remote Satellite area.

The HydroCAD model incorporates the Soil Conservation Service curve number calculations into the flood flow predictions. The runoff curve number is an empirical parameter used in hydrologic calculations for predicting direct or infiltration-excess runoff. The runoff curve number is determined, based on hydrologic soil group, land use, surface treatment and hydrologic condition. Two different curve numbers were utilized in the HydroCAD modeling for Willow Creek and its tributaries. Sub-basins that occupy areas of visible outcropping or shallow soils on aerial imagery will accordingly exhibit lower infiltration rates. A curve number of 76 was used for the upper reaches of several of the basins, in particular those that abut the North Butte. An average curve number of 70 was used in the lower, downstream sub-basin areas where outcropping was not visible and/or well drained soils are indicated.

The calculated discharges do not account for potential flood volume storage within the several stock ponds in the basin. For conservatism, the presence of the stock ponds is not incorporated into the analysis even though, under average conditions, a large amount of abstraction of the runoff would occur as a result of these stock ponds. The peak discharges and critical drainage basin parameters used for the North Butte Remote Satellite Project's culvert designs are presented in **Table 3.4-5, Peak Discharges for Design Recurrent Interval Storm Events.**

3.4.3.1.2 Surface Water Use and Quality

Typical surface water use at the North Butte Remote Satellite site is livestock and wildlife watering. Surface waters at North Butte are not used for any project related production or non-production water usage.

Cameco established 27 new surface water quality sampling sites in addition to maintaining the three original points established by Uranerz (SWS1, SWS2, and SWS3), making a total of 30 surface water monitoring sites at the North Butte Remote Satellite. The drainages in and around the permit area are ephemeral in nature, which complicates Cameco's ability to collect live flowing and representative surface water samples. Of the 27 surface water quality sampling sites established by Cameco, 18 are at impoundment locations where a berm or dam structure is trapping water creating a holding pond. The remaining nine sites are located upstream and downstream of drainages sufficiently close to the operation to be subject to surface drainage from potentially contaminated areas or well field leaks or spills. The location of all 30 sites (18 impoundment, 9 stream channel sites, and original sites SWS1, SWS2, and SWS3) are shown on Figure D6-1.6 of the North Butte WDEQ Permit.

All 30 surface water quality sampling sites were visited during field data collection in August 2010, early June 2011, and September 2011. During the August 2010 sampling campaign, the majority of the historic and contemporary water quality sampling sites were dry thereby preventing the collection of water samples for analysis. Three impoundment sites (NBI5, NBI12, and NBI16) contained ponded water and were sampled. In June 2011, all 30 surface water quality sites were visited again. Eleven impoundment sites (NBI3, NBI5, NBI6, NBI8, NBI10, NBI11, NBI12, NBI14, NBI15, NBI16, and NBI17) and one downstream sampling location (NBSD1) had enough water to sample. The sites were also visited in September 2011; two of the sites (NBI15 and NBI16) contained water and were sampled. The 2010 and 2011 surface water quality results are presented in **Table 3.4-6, North Butte Surface Water Quality Data Within 2 Kilometers.**

Most of the surface water quality samples collected to date have been from impoundments and therefore represent stagnant, non-flowing conditions. As a result, TDS, conductivity, nutrient and cation/anion values are likely higher than would be expected during an active rainfall/runoff event. Even in wet years, Willow Creek in the vicinity of the North Butte Remote Satellite only flows for a couple of months. In dry years, there is essentially no flow during the entire 12 month period. Stock reservoirs in the area provide sources of water for livestock and wildlife.

Sediment samples were collected from Willow Creek, impoundments, and ephemeral drainages in and near the North Butte Remote Satellite on three different occasions (August 12-14, 2010; May 31-June 2, 2011 and September 20-21, 2011). **Table 3.4-7, North Butte Remote Satellite Sediment Quality Data** presents the results of radionuclide analysis completed on all sediment samples. In general, concentrations of radium-226 and lead-210 averaged 1.4 pCi/gram, uranium concentrations average 2.2 milligrams/kilogram, and thorium-230 concentrations averaged 0.9 pCi/gram. See **Figure 5.8** of the TR for sediment sampling locations.

3.4.3.1.3 Surface Water Rights

Surface water rights within 5 kilometers (3 miles) of the North Butte Remote Satellite are identified in Table D6-1.6 of Addendum D6 to the North Butte WDEQ Permit. There are 16 adjudicated surface water rights located within a 5 kilometer (3 mile) radius of the North Butte Remote Satellite boundary according to the WSEO records. All 16 surface water rights are for either reservoirs or stock reservoirs. There are no surface water rights for diversion of direct flows from Willow Creek or its tributaries within 5 kilometers (3 miles) of the site boundary. A map showing the approximate locations of the surface water rights to the nearest quarter section is presented on Figure D6-1.6 of Addendum D6 to the North Butte WDEQ Permit.

3.4.3.2 Groundwater

3.4.3.2.1 Hydrogeologic Stratigraphy

The North Butte Remote Satellite is located within the southern portion of the Powder River Basin slightly west of the axis of the Powder River Basin syncline. The aquifers of interest are sand members within the Eocene Age Wasatch Formation, a fluvial deposit containing alternating layers of sands and shales. Recharge to the sands of the Wasatch Formation occurs **primarily through** their outcrops. Flow in the aquifers generally moves to the north along paleodrainage trends, with a small portion of the groundwater regionally discharging to streams. Aquifer properties are highly variable due to large variations in local lithologies. Reported transmissivities within the Wasatch Aquifer range anywhere from 0.01 to 62 **square** meters/day (0.1 to 667 **square** feet/day).

The hydrogeologic units that occur within the North Butte Remote Satellite area are described regionally in Section 3.4.1.1 and are summarized more specifically below.

<u>**Alluvium**</u> – Alluvial deposits in the North Butte Remote Satellite area consist of thin, unconsolidated, poorly stratified clays, silts, sands, and gravels along Willow Creek. The total thickness of these deposits is estimated to range from less than 0.3 to 9.1 meters (1 to 30 feet). Cameco conducted a field investigation of the alluvial deposits along Willow Creek during August 2011. Results of the 2011 alluvial/shallow aquifer investigation indicate the sand and gravel deposits are discontinuous and range between 0 and 2 meters (6 feet) thick within the channel of Willow Creek. Small amounts of precipitation infiltrate the alluvium during part of the year and intermittent flows across the alluvium may provide some recharge locally.

<u>**Wasatch Aquifer**</u> - The Wasatch Aquifer typically is comprised of lenticular, fine- to coarse-grained sandstones with interbedded claystones and siltstones. The Wasatch Aquifer is considered to have good potential for possible development as a future water supply; however, Hodson et al, (1973) could not adequately quantify its hydrologic characteristics to estimate the maximum amount of groundwater that could potentially be available.

Fort Union Aquifer - The Fort Union Aquifer underlies the Wasatch Aquifer. Typically, the Fort Union is comprised of lenticular fine to coarse-grained sandstones with interbedded claystones, siltstones, and coal. The formation is as much as 900 meters (3,000 feet) thick. The Fort Union Aquifer is an important water supply source in the Powder River Basin. While most of the Fort Union wells are completed for limited yields of 19 to 114 liters/minute (5 to 30 gallons/minute), some wells completed in the Fort Union Aquifer can produce substantial volumes of groundwater over extended periods.

Lance and Fox Hills Aquifers - The Lance and Fox Hills Aquifers underlie the Fort Union Aquifer. The formations are comprised of fine- to medium-grained sandstones, interbedded sandy shales and claystones. Well yields from these aquifers are not expected to exceed 380 liters/minute (100 gallons/minute), and the groundwater reserves may be limited. Little is known of the hydrologic characteristics of the Lance and Fox Hills Aquifers as no water wells tap these aquifers **within or near** the North Butte Remote Satellite site. The depth and low yield of these potential aquifers makes it unlikely that these formations will be tapped for water supplies in the future.

3.4.3.2.2 Summary of Aquifer Properties

Potential Alluvial Aquifer

Between November 1 and 2, 2011, a hydrogeologic investigation was conducted to determine if an alluvial aquifer exists within Willow Creek and if a shallow aquifer exists between the surface and the F Sand, considered the uppermost aquifer at the North Butte Remote Satellite. Two sites were selected within the channel of Willow Creek, and exploratory drilling was conducted. The locations of the exploratory boreholes are shown on **Figure 3.3.2**.

Borehole WC #1 was drilled to a depth of 32 meters (105 feet). No alluvium or water producing sands were encountered between the surface and the underlying F Sand (**Figure 3.4.2, WC#1 Borehole Log**). Borehole WC #2 was drilled to a depth of 24 meters (80 feet). Alluvium consisting of dry gravelly sand was encountered between 4 and 5 meters (14 and 18 feet) below ground surface at this location. In summary, the alluvium, which underlies Willow Creek is laterally discontinuous and is not water-bearing. Although no water was encountered in the alluvium, it was determined that the alluvium could become saturated during spring runoff. Therefore a monitoring well was drilled and completed on November 2, 2011. WCA #1 was offset approximately 2 meters (7 feet) east of WC #2 and completed to a depth of approximately 5.5 meters (22 feet) below ground surface. Well completion details are presented on **Figure 3.4.3, WCA #1 Well Completion Log. This well has been dry since it was installed in November 2011.**

This same drilling program investigated the stratigraphic column below the Holocene sediments and above the F Sand Aquifer. No potential water producing sands were encountered between the alluvium and the uppermost F Sand (**Figure 3.4.4, WC#2 Borehole Log**).

Production Zone Aquifers

Baseline aquifer tests on the production sands were performed by Cleveland-Cliffs in 1988. Two North Butte sites (SS2 and SSE) were tested to define the aquifer and aquitard baseline properties. The detailed hydrologic analyses and supporting data are presented in Attachment D6-1 of Appendix D6 of the North Butte WDEQ Permit. One multi-well test was conducted at the SS2 site and is referred to as HYDRO Test NB1. Two multi-well tests were performed at the SSE site. These tests are referred to as HYDRO Tests NB2 and NB3. Table A-1 of the above referenced attachment, presents the basic well data for wells used to define the aquifer properties. The aquifer pump test plans for both sites were approved by the NRC and the WDEQ LQD in letters dated March 22, 1988 and April 24, 1988 respectively, prior to running the tests.

The production zone at the North Butte Remote Satellite occurs in three sand members (A, B and C) with the A Sand being the lowest stratigraphically. These three sand members are directly connected at some locations in the North Butte Remote Satellite area, and when in combination are considered the production sand at those locations. Generally, where the B and C Sands are separately delineated, they are approximately 31 and 15 meters (100 and 50 feet) thick, respectively. At the SS2 site (NB1 test), the B and C Sands are connected hydrologically, are 49 meters (160 feet) thick, and are tested as one unit. Figure D6-1 of Appendix D6 of the North Butte WDEQ Permit presents a schematic diagram of the geologic setting of the HYDRO Test No. NB1 (SS2) site. This figure also shows the relative position of the next overlying aquifer, the F Sand and the intervening aquitard, FBC, which is approximately 31 meters (100 feet) thick at this location.

A schematic of the geologic setting of the SSE site, which is the location of the HYDRO Tests NB2 and NB3 is presented as Figure D6-2 of Appendix D6 of the North Butte WDEQ Permit. This schematic shows that the tested ore sand, A, is 22 meters (71 feet) thick at this location, and is underlain by an approximately 14 meter (45 foot) thick lower aquitard (A1). The lower aquitard (A1) isolates the production zone, and separates the A Sand and the underlying 1 Sand. The 1 Sand is a marginal sand at the SSE site and is approximately 9 meters (30 feet) thick. Figures D6-3 and D6-4 of the referenced attachment present the locations of the cluster of wells at the SS2 (NB1 test) and SSE (tests NB2 and NB3) sites, respectively.

3.4.3.2.3 BC Sand Aquifer

The aquifer characteristics of B and C Sands are discussed as a single unit in this section due to the fact that they are combined as a single unit at the SS2 location. The BC Sand aquifer was tested by pumping fully penetrating BC well SSM2M. Proximal BC Sand aquifer wells SS2BC1, SS2BC2 and SS2MP were monitored for drawdown. In addition, outlying B and C wells 11-2, 7-1 and 7-2 were also monitored.

A summary of the results from HYDRO Test NB1, are presented in Table D6-1 of Appendix D6 of the North Butte WDEQ permit. This table presents the range of aquifer properties obtained from the Jacob straight line analysis, the Hantush type curve match, and the recovery results.

The transmissivities for the observation wells obtained from the straight line analyses varied from 7 to 11 **square** meters/day (75 to 118 **square** feet/day). A very similar range of values was calculated from the Hantush type curve matches, 7 to 10 **square** meters/day (75 to 108 **square** feet/day). The recovery straight line solution also yielded similar transmissivity values ranging from 8 to 9 **square** meters/day (86 to 97 **square** feet/day). An average transmissivity obtained from the Hantush log-log analysis of 8 **square** meters/day (86 **square** feet/day) is thought to best represent the BC Sand aquifer in this area because this method accounts for a leaky aquitard.

The hydraulic conductivity (permeability) of the BC Sand was obtained by dividing the transmissivity of the aquifer by the aquifer thickness at the pumped well. Permeabilities of 0.14 to 0.17 meters/day (0.45 to 0.56 feet/day) were obtained from the Hantush analysis. An average horizontal permeability of 0.2 meters/day (0.5 feet/day) is thought to best represent the BC Sand aquifer at the SS2 site.

The BC Sand is a confined aquifer at the SS2 site. The calculated storage coefficient varied from 2.1E-4 to 2.6E-4 using the Hantush methodology. A storage coefficient of 2.4E-4 is thought to best represent the BC Sand aquifer at the SS2 site.

Two wells completed only in the B Sand aquifer and two wells completed only in the C Sand aquifer were tested by Cleveland-Cliffs. One of the B Sand wells is located at the SS1 North Butte site and is labeled SS1M. The transmisivity values determined for the B Sand aquifer at the SS1M location ranged from 13 to 14 **square** meters/day (140 to 1151 **square** feet/day). A permeability of between 0.8 and 0.9 meters/day (2.6 and 2.8 feet/day) was determined for the B Sand aquifer at that location.

The B Sand aquifer well SSEM tested at the SSE site yielded a transmissivity value of approximately 13 **square** meters/day (140 **square** feet/day). The B Sand aquifer at this site has a permeability of 0.4 meter/day (1.3 feet/day).

The C Sand aquifer was tested at the SS1 site by three pump tests using wells SS1U and SS1UP. The tests yielded transmissivity values of between 8 to 14 **square** meters/day (86 to 151 **square** feet/day) and permeabilities of between 0.4 to 0.7 **meter**/day (1.4 to 2.4 **feet**/day). A storage coefficient of 4.5E-5 was determined from these tests.

3.4.3.2.4 A Sand Aquifer

Two aquifer tests were performed on the A Sand aquifer at the SSE site. These tests are referred to as HYDRO Tests NB2 and NB3. The Jacob straight line and Theis log-log analyses yielded values very similar to each other for the SSE wells. The transmissivity values ranged from 3.8 to 5.5 **square** meters/day (41 to 59 **square** feet/day) with permeabilities between 0.2 to 0.3 meters/day (0.6 to 0.8 feet/day). Storage coefficients of between 4.7E-5 to 1.8E-4 were determined from the test with an average value of 7.0E-5.

Two other single-well tests were conducted in the A Sand aquifer by Cleveland-Cliffs. A short test on well SSEL yielded a lower transmissivity than those determined in HYDRO **Tests** NB2 and NB3. Well SS1L, completed in the A Sand aquifer, was also tested. The transmissivity of the aquifer at this location was determined to be 13 and 10 **square meters**/day (140 and 108 **square feet**/day) from the Jacob straight line and Theis recovery analyses, respectively. Permeability ranged from 0.27 to 0.34 **meters**/day (0.88 to 1.13 **feet**/day).

An average horizontal permeability of 0.3 **meters**/day (0.9 **feet**/day) is considered representative of the A Sand aquifer. A storage coefficient of 8.5E-5 is considered representative of the A Sand aquifer.

3.4.3.2.5 Summary of Aquitard Properties

In addition to determining the aquifer properties at each site, HYDRO Test NB1 was designed to evaluate the Upper aquitard and HYDRO Test NB2 was designed to evaluate the Lower aquitard. The "Upper" and "Lower" aquitards refer to the overlying aquitard between the C and F Sands and the underlying aquitard between the A and 1 Sands, respectively. Several pump tests previously conducted by Cleveland-Cliffs were analyzed and used for additional background aquifer characterization.

The Neuman-Witherspoon method was used to analyze drawdown data from the aquitard wells. Table D6-2 of Appendix D6 of the North Butte WDEQ Permit presents the summary of aquitard properties determined by the Neuman-Witherspoon method, and also presents comparative vertical permeability results determined from the Hantush leaky aquifer methods and the laboratory analysis of core samples. The Neuman-Witherspoon analysis calculated vertical permeabilities of 0.01 meter/year (0.04 feet/year) for the Upper aquitard, and 0.01 meter/year (0.04 **foot**/year) for the Lower aquitard. Specific storage values of 1.94E-5 and 1.67E-5 were determined for the Upper and Lower aquitards, respectively.

The modified Hantush leaky aquifer analysis calculated vertical permeabilities ranging from 2.1E-3 to 2.2E-2 meter/year (6.9E-3 to 7.3E-2 **foot**/year). The upper range of these values is approximately twice as high as the Upper aquitard vertical permeability calculated from the Neuman-Witherspoon method. It was assumed that all leakage came from the Upper aquitard in the Hantush calculation. If some leakage was attributed to the aquitard below the BC Sand, then the Hantush results would be lower.

Cores from the Upper and Lower aquitard intervals were loaded in a triaxial machine to simulate the field conditions and measure laboratory vertical permeabilities. The coefficient of compressibility and porosity (void ratio) were also measured on these cores. The laboratory vertical permeabilities were 2.0E-3 for the Upper aquitard and 4.3E-3 meter/year (6.6E-3 and 1.4E-2 **foot**/year) for the Lower aquitard core samples.

Wells completed in the adjacent aquifers in HYDRO Tests NB1, NB2, and NB3 were monitored for drawdown. In test NB1, the overlying sand to the BC Sand, the F Sand, was monitored during the test by using well SS2U. Approximately 0.1 meter (0.2 feet) of drawdown was observed in this well during the test. The underlying aquifer (AL Sand) at the SS2 site showed no signs of drawdown during the test or recovery phases of the test in wells SS2L or 11-1.

The lower 1 Sand and upper B and F Sands at the SSE site were measured during both HYDRO Tests NB2 and NB3. In addition, two B and one C Sand aquifer wells, located a radius of 900 to 1,130 meters (3,000 to 3,700 feet) from the pumping well, were measured during test NB2. The lower 1 Sand showed 0.1 meter (0.4 feet) of drawdown during the pump test. No drawdown was observed as a result of pumping the A Sand aquifer well SSEA1 in any other adjacent aquifer wells during the NB2 and the NB3 tests.

3.4.3.2.6 Aquifer Potentiometric Surfaces

Static water levels were measured in monitoring wells at the North Butte Remote Satellite in June, September and November 2010. Completion information and static water levels for the wells that were sampled in 2010 are summarized in Table D6-1.1 of the North Butte WDEQ Permit. Using static water levels measured in 2010, potentiometric maps of two hydrostratigraphic units in the Wasatch Aquifer beneath the North Butte Remote Satellite have been prepared: 1) the F Sand which is the first overlying unmineralized aquifer (Figure D6-1.1 of the North Butte WDEQ Permit), and 2) the CB Sands Production Zone Aquifer (Figure D6-1.2 of the North Butte WDEQ Permit).

In November 2010, F Sand static water levels were measured in wells UM-1 through UM-8, SS1-F, SSE-U, and SS2-U to determine the potentiometric surface of the F Sand. The F Sand potentiometric contours indicate that this aquifer is confined, and groundwater flow is generally towards the south/southwest beneath the site. This flow orientation is distinctly different than the Production Zone Aquifer groundwater flow direction but correlates well with the 1996 potentiometric surface determined by PMC. The gradient of the F Sand potentiometric surface was 0.02 in 2010. In 1988 the average groundwater gradient was 0.008. A comparison of water levels in wells between 1988 and 2010 indicates an average decline of 0.6 meter (2 feet).

Water levels were measured in September 2010 to determine the potentiometric surface of the Production Zone Aquifer. The C, B, and A Sands all were identified as the Production Zone Aquifer in the original permit. Wells completed in the C and B Sands exhibit similar heads across the site. The Production Zone Aquifer groundwater elevations indicate that groundwater in the ore zone is confined, and flow is generally towards the northwest. The gradient of the Production Zone Aquifer is 0.006 which is unchanged when compared to the 1988 data. A comparison of water levels measured in 1988 and 2010 indicate an average decline of 0.9 meter (3 feet) in static water levels.

The A Sand water levels indicate that this sand is also confined and groundwater flow is generally towards the northwest beneath the site. Water levels in four A Sand wells were measured in September 2010 and are included on Figure D6-1.2 of the North Butte WDEQ Permit (Wells SSE-L, SS2-L, NBHW-16, and SS1-L). The average gradient of the A Sand potentiometric surface in 2010 was 0.02. In 1988 the groundwater gradient was also approximately 0.02.

3.4.3.2.7 Groundwater Quality

Original mine site owner Cleveland-Cliffs conducted a groundwater assessment program at the North Butte Remote Satellite from October 1978 through July 1981. In April 1988, subsequent mine site owner, Uranerz collected additional groundwater samples from three monitor wells completed in the A Sand, two monitor wells completed in the B Sand, one well completed in the C Sand, one well completed in the BC Sand, and three wells completed in the F Sand. In 1992 PMC drilled 40 monitoring wells in the Mine Unit 1 and 2 areas for acquisition of baseline data, including 20 perimeter ore zone wells, nine upper sand wells, two upper-upper sand wells, and nine ore zone/baseline restoration wells. Mechanical integrity testing was completed in 1993. In 1996, PMC collected four quarters of baseline water quality samples from the monitoring wells and completed aquifer pump testing to determine the hydraulic communication with the monitoring wells within the ore zone. PMC installed 20 additional hydrology test wells in 1996 and conducted aquifer testing of those wells in 1997. Water quality data from these wells were submitted with the 1996 PMC annual report to WDEQ LQD.

Cameco sampled representative wells in June and September 2010. These wells were selected to provide spatial and stratigraphic distribution within the production zone and the overlying F Sand Aquifers. Existing monitoring wells were inspected to verify location, completion information, well integrity, and to establish standard measuring points. Two sets of water quality samples were collected from selected wells in 2010 for comparison to baseline water quality data and to analyze for constituents required by recent updates to LQD guidelines. Ore zone wells sampled included SSE-L, SS1-L, SS2-L, SSE-M, SS1-M, SS2-M, and SS1-U. F Sand wells sampled included UM-1, UM-3, UM-5, and UM-7.

The baseline water quality data collected up through 1988 are presented in Tables D6-1.2 and D6-1.3 of Addendum D6 and Tables D6-3 through D6-7 of Appendix D6 of the North Butte WDEQ Permit. A summary of the baseline water quality data are presented in Tables D6-8 through D6-13 of the same Appendix D6. Uranerz drilled and completed a well in the Lower aquitard, the 1 Sand, as a part of HYDRO Test NB2. In addition to serving as an observation well for the aquifer pump test, Uranerz planned to sample the well for water quality analysis. Uranerz was unable to obtain sufficient water from the 1 Sand aquifer to provide a representative sample.

Cameco compared the 2010 data to the 1980s age baseline data to evaluate whether baseline water quality had changed since the North Butte Remote Satellite was originally permitted. With respect to the ore zone water quality (A, B and C Sands) Cameco found that the 2010 data compared favorably to the historical baseline water quality. Out of the 384 analyses that were performed, only eight analyses fell outside of the previously established baseline in the production zone wells. These analytes are highlighted in bold in Table D6-1.2 of Addendum D6 of the North Butte WDEQ Permit. Five fell below the minimum value reported in the original WDEQ permit, one chloride concentration and four uranium concentrations. The minimum value exceedance is likely due to increased lab precision. Three analyses exceeded the maximum value established by baseline sampling. One analysis barely exceeded the maximum ammonium concentration. Monitoring well SS1-L contained two values that exceeded the maximum established baseline value for radium-226, 183 and 184 pCi/Liter. Baseline water quality sampling established radium-226 concentrations ranging between 0 and 82.4 pCi/Liter. Given the natural variability of radium concentrations and its mobility under the current pH/Eh conditions, these two analyses are not considered problematical. The 2010 data confirmed the viability of the original baseline water quality characterization.

Analytical results from the two rounds of water quality samples collected in 2010 were similar between the two sampling events, and as such establish relative stability of the individual wells. The ore zone water quality is dominated by calcium-sodium bicarbonate-sulfate water. Radium-226 and Gross Alpha concentrations exceed the WDEQ WQD Class III standards and make these waters unsuitable for livestock use.

Baseline water quality data was established in 1989 for the F Sand Aquifer using samples collected from wells SS2-U, SSE-U, and SS1-F. These wells were not sampled in 2010. F Sand wells located near SSE-U were sampled and include UM-1, UM-3, UM-5, and UM-7. As was done for the ore zone wells, Cameco compared 2010 F Sand water quality to established baseline. PMC collected four quarterly samples from these wells in 1996 to characterize water quality in the F Sand in the vicinity of Mine Units 1 and 2. The 1996 PMC data were submitted to WDEQ LQD in the 1996 Annual Report.

Water quality within the F Sand exhibits more variability compared to the Production Sand Aquifer. Of the 264 constituents analyzed, Cameco identified 18 analyses that fell outside of the values measured in the 1996 baseline water quality summary for the F Sand. Ten are less than the minimum values established during baseline sampling including one calcium concentration measured in Well UM-1 and two pH measurements in Well UM-5. The other minimum value exceedances are likely due to increased lab precision in radium analysis. Eight analyses exceeded the maximum baseline values. Well UM-1 has one concentration that slightly exceeds the maximum value for fluoride. Well UM-5 has seven analyses that exceed the maximum value established during 1996 baseline sampling. UM-5 has elevated levels of magnesium, sulfate, TDS, iron, and manganese. Although these wells are all completed in the F Sand, it appears that F Sand water quality is highly variable. An isopach map (Plate D5-1.2 in Addendum D5-1 of the North Butte WDEQ Permit) indicates the F Sand unit is discontinuous over the site, which could explain the variability in water quality.

Overall, F Sand water quality is dominated by calcium-sodium bicarbonate-sulfate water. Based on both the historic and the 2010 water quality data, radium-226 and pH exceed the WDEQ WQD Class III (livestock use) standards.

In addition to the above mentioned sampling effort, Cameco started monitoring private stock wells within 2 kilometers (1.2 miles) of the North Butte Satellite beginning in 2011 (see **Table 3.4-8, North Butte Wells within 2 Kilometers**). The following wells were sampled in June and September of 2011; Brown #1, CCI#2, Beck Well, Red Barrel #1, Brown #5, Dobie Hill #1, and City Service Brown. **Table 3.4-9, North Butte Groundwater Quality Results** contains the groundwater quality baseline data for private wells within 2 kilometers (1.2 miles) of the North Butte Remote Satellite.

3.4.3.2.8 Groundwater Use and Water Rights

All groundwater rights located within a 5 kilometer (3 mile) radius of the North Butte Remote Satellite are presented on **Figure 3.4.5, Surface Water & Groundwater Rights Location Map** and in **Table 3.4-10, North Butte Groundwater Rights.** According to the WSEO database, there are 778 groundwater rights within this radius. Approximately half of the water rights are related to CBM production wells, most of which were installed since 2000. Since these wells are installed in clusters and are only located to the nearest quarter section, the symbols on **Figure 3.4.5** indicate the quarter sections where the locations of the wells are reported on the WSEO database. The remaining water wells are primarily used for industrial purposes with a limited number (approximately 39) of groundwater wells, which are dedicated to livestock watering and domestic use. The industrial use consists of water for exploration drilling, and environmental wells for water quality monitoring and hydrologic studies for proposed uranium mining.

There are three non-industrial water wells (with pumps) within the North Butte Remote Satellite license area. All three wells are utilized by the T-Chair Land Company for stock watering. There are five permitted domestic wells located within 5 kilometers (3 miles) of the site. Three are located northwest, one is located northeast, and one is located southeast of the North Butte Remote Satellite. There is one non-permitted domestic well located at the Pfister Ranch (Beck Well). This well is used for lawn and stock watering. Water for household consumption is trucked in. There are 31 additional wells within this radius that are permitted for stock watering. The locations of all permitted domestic and stock wells are shown on **Figure 3.4.5** along with the WSEO permit numbers.

Wells located within 2 kilometers (1.2 miles) of the North Butte Remote Satellite boundary are presented in **Table 3.4-8.** These wells are presented on Figure D6-1.3 of the North Butte WDEQ Permit. Several of these wells are no longer in operation and include the Calving Shed, Sheeptick Well #1, North Pfister #2, and Brown #2. The remaining wells are in operation and include Brown #1, CCI #2, Beck Well, Red Barrel #1, Brown #5, Dobie Hill #1, and City Services Brown. These wells have been sampled **in accordance with guidance provided in** NRC **Regulatory Guide** 4.14 and will continue to be monitored in the future.

There are three PWS in the vicinity of the North Butte Remote Satellite. They include Exxon Hertzog Draw Unit (PWS # 5601192), Four J School (PWS # 5601056), and Sussex Unit Well #1 (5600241). They are located 11 kilometers (7 miles) northeast, 40 kilometers (25 miles) northeast, and 51 kilometers (32 miles) southwest, respectively.

Besides the stated industrial uses, Cameco also uses groundwater for project related non-production purposes. It is estimated that non-production water use at the North Butte Remote Satellite will total between approximately 2 to 3.8 million liters (550,000 to 1 million gallons) per year during the life of the project. The water is obtained from a WSEO permitted water well completed in a non-uranium bearing sand unit within the lower Wasatch formation. The well operates as a small public water supply and is permitted as such under the requirements of WDEQ/WQD Rules and Regulations Chapter 12. The well is 120 meters (390 feet) deep and is screened from 90 to 120 meters (290 to 390 feet). Drinking water is obtained from a commercial water bottling company.

3.4.4 Gas Hills

The *Safety Evaluation Report for Operation of the Gas Hills Project In Situ Leach Uranium Recovery Facility in Fremont and Natrona Counties, Wyoming (2004)* states that the NRC has reviewed and accepted the hydrologic site characterization contained in the Environmental Assessment for the Operation of the Gas Hills Project Satellite In Situ Leach Uranium Recovery Facility (2004). The approved hydrologic site characterization for the Gas Hills is summarized in the following sections. Updated water rights and water quality data and an updated potentiometric surface map are included in this report.

3.4.4.1 Surface Water

3.4.4.1.1 Hydrology and Stream Flow

Within the Gas Hills Remote Satellite, surface drainage is primarily to West Canyon Creek, with lesser amounts of drainage to Fraser Draw. West Canyon Creek has its headwaters at the Beaver Divide in the southern portion of the site. Its tributaries drain approximately 70% of the Gas Hills Remote Satellite area. West Canyon Creek is tributary to Canyon Creek, then to Deer Creek, and subsequently to Poison Creek. Fraser Draw and its tributaries drain approximately 25% of the southwest portion of the Gas Hills Remote Satellite area. Fraser Draw is tributary to Muskrat Creek, but is impounded by a reclaimed waste dump at Pathfinder's Central Gas Hills surface mine. Both Poison Creek and Muskrat Creek are within the Wind River Basin. Only a minor portion (less than 2%) of the area lies within the West Sage Hen Creek drainage in the Sweetwater River Basin. The local topography and surface water drainage system are shown on Plate D6-2 of the Gas Hills WDEQ Permit.

Tributaries to West Canyon Creek and to Fraser Draw drain in a northwesterly direction through the Gas Hills Remote Satellite area. The headwaters of these tributaries are located along steep slopes of the Beaver Divide, which trends along the southeast boundary of the site. The tributary drainages are generally small and have drainage basin areas that range from 0.05 to 0.62 **square** kilometer (0.02 to 0.24 **square** mile). Basin slopes are relatively steep, averaging from 10 to 15%. The drainage basins are elongate, and sub-dendritic in pattern. The natural elaboration of the stream network is characterized by the ongoing development of channel headcuts.

Many of the basin areas have been disturbed by previous surface and underground mining activities. These disturbances include total blockage of channels by spoils piles, stream capture by mine pits, and surface disturbance by exploration activities. Gully erosion and headcutting are actively occurring adjacent to the pit highwalls and oversteepened reaches near the basin divide. Sedimentation and ephemeral ponding occurs where drainages are impounded by spoil piles. Areas disturbed by historic mining are summarized in Table D6-1-1 and located on Plate D6-1 of the Gas Hills WDEQ Permit.

Drainages in the Gas Hills region are generally ephemeral. They flow only in response to snowmelt or rainfall events. Therefore, with the exception of isolated spring-fed reaches, these channels are dry for the majority of the year. These channels are generally above the local water table except at a few locations where springs or seeps may exist. Springs originating from perched aquifers within the White River Formation or at the contact between the White River and the underlying Wind River Formation exist. Discharge from these springs can create a limited reach of perennial flow.

Hydrologic analysis points have been selected for the purposes of surface hydrology evaluation. These sites are depicted on Plate D6-2 of the Gas Hills WDEQ Permit. The locations of the hydrologic design points were selected to evaluate surface water discharge at key locations. Therefore, they either coincide with the surface water monitoring sites (WCC-1 and WCC-2 [West Canyon Creek]), the WDEQ permit boundary (WFD [West Fraser Draw] and EFD [East Fraser Draw]), or the confluence with a higher order stream (WCC-3). Discharge at hydrologic analysis points WCC-3, WFD, and EFD is ephemeral, therefore, surface water monitoring stations have not been established. In the event that discharge is occurring at the time that water quality sampling is taking place, water quality samples will be obtained at these locations.

Each of the two permanent monitoring locations (WCC-1 and WCC-2) has been equipped with a combination v-notch/cipolletti weir **gauging station** to facilitate sample collection and **water** discharge measurement. Calibrated staff gages allow for instantaneous discharge measurement at the time of sample collection. The weirs are capable of accurately measuring discharges as low as 19 liters/minute (5 gallons/minute) and as high as 7,950 liters/minute (2,100 gallons/minute). Rating tables for the staff gages are included in Addendum D6-1 of the Gas Hills WDEQ Permit.

Discharge from the spring (WCC-1, September 1996) was measured at 34 liters/minute (9 gallons/minute). Based on fourth quarter, 1996 observations, flow from this spring is predicted to occur year-round. At the time of third quarter gaging activities, there was no difference in flow between the upstream (WCC-1) and downstream (WCC-2) gaging sites. Approximately 150 meters (500 feet) downstream from WCC-2, surface discharge disappears. In summary, approximately 2.7 kilometers (1.7 miles) of West Canyon Creek flows on a perennial or intermittent basis. The average (fall 1996) surface flow ranged from 34 to 38 liters/minute (9 to 10 gallons/minute).

In the Mine Unit 3 area, Cameron Spring discharges to the East Fork of Fraser Draw. The spring flows at a rate of approximately 8 to 11 liters/minute (2 to 3 gallons/minute) and feeds a local stock pond.

Discharge from the spring can be monitored at **an established gauging station similar to those locted at WCC-1 and WCC-2**.

Runoff from intense rainfall (i.e., thunderstorms) and from spring snowmelt will occur. Methods for characterizing stream discharge in ungaged watersheds have been developed by Lowham (1988) and Craig and Rankl (1978). Lowham examined streamflow data for several hundred gaged watersheds and developed regression relationships based upon basin characteristics such as size, geographic factors, and elevation. Lowham's regression equations are generally applicable to basins greater than 13 **square** kilometers (5 **square** miles) in area. Craig and Rankl's (1978) methodology is generally accepted as more appropriate for small drainage basins. Table D6-2-2 of the Gas Hills WDEQ Permit presents the basin characteristics used in the hydrologic estimations. For the purposes of comparison, estimates of flood flows using both methods are tabulated in Table D6-2-3 of the Gas Hills WDEQ Permit. Flood volumes, estimated using Craig and Rankl's (1978) methodology, are also presented. These calculations are for characterization purposes only. Cameco has developed a hydrologically based watershed model (HEC-1) for the design of drainage control and diversion structures. The flow data from this model compare reasonably well with the empirically derived estimates.

3.4.4.1.2 Surface Water Use and Quality

Surface water quality within the study area was characterized using data collected during the 1996 and 1997 water quality monitoring effort, augmented with data obtained from previous mine permits. Two permanent water quality monitoring locations were established, and preliminary data were evaluated. The locations and descriptions of the stations (WCC-1 and WCC-2) are described above. The data collected from WCC-1 and WCC-2 have been augmented with data obtained from existing mine permits and more recently obtained measurements (2011) to characterize background water quality.

The surface water quality data are presented in a spreadsheet format in Addendum D6-2 of the Gas Hills WDEQ Permit. Historic data at sites no longer monitored have also been included in the same addendum (i.e., SW-1, SW-2, SM-5, SM-6, and SM-7). In some cases, the historic data are incomplete, and sampling techniques cannot be verified. However, the data are useful for comparative purposes with the current data, and can be used to document long-term water quality trends, as well as spatial variability of water quality within the study area. Historic and existing surface water monitoring sites are shown on Plate D6-1 of the Gas Hills WDEQ Permit.

Several types of water bodies have been sampled. Data are available from groundwater-fed impoundments (i.e., Buss and PC Pits), springs (i.e., Cameron Spring), and spring-fed perennial stream reaches (i.e., West Canyon Creek). Monitoring stations SM-5, SM-6, and SM-7 are surface water discharge monitoring sites. These sites were equipped with a crest gage to measure the maximum water surface elevation of an event and a self-sampling water sampler. These sites were established by Pathfinder Mine and monitored intermittently from 1984 to 1989.

In general, the surface water sources in the Gas Hills Remote Satellite area are acceptable for wildlife and livestock consumption. **It is not anticipated that Cameco will use any of the existing surface waters at Gas Hills for any project related production or non-production water usage**.

Surface water quality in the study area varies greatly with the type of water body sampled. Stream water quality also varies greatly with discharge. Trace metal concentrations are generally present in levels below livestock standards and are mostly below detectable limits. Iron, manganese, arsenic, and zinc are frequently present in detectable levels but generally do not exceed livestock standards. TDS concentrations are consistently below the livestock standard of 5,000 milligrams/Liter. Uranium and radium-226 are generally below the livestock standards of 5 milligrams/Liter and 5 pCi/Liter, respectively; however, these levels are occasionally exceeded. Additional surface water quality characterization is presented in the Gas Hills WDEQ Permit. **Table 3.4-11, Gas Hills Surface Water Quality** has been updated and includes historic water quality data and recent water quality sampling results.

Sediment samples were collected from West Canyon Creek, the Buss Pit, impoundments, and ephemeral drainages in and near the Gas Hills Remote Satellite between August 30 and September 1, 2011. **Table 3.4-12, Gas Hills Sediment Quality Data** presents the results of radionuclide analysis completed on all sediment samples. In general, radium-226 concentrations average 2.7 pCi/gram, lead-210 concentrations average 3.5 pCi/gram, uranium concentrations average 2.9 milligram/kilogram, and thorium-230 concentrations average 2.0 pCi/gram.

3.4.4.1.3 Surface Water Rights

Surface water rights within 2 kilometers (1.2 miles) of the Gas Hills Remote Satellite are identified in **Table 3.4-13, Gas Hills Surface Water Rights**. As of November 2011 there are eight surface water rights according to the WSEO records. All but one of the surface water rights are for stock watering or wildlife purposes. One surface water right is permitted for industrial purposes and is associated with the B-Spoils Reservoir. A map showing the approximate locations (nearest quarter quarter) of the surface water rights within 2 kilometers (1.2 miles) is presented on **Figure 3.4.6, Gas Hills Surface Water and Groundwater Rights**.

3.4.4.2 Groundwater

3.4.4.2.1 Hydrogeologic Stratigraphy

The hydrogeologic units and site-specific hydrology are presented within Appendix D6 of the Gas Hills WDEQ Permit. The following section summarizes hydrogeologic units within the Gas Hill Remote Satellite area.

Post-Wind River Aquifers - Post-Wind River Formations that crop out within the Gas Hill Remote Satellite area are, in descending order, the Quaternary Alluvium, the Miocene Split Rock, the Oligocene White River, and the Eocene Wagon Bed Aquifers. Quaternary alluvium occurs along Fraser Draw and West Canyon Creek and consists of unconsolidated sand, silt and clay. It is recharged vertically by precipitation and by discharge from springs, which originate from the post Wind River sediments. The primary aquifer of the Post-Wind River Formations is the Split Rock Aquifer, which crops out south of, and caps, the Beaver Divide. The Split Rock Aquifer is both stratigraphically and topographically higher than the Wind River Aquifer and consists of arkosic sands and conglomerates. It is a source of springs and a significant groundwater resource south of the Gas Hills Remote Satellite area. The Wagon Bed and White River Formations are generally considered aquitards in the area.

Wind River Aquifer - The Wind River Aquifer is the uranium host and aquifer of primary importance within the Gas Hills Remote Satellite area. The Eocene Wind River Formation consists of alternating layers of sandstone, siltstone, claystone, and conglomerate. The ore and water-bearing sand and conglomerate units are collectively referred to as the Wind River Aquifer. Localized faulting combined with regionally discontinuous low permeability shale horizons have resulted in the perching of some saturated sand horizons above the main saturated zone of the aquifer. Subcropping and outcropping pre-Wind River deposits tend to restrict the regional flow of the Wind River Aquifer, forcing it to discharge through West Canyon Creek northwest of the Mine Unit 4 area, and Fraser Draw northwest of the Mine Unit 3 area. These discharge zones lie outside of the Gas Hills Remote Satellite boundary.

Recharge of the Wind River Aquifer from precipitation occurs within the Gas Hills Remote Satellite where the formation crops out and by vertical migration through overlying younger sediments. Recharge of upper perched horizons occurs along the Beaver Divide and from overlying younger sediments to the south. Recharge may also occur where subcropping pre-Wind River aquifers discharge into the Wind River Formation.

Pre-Wind River Aquifers - A thick sequence of pre-Wind River sediments containing several aquifers underlie the Gas Hills Remote Satellite. The primary aquifers in this sequence are the Cretaceous Cloverly, Jurassic Nugget, Permian Phosphoria, and Pennsylvanian Tensleep Aquifers. The Cloverly and Nugget Aquifers are recharged north of the Gas Hills Remote Satellite on the flanks of the Dutton Basin Anticline and discharge into the Wind River Aquifer. The Permian Age Phosphoria Formation is classified as a leaky confining layer and locally provides recharge to the underlying Tensleep Sandstone. The Phosphoria Formation is a hydrocarbon-bearing unit and is occasionally a target for oil and gas development in the area. The Tensleep Aquifer is recharged at high elevations along the southern and western flanks of the Wind River Basin. These formations primarily discharge into the Wind River Aquifer, south of the project area. The Tensleep is a highly producing aquifer and in places contains water hot enough to provide a geothermal energy source. A complete stratigraphic column showing the aquifers in the Gas Hills Remote Satellite area is presented as Table D5-2-1 in Appendix D5 of the Gas Hills WDEQ Permit.

3.4.4.2.2 Producing Sands and Confining Unit Characteristics

Faulting has disrupted the continuity of the ore sands and confining layers within the Gas Hills Remote Satellite. Plate D5-2 in the Gas Hills WDEQ Permit shows the locations of the major faults in the Wind River Formation across the Gas Hills Remote Satellite. The main saturated zone within the Wind River Aquifer ranges in thickness from approximately 18 meters (60 feet) at the Mine Unit 1 area, where the 70 Sand is confined by substantial shale breaks, to more than 31 meters (100 feet) at the Mine Unit 3 area, where the 30-40-50-60 Sands act as a single hydrostratigraphic unit. The hydrostatic head in the ore zone monitoring wells at the Mine Unit 1 area is approximately 70 meters (230 feet) above the screened interval. The static water level in a well completed in an overlying unit (MO-1) is 24.4 meters (80 feet) higher than the static water level in the adjacent production zone wells.

At the Mine Unit 2 area the majority of the wells are screened across the 70 Sand. The 70 Sand in wells BSMP-1 and BSMP-2 has been displaced downward by faulting. Despite the faulting, the hydrostatic heads in all the Mine Unit 2 wells appear to be continuous at approximately 2,000 meters (6,630 feet) above mean sea level. Downgradient from the Buss Pit in Mine Units 2 and 4, the potentiometric surface is relatively flat due to the lingering effects of conventional mine dewatering in the East Gas Hills. At the Mine Unit 3 area, the hydrostatic head occurs approximately 15 meters (50 feet) above the top of the screen in each well. The static water level in well PCHMO97-1, which is screened 32 meters (105 feet) higher than the adjacent ore zone monitoring well, is 2 meters (5 feet) higher than a nearby ore zone monitor well.

At the Mine Unit 4 area, the 50-60 Sands interfinger with a portion of the East Canyon Conglomerate, and are confined above and below by continuous claystone horizons. The hydrostatic head in production zone wells south of the Buss Fault is approximately 61 meters (200 feet) above the top of the 60 Sand (Cross Section L-L, Plate D5-13 of the Gas Hills WDEQ Permit). Hydrostatic head above the 60 Sand increases to 72 meters (235 feet) above the screened interval at well BUMP97-1. Static water levels are 12 meters (38 feet) higher in an adjacent well which is screened in the 90 Sand.

The 50 Sand is the ore-bearing zone at the Mine Unit 5 Area. Borehole data indicate that this unit is confined above and below by continuous claystone strata (Cross Section O-O, Plate D5-16 of the Gas Hills WDEQ Permit). Well data show the static water levels range from 12 to 46 meters (40 feet to 150 feet) above the top of the 50 Sand. The static water level in well PIXMU97-1 (an underlying well) is 27.4 meters (90 feet) lower than the water level in Well PIXMP97-1 completed in the adjacent 50 Sand. Well PIXMU97-1 is screened in the East Canyon Conglomerate.

The ore zone sands are upwardly confined by continuous claystone strata at Mine Units 1, 2, and 5. At Mine Unit 3 mineralized zones occur in the 30-40-50 Sands which together form a single hydrostratigraphic production unit. This unit is semi-confined and may be hydraulically connected with the overlying 60-70 Sands. Additional hydrogeologic studies will address confinement at this location. At Mine Unit 4, ore zones occur in the 50 through 80 Sands, south of the Buss Fault. North of the fault, mineralized zones are present in the 60-70 Sands. The 60 Sand is confined by continuous claystone strata. The 70 Sand is connected hydraulically with the overlying 80-90 Sands. Again, additional hydrogeologic studies will address confinement at this location.

With the exception of Mine Unit 4, all the ore sands are confined below by continuous claystone layers or pre-Wind River aquitards. At Mine Unit 4 the 60 Sand is underlain by the 50 Sand, which interfingers with the East Canyon Conglomerate. These underlying units are confined by a continuous claystone layer.

Core samples have been collected from the overlying confining unit at Mine Unit 1. Laboratory vertical permeabilities obtained from these core samples are low, ranging from 8.6E-6 to 8.6E-8 **meter**/day (2.8E-5 to 2.8E-7 **foot**/day). Typical permeabilities for unweathered claystones and siltstones range from 8.6E-5 to 8.6E-7 meter/day (2.8E-4 to 8.6E-6 **foot**/day) (Freeze and Cherry, 1979). Actual vertical permeabilities of the confining units and their continuity will be determined at other Gas Hills Remote Satellite mine units prior to the initiation of any production. As was the case at Mine Unit 1, vertical permeability will be determined by laboratory testing of cored material and from long-term pump test results utilizing appropriate analytical procedures. Continuity of mine units will be established during the delineation drilling program.

3.4.4.2.3 Aquifer Pump Tests and Analysis

Aquifer tests have been conducted by Cameco on wells located in all of the mine units within the Gas Hills Remote Satellite area. The aquifer tests were conducted to determine the characteristics of the ore zone aquifer and overlying and underlying units, evaluate the hydrologic significance of adjacent faults, and determine if the ore zone is hydraulically isolated from overlying and underlying units. A detailed discussion is available in Appendix D6 of the Gas Hills WDEQ Permit.

The results of the aquifer testing are summarized in Table D6-3-2 of the Gas Hills WDEQ Permit. Transmissivity for the Wind River Aquifer within the Gas Hills Remote Satellite area varies from 6.5E-2 to 89.7 **square** meters/day (0.7 to 966 **square** feet/day). Horizontal hydraulic conductivities range from 0.01 to 2.9 meters/day (3.3E-2 to 9.5 feet/day). In Mine Unit 3 where the highest hydraulic conductivities were reported, the values are believed to be influenced by proximity to faults which were acting as recharge boundaries. The representative horizontal hydraulic conductivities by Mine Unit area are:

Area	Average Hydraulic Conductivity (m/day)	Minimum (m/day)	Maximum (m/day)
Mine Unit 1	7.1E-1	4.2E-1	1.2
Mine Unit 2	5.8E-1	2.9E-1	2.0
Mine Unit 3	1.3	2.4E-2	2.9
Mine Unit 4	3.7E-1	1.1E-2	1.0E-2
Mine Unit 5	1.1E-1	1.3E-3	3.1E-1
* Meter to foot conversion – 1 meters ≈ 3.28 feet			

Hydraulic conductivities generally increase from east to west across the Gas Hills Remote Satellite area corresponding to coarsening texture of the Wind River sediments. Calculated storage coefficients range from 8.5E-5 in Mine Unit 4 to 1.3E-3 in Mine Unit 2. The average storage coefficient for the Wind River Aquifer throughout the Gas Hills Remote Satellite area is 3.1E-4. Additional aquifer testing will take place during the Hydrologic Unit Testing phase prior to well field development.

3.4.4.2.4 Aquifer Potentiometric Surfaces

Completion information for wells located in and near the project area is summarized in Table D6-3-1 of the Gas Hills WDEQ Permit. Water-level elevations and static water levels measured in conjunction with water quality sampling are included in the spreadsheets in Addendum D6-7 of the Gas Hills WDEQ Permit. Based on the fourth quarter 1997 static water level measurements, potentiometric contours for the Wind River Aquifer have been developed and are presented on Plate D6-3 of the Gas Hills WDEQ Permit. The static water levels on this drawing include some characteristic of a locally perched horizon. The potentiometric surface contours reflect the main saturated zone of the Wind River Aquifer only. Water levels from wells screened in underlying formations and overlying perched systems are noted on the figure but were not used in the construction of the potentiometric surface map (Plate D6-3 of the Gas Hills WDEQ Permit). Static water levels were collected again in 2010 and an updated potentiometric surface map for the Gas Hills Remote Satellite area was prepared (**Figure 3.4.7, Updated Gas Hills Potentiometric Surface Map**).

The potentiometric contours indicate that groundwater flow is generally to the west and southwest, but is influenced by past mining practices. Regional flow has a northward component. North of Mine Unit 3 and in the East Gas Hills where historic open pit mining and associated dewatering occurred, depressions in the potentiometric surface are evident. In Mine Unit 3 potentiometric contours are deflected north towards the PMC Central Gas Hills Disturbance. In Mine Unit 4, dewatering has ceased and water levels associated with a cone of depression around the Buss Pit are partially recovering.

3.4.4.2.5 Groundwater Quality

Beginning in the early 1980s, groundwater quality data have been collected from the Gas Hills Remote Satellite. The purpose of the sampling is to characterize background water quality of the Wind River Aquifer within the Gas Hills Remote Satellite. In many cases, the historical data (pre-1996) are incomplete, and sampling techniques cannot be verified. The data are useful for comparative purposes with the current data, and document long-term water quality trends, and spatial variability of water quality within the Wind River Aquifer. Historical groundwater quality data are available for wells in the vicinity of the Gas Hills Remote Satellite and are included in Addendum D6-7 of the Gas Hills WDEQ Permit. The historic groundwater quality data has been combined with recent (2011) water quality data and are presented in **Table 3.4-14, Gas Hills Historical Groundwater Quality Data**. The monitoring wells and water quality sample sites are presented on Plate D6-1 of the Gas Hills WDEQ Permit. As well fields are developed within a specific unit, additional water quality and aquifer characterization data will be collected and presented to WDEQ and NRC within the framework of their mine unit hydrologic testing program, permitting and annual reports. An extensive discussion on the Gas Hills Remote Satellite water quality is presented in Appendix D6 of the Gas Hills WDEQ Permit. A summary is provided below.

The water quality in the Wind River Aquifer is dominated by calcium sulfate water in the east transitioning to calcium-sodium bicarbonate-sulfate water in the west. In areas affected by past disturbance and reclamation activities and where groundwater has flowed through backfilled mine pits (Mine Units 4 and 5), TDS can range between 1,000 to 3,070 milligrams/Liter. Downgradient from these locations, calcium sulfate type water predominates.

West of the East Gas Hills area, Mine Units 1 and 2 are located in relatively undisturbed lands downgradient from the Beaver Divide. Waters from many of the Mine Unit 2 wells (single completion into the 70 Ore Sand) average 573 milligrams/Liter TDS. The major cations contributing to TDS are bicarbonate (primarily) and sulfate (secondarily). As the groundwater moves downgradient from the Divide and into the vicinity of Mine Units 1 and 3, average TDS increases from 623 to 863 milligrams/Liter and sulfate content also increases.

Uranium concentrations are relatively low in all monitoring wells including the ore zone wells. Maximum uranium concentrations were identified at Well BSMP-1 (0.32 milligrams/Liter), Peach MP-1 (0.31 milligrams/Liter) and Veca MW3A (0.21 milligrams/Liter). The BSMP and Peach wells were completed in the ore zone within Mine Units 2 and 3, respectively. The Veca well is completed downgradient from extensive AML reclamation and reflects some influence of waste dump spoils backfilled into an abandoned mine pit.

Radium-226 concentrations in the groundwater are variable, **with** higher concentrations **being** found near existing and mined out uranium deposits. For example, Peach MP-1 (722 pCi/Liter) and MUMP 97-1 (898 pCi/Liter) are completed in ore bodies (Mine Units 3 and 1, respectively). These values exceed the Class **I, II, and III** standard by **150** to 180 times. Outside the ore bodies, radium levels are significantly lower. Upgradient from these deposits, radium-226 is typically less than 5 pCi/Liter. Downgradient values are higher, but still less than 50 pCi/Liter. Mean values of radium-226 are presented on Table D6-3-3 of the Gas Hills WDEQ Permit. These mean values are skewed on the high end of the spectrum, based on the influence of the ore zone wells. Nevertheless, radionuclide levels within the mine units generally make these waters unsuitable for Class III (livestock use).

The baseline groundwater within the Gas Hills Remote Satellite and within the mine units is typically low in trace metals. Most constituents are below method detection limits. Occasionally undisturbed groundwater will exhibit low concentrations of manganese, arsenic, boron, selenium, iron, and zinc. However, typically these concentrations are well below Class III water quality standards.

In the groundwater affected by historical disturbance and reclamation activities, certain trace metals including iron, manganese, and arsenic are routinely elevated. The increase in iron and manganese can be attributed to the oxidation and dissolution of iron-bearing minerals (pyroxenes, amphiboles, phyllosilicates, and sulfides) and the local reduction in pH and increase in Eh.

The natural pH of the groundwater in the Gas Hills is slightly greater than 8, although values ranging from 6.5 to 8.5 are common. In some of the northern portions of the Gas Hills, and in the vicinity of Iron Springs, natural pH values below 4.0 were recorded in the 1950s. Within the mine units, groundwater pH typically ranges from 6.3 to 9.7.

Near the historical mining disturbances, pH values are generally lower than those measured in the typical Gas Hills Remote Satellite groundwater. Based on collected sample data, groundwater pH ranges from 6.3 to 7.9 within or immediately adjacent to historical mining disturbances. Studies in adjacent areas have documented a similar range in pH values immediately following reclamation. As groundwater continues to recover in the backfilled pits, pH values are predicted to increase towards background or upgradient conditions.

Additional characterization of groundwater quality within Mine Units 1, 2, 3, 4, and 5 are presented in Appendix D6 of the Gas Hill WDEQ Permit.

3.4.4.2.6 Groundwater Use and Rights

A list of all groundwater rights within the Gas Hills Remote Satellite and a boundary of 2 **kilometers** (1.2 **miles**), as of November 2011 are included in **Table 3.4-15, Gas Hills Groundwater Rights**. The locations of the groundwater rights are shown on **Figure 3.4.6**.

There are 177 groundwater rights on file with the WSEO within and adjacent to the Gas Hills Remote Satellite area. The vast majority of these groundwater rights are for wells installed for hydrologic monitoring or industrial purposes. There are seven groundwater rights associated with wells installed for livestock watering. There are no domestic use groundwater rights within 2 kilometers (1 mile) of the Gas Hills Remote Satellite according **to** the WSEO.

The nearest PWS in the vicinity of the Gas Hills Remote Satellite is the WYDOT Waltman Rest Area (5600964). It is located 37 kilometers (23 miles) northeast of the site.

Besides the stated industrial uses, Cameco also uses groundwater for project related non-production purposes. Although unknown at this time, it is anticipated that the non-production water use at the Gas Hills Remote Satellite site will be similar to the Smith Ranch site, or approximately 3.8 million liters (1 million gallons) per year. The water used will be obtained either from a well completed in a non-uranium bearing sand unit of the Wind River Formation or from an external bulk water supplier. Drinking water will be obtained from a commercial water bottling company.

3.4.5 Ruth Remote Satellite

3.4.5.1 Surface Water

3.4.5.1.1 Hydrology and Stream Flow

The Ruth Remote Satellite is located in the Dry Fork of the Powder River drainage which is a tributary of the Powder River located approximately 35 kilometers (22 miles) upstream of the confluence of Dry Fork and the Powder River. The Powder River is tributary to the Yellowstone River which is part of the Missouri River drainage basin. Dry Fork flows in a northerly direction through the center of the Ruth Remote Satellite. The Dry Fork drainage system is shown on Figure 10.6 of Volume II (Ruth Supplemental Report). The Dry Fork of the Powder River is classified as an intermittent stream and mainly flows in response to snow melt and large convective rainstorms. However, the alluvium is partially saturated and supports cottonwood trees and willows.

The size of the drainage area above the Ruth Remote Satellite is approximately 156 **square** kilometers (60 **square** miles). The Dry Fork channel has a gradient of **approximately** 0.007 **meter/meter**; an active channel width of 2 meters (7 feet); and a length of approximately 6 kilometers (4 miles) through the Ruth Remote Satellite area. Figures 9.2 and 9.3 of Volume II (Ruth Supplemental Report) show the Dry Fork and smaller tributary drainages in the Ruth Remote Satellite area.

There are no stream gauging stations located on the Dry Fork of the Powder River. Using methods from Craig and Rankl (**1978**), the mean annual flow of Dry Fork at the Ruth Remote Satellite is estimated to be 0.1 **cubic** meter/second (5 **cubic** feet/second). Peak flows with recurrence intervals between 2 and 100 years have been calculated with the "Basin Characteristics Method" of Craig and Rankl, with the "Channel Geometry Method" of Lowham (1976) and with the triangular unit hydrograph method in HEC-1. The basin characteristics, rainfall depth, and results of these calculations are presented in Table 10.16 of Volume I (Ruth Supplemental Report). Figure 10.6 of Volume II (Ruth Supplemental Report) presents drainage divides of the three basins for which peak flows were obtained.

3.4.5.1.2 Surface Water Use & Quality

Two surface water quality sampling sites were established along the Dry Fork of the Powder River. The first station is located downstream of the Ruth Remote Satellite and the other site is located upstream. The downstream sampling site is at the same location for the Research and Development (R&D) operations. The upstream location was moved from the original location to accommodate the increased license boundary. The sites are identified as SWS L, SWS U (old) and SWS U (new) on the Monitoring Site map, Figure 14.1 of Volume II (Ruth Supplemental Report). A total of 35 samples were collected from the three sites between 1980 and 1988. The surface water quality data is presented in Tables 10.17, 10.18, and 10.19 of Volume I (Ruth Supplemental Report).

Surface water within and adjacent to the Ruth Remote Satellite is used for livestock and wildlife watering, and contributes to the riparian vegetation along the Dry Fork of the Powder River. **It is not anticipated that surface waters at Ruth will be used for any project related production or non-production water usage.**

Sediment samples were collected at two locations on the Dry Fork of the Powder River upstream and downstream from the Ruth Remote Satellite. One sample was collected at the upstream sample site (SWS U New) and four were collected at the downstream sample site (SWS L). The results of the sediment sample analyses are presented in Table 14.3 of the Ruth Supplemental Report.

3.4.5.1.3 Surface Water Rights

Surface water rights within 2 kilometers (1.2 miles) of the Ruth Remote Satellite are identified in **Table 3.4-16, Ruth Surface Water Rights**. As of November 2011, there are 32 surface water rights according to the WSEO records. All but one of the surface water rights are for stock watering purposes. One surface water right is permitted for industrial purposes and is associated with the Ruth ISL Retention Reservoir. The Ruth ISL Retention Reservoir consists of a two-celled solar evaporation pond located off-channel in the Dry Fork of the Powder River drainage (NENE, Sec. 14, T42N, R77W). A map showing the approximate locations (nearest quarter quarter) of the surface water rights within 2 kilometers (1.2 miles) is presented on **Figure 3.4.8, Ruth Surface Water and Groundwater Rights**.

3.4.5.2 Groundwater

The hydrogeologic units within the Ruth Remote Satellite were mentioned previously in the regional setting. The uranium producing sands are hosted within the Eocene-age Wasatch Formation and are summarized below.

3.4.5.2.1 Hydrogeologic Stratigraphy

The Ruth Remote Satellite ore zone aquifer is hosted in the Wasatch Formation. The Wasatch Formation is a fluvial deposit and consists of brown to gray claystone, siltstone, and carbonaceous shales interbedded with buff sandstone lenses and coal beds. At the Ruth Remote Satellite area, the Wasatch Formation is approximately 443 meters (1,350 feet) thick. The major sands can be correlated for miles and are the basis for regional aquifers in the Powder River Basin. Aquifer properties are locally variable due to large variations in local lithologies. Recharge to the Wasatch Formation is mainly by exposure to outcrops with some influx of groundwater from vertical movement through adjacent aquifers.

Regionally, the Wasatch Formation combined with the underlying Fort Union Formation is developed extensively for shallow domestic and stock wells in the area.

3.4.5.2.2 Producing Sands and Confining Unit Characteristics

Locally the Ruth Remote Satellite stratigraphy consists of alternating layers of sand and shale with lignite marker beds. The A Sand (ore sand) is approximately 176 meters (535 feet) below ground surface and generally 16 meters (50 feet) thick. Above the A Sand lies the B Sand with the B-A Aquitard separating the two sands. The B-A Aquitard is approximately 13 meters (40 feet) thick. Below the A Sand lies the 1 Sand with the A-1 Aquitard separating the two sands.

Within the B-A Aquitard occasional sand lenses divide the aquitard into two or three thinner shale sequences. The shale lenses still provide a continuous, low permeability cap over the A Sand but locally reduce the total thickness of the B-A Aquitard. The interbedded sand lenses are discontinuous and are not laterally traceable for any significant distances. These sand lenses are saturated but due to their discontinuous lithology and limited size they cannot be considered aquifers. Over most of the Ruth Remote Satellite, the B-A Aquitard is vertically continuous and not compromised by sand lenses.

The A-1 Aquitard consists of two unequal shale layers separated by a thin coal seam. This is not expected to significantly affect the ability of the A-1 Aquitard to prevent lixiviant migration to the underlying 1 Sand during ISR operations. Figure 10.1 of Volume II (Ruth Supplemental Report) presents a schematic of the hydrogeologic setting at the Ruth Remote Satellite.

Vertical permeability of confining units has been determined in the laboratory from actual cored material and from pump test results utilizing the Neuman-Witherspoon method. Table 10.3 of Volume I (Ruth Supplemental Report) contains estimates of the vertical permeability of the confining units. These vertical permeabilities are considered representative of confining conditions throughout the Ruth Remote Satellite area.

3.4.5.2.3 Aquifer Pump Tests and Analysis

A total of seven aquifer tests were conducted at the Ruth Remote Satellite in the 1980s. Six aquifer tests were conducted for the R&D license and one for the Ruth Supplemental Report. Aquifer tests for the R&D license were numbered sequentially and include pump tests No. 1, 2, 4, 9, 14, and 15. These pump tests produced useful aquifer properties. Additional tests including step drawdown and variable rate injection tests were not very useful in defining aquifer properties. Aquifer tests No. 9 and 15 were the most thorough tests conducted for the R&D license with pumping times of 38.5 and 7.3 hours. Aquifer properties obtained from aquifer tests on the A Sand during the R&D project are presented in Table 10.2, Volume I (Ruth Supplemental Report).

The aquifer test conducted for the Ruth Supplemental Report consisted of a seven day test (four days pumping and three days of recovery). The test was named Hydro Test No. 24 and was conducted at the Ruth Remote Satellite area between July 5 and July 12, 1988. The A Sand (ore zone) was stressed by pumping well A1 (see Figure 10-2 of Volume I of Ruth Supplemental Report) at an average rate of 18 liters/minute (5 gallons/minute). The adjacent aquitards including the B-A and the A-1 Aquitards were monitored to obtain field vertical permeabilities. The B Sand and the 1 Sand were also monitored for potential response to pumping from the A Sand. Aquifer properties obtained from the Hydro Test No. 24 are presented in Table 10.2, Volume I (Ruth Supplemental Report). Drawdown impacts to the A Sand at the end of Hydro Test No. 24 are presented on Figure 10.3, Volume I (Ruth Supplemental Report). The complete results of Hydro Test No. 24 including drawdown data are presented in the Groundwater Hydrology Supplement, Volume III of the Ruth Supplemental Report.

Based upon the above mentioned testing the A Sand exhibits an average transmissivity of 1.4 **square** meters/day (15 **square** feet/day) and a horizontal permeability of 0.09 meter/day (0.29 **foot**/day). The A Sand is a confined aquifer with a storage coefficient of 8.0E-5.

3.4.5.2.4 Aquifer Potentiometric Surfaces

Groundwater levels were collected from monitoring wells on July 5, 1988 prior to aquifer testing. Figure 10.4 of Volume I and Figure 10.4A of Volume II (Ruth Supplemental Report) present potentiometric surface maps of the A Sand. Based on these water levels, groundwater flows towards the northwest. The groundwater gradient is 0.005 with a movement rate of 0.4 centimeter/day (0.16 inch/day), an average permeability of 0.09 meter/day (0.29 **foot**/day), and an effective porosity of 0.1.

3.4.5.2.5 Groundwater Quality

The groundwater sampling program for the Ruth Remote Satellite started in February 1980. During the Ruth R&D operation from 1982 to 1984, water sampling was conducted on a quarterly basis. Well sampling was discontinued after the R&D restoration phase in 1984. However, during 1985 the Moore South well was sampled quarterly.

The monitoring data included nine sample points in the A Sand, two in the B Sand, and one in the 1 Sand. The well sampling locations are identified on Figure 10.5 of Volume II (Ruth Supplemental Report). All quarterly water samples collected from the Ruth Remote Satellite were sent to an outside commercial laboratory. The baseline water quality results are presented in Tables 10.4 through 10.12 of Volume I (Ruth Supplemental Report). A summary of key water quality parameters from the 1 Sand, A Sand, and B Sand is summarized in Tables 10.13, 10.14, and 10.15 of Volume I (Ruth Supplemental Report).

3.4.5.2.6 Groundwater Rights

A list of all groundwater rights within the Ruth Remote Satellite **license area** and 2 kilometers (1.2 miles) **from the boundary**, as of November 2011 are included in **Table 3.4-17, Ruth Groundwater Rights**. The locations of the groundwater rights are shown on **Figure 3.4.8**.

There are 125 groundwater rights on file with the WSEO within and adjacent to the Ruth Remote Satellite area. The vast majority of these groundwater rights are for wells installed for CBM development. There are 22 groundwater rights associated with wells installed for livestock water. There are three monitoring wells remaining that were installed by Uranerz in the 1980s. There is one dual use domestic and stock groundwater right within approximately 0.8 kilometer (0.5 mile) southeast of the Ruth Remote Satellite area.

The nearest municipal water source is located at the unincorporated community of Linch located 8 kilometers (5 miles) west of the Ruth Remote Satellite area. Linch does not have an EPA PWS number.

3.4.6 References

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3.5 Ecological Resources

3.5.1 Smith Ranch, Highland and Reynolds Ranch Vegetation Surveys

Cameco completed an updated vegetation survey which commenced in the spring of 2011. The focus of the survey **was** on threatened and endangered (T&E) plant species. A copy of all correspondence with the WGFD and USFWS regarding updated vegetation and wetlands mapping along with the Vegetation and Wetlands Survey Methodology are included in Appendix D8 of the Smith Ranch WDEQ Permit under the heading "Supplemental Information."

Cameco completed a wetland survey effort in the Smith Ranch, Highland and Reynolds Ranch areas between June 20 and June 30, 2011 in accordance with regulations issued by the USACE. During a meeting which took place on May 2, 2011, Hayden-Wing and Associates (HWA), Cameco, and USACE determined that wetland surveys would be necessary within areas of proposed mining disturbance, but not within the entire permit area. It was also decided that the goal of initial surveys would be to determine whether wetlands were present within the proposed mine units and full delineations would be required if direct disturbance (i.e., filling) would result from ISR recovery activities. It was also agreed that the locations of the drainages would be verified. A total of 19 potential wetland sites were surveyed during June 2011 within the Smith Ranch, Highland and Reynolds areas. The wetlands survey is included as **Appendix A, Wetlands Survey – 2011**.

Sections 3.5.1.1 through 3.5.1.3 describe previous vegetation studies completed at the Smith Ranch, Highland and the Reynolds Ranch Satellite to date. **Summaries of previous ecological surveys, including survey methodology for each site under the Smith Ranch Project, including historical, current, and proposed impacts to vegetation, wildlife, and aquatic surveys can be found in ER Appendix A.1.**

3.5.1.1 Smith Ranch Historical Vegetation Surveys

Cameco and their predecessors conducted vegetation studies at Smith Ranch in 1976, 1978, and 1979 when the project was under Kerr McGee ownership. Additional survey work was completed in the summer of 1990 and a final Baseline Vegetation Assessment was prepared in 1997.

The vegetation studies conducted at Smith Ranch and mentioned above can be found in Appendix D8 of the WDEQ Permit in the following locations:

- Addendum D-8 A1 – Smith Ranch Tables
- Addendum D-8 A2 – Smith Ranch Figures and Plates
- Addendum D-8 A3 – Smith Ranch Supplemental Information

3.5.1.2 Highland Historical Vegetation Surveys

Highland was originally permitted as an ISR operation by Everest Minerals Corporation. Cameco and their predecessors completed a vegetation inventory at Highland in 1987. United Nuclear Corporation completed a vegetation inventory for the lands comprising the North Morton property. This information was utilized for Section 14 and portions of the West Highland Amendment areas. Supplemental information was later provided for Mine Unit J.

The vegetation studies conducted at Highland and mentioned above can be found in Appendix D8 of the Smith Ranch WDEQ Permit in the following locations:

- Addendum D-8 B1 – Highland Tables
- Addendum D-8 B2 – Highland Figures and Plates
- Addendum D-8 B3 – Highland Supplemental Information

3.5.1.3 Reynolds Ranch Historical Surveys

Cameco and their predecessors completed a vegetation inventory (including vegetation mapping) for the Reynolds Ranch Satellite in 1997. This work was updated and supplemented by BKS Environmental Associates, Inc. as part of the 2007 BLM EA. In 1997 the Reynolds Ranch Satellite was under RAMC ownership. Since 1997, the surface area of the Reynolds Ranch Satellite has been reduced such that the study performed in 1997 encompasses a greater area than the contemporary Reynolds Ranch Satellite boundary.

The vegetation studies conducted at the Reynolds Ranch Satellite and mentioned above can be found in Appendix D8 of the Smith Ranch WDEQ Permit in the following locations:

- Addendum D-8 C – Reynolds Ranch Vegetation
- Addendum D-8 C2 – Reynolds Ranch Figures and Plates
- Addendum D-8 C3 – Reynolds Ranch Supplemental Information

3.5.1.4 Existing Vegetation Resource Information Summary

Vegetation surveys completed to date have consistently shown that the study area is primarily grassland, with sagebrush/grassland vegetation present throughout the affected area. For more specific conclusions related to cover, diversity, productivity, and shrub height please see Section 3.0 in Appendix D8 of the Smith Ranch WDEQ Permit.

The results of the vegetation mapping for Smith Ranch are shown on Figure D-8.1 of WDEQ Addendum D-8 A2 and in Table D-8.5 of Addendum D-8 A1 in Appendix D8 of the Smith Ranch WDEQ Permit. Highland vegetation mapping was completed according to plant community on Plate D8-1 of WDEQ Addendum D-8 B2 and aerial extent data are provided in Table D8-1 of Addendum D-8 B1 in Appendix D8 of the WDEQ Permit. The results of the vegetation mapping for the Reynolds Ranch license area are displayed spatially in the figure entitled "Vegetation Map" in Addendum D-8 C2 in Appendix D8 of the WDEQ Permit.

A discussion of the baseline vegetation information including vegetation, mapping, site photographs, T&E species, noxious weeds, and selenium indicator species can be found in Appendix D8 of the WDEQ Permit. The existing condition at the time of the Smith Ranch Supplement to the LRA (SUA-1548) can be characterized by an affected ISR environment which includes roads, wells, header houses, satellite facilities, a CPP, a CPF, various office buildings, mine reservoirs, a selenium treatment plant and irrigators. Reclamation is an ongoing process where sites have been disturbed by drilling and/or construction activities.

3.5.2 Smith Ranch, Highland and Reynolds Ranch Wildlife

The historical wildlife surveys **were updated during the spring of 2011. The** surveys focus**ed** on 1) **Species designated as Threatened or Endangered, Proposed Species, Candidate Species or Wyoming Species of Concern by the USFWS (USFWS 2011); and 2) Species designated as Species of Greatest Conservation Need by the WGFD (WGFD 2010).**

The surveys encompassed the entire license area, including Smith Ranch, Highland and Reynolds Ranch and were conducted during the appropriate survey windows and in accordance with agency-approved protocols for each species as outlined in the Wildlife Monitoring Plan. Species survey**ed** included: wintering bald eagles (*Haliaeetus leucocephalus*), greater sage grouse (*Centrocerus urophasianus*), raptors, black-tailed prairie dog (*Cynomys ludovicianus*), swift fox (*Vulpes velox*), shorebirds, and waterfowl.

The report and associated documents, including Agency correspondence, is located in Appendix D9 of the Smith Ranch-Highland WDEQ permit application.

Sections 3.5.2.1 through 3.5.2.3 describe previous wildlife studies completed at the Smith Ranch, Highland and the Reynolds Ranch Satellite to date.

3.5.2.1 Smith Ranch Historical Wildlife Surveys

Wildlife and wildlife habitat studies were performed in 1976, 1979, and 1990 at Smith Ranch. Multiple ground surveys were completed to address seasonality of species with a minimum of four separate surveys performed over the space of at least one year. Additionally, a series of three aerial surveys were conducted over a portion of the permit area in February, August, and December 1990 to record numbers, distribution and habitat affinity, as well as pre- and post-hunt population statistics.

The wildlife studies conducted at Smith Ranch and mentioned above can be found in Appendix D9 of the WDEQ Permit in the following locations:

- Addendum D-9 A1 – Smith Ranch Tables
- Addendum D-9 A2 – Smith Ranch Figures and Plates
- Addendum D-9 A3 – Smith Ranch Supplemental Information

3.5.2.2 Highland Historical Wildlife Surveys

Wildlife surveys were performed at Highland in 1987 and 1989. Multiple ground surveys were completed to survey wildlife species. A minimum of four separate surveys were performed over the space of at least one year. Additionally, a series of three aerial surveys were conducted over a portion of the permit area in February, August, and December 1990 to record numbers, distribution and habitat affinity, as well as pre- and post-hunt population statistics.

The wildlife studies conducted at Highland and mentioned above can be found in Appendix D9 of the Smith Ranch WDEQ Permit in the following locations:

- Addendum D-9 B1 – Highland Tables
- Addendum D-9 B2 – Highland Figures and Plates
- Addendum D-9 B3 – Highland Supplemental Information

3.5.2.3 Reynolds Ranch Historical Wildlife Surveys

Baseline wildlife surveys were conducted at the Reynolds Ranch Satellite by Cameco and their predecessors in January of 1997 and 1998. At this time the Reynolds Ranch Satellite was under RAMC ownership. Since 1997, the surface area of the Reynolds Ranch Satellite has been reduced such that the study performed in 1997 encompasses a greater area than the contemporary Reynolds Ranch Satellite boundary.

Wildlife surveys were completed on the Reynolds Ranch Satellite in the winter, spring, and summer of 2007 and 2008 by Cameco. These surveys investigated wildlife use on site and in a 1 kilometer (0.5 mile) observation area surrounding the license boundary. Observations were conducted to document the presence or absence of big game, T&E species, migratory birds of high federal interest (MBHFI), nesting raptors, sage grouse and wildlife habitat.

The wildlife studies conducted at the Reynolds Ranch Satellite and mentioned above can be found in Addendum D-9 C3 in Appendix D9 of the Smith Ranch WDEQ Permit.

3.5.2.4 Ecology

The Smith Ranch, Highland and the Reynolds Ranch Satellite are located in the western part of the Great Plains in a region referred to as short-grass prairie. Many animals are associated with the short-grass prairie of eastern Wyoming. The pronghorn antelope, mule deer, coyote, prairie dog, badger, deer mouse, horned lark, and meadowlark are abundant. During the past century however, some animal populations have changed as a result of increased human settlement. For example, the bison and gray wolf were both formerly abundant on the short-grass prairie, but have been virtually **eliminated** from this habitat **during** the past 140 years. Today the pronghorn antelope is the dominant big game species of the prairie, and more antelope occur in Wyoming than in any other state (Sundstrom et al., 1973). For additional information on area ecology in and around Smith Ranch, Highland and the Reynolds Ranch Satellite please see Sections 3.0 and 4.0 in Appendix D9 of the Smith Ranch WDEQ Permit.

3.5.2.5 Existing Wildlife Resource Information

A discussion of the baseline wildlife information including big game, small to medium-sized mammals, birds, reptiles and amphibians, invertebrates, T&E species, and aquatic habitats can be found in Appendix D9 of the WDEQ Permit.

3.5.3 North Butte Vegetation

Vegetation sampling was conducted at the North Butte Remote Satellite in 1979 and compiled in the "Cleveland-Cliffs North Butte Vegetation Report." This original report can be found in Attachment D8-1 in Appendix D8 of the North Butte WDEQ Permit.

Cameco completed updated vegetation studies at the North Butte Remote Satellite in 2010. Based on examination of all the available license application information, it was concluded that no additional sampling would be required in 2010. Revisions and supplemental information compiled by Real West Natural Resources Consulting (Real West) for the update include:

1. Preparation of a new vegetation map.
2. Update of the plant species list.
3. Identification of any wetlands in the license area.
4. Identification of the potential for any T&E plant species to occur on the license area.

Site surveys to update the plant species list, identify the potential for T&E species, and determine wetland areas (wetlands are reported in Appendix D11 of the North Butte WDEQ Permit) were conducted by Real West on June 17, July 6 and 7, and August 5 and 6, 2010.

3.5.3.1 Existing Vegetation Resource Information

The North Butte Remote Satellite area supports four vegetation community types including sagebrush-grassland, grassland, bottomland and juniper-sagebrush. Photographs of the Satellite taken in 2010 are included as Figures D8-1.1 through D8-1.7 in Addendum D8-1 in Appendix D8 of the WDEQ Permit. Photo points are identified on the 2010 vegetation map (Plate D8-1.1 in WDEQ Addendum D8-1 in Appendix D8 of the WDEQ Permit). For additional information on specific species observed, cover data, noxious weeds, T&E species (including the Ute ladies'-tresses and blowout penstemon) see Addendum D8-1 in Appendix D8 of the WDEQ Permit.

3.5.4 North Butte Wildlife

In 2010, Cameco conducted field surveys in and around the North Butte Remote Satellite for wildlife species of management concern to the WGFD and the USFWS. These are species that are known to occur or have a high probability for occurring in and around the license area.

The 2010 wildlife species surveys include: 1) aerial and ground surveys for raptor nests in and within 2 kilometers (1 mile) of the license boundary; 2) ground surveys to locate and delineate potential mountain plover (*Charadrius monfanus*) habitat in and within 0.4 kilometer (0.25 mile) of the license boundary; 3) ground surveys to locate and delineate black-tailed prairie dog (*Cynomys ludovicianus*) colonies within the license boundary; and, 4) spotlight surveys for swift foxes (*Vulpes velox*) in and within 0.4 kilometer (0.25 mile) of the license boundary. Greater sage grouse (*Centocercus urophasianus*) leks were surveyed by another consultant for an adjacent CBM project in April 2010 and HWA obtained the locations, status, and peak male counts of leks within 3 kilometers (2 miles) of the license boundary from WGFD. Wildlife surveys were performed in accordance with the WGFD protocols and/or the respective USFWS survey protocols.

3.5.4.1 Existing Wildlife Resource Information

Appendix D9 of the WDEQ Permit contains updated information on survey methodology and the results of wildlife surveys for the following: big game, medium-sized and small mammals and predators, avifauna, raptors, sage grouse, passerine and other birds, herpetofauna, T&E species, and fisheries and aquatics. Section 3.11 of Appendix D9 of the WDEQ Permit also contains information on wildlife related recreation in the area.

Addendum D9-1 in Appendix D9 of the WDEQ Permit contains the updated Wildlife Monitoring Plan. The purpose of this Wildlife Monitoring Plan is to set forth protocols and schedules for monitoring the status of wildlife species identified by the regulatory agencies as species of concern that may occur in or proximal to the North Butte Remote Satellite. This plan has been tailored to meet the specific wildlife monitoring needs of the North Butte Remote Satellite and does not address species that are unlikely to occur in the survey area.

3.5.5 Gas Hills Vegetation

Vegetation sampling was conducted by Cameco's predecessors in the summer of 1997 for the WDEQ permit requirements and by HWA (**for Cameco**) in 2010. According to the environmental assessment for the operation of the "Gas Hills Project Remote Satellite In-Situ Leach Uranium Recovery" prepared for the NRC in 2004 (Docket No. 40-8857), five native vegetation types occur within the project area — mixed sagebrush grassland, rough breaks, bottomland sagebrush, upland grassland, and wetlands. Table 2.8-1 of the **NRC** Gas Hills EA presents the area vegetation map units for the Gas Hills Remote Satellite. Section 2.8.1.1 of the EA contains additional information on the existing vegetation resources at the Gas Hills satellite including a description of native vegetation types, disturbed lands, and noxious weeds.

No federally listed plant species were observed during the 2010 surveys of the project area. Based on records of the Wyoming Natural Diversity Database, plant species of concern include devil's gate twinpod (*Physaria eburniflora*), cedar rim thistle (*Cirsium aridum*), and Nelson's milkvetch (*Astragalus nelsonianus*). These species are all considered rare in the state.

Eleven hectares (28 acres) of potential wetlands were mapped based on the presence of wetland vegetation. Most of this wetland vegetation exists along and within the stream channel of West Canyon Creek, but wetland vegetation also occurs along the margins of Cameron Spring Reservoir and several small seeps which issue from the base of the Beaver Divide in the southern portion of the site. Wetland species on the site include creeping spikerush (*Eleocharis palustris*), bulrush (*Scirpus pungens*), sedges (*Carex* spp.), and rushes (*Juncus* spp.). A small stand of willows (*Salix* spp.) occurs in the upper portion of West Canyon Creek. A delineation of jurisdictional wetlands in the satellite area has not been conducted, but will likely be required should direct disturbance (i.e., filling) be proposed as ISR recovery activities are more clearly defined (after delineation drilling is completed).

3.5.6 Gas Hills Wildlife

Surveys of the Gas Hills Remote Satellite were conducted by Shell Valley Consulting in 2006, 2007, and 2008. HWA conducted surveys in 2009, 2010, and 2011. Wildlife surveys include evaluation of big game species, upland game birds, raptors, small mammals, and MBHFI. Section 2.8.1.2 of the Gas Hills EA contains a description of wildlife survey work completed to date at the satellite. Table 2.8-2 of the Gas Hills EA lists all federally listed T&E or Candidate Species and Wyoming Species of Concern that could potentially occur at the Gas Hills Remote Satellite.

3.5.7 Ruth Vegetation

Uranerz used the Extended Reference Area (EXREFA) concept when describing vegetation at the Ruth Remote Satellite. In addition, a vegetation map, discussion of the communities and species present, and a comparison of vegetation studies previously conducted in the region was prepared. The original baseline data was collected by NUS Corporation and baseline verification was performed by Applied ECOsystems in the summer of 1988.

As presented in Section 12, Volume 1 of the Ruth Supplemental Report, vegetation types at the Ruth Remote Satellite were delineated into one of four mapping units:

1. Drainage Bottomland,
2. Sprayed Sagebrush-Grassland,
3. Sagebrush-Grassland, and
4. Grassland.

Section 12.2 of the Ruth Supplemental Report presents descriptions and photographs of all four mapping units. No rare or endangered plant species were encountered at the Ruth Remote Satellite.

Section 12.3 of the Ruth Supplemental Report presents a comparison of vegetation cover and productivity data from studies conducted on the Ruth Remote Satellite area and others done in the region. The comparison included the following projects and owners: the Ruth property (Uranerz), the North Butte property (Cleveland-Cliffs), the Greasewood Creek property (Cleveland-Cliffs), the Charlie property (Cotter Corp.), the Christensen Ranch property (Malapai Resources) and the Irigaray property (Malapai Resources).

Figure 12.1 in the Ruth Supplemental Report includes the vegetation mapping and upland and lowland EXREFA. Table 12.3 in the Supplemental Report lists all plant species encountered.

3.5.8 Ruth Wildlife

The baseline wildlife study at the Ruth Remote Satellite is a composite of work initiated in the fall of 1987 and supplemented by earlier work. The wildlife study area included the license area and a buffer of 2 kilometers (1 mile) for raptors and 1 kilometer (0.5 mile) for all other wildlife. Field investigations for big game, mammalian predators, small and medium-sized mammals, raptors, game birds, passerine birds, herptiles, and T&E species were completed on the Ruth Remote Satellite area and adjacent habitats.

3.5.8.1 Existing Wildlife Resource Information

No big game migration routes or critical habitat are known to occur on the Ruth Remote Satellite area. No nesting or other significant use by raptor species is expected. At the time of the 1989 Ruth Supplemental Report, three T&E species had the potential to occur at the Ruth Satellite; the bald eagle, the peregrine falcon, and the black-footed ferret. The bald eagle was occasionally sighted in the winter, no sightings of the peregrine falcon were reported and neither the black-footed ferret nor its presence was identified.

Tables 13.1, 13.2 and 13.3 in the Ruth Supplemental Report contain a list of all mammal, avian and amphibian species expected or having the potential to occur at the Ruth Satellite. Sage grouse leks are not known to occur at the Ruth Satellite. Section 13.4 of the Ruth Supplemental Report contains a wildlife management plan.

3.5.9 References

Sundstrom, C., W.G. Hepworth, and K.L. Diem. 1973. Abundance, distribution and food habits of the pronghorn. Wyoming Game and Fish Commission, Cheyenne. 61 pp.

3.6 Meteorology, Climatology and Air Quality

3.6.1 Regional Meteorology, Climatology and Air Quality

All SUA-1548 license areas (Smith Ranch, Highland, Reynolds Ranch, North Butte, Gas Hills and Ruth) are located in the northeast quadrant of Wyoming. Section 3.6.1 describes the temperature, precipitation, wind, evaporation and severe weather in regional terms. Site-specific climatologic data are presented in Sections 3.6.2 through 3.6.5 and air quality information is in Section 3.6.6.

3.6.1.1 Temperature

Wyoming's elevation results in relatively cool temperatures. Much of the temperature variations within the state can be attributed to elevation with average values dropping 1 to 2°C (1.8 to 3.6°F) per 300 meters (1,000 feet). Summer nights are almost invariably cool, even though daytime readings may be quite high at times. For most places away from the mountains, the mean minimum temperature in July ranges from 10 to 16°C (50 to 60°F). The mountains and high valleys are cooler with average lows in the middle of the summer from -1 to 4°C (30 to 40°F) with occasional drops below freezing (Curtis and Grimes, 2004). The fall, winter, and spring can experience rapid changes with frequent variations from cold to mild periods. Freezes in early fall and late spring are typical and result in long winters and a short growing season. In the mountains and high valleys, freezes can occur any time in the summer. During winter warm periods, nighttime temperatures can remain above freezing. Valleys protected from the wind by mountain ranges can provide ideal pockets for cold air to settle and temperatures in the valley can be considerably lower than on nearby mountainsides.

3.6.1.2 Precipitation

Precipitation within Wyoming varies, with spring and early summer being the wettest time for much of the state. Mountain ranges are generally oriented in a north-south direction. This is perpendicular to the prevailing westerly wind direction. Therefore, these mountains often act as moisture barriers. Air currents of the Pacific Ocean rise and drop much of their moisture along the western slopes of the mountains. Summer showers are frequent, but typically result in rainfall amounts of a few hundredths of an inch. Usually several times a year, local thunderstorms will result in 2.5 to 5 centimeters (1 to 2 inches) of rain in a 24-hour period. On rare occasions, rainfall in a 24-hour period can reach 7.5 to 12.5 centimeters (3 to 5 inches) (Curtis and Grimes, 2004). Heavy rains can create flash flooding in headwater streams, and this flooding intensifies if these storms coincide with snowpack melting.

3.6.1.3 Wind

Wyoming ranks first in the United States for wind with an annual average speed of 6 meters/second (12.9 miles/hour). During winter, Wyoming frequently experiences periods where wind speed reaches 13 to 18 meters/second (30 to 40 miles/hour) with gusts 22 to 27 meters/second (50 to 60 miles/hour) (Curtis and Grimes, 2004). Prevailing wind direction varies by location but usually ranges from west-southwest through west to northwest. Because the wind is normally strong and constant from those directions, trees often lean to the east or southeast.

3.6.1.4 Evaporation

Pan evaporation is a technique that measures the evaporation from a metal pan typically 121 centimeters (48 inches) in diameter and 25 centimeters (10 inches) tall. Pan evaporation rates can be used to estimate the evaporation rates of other bodies of water such as lakes or ponds. Pan evaporation rate data are typically available only from May to October. Freezing conditions often prevent collection of quality data during the other parts of the year. Pan evaporation rates in the northeast quadrant of Wyoming range from 89 to 114 centimeters/year (35 to 45 inches/year) (NOAA, 1982).

3.6.1.5 Severe Weather

Hailstorms are the most destructive storm event in Wyoming. Most hailstorms pass over open rangeland with minimal impact. When a hailstorm passes over a city or farmland, the property and crop damage can be severe. Most of the severe hailstorms occur in the southeast corner of the state.

Low elevations typically experience light to moderate snowfall from November to May. Snowfall within Wyoming varies by location with the mountain ranges typically receiving the most. Significant storms of 25 to 40 centimeters (10 to 16 inches) of snowfall are infrequent outside of the mountains (Curtis and Grimes, 2004). Wind often coincides or follows snowstorms and can form snow drifts several meters deep. Snow can accumulate to considerable depths in the high mountains. Blizzards that last more than two days are uncommon.

3.6.2 Smith Ranch Meteorology and Climatology

Appendix D4 of the WDEQ Smith Ranch Permit Update provides a qualitative description of Smith Ranch, Highland and Reynolds Ranch site climatology using the closest official weather station located at the Natrona County International Airport near Casper.

Cameco installed an on-site meteorological station at Smith Ranch in November 2010, which is collecting continuous site-specific data. The first **12** months of data received from the station have been certified and compared with the regional data from the Natrona County airport data **to determine representativeness of the regional data to site conditions**. This site-specific data and comparison are provided in the following subsection.

3.6.2.1 Site Specific Meteorological Information

A meteorological station installed at Smith Ranch continuously collects data on wind speed **and direction, barometric pressure**, temperature, relative humidity, precipitation, and solar radiation. **Appendix B of this ER provides a meteorological analysis of the Smith Ranch data and compares the baseline year of data to long-term regional data. The baseline year of data extended from November 2, 2010 through December 31, 2011. The site-specific data was compared to long term data received from the Casper airport and the Glenrock Coal Mine site which was active between 1996 and 2009. The Glenrock Mine station was located less than 13 kilometers (8 miles) from the Smith Ranch station and makes an excellent comparison source, as the topography and elevations are similar between the two sites. The comparative analysis between the long term data at the Casper airport and the Glenrock Mine station and the Smith Ranch baseline year data supports the determination that 2011 baseline year of data from the Smith Ranch station are representative of the long term and validates the similarities drawn between the short term on site data and the long term data collected from the Casper airport and the Glenrock Coal Mine.**

3.6.3 North Butte Meteorology and Climatology

Appendix D4 and Addendum D4-1 of the North Butte WDEQ Permit Update provide a qualitative description of the North Butte Remote Satellite climatology using the closest official weather station located at the Campbell County Airport near Gillette as well as ten other regional **National Weather Service (NWS)** weather stations located within close proximity to the site.

3.6.3.1 Site Specific Meteorological Information

Cameco installed an on-site meteorological station at the North Butte Remote Satellite in November 2010, which collected continuous site-specific **meteorological** data **until it was deactivated in 2013. Data collected included wind speed and direction, relative humidity, precipitation, solar radiation and temperature. Appendix C of this ER provides an** analysis **of** the first 12 months of data collected (December **21**, 2010 through January **5**, 2012) **and a comparison of this data with long term data collected at the Antelope Coal Mine station. The Antelope site is the closest site to North Butte with wind data, located approximately 58 kilometers (36 miles) southeast of the North Butte Remote Satellite station. Both sites are located in mostly dry and hilly terrain and differ in elevation by approximately 120 meters (400 feet). The comparative analysis made between the long term Antelope Coal Mine station and the baseline year data from the North Butte station supports the determination that 2011 baseline year of data from the North Butte Remote Satellite station are representative of the long term, and validates the similarities drawn between the short term on site data and the long term data collected from the Antelope Coal Mine.**

3.6.4 Gas Hills Meteorology and Climatology

Appendix D4 of the WDEQ Gas Hills Permit to Mine application provides a historical summary of the climatology of the area within and surrounding the Gas Hills region of south-central Wyoming. The **summary** is based on data collected at the Gas Hills 4E NWS station, located at the Gas Hills site, and the Casper NWS station located at the Natrona County International Airport near Casper. The Casper NWS station is 90 kilometers (56 miles) east of the Gas Hills Satellite. The Gas Hills 4E NWS station recorded temperature and precipitation data only.

Cameco installed an on-site **meteorological** station at the Gas Hills Remote Satellite in November 2010 **which collected** continuous **site-specific meteorological** data **until it was deactivated in 2013. Data collected included wind speed and direction, temperature, relative humidity, precipitation and solar radiation. Appendix D of this ER provides a site specific and regional meteorological analysis as well as a comparison of the baseline period of site-specific data with long-term regional data. The baseline period for the site-specific analysis utilizes data collected from the Gas Hills station during an approximately one-year period extending from December 8, 2010 through January 27, 2012. This data was compared with long-term data from the Riverton (15 years) and Casper (8 years) airport sites, located 77 kilometers (48 miles) northwest and 93 (58 miles) east, respectively, from the Gas Hills site. The comparative analysis indicates that the one-year site-specific baseline data are representative of the long term conditions that could be expected at the site**.

3.6.5 Ruth Meteorology and Climatology

The most recent presentation of meteorological or climatological data associated with the Ruth Remote Satellite is included in the 1988 report entitled "Supplemental Information for Wyoming D.E.Q. Permit to Mine Application and U.S.N.R.C. Source Material License Application" (Ruth Supplemental Report).

Cleveland-Cliffs operated a meteorological data collection program from 1978 to 1979. The meteorological station was located 22.5 kilometers (14 miles) northeast of the Ruth Remote Satellite. Parameters measured included wind speed and direction, temperature, relative humidity and particulate concentrations. Sounding balloons were also used to determine atmospheric stability.

Data from both the Cleveland-Cliffs meteorological data collection program and regional NWS stations in Kaycee, Midwest, Casper, and one additional station 29 kilometers (18 miles) southeast of Gillette **have been** used to describe meteorology and climate conditions at the Ruth Remote Satellite. Sections

8.2 through 8.8 in Volume 1 of "Supplemental Information for Wyoming WDEQ Permit to Mine Application and U.S.N.R.C. Source Material License Application" (Ruth Supplemental Report) presents the results of the compilation of the most recently analyzed data associated with the Ruth property. The following data are presented in the Ruth Supplemental Report:

1. Table 8.1 – Maximum snowfall amounts.
2. Table 8.2 – Average relative humidity.
3. Tables 8.3 to 8.6 – Regional monthly precipitation.
4. Table 8.7 – Mean sky cover.
5. Tables 8.8 to 8.11 – Regional monthly temperature.
6. Figures 8.2 and 8.3 – Wind rose diagrams.

3.6.5.1 Site Specific Meteorological Information

There is presently no meteorological station in operation at the Ruth Remote Satellite. The Ruth Remote Satellite is 18.5 kilometers (11.5 miles) southwest of the North Butte Remote Satellite. At this time, the contemporary dataset most relevant to Ruth is **North Butte**. This data set is described in Section 3.6.3.1. When development commences at the Ruth Remote Satellite, a meteorological station will be established at the site and at least 12 months of climatological data will be collected and assessed.

3.6.6 Air Quality

The WDEQ, Air Quality Division (AQD) has the responsibility to protect, conserve, and enhance the quality of Wyoming's air resource. The AQD helps ensure that the ambient air quality in the State of Wyoming is maintained in accordance with the National Ambient Air Quality Standards (NAAQS). To carry out this goal, AQD operates and maintains a network of ambient air quality monitors and requires industrial sources of air pollutants to conduct source-specific ambient air monitoring. Stations in Wright (56-005-0099) and Casper (56-025-0001) are the closest stations to Smith Ranch. The Casper station has gathered data since the early 1990s and the Wright station has only been operational since 2002.

The Air Quality System (AQS) is a repository of ambient air quality data established by the EPA. AQS stores data from over 10,000 monitors, 5,000 of which are currently active. State (WDEQ AQD), local and Tribal agencies collect the data and submit it to AQS on a periodic basis. The most recent air quality data available on AQS for the State of Wyoming are from 2002. **Table 3.6-1, AQS Data** present tonnage of carbon monoxide (CO), ammonia (NH_3), nitrogen oxides (NOx), particulate matter smaller than 10 micrometers (PM_{10}), particulate matter smaller than 2.5 micrometers ($PM_{2.5}$), sulfur dioxide (SO_2) and volatile organic compounds (VOC).

In 2002, slightly less than 1.4 million tons (3,090 million pounds) of air pollutants were reported. Fifty percent of the identified source air pollution is related to highway and off-highway vehicle traffic. In fact, 18% of the total air pollution tonnage reported is carbon monoxide from highway vehicle travel (**Table 3.6-1**). In addition to carbon monoxide, the bulk of the air pollution tonnage reported in 2002 is particulate matter, 85% of which comes from miscellaneous sources. $PM_{2.5}$ concentrations have been very low at most monitoring sites. Wyoming has some of the lowest average concentrations of $PM_{2.5}$ observed in the contiguous United States, as demonstrated by long-term monitoring at Interagency Monitoring of Protected Visual Environments (IMPROVE) sites (Debell et al., 2006). The PM_{10} concentrations across the WDEQ AQD air-monitoring network have also been generally low. Overall, the only air quality issues in Wyoming have been associated with oil and gas drilling in western Wyoming.

No potential impacts to NAAQS parameters or PSD Class I, II or III areas are expected to occur as the result of continued Smith Ranch operations. The primary emissions from Smith Ranch, including the

North Butte and Reynolds Ranch Remote Satellites, will be tailpipe emissions of nitrogen oxides, carbon monoxide, sulfur dioxide, non-methane-ethane volatile organic compounds and particulate matter with a diameter less than 10 micrometers (4E-4 inches) resulting from vehicle traffic within the **license areas**. The majority of the emissions generated during construction will be fugitive dust and vehicle combustion emissions. Effects of air emissions and impacts associated with construction and operations are discussed in Section 7.2 of the TR.

3.6.6.1 Site-Specific Air Quality – Fugitive Dust

Fugitive dust from vehicular traffic on unpaved roads is the primary emission associated with SUA-1548 operations. Fugitive dust is released by traffic on the main access roads, the secondary access roads to the satellites, and traffic within the mine unit areas. Fugitive dust is also generated from trucks transporting IX resin, yellowcake slurry, chemical deliveries to process facilities, and deliveries of supplies. Employee travel on unpaved roads to the various operating units is also a significant component of the total fugitive dust emissions. Well field traffic, including drilling rigs, water trucks, pipe trucks, and geophysical logging trucks provides the largest contribution to fugitive dust emissions.

The fugitive dust estimates were calculated using the methodology provided in the EPA's AP-42 publication. The amount of fugitive dust (PM_{10}) generated during operations can be estimated using equations provided in EPA Publication AP-42. The non-SI (metric) units in the following equations were maintained for consistency with the publication. For reference, the metric conversion from lb/vmt (vehicle mile travelled) to grams (g) per vehicle kilometer travelled (vkt) is as follows:

1lb/vmt = 281.9 g/vkt.

Two equations are provided in U.S. EPA Publication AP-42, *Section 13.2.2 Unpaved Roads* as follows:

$$E = k \times \left(\frac{s}{12}\right)^a \left(\frac{W}{3}\right)^b \times \left(\frac{365-p}{365}\right) \quad (1)$$

$$E = \left[\frac{k\left(\frac{s}{12}\right)^a \times \left(\frac{S}{30}\right)^d}{\left(\frac{M}{0.5}\right)^c} - C\right] \times \left[\frac{365-p}{365}\right] \quad (2)$$

where

E= emission factor (lb/vmt)
C = emissions factor for 1980s fleet exhaust, brake wear and tire wear
a = 0.9 (Industrial Roads, 1.0 Public Roads)
b = 0.45 (Industrial Roads)
c = 0.2 (Public Roads)
d = 0.5 (Public Roads)
k = particle size multiplier –assumed 0.36 (particle ≤10%µm)
s = silt content of road surface material (%) – assume 10%
S = mean vehicle speed (mph)
W= mean vehicle weight (tons)
p = number of days with at least 0.01 inches of precipitation per year – assume 100 days.

Equation 1 is used to estimate emissions from vehicles travelling on unpaved surfaces at industrial sites such as secondary access roads, well field roads and other minor roads. Equation 2 provides an estimate of emissions from publicly traveled roads, which include unpaved roads to the license area and the main access road at the ISR facility. **Cameco developed transportation plans for Smith Ranch, North Butte and Gas Hills to provide a basis for estimating vehicle miles traveled for employees traveling to the site, service or delivery trucks, drilling operations, construction traffic and operations. Fugitive dust emissions were not calculated for Ruth, as Cameco currently does not have a specific operations plan for the Ruth Project. A transportation plan for Ruth will be developed as required for future licensing.** Reasonable weights were assumed for the various vehicles, and to be conservative, the vehicles were assumed to be fully loaded the entire trip. Again, the most significant emissions source was well field traffic followed by employees commuting to the ISR facilities, **except at Smith Ranch where all primary roads leading to the CPP facility are paved.** A summary of the estimated annual fugitive dust emissions (PM_{10}) in metric tons (tons) is provided below.

Smith Ranch is operational and for the purposes of this LRA, baseline conditions are those present in the fall of 2011. Current operations at Smith Ranch are estimated to produce **approximately** half of the amount of fugitive dust as compared to the long-term projections. The North Butte and Gas Hills Remote Satellites are not currently **(2011)** operational; however exploratory drilling programs are running at both locations. Employee pickup trucks, drill rigs, water trucks and backhoe tractors comprise the existing sources of fugitive dust at the remote satellites. There is no current activity at the Ruth Remote Satellite and accordingly no existing sources of fugitive dust.

Facility	Employee Travel	Drilling Support	Construction	Operational Support	Operational Supply Support Deliveries	Transport of Resin/Yellowcake Slurry	Total Emissions
Smith Ranch	0	102.7	8.0	30.1	0	0.4	141.2
North Butte	34.5	42.1	5.8	12.5	0.5	1.4	96.9
Gas Hills	54.0	41.4	8.5	12.5	1.5	12.2	129.8
*All units are in metric tons (tons)							

A review of estimated fugitive dust emissions presented above shows no emissions for employee travel and operational supply support deliveries at Smith Ranch. The roads to Smith Ranch are paved and employee travel from Casper, Glenrock and Douglas and delivery trucks will not produce significant fugitive dust emissions. In contrast, employee travel and delivery trucks are a significant portion of the total fugitive dust emissions for North Butte and Gas Hills because of the lengthy dirt roads that would be utilized to reach each facility. The current and proposed road upgrades at the North Butte and Gas Hills (AML and Dry Creek Roads) should reduce the fugitive dust emissions.

3.6.6.2 Green House Gas Emissions

Cameco has provided an estimate of the potential fugitive dust emissions for the Smith Ranch Project but does not track greenhouse gas emissions or other sustainability parameters for each Cameco-owned global uranium mining and milling operations. In the US, there are statutory national pollutant release inventories which require public reporting. To date, it is extremely rare that uranium companies have included such data in their reporting, leaving a major gap in understanding the full implications of emissions and pollutant issues associated with uranium mining and milling. Numerous studies have been completed that estimate the greenhouse gas (GHG) emission per metric ton (tonne) of uranium production at a standard mine, but Cameco is not aware of any detailed studies or data that are available for an ISR operation.

Cameco does; however, provide an annual sustainable development report at the corporate level, which includes data for all 31 Global Reporting Initiative (GRI) indicators and four indicators that are unique to the corporation. The GRI is a leading non-profit organization in the sustainability field. GRI promotes the use of sustainability reporting as a way for organizations, including Cameco, to become more sustainable and contribute to sustainable development. GRI has pioneered and developed a comprehensive Sustainability Reporting Framework that is widely used around the world.

A sustainability report is a report published by a company or organization about the economic, environmental and social impacts caused by its everyday activities. A sustainability report also presents the organization's values and governance model, and demonstrates the link between its strategy and its commitment to a sustainable global economy. GRI's mission is to make sustainability reporting a standard practice for all companies and organizations. Its framework is a reporting system that provides metrics and methods for measuring and reporting sustainability-related impacts and performance.

A PDF document of Cameco's 2012 sustainable development report can be downloaded at *http://www.cameco.com/sustainable_development/2012/report_builder/*. The report summarizes data from Cameco's 2010 and 2011 global uranium mining and milling operations. GRI indicators (see Table 3.6-2, Cameco Global Reporting Initiative Reporting) reported by Cameco that pertain to air quality and GHGs include the following:

1. **EN3 – Direct Energy Use (by primary source)**
2. **EN4 – Indirect Energy Use (by primary source)**
3. **EN16 – GHG Emissions (by weight)**
4. **EN20 – Air Emissions (by type and weight)**

3.6.7 References

AATA Meteorological Instrument Raw Data Files. Dec. 2010 to Jan. 2012. (North Butte Baseline Year data).

Curtis, J., and K. Grimes. 2004. Wyoming Climate Atlas. Office of the Wyoming State Climatologist, 100 E. University Ave., Laramie, WY 82071, 328 pp. plus data CD. Available online at: http://www.wrds.uwyo.edu/wrds/wsc/climateatlas/title_page.html.

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High Plains Regional Climate Center. March 1902 to December 2010. (Gillette temperature, precipitation and snowfall data).

IML Meteorological Database. 1986 to 2012. (Antelope Mine data).

IML Meteorological Database. 2005 to 2012. (Black Hills Power, Wyodak site relative humididty data).

M.E. Jensen, R.D. Burman, and R.G. Allen. 1990. Evapotranspiration and Irrigation water Requirements, ASCE manuals and Reports on Engineering Practice NO.70 American Society of Civil Engineers NY 1-332.

National Oceanic and Atmospheric Administration (NOAA). 1982. NOAA Technical Report NWS 33 – Evaporation Atlas for the Contiguous United States.

Western Regional Climate Center. 1925 to 2005. (Gillette pan evaporation data).

3.7 Land Use

3.7.1 Smith Ranch

ISR operations, rangeland, and wildlife habitat have been the primary land uses within 3 kilometers (2 miles) of Smith Ranch. Other land uses include oil and gas exploration and production, as well as wind farming. There are only four ranch homes in the vicinity of the Smith Ranch. These ranches are the Vollman Ranch, Fowler Ranch, Duck Creek Ranch, and the Boner Ranch. As a result of the remote location of the project and the low population density of the surrounding area, impacts from noise or congestion within the project area or in the surrounding 3 kilometer (2 mile) area are not anticipated. Any existing ambient noise in the vicinity of Smith Ranch is dominated by the ongoing ISR operations and oil and gas exploration and production operations with some additional noise during wind farm construction and operation. Such noise levels include plant operations, road traffic, heavy machinery involved in either well field preparation or reclamation of well fields as well as drilling and pipeline construction activities. There have been no changes in noise generation or receptors since the last renewal.

3.7.2 North Butte Remote Satellite

As with Smith Ranch, rangeland and wildlife habitat have been the primary use for the lands within and surrounding (3 kilometers [2 miles]) the North Butte Remote Satellite. These lands are also being used for CBM production and uranium ISR operations. Within close proximity of the North Butte Remote Satellite, there is one occupied ranch unit, the Pfister Ranch house, which is located approximately 1 kilometer (0.5 mile) south of the satellite license boundary. Due to the remoteness of this location, typical noise levels are relatively low. Any noise created by adjacent land uses, including CBM and nearby ISR uranium recovery operations (i.e., Nichols Ranch and Willow Creek), remains part of the ambient noise levels. The primary difference from the last renewal is that there has been an increase in CBM development and operations within the last 10 years, possibly adding to the ambient noise levels. Additionally, uranium ISR development to the south and west of the North Butte Remote Satellite may add additional ambient noise to the area during the next renewal period. No new permanent receptors have been identified within or adjacent to the North Butte Remote Satellite.

3.7.3 Gas Hills Remote Satellite

Rangeland and wildlife habitat are the primary use for the land within and surrounding the Gas Hills Remote Satellite. Historically, the surrounding area and lands within the Gas Hills Remote Satellite were mined for uranium by conventional mining (both underground and open pit). Currently, there is ongoing mine-land reclamation activity within 3 to 6 kilometers (2 to 4 miles) of the Gas Hills Remote Satellite. Within proximity of the Gas Hills Remote Satellite, the nearest occupied residence is the JE Ranch, which is located approximately 19 kilometers (12 miles) northeast of the satellite license boundary, and is occupied year-round. Due to the remoteness of this location, typical noise levels are relatively low. Any noise created by adjacent land uses, including mine reclamation activities remains part of the ambient noise levels. Because of the distance and topography, construction activities near or within the Gas Hills Remote Satellite do not extend to the nearest occupied residence. There have been no changes in noise generation or receptors since the last renewal.

3.7.4 Ruth Remote Satellite

Because the Ruth Remote Satellite is located only 18 kilometers (11 miles) from the North Butte Remote Satellite, the usage of the area can be likened to that of the North Butte Remote Satellite area. As with the North Butte Remote Satellite, rangeland and wildlife have been the primary use for the lands within and surrounding the Ruth Remote Satellite. These lands are also being used for CBM production. There are no occupied units within 3 kilometers (2 miles) of the satellite license boundary, and CBM production contributes to the ambient noise levels. Due to the remoteness of this location, typical noise levels are relatively low. Any noise created by adjacent land uses, including CBM, are generally insignificant. The only difference from the last renewal is that there has been an increase in CBM development and operations within the last 10 years, possibly adding to the ambient noise levels. No new receptors have been identified within or adjacent to the Ruth Remote Satellite.

3.8 Historic and Cultural Resources

NRC confidentiality requested – Information provided separately as confidential Appendix F.

3.9 Visual and Scenic Resources

3.9.1 Proposed Action

Visual resources at SUA-1548 had not been described in the past as it did not become an application or renewal requirement until the publication of NUREG-1569 and 1748 in 2003, two years after the approval of the previous LRA. Therefore, Cameco is providing a visual resources description of SUA-1548 in this section. Section 4.9 **of this ER** discusses potential impacts to SUA-1548 visual resources due to the proposed action, no-action, and the alternative action scenarios. The Smith Ranch **license area** is a mix of private, state, and public lands. The public lands within Smith Ranch comprise approximately 1,214 hectares (3,000 acres) or approximately 8% of the total area within the Smith Ranch boundary and are administered by the Casper Field Office of the BLM. The North Butte Remote Satellite is located completely on private land. North Butte is located in prairie landscape of the Powder River Basin southwest of Gillette and near the Pumpkin Buttes. Although the remote satellite does not contain any public lands, it is within close proximity to public lands that are administered by the Buffalo Field Office of the BLM. The Gas Hills Remote Satellite is located approximately 129 kilometers (80 miles) west of the Southern Powder River Basin, within the Wind River Basin, and **contains approximately 8,500 acres of which approximately 8,075 acres** are administered by the Lander Field Office of the BLM. The Ruth Remote Satellite is located on the southwest flank of the Pumpkin Buttes District, approximately 18 kilometers (11 miles) southwest of the North Butte Remote Satellite. The lands for the Ruth Remote Satellite are a mixture of private and public lands, the latter of which are administered by the Buffalo Field Office of the BLM.

3.9.2 General Visual Resource Management Methodology

The BLM has inventoried visual resources of all lands within the boundaries of the Buffalo, Casper, and Lander Field Offices including private lands, with the Visual Resource Management (VRM) system. The VRM system is the basic tool used by the BLM to inventory and manage visual resources on public lands. The VRM inventory process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points.

Cameco obtained a shapefile from the BLM that classified the VRM classes for the entire state. Shapefiles of the license boundaries for the Smith Ranch and the remote satellites (North Butte and Gas Hills) were created and overlaid, and a GIS analysis was performed to determine the area (hectares) of each VRM class with the license boundaries. The following table provides a summary of the VRM classes within each facility.

Facility	Class III Hectare (acres)	Class IV Hectare (acres)	Class V Hectare (acres)	Total License Area Hectare (acres)
Smith Ranch- Reynolds	2,541 (6,278)	13,646 (33,719)	0 (0)	16,187 (40,000)
North Butte	370 (915)	38 (95)	0 (0)	409 (1,010)
Gas Hills	0 (0)	3,180 (7,859)	261 (646)	3,440 (8,500)

Cameco also conducted a view shed analysis at a distance of 3.2 kilometers (2 miles) from the license boundaries at all facilities except Ruth. Global Mapper ™ (Blue Marble Geographics) software and USGS digital elevation models were utilized to complete the view shed analysis. The CPP (Smith Ranch) and the CPF (Highland) at Smith Ranch/Reynolds and the Carol Shop (Gas Hills) were assigned an elevation of 12.2 meters (40 feet) above the ground surface and remote satellites at all facilities were assigned an elevation of 7.6 meters (25 feet) above the ground. The elevation of the hypothetical observer at 3.2 kilometers (2 miles) from the license boundaries was assigned an elevation of 1.8 meters (6 feet). The software accounts for the curvature of the earth in the viewshed calculations. The viewshed analysis and BLM VRM classes for each facility are provided on the following figures:

- **Figure 3.9.1: View Shed Analysis – Smith Ranch/Reynolds**
- **Figure 3.9.1A: BLM VRM Classes – Smith Ranch/Reynolds**
- **Figure 3.9.2: View Shed Analysis – North Butte Remote Satellite**
- **Figure 3.9.2A: BLM VRM Classes – North Butte Remote Satellite**
- **Figure 3.9.3: View Shed Analysis – Gas Hills Remote Satellite**
- **Figure 3.9.3A: BLM VRM Classes – Gas Hills Remote Satellite**

3.9.2.1 Visual Resource Management Classes

The VRM system is based on research that has produced ways of assessing aesthetic qualities of the landscape in objective terms. In accordance with the BLM Handbook H-8410-1, a visual resource can be evaluated using three categories. These categories include scenic quality, visual sensitivity levels, and distance zones, as described below:

Scenic Quality – A measure of the visual appeal of a tract of land. In the visual resource inventory process, public lands are assigned an A, B, or C rating based on the apparent scenic quality, which is determined using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. During the rating process, each of these factors is ranked comparatively against similar features within the physiographic province.

Visual Sensitivity Level – A degree or measure of viewer interest in the scenic qualities of the landscape. Factors to consider include (1) type of users; (2) amount of use; (3) public interest; (4) adjacent land uses; and, (5) special areas. Three levels of sensitivity have been defined:

- Sensitivity Level 1 – The highest sensitivity level, referring to areas seen from travel routes and use areas with moderate to high use.

- Sensitivity Level 2 – An average sensitivity level, referring to areas seen from travel routes and use areas with low to moderate use.
- Sensitivity Level 3 – The lowest sensitivity level, referring to areas seen from travel routes and use areas with low use.

Distance Zones – Areas of landscapes denoted by specified distances from the observer, particularly on roads, trails, concentrated-use areas, rivers, etc. The three zones are foreground-middleground, background, and seldom seen.

- Foreground-Middleground – The area is visible from a travel route, use area, or other observer position to a distance of 5 to 8 kilometers (3 to 5 miles). The outer boundary of this zone is defined as the point where the texture form of individual plants are no longer apparent in the landscape and vegetation is apparent only in pattern or outline.
- Background – The viewing area of a distance zone that lies beyond the foreground and middleground. This area usually measures from a minimum of 5 to 8 kilometers (3 to 5 miles) to a maximum of approximately 24 kilometers (15 miles) from a travel route, use area, or other observer position. Atmospheric conditions in some areas may limit the maximum to about 13 kilometers (8 miles) or increase it beyond 24 kilometers. Vegetation should be visible at least as patterns of light and dark.
- Seldom Seen – The area is screened from view by landforms, buildings, other landscape elements, or distance.

The visual resource inventory categories described above are used to develop VRM classes, which are generally assigned by the BLM through the resource management plan process. VRM objectives are developed to determine how the land should be managed to protect the scenic quality of the lands, especially those lands that receive the greatest amount of public viewing. The following four VRM class objectives outline the amount of disturbance an area can tolerate before it no longer meets the visual quality of that class.

- **Class I Objective**: To preserve the existing character of the landscape. This objective provides for natural ecological changes but also does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
- **Class II Objective**: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of a casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.
- **Class III Objective**: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- **Class IV Objective**: To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the

major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic elements.

The Scenic Quality, Sensitivity Level, and Distance Zone inventory levels are combined to assign the VRM Class to inventoried lands as shown in the following matrix:

Determining BLM Visual Resource Inventory Classes								
Visual Sensitivity		**High**			**Medium**			**Low**
Special Areas		I	I	I	I	I	I	I
Scenic Quality	A	II	II	II	II	II	II	II
	B	III	IV	III/IV	III	IV	IV	IV
	C	III	IV	IV	IV	IV	IV	IV
Distance Zones		f/m	b	ss	f/m	b	ss	ss
f/m = foreground-middleground (0-5mi)			A = 19 or more					
b = background (5-15mi)			B = 12-18					
ss = seldom seen (>15mi)			C = 11 or less					

Site-specific VRM evaluations were conducted at Smith Ranch and the North Butte, Gas Hills, and Ruth Remote Satellites during 2011 using the methodology provided in BLM Handbook 8410-1 as well as a review of the factors contributing to the existing Class IV inventory for Smith Ranch and the Ruth Remote Satellite, and Class II and III for the North Butte and Gas Hills Remote Satellites.

3.9.3 Smith Ranch Visual Resource Management Rating

The existing condition of the Smith Ranch license area was measured for visual resources. No developed parks or recreation areas are located within the VRM study area and the area is a producing ISR operation. The landscape is characterized by a gently rolling topography with large open expanses of upland grasslands, pasture, and sagebrush shrubland dissected by ephemeral drainages that seasonally drain the adjacent uplands. There are also altered areas of landscape within the area, including ranch residences, wind energy farms, oil production facilities, roads, overhead utility lines and electrical substations, fences, stock tanks, livestock water windmills, and uranium production facilities. These latter production facilities consist of well fields, monitor wells, access roads, buildings, processing facilities and fences. A wind energy farm is located immediately west of the study area. A site-specific VRM evaluation was conducted in 2011 at Smith Ranch utilizing the methods described above as well as a review of the factors that contribute to the existing VRM Class IV inventory for the area. The key factors of landform, vegetation, water, color, influence of adjacent scenery, scarcity and cultural modifications were evaluated and scored according to the rating criteria. The criteria for each key factor ranged from high to moderate to low quality based on the variety of line, form, color, texture and scale of the factor within the landscape. A score was associated with each rating criteria, with a higher score applied to greater complexity and variety for each factor in the landscape. The results of the inventory and the associated score for each key factor are summarized in **Table 3.9-1, Scenic Quality Inventory and Evaluation for Smith Ranch**. According to the NRC NUREG-1569, if the visual resource evaluation rating is less than 19, no further evaluation is required. Based on field reconnaissance conducted in July 2011 the total score of the scenic quality inventory for Smith Ranch is 5; therefore, no further evaluation of existing scenic resources is required. Further, no significant changes to the scenic resources are anticipated. **Using the methodology described in Section 3.9.2, the viewshed and VRM classes for Smith Ranch and Reynolds Ranch are illustrated on Figure 3.9.1 and Figure 3.9.1A, respectively.**

Photo 3.9-1, Smith Ranch Area presents photographs of the view from the scenic quality evaluation site as well as photographs taken from nearby roads and structures. As indicated by **Photo 3.9-1,** Smith

Ranch is not visible beyond a distance of approximately 16 kilometers (10 miles) in all directions due to low-lying hills that surround the site. When viewing the area from the north, it is no longer visible from a distance of approximately 8 kilometers (5 miles) due to these low-lying hills **(see Smith Ranch Area Photo A)**.

3.9.4 North Butte Visual Resource Management Rating

The area considered for visual resources includes the North Butte Remote Satellite and a surrounding 3 kilometer (2 mile) area. The BLM has rated approximately half of the area, the northwestern portion in the vicinity of the North Butte Remote Satellite, as Class II, while the other half has been assigned a rating of Class III. The remote satellite is located on the south flank of the North Butte in the Pumpkin Buttes District. The landscape is characterized by gently rolling hills and low ridges, as well as steep terrain near the North Butte and some deeply eroded areas associated with Willow Creek, an ephemeral drainage located near the southern boundary of the project site. The area is dissected by a series of ephemeral drainages that generally drain southward toward Willow Creek. Altered areas of landscape within the study area include oil production facilities, CBM facilities, ranch residences, overhead utility lines, roads, fences, stock tanks and monitor wells. The Pumpkin Buttes are the most important visual resource in the area.

The results of the site-specific inventory and the associated score for each key factor are summarized in **Table 3.9-2, Scenic Quality Inventory and Evaluation for the North Butte Satellite.** Based on field reconnaissance conducted in 2011 the total score of the scenic quality inventory for the North Butte Remote Satellite is 17; therefore, no further evaluation of existing scenic resources is required. **Furthermore**, no significant changes to the scenic resources are anticipated. **Using the methodology described in Section 3.9.2, the viewshed and VRM classes for North Butte are illustrated on Figure 3.9.2 and Figure 3.9.2A, respectively.**

Photographs taken at the North Butte Remote Satellite in the four cardinal directions as well as photos taken from nearby roads and homes are included in **Photo 3.9-2, North Butte Remote Satellite Area.** As shown in **Photo 3.9-2,** the North Butte Remote Satellite is not visible beyond a distance of approximately 16 kilometers (10 miles) in all directions due to low-lying hills that surround the site. The site does, however, become partially visible from a distance of approximately 8 kilometers (5 miles) in all directions except from the north. From the north, there is no visibility of the remote satellite.

3.9.5 Gas Hills Visual Resource Management Rating

The area considered for visual resources includes the Gas Hills Remote Satellite and a surrounding 3 kilometer (2 mile) area. The remote satellite encompasses one BLM rating: Class IV. The site is located approximately 129 kilometers (80 miles) west of the Southern Powder River Basin District, where Smith Ranch is located. The landscape is characterized by gently rolling hills, deeply dissected drainages, badland topography to the west, extensive remnants of past mining practices including reclaimed mine pits and waste dumps, low ridges, and the predominant Beaver Rim. The drainage pattern originates from the Beaver Rim and flows towards the north into West Canyon Creek, which is the dominant drainage on the eastern portion of the license area. Fraser Draw, which is the dominant drainage on the western portion of the license area, is blocked by a large mine dump and open pit mine and does not flow through. All drainages are ephemeral except where a spring provides a short reach of intermittent flow. Cameron Springs is the dominant water body in the area and exists year round. Altered areas of landscape within the remote satellite area include conventional mined and reclaimed properties both within and adjacent to the remote satellite area, monitoring wells, Carol Shop, a radium treatment building, roads, and fences. The Beaver Rim is the most important visual resource in the area.

The results of the site specific inventory and the associated score for each key factor are summarized in **Table 3.9-3, Scenic Quality Inventory and Evaluation for the Gas Hills Satellite Area**. Based on field reconnaissance conducted in 2008, the total score of the scenic quality inventory for Gas Hills Remote Satellite is 10; therefore, no further evaluation of existing scenic resources is required. Furthermore, no significant changes to the scenic resources are anticipated. **Using the methodology described in Section 3.9.2, the viewshed and VRM classes for Gas Hills are illustrated on Figure 3.9.3 and Figure 3.9.3A, respectively.**

Photographs taken at the Gas Hills Remote Satellite are included in **Photo 3.9-3, Gas Hills Remote Satellite Area.** As shown in **Photo 3.9-3**, the Gas Hills Remote Satellite is not visible beyond a distance of approximately 16 kilometers (10 miles) to the west due to the presence of the Beaver Rim. The Beaver Rim also prevents the remote satellite from being visible from a distance of approximately 2 kilometers (1 mile) from the south. In all other directions, the site is visible for approximately 16 kilometers (10 miles) only, due to low-lying hills and other landforms that exist in the distance.

3.9.6 Ruth Visual Resource Management Rating

The area considered for visual resources includes the Ruth Remote Satellite and a surrounding 3 kilometer (2 mile) area. The remote satellite area encompasses a BLM rating of Class IV, and is located on the southwest flank of the Pumpkin Buttes District, approximately 18 kilometers (11 miles) southwest of the North Butte Remote Satellite. The landscape is characterized by gently rolling hills, plains, and low ridges. Altered areas of landscape within the remote satellite include a processing plant, a warehouse, a generator building, three monitoring wells, two evaporation ponds, and one access road. The Pumpkin Buttes are the most important visual resource in the area.

The results of the site-specific inventory and the associated score for each key factor are summarized in **Table 3.9-4, Scenic Quality Inventory and Evaluation for the Ruth Satellite Area.** Based on field reconnaissance conducted in 2010, the total score of the scenic quality inventory for the Ruth Remote Satellite is 5; therefore, no further evaluation of existing scenic resources is required. Furthermore, no significant changes to the scenic resources are anticipated.

The Ruth Remote Satellite is shown in **Photo 3.9-4, Ruth Remote Satellite Area**. The Ruth Remote Satellite is not visible beyond a distance of approximately 16 kilometers (10 miles) in all directions due to low-lying hills that surround the site. The site does, however, become partially visible, from a distance of approximately 8 kilometers (5 miles) in all directions.

Photo 3.9-1, Smith Ranch Area

Photo A - Looking north towards Smith Ranch as seen from the corner of Highway 31 and Highway 93; approximately 16 kilometers (10 miles) south of the site boundary.

Photo B - Looking north towards Smith Ranch as seen from Ross Road; approximately 8 kilometers (5 miles) south of the site boundary.

Photo C - Looking west from the eastern boundary of Smith Ranch as seen from Wellfield H Road.

Photo D - Looking south towards Smith Ranch as seen from Ross Road; approximately 8 kilometers (5 miles) north of the site boundary.

Photo 3.9-2, North Butte Remote Satellite Area

Photo A - Looking west towards the North Butte Remote Satellite as seen from Van Buggenum Road; approximately 24 kilometers (15 miles) from site boundary.

Photo B - Looking west towards the North Butte Remote Satellite as seen from Van Buggenum Road; approximately 16 kilometers (10 miles) from site boundary.

Photo C - Looking west towards the North Butte Remote Satellite as seen from Van Buggenum Road; approximately 8 kilometers (5 miles) from site boundary.

Photo D - Looking west from the eastern boundary of the North Butte Remote Satellite as seen from Christensen Road.

Photo E - Looking west from the northeastern corner of the North Butte Remote Satellite as seen from Christensen Road.

Photo F - Looking north from the southeastern corner of the North Butte Remote Satellite as seen from Christensen Road.

Photo 3.9-3, Gas Hills Remote Satellite Area

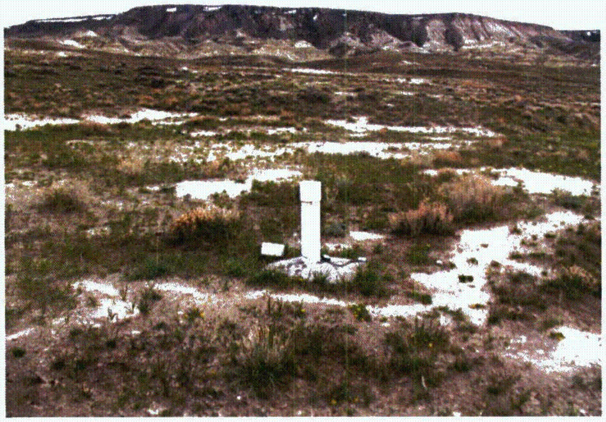

Photo A - Looking south towards the Beaver Rim from within the remote satellite boundary.

Photo B - Looking southwest from within the remote satellite boundary. Note Carol Shop on the right-hand side.

Photo C - Looking west from within the remote satellite boundary. Note Carol Shop on the right-hand side.

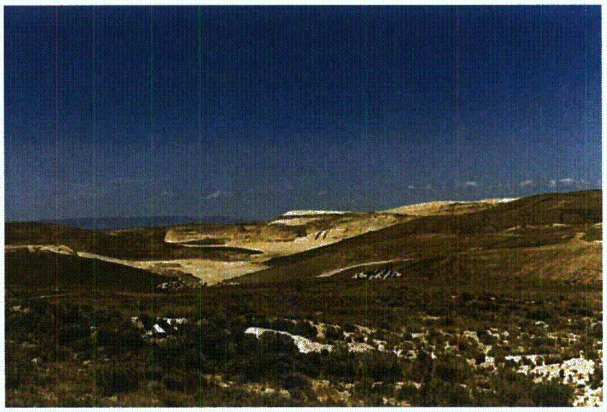

Photo D - Looking northwest from within the remote satellite boundary. Note the mine spoils and reclamation in the background.

Photo E - Looking south from within the remote satellite boundary. Note the mine reclamation in the foreground.

Photo 3.9-4, Ruth Remote Satellite Area

Looking north from within the remote satellite boundary. Note the old Research & Development processing building (tan), the warehouse building (silver), and the generator building (brown) on the left-hand side.

3.9.7 References

United States Department of the Interior (USDOI), Bureau of Land Management (BLM). Buffalo Resource Management Plan. http://www.blm.gov/rmp/WY/application/rmp_toc.cfm?rmpid=101. Accessed May 24, 2011.

United States Department of the Interior (USDOI), Bureau of Land Management (BLM). 2007 Visual Resource Inventory. BLM Handbook 8410-1. 2007.

United States Department of the Interior (USDOI), Bureau of Land Management (BLM). 2007. Visual Resource Contrast Rating. BLM Manual 8431. 2007.

3.10 Socioeconomics

3.10.1 Introduction

Information presented in this section is directly related to the demographic and social characteristics of the counties and communities that may be affected by SUA-1548 operations pursuant to NUREG-1748. For each location, Smith Ranch and the North Butte, Gas Hills and Ruth Remote Satellites, pursuant to NRC Regulatory Guide 3.46, a perimeter or boundary with an 80 kilometer (50 mile) radius was identified to incorporate surrounding counties and communities into the socioeconomic analysis. All counties that predominately lie within the 80 kilometer (50 mile) boundary for each site are described below and are used to determine the demographic and social characteristics that could be affected under this LRA (January 2012). Counties that cover a small percentage of the 80 kilometer (50 mile) boundary and are not anticipated to have any significant impacts on demographic or social characteristics are not included in the socioeconomic analysis.

Smith Ranch is located in western Converse County. The 80 kilometer (50 mile) boundary covers portions of eight counties in northeastern Wyoming (Campbell, Converse, Natrona, Albany, Johnson, Niobrara, Platte, and Weston County). Because only a small portion of the 80 kilometer (50 mile) radius around Smith Ranch extends into Albany, Platte, and Weston Counties, these three counties are not addressed in the data analysis in Section 3.10.2.

The North Butte Remote Satellite is located in southwestern Campbell County, with its 80 kilometer (50 mile) radius extending into portions of Natrona, Converse and Weston Counties. Similar to Smith Ranch, Weston County is largely unaffected by development at North Butte and is not included in the data analysis in Section 3.10.3.

The Gas Hills Remote Satellite is located in Fremont County, but the 80 kilometer (50 mile) radius also includes parts of Natrona, Carbon, Sweetwater, Hot Springs, and Washakie Counties. Both Hot Springs and Washakie Counties make up less than 10% of the 80 kilometer (50 mile) boundary and do not significantly impact socioeconomics in and around the Gas Hills license area. These two counties are omitted from the data analysis in Section 3.10.4.

The Ruth Remote Satellites is located in southeastern Johnson County and includes portions of Natrona, Converse and Weston Counties within its 80 kilometer (50 mile) radial boundary. Similar to North Butte, Weston County is not addressed in the socioeconomic analysis in Section 3.10.5.

3.10.2 Smith Ranch (Converse County)

3.10.2.1 Demography

3.10.2.1.1 Regional Population

Figure 3.10.1, Population Centers within 80 kilometers of the Smith Ranch Project shows the five significant counties that are partially encompassed by the 80 kilometer (50 mile) radius surrounding Smith Ranch, which are Converse, Campbell, Johnson, Natrona, and Niobrara. The nearest communities from Smith Ranch are Glenrock, a Converse County incorporated town located southwest of the site on Highway 20, and the cities of Casper and Douglas. Casper is located southwest of Smith Ranch in Natrona County, and Douglas is located southeast of Smith Ranch in Converse County. Both Casper and Douglas are located along Highway 20 and I-25.

Historical and current population trends in counties and communities within an 80 kilometer distance of the Project are shown in **Table 3.10-1, 1980-2008 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of Smith Ranch**, which summarizes past growth trends in the counties relative to state population trends between 1980 and 2008. The largest growth rates in the five-county region since 2000 occurred in Campbell, Johnson, and Natrona counties, primarily because of ongoing mineral and oil and gas resource development in the Powder River Basin (U.S. Department of Commerce, 1980-2008). Between 1980 and 1990, the state population declined primarily because of declines in historic agricultural economic sectors, while the high growth rates in Campbell, Johnson, and Converse Counties indicated boom years in oil, coal, and gas development during this decade. The population in Converse County grew at a slower rate between 2000 and 2008 than in previous decades, and therefore the growth rates are more in line with state growth rates. The overall county and state economies are more diverse in the current decade than they were during the 1980s.

3.10.2.1.2 Population Characteristics

The 2009 population by age and sex for counties within 80 kilometers of Smith Ranch is shown in **Table 3.10-2, 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of Smith Ranch.** Overall, the 40- to 64-year age group (which includes the 'baby boom' cohort) is the largest age group in each of the counties. According to the Wyoming Economic and Demographic

Forecast (Wyoming Department of Administration & Information: Economic Analysis Division (WDAI EAD), 2005), from 2005 to 2014, the early baby boom population in Wyoming will be one of the highest in the nation as a result of the influx of workers during the oil boom years in the late 1970s and early 1980s. In contrast, the population of the 27- to 42-year age group is relatively low because there was a high net outflow (outflow greater than inflow) in this age group between 1995 and 2000 as young adults left the state during the declining economy (WDAI EAD, 2000c).

In 2009, an average of 94% of the five-county population was classified as white. Native American persons comprised an average of 1% (U.S. Department of Commerce, 2010a), while persons of Hispanic origin comprised an average of 6% out of the total five-county population of 146,469 (U.S. Department of Commerce, 2010a). The populations in all other racial categories account for less than 1% of the total population when averaged among the five counties. The racial characteristics of each county were similar to the racial characteristics of the state of Wyoming as a whole.

3.10.2.1.3 Population Projections

The projected populations for selected years by county within the 80 kilometer radius of Smith Ranch are shown in **Table 3.10-3, 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of Smith Ranch.** The population projections between 2010 and 2030 anticipate that the relatively stable population trends evident between 2000 and 2010 will continue for the selected counties and the state as a whole. The projected population growth in Campbell and Johnson Counties will continue to outpace population growth in the state as a whole in response to ongoing and potential new mineral development projects located in these counties. The population of Niobrara County will experience very slow growth or perhaps even a decline in population, indicating that it is not anticipated to see influx of new residents seeking employment in the mineral development of nearby counties. It is not expected that there will be the large influx of populations that were typical of the 1980s (WDAI EAD, 2000b).

3.10.2.1.4 Seasonal Population and Visitors

Smith Ranch and its satellites in Converse County consist of a mix of private, state and federal lands. The surrounding area within an 80 kilometer (50 mile) radius contains mostly private lands, but also some federal and state lands, which provide open space for a variety of dispersed outdoor recreational opportunities. No developed recreational opportunities are provided on federal and state lands within the 80 kilometer (50 mile) radius.

According to the official State of Wyoming website (Wyoming State Parks, Historic Sites, and Trails), the main documented trails located within the 80 kilometer (50 mile) area are the Casper Mountain Trails and the Muddy Mountain Trails. The Casper Mountain Trails are located approximately 7 kilometers (4 miles) south of Casper on Casper Mountain, and the Muddy Mountain Trails are located approximately 29 kilometers (18 miles) south of Casper in the Laramie Mountains. Visitation statistics are not compiled for these trails (Rails-to-Trails, 2011).

Included in the northeastern portion of the 80 kilometer (50 mile) boundary, north of Douglas and located in the Powder River Basin, is the Thunder Basin National Grassland. Approximately half of the Thunder Basin National Grassland is included within the 80 kilometer (50 mile) boundary, located approximately 55 kilometers (34 miles) east of Smith Ranch. Recreational activities in this area include hiking, hunting, fishing, and bird and wildlife viewing. Camping is also allowed in the area, but there are no developed campgrounds or recreational facilities within the National Grassland. Recreational use accounted for an average of 64,100 Recreation Visitor Days annually between 1992 and 1996 (Wyoming Tourism, 2010).

Also included in the 80 kilometer (50 mile) boundary, south of Glenrock and Douglas, is the Medicine Bow National Forest. Recreational activities in this area include rock-climbing, rafting, boating, fishing, hiking trails, and camping. French Creek campground is a developed campground found within the 80 kilometer (50 mile) boundary (U.S. National Forest, 2011).

A primary source of seasonal population for Smith Ranch and the remote satellites is short-term labor for mineral resource development, construction, and service industries engaged in tourism/recreation. A review of reports prepared by the Wyoming Economic Analysis Division indicates that these workers are most likely to relocate temporarily from neighboring counties and states including Montana, Nebraska, Colorado, and South Dakota. The seasonal labor force for these economic sectors is not included in any available population or labor force data for the counties.

3.10.2.1.5 Schools

Smith Ranch is located within Converse County School District #2, which serves approximately half of Converse County. The nearest Converse County community that provides educational services to residents in the vicinity of Smith Ranch is Glenrock, which is located approximately 29 kilometers (18 miles) southwest of Smith Ranch on Highway 20. Three schools are located in Glenrock: Grant Elementary School serves K-4; Glenrock Middle School serves grades 5-8; and Glenrock High School serves grades 9-12. Total enrollment in these three schools for the 2010-2011 school year was 242 in the elementary school, 108 in the middle school, and 233 in the high school (Wyoming Department of Education, 2011). The elementary school currently has a student to teacher ratio of 11:1, the middle school currently has a student to teacher ratio of 7:1, and the high school also has a student to teacher ratio of 11:1 (Converse County School District 2, 2011).

The Natrona County school system provides classes for students from preschool through grade 12. Enrollment for the 2009-2010 school year was 11,500 and includes not only the city of Casper, but also the surrounding towns of Alcova, Bar Nunn, Edgerton, Evansville, Mills, Midwest, and Powder River. Starting in the 2007-2008 school year, average class sizes have been decreased to 17:1 (student to teacher ratio) (Natrona County, 2011).

3.10.2.1.6 Sectorial Population

Existing population within the 80 kilometer (50 mile) radius centered on Smith Ranch was estimated for 16 compass sectors, by concentric circles of 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, and 80 kilometers from the center of Smith Ranch, for a total of 208 sectors. Sectorial population was estimated with data from the U.S. Census Bureau's Population Estimates Program. Subtotals by sector and compass points, as well as the total population, are shown in **Table 3.10-4, 2010 Population within the 80 kilometer Radius of Smith Ranch.**

The most recent available population data were acquired from the 2010 U.S. Census Bureau for each of the individual towns within the 80 kilometer (50 mile) radius. Using Google Earth, the individual ranches were counted within the 80 kilometer (50 mile) radius, as well as any outlying homes that did not fit within nearby city or town limits. These ranches and outlying homes were counted separately from the city and town population data. Each ranch was assigned a general population of four people, while each outlying home was assigned a population of two since the average household size in Wyoming is approximately two people, according to the 2010 U.S. Census. Using these methods, the total current population within the 80 kilometer (50 mile) radius from the center of Smith Ranch is approximately 75,420 people (U.S. Department of Commerce, 2000-2010b). These methods of determining the sectorial population counts were used for Smith Ranch and the three remote satellites.

Some of the sectors throughout the 80 kilometer (50 mile) radius contain mostly BLM administered public lands and do not contain any residents, and were therefore assigned a zero population. Most of the area within the 80 kilometer (50 mile) radius is rural, with the majority of the population residing in the small communities near Smith Ranch or in larger urban areas in the sectors farthest from Smith Ranch. Some of the urban areas include the towns of Douglas, located approximately 41 kilometers (26 mile) south-southeast of Smith Ranch; Glenrock, located approximately 29 kilometers (18 mile) southwest of Smith Ranch; Edgerton, located approximately 61 kilometers (38 mile) to the northwest; and Midwest, located approximately 63 kilometers (39 mile) to the northwest. The City of Casper is located approximately 58 kilometers (36 mile) to the west-southwest of Smith Ranch.

All urban areas, including the City of Casper, are completely encompassed by the outermost perimeter of the 80 kilometer (50 mile) radius. Therefore, all Census Tracts and Block Groups within these urban areas were included in the 80 kilometer (50 mile) radius from Smith Ranch.

The population within approximately 3 kilometers (2 miles) of Smith Ranch was estimated by locating occupied residences using 2009 aerial photos through Google Earth. The 2000 U.S. Census blocks (blocks are subdivisions of block groups) included in this area were reviewed for the total number of people residing within housing units inside the census blocks. There are no individual block data available for the intercensal years of the U.S. Census Population Estimates Program.

3.10.2.2 Local Socioeconomic Characteristics

3.10.2.2.1 Major Economic Sectors and Labor Forces

Smith Ranch is located in Converse County. However, social and economic characteristics are also described for Natrona County because communities in Natrona County, primarily the City of Casper, provide a relatively large resident labor force for mineral extraction and construction industries in central Wyoming. A substantial portion of the project labor force is likely to be based in Natrona County, primarily residing in the City of Casper. **Table 3.10-5, 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Converse County** summarizes unemployment rates and employment in Converse and Natrona Counties (Wyoming Department of Employment (WDE), 2009).

The economy of Converse County depends on the energy sector, primarily that which is mineral-based. The largest employment sector in Converse County is mining, which includes coal and uranium mining. Additionally, oil and gas extraction, CBM, crude petroleum-natural gas, and gas field service, nonmetallic minerals, and recent wind farm installation and operation, as defined by the U.S. Bureau of Labor Statistics, add to the Converse County employment sector.

A report prepared by the U.S. Bureau of Labor Statistics analyzed the labor supply in Wyoming by place of residence. The analysis concluded that a portion of the available labor pool in Wyoming consists of non-residents. According to the report, approximately 11% of the available labor pool consisted of non-resident workers in 2007.

Table 3.10-5 shows the projected labor force characteristics in Converse County in 2010. In general, unemployment rates were high in the early 1990s and decreased until 2008, whereupon the unemployment rates began to rise once again. The unemployment rates have continued to increase into 2010, but fluctuate throughout any individual year. Annual fluctuations in unemployment rates are driven primarily by short-term changes in production due to changing prices for coal, uranium, oil, and CBM.

Table 3.10-6, Labor Force Statistics for Locations within the 80 kilometer Area Surrounding Smith Ranch uses Census Bureau information from the 1990 and 2000 censuses and from 2005-2009 American Community Survey (ACS) five-year estimates of the labor force and employment rates in recent years in the vicinity of Smith Ranch (U.S. Department of Commerce, 2009). Both labor force and employment have increased in the 2005-2009 estimates in all neighboring counties and towns within the 80 kilometer (50 mile) radius from Smith Ranch except for the town of Wright and Glenrock, both of which demonstrated a predicted decrease in population from the year 2000 to 2009 (U.S. Department of Commerce, 2000a), (U.S. Department of Commerce, 2005-2009).

Wyoming's economy is driven primarily by mineral extraction, including extraction of coal, natural gas, crude oil, and trona. The mining sector, which is the single biggest contributor to Wyoming's GDP, grew from $2.65 billion in 1999 (17% of the total state GDP) to $13 billion (34% of the total GDP) in 2009 (Bureau of Economic Analysis, 2010). Other major contributors to the state's GDP include government ($5 billion in 2009), real estate and rental leasing ($3 billion), manufacturing ($2 billion), transportation and warehousing ($2 billion), retail trade ($2 billion), and construction ($2 billion).

In the current recession (2007 to the present), Wyoming lagged the United States by approximately one year; the state's economic recession did not begin until 2008 (WDAI EAD 2010). Additionally, the state's overall unemployment rate did not fall as much as the U.S., sitting at 8% in the first quarter of 2010 compared to an average of 10% for the country as a whole. Wyoming's unemployment rate has been lower than that of the U.S. for the last 10 consecutive years.

3.10.2.2.2 Housing

The nearest permanent housing is located in the communities of Glenrock and Douglas in Converse County, and Casper in Natrona County. According to the 2010 U.S. Census, there were 1,201 housing units in Glenrock. Of these units, the average occupancy rate was 92%. A housing unit is any unit that represents a more permanent living situation, and therefore does not include apartments, mobile homes, recreational vehicles (RV), or any other dwelling unit that may be considered temporary. The vacancy rate for all types of housing units was 8%. In Douglas, there were a total of 2,788 housing units, and of these units, the average occupancy rate was 91%. The vacancy rate for all types of housing units was approximately 9%. In Natrona County, there were 24,536 housing units in Casper, of which 93% were occupied. The vacancy rate was 7% (WDE, 2011b; WDE, 2011e).

It is likely that current vacancy rates in Glenrock and Douglas will decrease as a result of insufficient housing stock and increasing influx of workers for employment in ongoing mineral resource development. A rental vacancy survey shows that rental vacancy rates in Converse County have increased from approximately 4% in 2001 to approximately 6% in 2010 (**Table 3.10-7, Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties within an 80 kilometer Radius of Smith Ranch**). However, the rental vacancy rates in Converse County have decreased over the last year, from approximately 7% in 2009 to approximately 5% in 2010. In Natrona County, the rental vacancy rate has also decreased from a rate of approximately 5% in 2002 to approximately 4% in 2010. The influx of population in these counties as a result of economic growth stimulated by CBM and coal production has outstripped the available housing supply (WDE, 2011b; WDE, 2011e).

Urban areas within Converse and Natrona Counties are generally within a one to two-hour commuting distance from Smith Ranch. Rural areas in the counties are sparsely populated, so that most of the housing units characterized in **Table 3.10-7** are located within the communities of Glenrock (Converse County), Douglas (Converse County), Casper (Natrona County), and other smaller communities located along the I-25 corridor throughout Natrona and Converse Counties. **Table 3.10-7** includes the total number of housing units in the counties, the rental rates, housing costs, and vacancy rates for each county within the 80 kilometer (50 mile) radius from Smith Ranch (Wyoming CDA, 2010; Wyoming CDA, 2011). The rental characteristics are important because most of the labor force that would originate from outside of Converse and Natrona County would likely reside in rental units and other temporary lodging.

The household forecast (a household is defined as all persons occupying a housing unit) projects an increase of 2,215 households in Converse County from 4,694 in 2000 to 6,909 in 2030. The number of renters in Converse County is projected to increase from 1,219 in 2000 to 1,430 in 2030. In Natrona County, the number of households is projected to increase from 26,819 in 2000 to 40,840 by 2030, while the number of renters is expected to increase from 8,079 in 2000 to 10,073 in 2030 (U.S. Department of Commerce, 2000-2010a).

3.10.2.2.3 Temporary Housing

Temporary housing options in the vicinity of Smith Ranch include hotels, motels, and campgrounds. Vacancy rates are not currently available for temporary accommodations in Converse and Natrona Counties. Available local motels/hotels/cabin establishments in the region generally have low vacancy rates during hunting seasons. Many motels and RV campgrounds in the region provide accommodation for long-term visitors by the week or month.

Casper, Glenrock, and Douglas, each located on the I-25 corridor south of Smith Ranch, provide numerous temporary lodging options (Casper Chamber of Commerce, 2011). There are 37 motel/hotels in the Casper area and 11 RV parks/campgrounds in the vicinity of Casper. Glenrock provides lodging in two motels and one RV park, and Douglas provides 11 hotels, four mobile home parks, and six apartment complexes.

3.10.2.2.4 Personal Income

Personal income varies across the counties and communities within 80 kilometers (50 miles) of Smith Ranch. Johnson and Niobrara Counties have lower household, family, and per capita incomes than the state as a whole, with Niobrara County also having the lowest level of personal income. Natrona County's income numbers track those of the state fairly closely, whereas Campbell County has a significantly higher income than the rest of the state. **Table 3.10-8, Personal Income Levels for Smith Ranch and Nearby Communities** summarizes income information for the state as well as the counties and incorporated communities within 80 kilometers (50 miles) of Smith Ranch (U.S. Department of Commerce, 2000-2010a).

Per capita personal income is the income that is received by persons from all sources, including wages and other income over the course of a year. In 2010, personal income in Converse County was $18,744, which was 70% of the state average of $26,925. The county ranks ninth in per capita annual income out of 23 counties in the state (Wikipedia, 2011). Natrona County had a higher per capita income of $18,913, which was more than 57% of the state average and ranked eighth in the state. Most of the Wyoming counties with the highest per capita incomes have strong mineral development economic sectors.

3.10.2.2.5 Public Facilities and Services

Because Smith Ranch is in Converse County, basic emergency services would be the responsibility of Converse County and would be dispatched through the Sheriff's Office. The Converse County Sheriff's Office and Detention Center, located in Douglas, contains approximately 36 beds. Details about the number of deputies, dispatch staff, as well as its current capacity, are unavailable (Converse County Sheriff's Office, 2009).

The Glenrock Fire Department consists entirely of volunteer firefighters. All firefighters have received first-aid, CPR, and HAZMAT training, and are equipped to fight structural, chemical, grass, and wild fires, as well as respond to vehicular accidents. The Glenrock Fire Department consists of two fire halls, one in Glenrock and one in Rolling Hills, making the Glenrock Fire Department the closest firefighting service to the project site (Glenrock Fire Department, 2011).

The Glenrock Ambulance Service provides round-the-clock emergency medical services and transport for critically ill or injured patients over the entire county. The ambulance service is staffed by four individuals, and offers a full range of medical transportation services (Glenrock Ambulance Service, 2011).

The closest hospitals to Smith Ranch are in Casper and Douglas. The Wyoming Medical Center in Casper is a 207-bed acute care hospital with a round-the-clock emergency department, 24-hour physician staffing, and a Regional Trauma Center. The Wyoming Medical Center consists of 150 physicians and is comprised of two centers of excellence: The Heart Center of Wyoming and the Neuroscience and Spine Institute. Services for the Wyoming Medical Center include women's services, radiology, ear, nose, and throat, neurosurgery, pathology, pediatrics, psychology, intensive care, and orthopedics, as well as many other specialties (Wyoming Medical Center, 2011). The Memorial Hospital of Converse County in Douglas is a 25-bed critical access hospital that provides services including a birthing center, cardiopulmonary care, a laboratory, radiology, rehabilitation, surgical services, and several rural health clinics. The number of physicians staffed by the Memorial Hospital of Converse County was unavailable (Memorial Hospital, 2011).

3.10.2.2.6 Taxes and Revenues

Wyoming does not have any personal or corporate income tax, and does not collect tax on retirement income received out of state. The state does have a 4% sales tax on most retail goods and some services, a county lodging tax ranging from 2 to 4%, and a 4% use tax that applies in situations in which sales tax is not collected. Sales and use taxes are the two local sources of revenue for state and local governments. Additionally, all counties in the state except Fremont, Park, and Sublette collect a 1% county sales tax. None of the counties that are included within the 80 kilometer (50 mile) radius surrounding Smith Ranch impose the optional 1% excise tax dedicated to capital improvement projects authorized through public election. **Table 3.10-9, State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of Smith Ranch** shows the 2009 sales and use tax revenues for the counties in the 80 kilometer (50 mile) area (WDAI EAD 2009).

Revenue from the sales and use tax is distributed between the state and the county of origin, with 6% going to the state general fund and the remainder distributed among the counties according to each county's decennial census population. County sales tax is returned to the county of origin and distributed to the county and its municipalities proportionally based on decennial census population.

Most of Wyoming's property-tax revenues are derived from a gross product (ad valorem) tax on mineral production. The Converse County average 2009 mill levy applied to 2008 mineral production was 59.9, which resulted in a total tax of $24,723,500 assessed on all minerals (Wyoming Department of Revenue, 2010). The state also imposes a severance tax on minerals; the severance tax rate for uranium was 4% in 2008. In the 2008 production year, the amount of taxable units of uranium in Converse County was 1,235,311, which resulted in a taxable valuation of $11,396,553.

3.10.3 North Butte Remote Satellite Area (Campbell County)

3.10.3.1 Demography

3.10.3.1.1 Regional Population

The area within an 80 kilometer (50 mile) radius of the North Butte Remote Satellite includes portions of four counties in northeastern Wyoming (Campbell, Converse, Johnson, and Natrona Counties), as shown on **Figure 3.10.2, Population Centers within 80 kilometers of North Butte**. The North Butte Remote Satellite is located in southwest Campbell County. The nearest communities are Wright, a small Campbell County incorporated town located northeast of the satellite area on Highway 387, and the Towns of Edgerton and Midwest, which are located in Natrona County southwest of the satellite area on Highway 387. Other nearby towns are Kaycee, located in Johnson County west of the satellite area at the junction of Highway 192 and I-25, and Gillette, located in Campbell County northeast of the satellite area at the junction of Highway 59 and I-90.

Historical and current population trends in counties and communities within an 80 kilometer (50 mile) distance of the Project are shown in **Table 3.10-10, 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of the North Butte Remote Satellite**. The largest growth rates in the four-county region since 2000 occurred in Campbell, Converse, and Johnson County, primarily because of ongoing mineral resource development in the Powder River Basin. Population growth in Campbell, Converse, and Johnson Counties has outpaced state population growth for most years since 1980, with the largest average annual growth rate of approximately 14% occurring in Converse County during the 1980s (U.S. Department of Commerce, 1980-2008). The state population declined during this period primarily because of declines in historic agricultural economic sectors, while the high growth rates in Campbell, Converse, and Johnson Counties indicated boom years in oil, uranium, coal, and gas development. As with Converse County, the population in Campbell County grew at a slower rate between 2000 and 2008 than in previous decades, making the growth rates more in line with the state growth rates. The overall county and state economies are more diverse in the current decade than they were during the 1980s.

3.10.3.1.2 Population Characteristics

In 2009, the population by age and sex for counties within 80 kilometers (50 miles) of the North Butte Remote Satellite is shown in **Table 3.10-11, 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of the North Butte Remote Satellite** (WDAI EAD, 2000a). Overall, the 40- to 64-year age group is the largest age group in each of the counties. In 2010, an average of 96% of the four-county population was classified as white. Native American persons comprised an average of 1% (U.S. Department of Commerce, 2010a), while persons of Hispanic origin comprised an average of 4% of the total four-county population of 143,985 (U.S. Department of Commerce, 2010a).

3.10.3.1.3 Population Projections

The projected populations for selected years by county within the 80 kilometer (50 mile) radius of the proposed remote satellite are shown in **Table 3.10-12, 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of the North Butte Remote Satellite.** On a county basis, this area is very similar to the population projections at Smith Ranch described in Section 3.10.2.1.3 above.

3.10.3.1.4 Seasonal Population and Visitors

The North Butte Remote Satellite consists of private lands in southwest Campbell County. The surrounding area within an 80 kilometer (50 mile) radius contains mostly private lands, but also federal and state lands, which provide open space for a variety of dispersed outdoor recreational opportunities. No developed recreational opportunities are provided on federal and state lands within the 80 kilometer (50 mile) radius.

According to the official Wyoming State Parks, Historic Sites, and Trails web site (SPHS, 2011), there are no state parks, historic sites, or known recorded trails within the 80 kilometer (50 mile) area.

Included in the eastern portion of the 80 kilometer (50 mile) boundary, just south and east of Wright, located in the Powder River Basin, is the Thunder Basin National Grassland. Approximately half of the Thunder Basin National Grassland is included within the 80 kilometer (50 mile) boundary, located approximately 44 kilometers (27 miles) east of the North Butte Remote Satellite (Wyoming Tourism, 2011). Refer to Section 3.10.2.1.4 for more information about Thunder Basin National Grassland and other primary sources of seasonal population for the North Butte Remote Satellite.

3.10.3.1.5 Schools

The North Butte Remote Satellite is located within Campbell County School District #1, which serves all of Campbell County. The nearest Campbell County community that provides educational services to residents in the vicinity of the remote satellite is Wright, which is located approximately 40 kilometers (25 miles) east of the remote satellite on Highway 387. Two schools are located in Wright: Cottonwood Elementary School serves K-6 and the Wright Junior & Senior High Schools serve grades 7-12. Total enrollment in these two schools for the 2010-2011 school year was 280 in the elementary school and 228 in the junior and senior high schools (Wyoming Department of Education, 2011). Enrollment in the elementary school has increased by 52 students since the 2005-2006 school year, while enrollment in the high schools has remained the same since the 2005-2006 school year. The elementary school currently has a student to teacher ratio of 25:1 while the high schools have a ratio of 10:1 (Campbell County, Cottonwood, 2011; Campbell County, Wright, 2011).

The North Butte Remote Satellite employees may also utilize schools located in Natrona County. Please refer to Section 3.10.2.1.5 for further information.

3.10.3.1.6 Sectorial Population

The existing population within the 80 kilometer (50 mile) radius from the North Butte Remote Satellite was estimated using the same methods described in Section 3.10.2.1.6. Subtotals by sector and compass points, as well as the total population, are shown in **Table 3.10-13, 2010 Population within the 80 kilometer Radius of the North Butte Remote Satellite.** The total current population within the 80 kilometer (50 mile) radius from the North Butte Remote Satellite is approximately 34,900 people (U.S. Department of Commerce, 2000-2010b).

Urban areas located near the North Butte Remote Satellite include the towns of Wright, located approximately 40 kilometers (25 miles) to the east of the satellite area; Edgerton, located approximately 46 kilometers (29 miles) to the south southwest; Midwest, located approximately 47 kilometers (29 miles) to the southwest; Kaycee, located approximately 56 kilometers (35 miles) to the west; Antelope Valley-Crestview, located approximately 65 kilometers (40 miles) to the northeast; and Sleepy Hollow, located approximately 67 kilometers (42 miles) to the northeast of the remote satellite. The City of Gillette, which contributes the majority of the population within the 80 kilometer (50 mile) radius, is located approximately 69 kilometers (43 miles) to the north northeast of the remote satellite.

3.10.3.2 Local Socioeconomic Characteristics

3.10.3.2.1 Major Economic Sectors and Labor Forces

A substantial portion of the project labor force for the North Butte Remote Satellite is likely to be based in Campbell County, primarily residing in the cities of Gillette and Wright. Some labor may originate from Natrona County and information on labor and employment includes Casper, Midwest and Edgerton. **Table 3.10-14, 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Campbell County** summarizes unemployment and employment rates in Campbell County (WDE Campbell, 2011).

As with Converse County, the economies of Campbell County depend primarily on the energy sector, especially those that are mineral-based. Refer to Section 3.10.2.2.1 for more information about the energy sector as it applies to the North Butte Remote Satellite.

Table 3.10-14 shows the projected labor force characteristics in Campbell County in 2010. These characteristics greatly resemble those for Smith Ranch, which are described in Section 3.10.2.2.1.

Table 3.10-15, Labor Force Statistics for the North Butte Remote Satellite uses Census Bureau information from the 1990 and 2000 censuses and the 2005-2009 ACS five-year estimates to summarize the labor force and employment rates in recent years in the vicinity of the North Butte Remote Satellite. Both labor force and employment have increased in the 2005-2009 estimates in all neighboring counties and towns within the 80 kilometer (50 mile) radius from the remote satellite (U.S. Department of Commerce, 2000a), (U.S. Department of Commerce, 2005-2009).

3.10.3.2.2 Housing

The nearest permanent housing is located in the communities of Wright in Campbell County, and Midwest and Edgerton in Natrona County. According to the 2010 U.S. Census, there were 813 housing units in Wright. Of these units, the average occupancy rate was 84%, making the vacancy rate for all types of housing units was 16% (WDE, 2011a).

In Natrona County, there were 111 housing units in Edgerton, of which 81% were occupied. Therefore, the vacancy rate was 19%. In nearby Midwest, 148 of the total 200 housing units were occupied, creating a vacancy rate of 26% (WDE, 2011e).

The rental vacancy rates for the housing most likely utilized by the North Butte Remote Satellite employees are found in **Table 3.10-16, Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties Within an 80 kilometers Radius of the North Butte Remote Satellite**. The rental vacancy rates in Campbell County have decreased from a high of approximately 11% in 2009 to the 2010 rate of approximately 8%. The influx of population in these counties as a result of economic growth stimulated by CBM and coal production has outstripped the available housing supply (WDE, 2011a; WDE, 2011e).

Incorporated communities within Campbell and Natrona Counties are generally within a one hour commuting distance from the North Butte Remote Satellite. Rural areas in the counties are sparsely populated, so that most of the housing units characterized in **Table 3.10-16** are located within the communities of Gillette (Campbell County), Casper (Natrona County), and other smaller communities located along the I-25 and I-90 corridors throughout Natrona, Converse and Campbell Counties. See **Table 3.10-16** for a total number of housing units, the rental rates, housing costs, and vacancy rates for each county within the 80 kilometer (50 mile) radius from the remote satellite (Wyoming CDA, 2010;

Wyoming CDA, 2011). Section 3.10.2.2.2 describes the household forecast projections for Natrona County.

The household forecast (a household is defined as all persons occupying a housing unit) in Campbell County is projected to increase from 12,207 in 2000 to 22,973 in 2030, while the number of renters is also expected to increase from 3,218 in 2000 to 6,052 in 2030. In Johnson County, the number of households is projected to increase from 2,959 in 2000 to 6,232 in 2030 and the number of renters is projected to increase from 777 in 2000 to 1,770 in 2030. In Natrona County, the number of households is projected to increase from 26,819 in 2000 to 42,456 by 2030, and the number of renters is expected to increase from 8,079 in 2000 to 12,710 in 2030 (WDE, 2011a; WDE, 2011d; WDE, 2011e).

3.10.3.2.3 Temporary Housing

Temporary housing options in the vicinity of the North Butte Remote Satellite include hotels, motels, and campgrounds. Vacancy rates are not currently available for temporary accommodations in Campbell and Natrona Counties. Available local motels/hotels/cabin establishments in the region generally have low vacancy rates during hunting seasons. There is also a high level of occupancy by the CBM industry workers. Many motels and RV campgrounds in the region provide accommodations for long-term visits by the week or month.

The temporary lodgings closest to the North Butte Remote Satellite are in Wright and Edgerton. Accommodations in Wright include a mobile home park, two hotels, and one apartment complex. One motor lodge is located in Edgerton.

There are 28 hotels/motels in Gillette. In addition, the two campgrounds in the Gillette area provide RV hookups and tent sites. The Cam-Plex is funded by Gillette and Campbell County, and may not compete with private enterprise. The additional 1,821 RV sites at the Cam-Plex are available only for special events and not for the general public (Cam-Plex, 2011).

Refer to Section 3.10.2.2.3 for information on available lodging in city of Casper and the town of Glenrock, which are additional potential temporary housing locations for the North Butte Remote Satellite employees.

3.10.3.2.4 Personal Income

Personal income varies across the counties and communities within 80 kilometers (50 miles) of the remote satellite. Johnson County is the only county within the 80 kilometer (50 mile) radius that has a lower household, family, and per capita income than the state as a whole. **Table 3.10-17, Personal Income Levels for the North Butte Remote Satellite and Nearby Communities,** summarizes the income information for the state as well as the counties and incorporated communities within 80 kilometers (50 miles) of the remote satellite (U.S. Department of Commerce, 2005-2009).

In 2010, personal income in Campbell County was $20,063, which was approximately 75% of the state average of $26,925. The county ranks second in per capita annual income out of 23 counties in the state (Wikipedia, 2011). Natrona County had a smaller per capita income of $18,913, which was approximately 70% of the state average and ranked eighth in the state.

3.10.3.2.5 Public Facilities and Services

Because the North Butte Remote Satellite is in Campbell County, basic emergency services would be the responsibility of Campbell County and would be dispatched through the Sheriff's Office. The Campbell County Sheriff's Office and Detention Center, located in Gillette, employs 57 Detention Officers and 34 uniformed deputies. The Detention Center contains a separate juvenile facility with 16 beds. The duties of the Campbell County Sheriff's deputies include responding to emergency calls, investigating crimes, conducting traffic enforcement, and serving warrants and civil papers. The Sheriff's deputies perform 24-hour rotating patrol shifts seven days a week (Campbell County Sheriff's Office, 2011).

The Campbell County Fire Department, also located in Gillette, is comprised of 29 career and 150 volunteer firefighters. The service provided by the Campbell County Fire Department encompasses approximately 1 million hectares (5,000 square miles). This fire department possesses 80 pieces of apparatus and support vehicles, and provides 24-hour response services which include fire rescue, EMS, and hazardous materials services to about 50,000 citizens. There are 10 fire stations and 11 wildland support stations that are part of the Campbell County Fire Department system. One of these fire stations is located in Wright, which is the closest town to the North Butte Remote Satellite (Campbell County Fire Department, 2011).

The closest hospitals to the project site are located in Gillette. The Campbell County Memorial Hospital is a 90-bed acute care hospital and 150-bed long-term care facility. It possesses two primary clinics, one urgent care clinic, an ear, nose, and throat clinic, an OB/GYN clinic, and an orthopedic clinic. Other services provided by the Campbell County Memorial Hospital include dialysis, Home Medical Resources, home health and hospice, medical and radiation oncology, 24-hour daycare, inpatient and outpatient behavioral health services, occupational health services, and rehabilitation services. In addition to these services, Campbell County Memorial Hospital provides 24-hour ambulatory services to the area (Campbell County Memorial Hospital, 2011).

3.10.3.2.6 Taxes and Revenues

As previously stated, sales and use taxes are the two local sources of revenue for state and local governments. None of the counties that are included within the 80 kilometer (50 mile) radius from the project site impose the optional 1% excise tax dedicated to capital improvement projects authorized through public election. **Table 3.10-18, State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of the North Butte Remote Satellite** shows the 2009 sales and use tax revenues for the counties within the 80 kilometer (50 mile) radius of the remote satellite (WDAI EAD, 2009)

The Campbell County average 2009 mill levy applied to 2008 mineral production was 58.802, which resulted in a total tax of $283,685,967 assessed on all minerals (Wyoming Department of Revenue, 2010). In the 2008 production year, the amount of taxable units of uranium in Campbell County was 0, which resulted in a taxable valuation of $0. This will change in the future with the onset of production from the North Butte Remote Satellite and other uranium projects in the area that are approved to commence construction and production.

3.10.4 Gas Hills Remote Satellite Area (Fremont and Natrona Counties)

3.10.4.1 Demography

3.10.4.1.1 Regional Population

The area within an 80 kilometer (50 mile) radius of the Gas Hills Remote Satellite includes portions of four potentially-impacted counties in central Wyoming (Fremont, Natrona, Carbon, and Sweetwater County), as shown on **Figure 3.10.3, Population Centers within 80 kilometers of the Gas Hills Project.** The Gas Hills Remote Satellite is located in eastern Fremont County with a single mining unit within Natrona County. The nearest larger communities include Riverton, Arapahoe, and Shoshoni (all in Fremont County), which are located approximately 60 to 80 kilometers (37 to 50 miles) west and northwest of the remote satellite.

Historical and current population trends in counties and communities within an 80 kilometer (50 mile) distance of the Gas Hills Remote Satellite are shown in **Table 3.10-19, 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of the Gas Hills Remote Satellite**. The largest growth rates in the four-county region since 2000 occurred in Fremont, Natrona, and Sweetwater Counties, primarily because of ongoing mineral, oil and gas resource development in the Powder River Basin (U.S. Department of Commerce, 1980-2008). The overall county and state economies are more diverse in the current decade than they were during the 1980s.

3.10.4.1.2 Population Characteristics

The 2010 population by age and sex for counties within 80 kilometers (50 miles) of the Gas Hills Remote Satellite is shown in **Table 3.10-20, 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of the Gas Hills Remote Satellite** (U.S. Department of the Census, 2005-2009). Once again, the 40- to 64-year age group is the largest age group in each of the counties (WDAI EAD, 2000c).

In 2010, an average of 90% of the four-county population was classified as white. Native American and Hispanic persons comprised an average of 7% (U.S. Department of Commerce, 2010) of the four-county (Fremont, Natrona, Carbon and Sweetwater) population total of 175,264 (U.S. Department of Commerce, 2010a).

3.10.4.1.3 Population Projections

The projected populations for selected years by county within the 80 kilometer (50 mile) radius of the Gas Hills Remote Satellite boundary are shown in **Table 3.10-21, 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of the Gas Hills Remote Satellite** (WDAI EAD, 2011). The population projections between 2010 and 2030 anticipated that the relatively stable population trends evident between 2000 and 2010 will continue for the selected counties and the state as a whole (WDAI EAD, 2000b).

3.10.4.1.4 Seasonal Population and Visitors

The Gas Hills Remote Satellite consists of a mix of private, state, federal and Indian (tribal) lands. The surrounding area within an 80 kilometer (50 mile) radius contains mostly federal lands, administered by the BLM. There are state lands (school sections) and private sections within the mass of federal and tribal lands. Private lands include patented mineral, Homestead Act, and Taylor Grazing Act lands. Because of the large amount of federal lands, there are a variety of dispersed outdoor recreation opportunities. Boysen Reservoir, which is a state recreation area that encompasses developed campgrounds, is within the 80 kilometer (50 mile) radius.

According to the official State of Wyoming website (Wyoming State Parks, Historic Sites, and Trails), the main documented trail located within the 80 kilometer (50 mile) area is the Wyoming Heritage Trail. The Wyoming Heritage Trail is 35 kilometers (22 miles) and stretches between Riverton City and Shoshoni Town. Visitation statistics are not compiled for these trails (Rails-to-Trails, 2011).

Included in the northwestern portion of the 80 kilometer (50 mile) boundary, just west of the town of Shoshoni and encompassing Riverton, St. Stephens, and Arapahoe, is the Wind River Indian Reservation. The Boysen Reservoir and approximately 1/6 of the Wind River Indian Reservation are encompassed by the 80 kilometer (50 mile) boundary. The Wind River Indian Reservation spans approximately 2.2 million acres and is home to 2,500 Eastern Shoshone and more than 5,000 Northern Arapahoe Indians. Most of the Shoshone live in the western half around Fort Washakie, while the Arapahoe are centered at Ethete as well as near the Town of Arapahoe. Recreational activities on the reservation include walking and hiking trails, camping, horseback riding, mountain and road biking, and snowshoeing. These activities are stationed mostly out of Dubois, Lander, and Thermopolis, none of which are located within the 80 kilometer (50 mile) radius around the satellite boundary. Fishing and boating, however, is based out of Boysen Reservoir near Shoshoni. This reservoir is located within the 80 kilometer (50 mile) radius (Wyoming's Wind River Country, 2011).

3.10.4.1.5 Schools

The Gas Hills Remote Satellite is located in Fremont County School District #25, which serves approximately one-fifth of Fremont County. The nearest Fremont County community that provides educational services to residents in the vicinity of the remote satellite is Riverton, which is located 80 kilometers (50 miles) northwest of the remote satellite on Highway 136. There is one high school (Riverton High School), one middle school (Riverton Middle School), and four elementary schools (Aspen Park Elementary, Jackson Elementary, Ashgrove Elementary, and Rendezvous Elementary) located in Riverton. Riverton High School serves grades 9-12; Riverton Middle School serves grades 6-8, and the four elementary schools serve grades K-5. Total enrollment in these schools for the 2009-2010 school year was 727 in Riverton High School, with a student/teacher ratio of 15:1, 579 in Riverton Middle School, with a student/teacher ratio of 17:1, 197 in Jackson Elementary, which had a student/teacher ratio of 10:1, 283 in Ashgrove Elementary, with a student/teacher ratio of 15:1, 392 in Rendezvous Elementary, which had a student/teacher ratio of 14:1, and 287 in Aspen Park Elementary, with a student/teacher ratio of 14:1 (School Digger, 2011).

As with Smith Ranch and the North Butte Remote Satellite, the Natrona County school system, primarily in Casper or the surrounding communities, may also be utilized by the Gas Hills Remote Satellite employees. Please refer to Section 3.10.2.1.5 for more information about the schools in the Natrona County School District.

3.10.4.1.6 Sectorial Population

Existing population within the 80 kilometer (50 mile) radius centered on the Gas Hills Remote Satellite was estimated using the same methods described in Section 3.10.2.1.6. Subtotals by sector and compass points, as well as the total population, are shown in **Table 3.10-22, 2010 Population within the 80 kilometer Radius of the Gas Hills Remote Satellite.**

The total current population within the 80 kilometer (50 mile) radius from the center of the Gas Hills Remote Satellite is approximately 13,500 people (U.S. Department of Commerce, 2000-2010b).

Some of the urban areas include the city of Riverton and the town of Arapahoe, located approximately 80 kilometers (50 miles) west-northwest of the satellite area; Shoshoni, located approximately 69 kilometers (43 miles) northwest of the satellite area; Jeffrey City, located 39 kilometers (24 miles) southwest of the satellite area; Bairoil, located 59 kilometers (37 miles) south of the satellite area; Bessemer Bend, located approximately 80 kilometers (50 miles) from the satellite area; and Powder River, located approximately 48 kilometers (30 miles) east-northeast of the satellite area.

All urban areas, except for Bessemer Bend, are completely encompassed by the outermost perimeter of the 80 kilometer (50 mile) radius. Therefore, all Census Tracts and Block Groups within these urban areas, with the exception of Bessemer Bend, were included in the 80 kilometer (50 mile) radius from the remote satellite area. Bessemer Bend is encompassed by the 80 kilometer (50 mile) radius by approximately 75%. Therefore, 75% of the population for Bessemer Bend was included in the overall population count for the 80 kilometer (50 mile) radius.

3.10.4.2 Local Socioeconomic Characteristics

3.10.4.2.1 Major Economic Sectors and Labor Forces

Table 3.10-23, 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Fremont County summarizes employment and unemployment rates, as well as employment and occupation types for both Fremont County and the state of Wyoming (U.S Department of Commerce, 2005-2009).

The economy of Fremont County depends on agriculture, ranching, and recreation. As defined by the U.S. Bureau of Labor Statistics, the largest employment sector in Fremont County is agriculture, which includes ranching and farming.

A report prepared by the U.S. Bureau of Labor Statistics analyzed the labor supply in Wyoming by place of residence. The analysis concluded that a portion of the available labor pool in Wyoming consists of non-residents. According to the report, approximately 11% of the available labor pool consisted of non-resident workers in 2007.

Table 3.10-23 shows the projected labor force characteristics in Fremont County in 2009 (U.S Department of Commerce, 2009). In general, unemployment rates were high in the early 1990s and decreased until 2008, whereupon the unemployment rates began to rise once again. The unemployment rates have continued to increase overall into 2009, but will fluctuate throughout any individual year. Annual fluctuations in unemployment rates are driven primarily by short-term changes in production due to changing prices for coal, uranium, oil, and CBM.

Table 3.10-24, Labor Force Statistics for Locations within the 80 kilometer Area Surrounding the Gas Hills Remote Satellite uses Census Bureau information from the 1990 and 2000 censuses and from the 2005-2009 ACS five-year estimates of the labor force and employment rates in recent years in the vicinity of the Gas Hills Remote Satellite (U.S. Department of Commerce, 2009). Both labor force and employment have increased in the 2005-2009 estimates in all neighboring counties and towns within the 80 kilometer (50 mile) radius from the satellite area (U.S. Department of Commerce, 2009).

3.10.4.2.2 Housing

The nearest permanent housing is located in the communities of Jeffrey City and Riverton in Fremont County, and Bairoil in Sweetwater County. According to the 2010 U.S. Census, there were 4,567 housing units in Riverton, and of these units, the average occupancy rate was 93%. In Bairoil, there were a total of 68 housing units, and of these units, the average occupancy rate was 72%. The vacancy rate for housing units overall was approximately 28%. In Jeffrey City, there were 84 housing units, of which 41% were occupied. The vacancy rate was 60% (U.S. Department of Commerce, 2010b).

A rental vacancy survey shows that rental vacancy rates in Fremont County have decreased from approximately 5% to approximately 3% from 2001 to 2009 (**Table 3.10-25, Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties within an 80 kilometer Radius of the Gas Hills Remote Satellite**). The vacancy rates, however, remained the same from 2009 to 2010, at a rate of 5%. The rental vacancy rates in Natrona and Sweetwater County have increased from approximately 2% in 2009 to 4% in 2010 and 5% in 2009 to 6% in 2010 respectively. The influx of population in Natrona County as a result of economic growth stimulated by CBM has outstripped the available housing supply (WDE, 2011d; WDE, 2011e; WDE, 2011f).

Urban areas within Sweetwater, Carbon and Natrona Counties are generally within a two-hour commuting distance from the Gas Hills Remote Satellite. Rural areas in the counties are sparsely populated, so that most of the housing units characterized in **Table 3.10-25** are located within the communities of Jeffrey City (Fremont County), Riverton (Fremont County), Bairoil (Sweetwater County), and other smaller communities located along State Highway 287. See **Table 3.10-25** for a total number of housing units in the counties, the rental rates, housing costs, and vacancy rates for each county within the 80 kilometer (50 mile) radius from the remote satellite area (Wyoming CDA, 2010; Wyoming CDA, 2011).

The household forecast (a household is defined as all persons occupying a housing unit) projects an increase of 13,545 households in Fremont County from 6,510 in 2000 to 20,055 in 2030. The number of renters in Fremont County is projected to increase from 3,675 in 2000 to 5,002 in 2030. In Sweetwater County, the number of households is projected to increase from 14,105 in 2000 to 21,938 in 2030. The number of renters is expected to increase from 3,519 in 2000 to 5,033 in 2030 (WDE, 2011d; WDE, 2011e; WDE, 2011f).

3.10.4.2.3 Temporary Housing

Temporary housing options in the vicinity of the Gas Hills Remote Satellite include hotels, motels, and campgrounds. Vacancy rates are not currently available for temporary accommodations in Fremont County. Available local motels/hotels/cabin establishments in the region generally have low vacancy rates during hunting seasons, and many motels and RV campgrounds in the region provide accommodations for long-term visitors by the week or month.

Riverton, Shoshoni, Bairoil, and Jeffrey City, each located on the Highway 287 or Highway 20/26 corridor northwest, south and southeast of the Gas Hills Remote Satellite respectively, provide numerous temporary lodging options. There are 15 motel/hotels and 1 RV park/campground in the Riverton area, as well as six mobile home parks and five apartment complexes. Shoshoni provides lodging in one motel/hotel and one RV park/campground. Bairoil and Jeffrey City do not provide lodging by way of motels/hotels, RV parks/campgrounds, apartment complexes, or mobile home parks.

3.10.4.2.4 Personal Income

Personal income varies across the counties and communities within 80 kilometers (50 miles) of the Gas Hills Remote Satellite. Carbon and Fremont Counties have lower household, family, and per capita incomes than the state as a whole, with Fremont County having the lowest level of personal income. Natrona County has a lower median household and median family income than the state as a whole, but has a higher per capita income. Sweetwater County is the only county within the 80 kilometer (50 mile) radius that has higher levels of household, family, and per capita incomes than the overall state. **Table 3.10-26, Personal Income Levels for the Gas Hills Remote Satellite and Nearby Communities** summarizes income information for the state as well as the counties and incorporated communities within 80 kilometers (50 miles) of the Gas Hills Remote Satellite (U.S. Department of Commerce, 2000-2010a).

In 2010, personal income in Fremont County was $23,868, which was 89% of the state average of $26,925. The county ranks twentieth in per capita annual income out of 23 counties in the state (Wikipedia, 2011). Sweetwater County had a higher per capita income of $29,825, which was more than 110% of the state average, ranking fifth in the state.

3.10.4.2.5 Public Facilities and Services

Because the Gas Hills Remote Satellite is in Fremont County, basic emergency services would be the responsibility of Fremont County and would be dispatched through the Sheriff's Office. The Fremont County Sheriff's Office and Detention Center, located in Lander, is a combined agency with dispatch services to the Lander Police Department (providing 20 officers) and the Shoshoni Police Department (providing 2 police officers). Details about the number of deputies, dispatch staff, as well as its current capacity, are unavailable. The Fremont County Sheriff's Department also dispatches the Fremont County Ambulance service, which provides coverage to the following areas: Riverton, Lander, Dubois, Crowheart, Shoshoni, Pavillion, Morton, and Kinnear. The Fremont County Fire Department provides coverage to the following areas: Fremont County Battalion 1, Lander Rural Fire Department, Lander Valley Fire Department, Shoshoni Fire Department, Crowheart Fire Department, Pavillion Fire Department, Morton/Kinnear Fire Department, and Jeffrey City Fire Department, among others (Fremont County Sheriff's Office, 2011).

The Riverton Area Fire Protection District is an all-volunteer department consisting of 33 members. The services provided are EMT-Paramedic non-transport emergency services, as well as fire extinguishment including brush, vehicle, and structural fires. Riverton Fire and EMS provides fire education and CPR courses throughout Riverton (Riverton Fire and EMS, 2011).

The closest hospital to the Gas Hills Remote Satellite is in Riverton. The Riverton Memorial Hospital is a 70-bed acute care hospital with a round-the-clock emergency department, 24-hour physician staffing, and a Regional Trauma Center (Riverton Memorial Hospital, 2011).

3.10.4.2.6 Taxes and Revenues

Wyoming does not have any personal or corporate income tax, and does not collect tax on retirement income received out of state. The state does have a 4% sales tax on most retail goods and some services, a county lodging tax ranging from 2 to 4%, and a 4% use tax that applies in situations in which sales tax is not collected. **Table 3.10-27, State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of the Gas Hills Remote Satellite** shows the 2009 sales and use tax revenues for the counties within 80 kilometers (50 miles) of the remote satellite area (WDAI EAD 2009).

The Fremont County average 2009 mill levy applied to 2008 mineral production was 71.1, which resulted in a total tax of $53,594,202 assessed on all minerals. The severance tax rate for the minerals mined in Fremont County was 2% in 2008. In the 2008 production year, the amount of taxable units of mined minerals in Fremont County was 574,621, which resulted in a taxable valuation of $1,078,864 (Wyoming Department of Revenue, 2010).

3.10.5 Ruth Remote Satellite (Johnson County)

3.10.5.1 Demography

3.10.5.1.1 Regional Population

The area within an 80 kilometer (50 mile) radius of the Ruth Remote Satellite includes portions of four counties in northeastern Wyoming (Campbell, Converse, Natrona, and Johnson Counties), as shown on **Figure 3.10.4, Population Centers within 80 kilometers of the Ruth Project.** The Ruth Remote Satellite is located in southeastern Johnson County, approximately 10 kilometers (6 miles) southwest of the North Butte Remote Satellite. Because the Ruth Remote Satellite is so close to the North Butte Remote Satellite, both of these remote satellites share the same four counties that lie within an 80 kilometer radius from the site, as well as the same nearby communities.

Historical and current population trends in counties and communities within an 80 kilometer (50 mile) distance of the Project are shown in **Table 3.10-28, 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of the Ruth Remote Satellite**.

3.10.5.1.2 Population Characteristics

The 2009 population by age and sex for counties within 80 kilometers (50 miles) of the Ruth Remote Satellite is shown in **Table 3.10-29, 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of the Ruth Remote Satellite.** As with the North Butte Remote Satellite, the 40- to 64-year age group is the largest age group in each of the counties.

In 2010, an average of 95% of the four-county population was classified as white. Native American persons comprised an average of 1% (U.S. Department of Commerce, 2010a), while persons of Hispanic origin comprised and average of 4% of the total four-county population of 143,985 (U.S. Department of Commerce, 2010a). The populations in all other racial categories account for less than 1% of the total population when averaged across the four counties.

3.10.5.1.3 Population Projections

The projected populations for selected years by county within the 80 kilometer (50 mile) radius of the proposed satellite area are shown in **Table 3.10-30, 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of the Ruth Remote Satellite.** The population projections indicate that the relatively stable population trends evident between 2000 and 2010 will continue for the four counties and the state as a whole through 2030 (WDAI EAD, 2000b).

3.10.5.1.4 Seasonal Population and Visitors

The Ruth Remote Satellite consists of private and BLM lands. The surrounding area within an 80 kilometer (50 mile) radius contains private lands, but also some state lands, which provide open space for a variety of dispersed outdoor recreation opportunities. No developed recreation opportunities are provided on private and state lands within the 80 kilometer (50 mile) radius.

According to the official *Wyoming State Parks, Historic Sites, and Trails* website (SPHS, 2011), there are no state parks, historic sites, or known recorded trails within the 80 kilometer (50 mile) area.

Included in the eastern portion of the 80 kilometer (50 mile) boundary, just south and east of Wright located in the Powder River Basin, is the Thunder Basin National Grassland. Please refer to Section 3.10.2.1.4 for more information about the Thunder Basin National Grassland, as well as any other information on potential primary sources of seasonal population.

3.10.5.1.5 Schools

The Ruth Remote Satellite is located within Johnson County School District #1, which serves all of Johnson County. The nearest Johnson County community that provides educational services to residents in the vicinity of the remote satellite is Kaycee, which is located 48 kilometers (30 miles) northwest of the remote satellite on Highway 1002 (Highway 192). Three schools are located in Kaycee: Kaycee Elementary School, which serves K-5; Kaycee Jr. High School, which serves grades 6-8; and Kaycee High School, which serves grades 9-12. Total enrollment in these three schools for the 2009-2010 school year was 54 in the elementary school, 34 in the junior high school, and 49 in the high school (School Digger, 2010). The elementary school currently has a student to teacher ratio of 6:1, the junior high school currently has a student to teacher ratio of 8:1, and the high school has a student to teacher ratio of 6:1 (School Digger, 2010).

School enrollment may also include Wright and Gillette in Campbell County as well as schools in Natrona County. Section 3.10.3.1.5 describes information about the available public schools in Wright and Natrona County.

3.10.5.1.6 Sectorial Population

Existing population within the 80 kilometer (50 mile) radius from the Ruth Remote Satellite was estimated using the same methods described in Section 3.10.2.1.6. Subtotals by sector and compass points, as well as the total population, are shown in **Table 3.10-31, 2010 Population within the 80 kilometer Radius of the Ruth Remote Satellite.**

The total current population within the 80 kilometer (50 mile) radius from the center of the Ruth Remote Satellite is approximately 7,272 people (U.S. Department of Commerce, 2000-2010b).

Some of the urban areas located near the Ruth Remote Satellite include the towns of Wright, located approximately 50 kilometers (31 miles) east-northeast of the remote satellite; Midwest and Edgerton, both located approximately 26 kilometers (16 miles) southwest of the remote satellite; Kaycee, located approximately 48 kilometers (30 miles) west-northwest of the remote satellite; and Bar Nunn, located approximately 80 kilometers (50 miles) south-southwest from the remote satellite.

3.10.5.2 Local Socioeconomic Characteristics

3.10.5.2.1 Major Economic Sectors & Labor Forces

Table 3.10-32, 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Johnson County summarizes unemployment rates and employment in both the state of Wyoming and Johnson County, where the Ruth Remote Satellite is located (U.S. Department of Commerce, 2009).

Table 3.10-32 shows the projected labor force characteristics in the state of Wyoming and Johnson County in 2009, which are further described in Section 3.10.2.2.1.

Table 3.10-33, Labor Force Statistics for Locations within the 80 kilometer Area Surrounding the Ruth Remote Satellite uses Census Bureau information from the 2000 censuses and from the 2005-2009 ACS five-year estimates of the labor force and employment rates in recent years in the vicinity of the Ruth Remote Satellite (U.S. Department of Commerce, 2009). As was the case with the North Butte Remote Satellite, both labor force and employment have increased in the 2005-2009 estimates in all neighboring counties and towns within the 80 kilometer (50 mile) radius from the remote satellite except for the town of Wright, which demonstrated a predicted decrease in population from the year 2000 to 2009 (U.S. Department of Commerce, 2009).

3.10.5.2.2 Housing

The nearest permanent housing is located in the communities of Kaycee in Johnson County, Midwest and Edgerton in Natrona County, and Wright in Campbell County. According to the 2010 U.S. Census, there were 134 housing units in Kaycee. Of these units, the average occupancy rate was 86% (WDE, 2011a; WDE, 2011d; WDE, 2011e). Section 3.10.3.2.2 describes the housing information for Midwest, Edgerton, and Wright.

A rental vacancy survey shows that rental vacancy rates in Johnson County have increased from approximately 2% in 2001 to approximately 6% in 2010. However, the rental vacancy rates in Johnson County have decreased from 2009 to 2010, from approximately 8% in 2009 to approximately 6% in 2010. In Natrona County, the rental vacancy rate has also increased from a rate of approximately 2% in 2001 to approximately 5% in 2010 (WDE, 2011a; WDE, 2011d; WDE, 2011e). Section 3.10.3.2.2 further describes the housing details for Natrona and Campbell Counties.

Urban (incorporated communities) areas within Johnson, Natrona, and Campbell Counties are generally within a one to two-hour commuting distance from the Ruth Remote Satellite. Rural areas in the counties are sparsely populated, so that most of the housing units characterized in **Table 3.10-34, Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties Within an 80 kilometer Radius of the Ruth Remote Satellite** are located within the communities of Kaycee (Johnson County), Wright (Campbell County), Midwest (Natrona County), Edgerton (Natrona County), and other smaller communities located along the I-25 corridor. See **Table 3.10-34** for a total number of housing units, the rental rates, housing costs, and vacancy rates for each county within the 80 kilometer (50 mile) radius from the satellite area. The rental characteristics are important because most of the labor force that would originate from outside of Johnson and Campbell County would likely reside in rental units and other temporary lodging.

Section 3.10.3.2.2 describes the household forecast projections from 2000 to 2030 for Johnson and Natrona Counties, the two counties anticipated to have the greatest demand for housing by the Ruth Remote Satellite employees.

3.10.5.2.3 Temporary Housing

Temporary housing options in the vicinity of the Ruth Remote Satellite include hotels, motels, and campgrounds. Vacancy rates are not currently available for these accommodations, located in Johnson, Natrona, and Campbell Counties. However, available local motels/hotels/cabin establishments in the region generally have low vacancy rates during hunting seasons.

Kaycee, Midwest, and Edgerton, each located on the I-25 corridor south and west of the Ruth Remote Satellite, provide numerous temporary lodging options. There are four motel/hotels, one RV park, two campgrounds, and 10 apartment complexes in the town of Kaycee. As mentioned in Section 3.10.3.2.3, Wright provides lodging through two motels/hotels and two apartment complexes. Edgerton provides one motel/hotel and one mobile home park.

3.10.5.2.4 Personal Income

Personal income varies across the counties and communities within 80 kilometers (50 miles) of the Ruth Remote Satellite. Johnson County has a lower household, family, and per capita income than the state as a whole. Natrona County's income numbers track those of the state fairly closely, whereas Campbell County has a significantly higher income than the rest of the state. **Table 3.10-35, Personal Income Levels for the Ruth Remote Satellite and Nearby Communities** summarizes income information for the state as well as the counties and incorporated communities within 80 kilometers (50 miles) of the Ruth Remote Satellite (U.S. Department of Commerce, 2000-2010a).

In 2010, personal income in Johnson County was $19,030, which was 71% of the state average of $26,925. The county ranks seventh in per capita annual income out of 23 counties in the state (Wikipedia, 2011).

3.10.5.2.5 Public Facilities and Services

Because the Ruth Remote Satellite is in Johnson County, basic emergency services would be the responsibility of Johnson County and would be dispatched through the Sheriff's Office. The Johnson County Sheriff's Office and Detention Center is located in Buffalo. Details about the number of deputies, dispatch staff, as well as its current capacity, are unavailable (USA Cops, 2011).

The town of Kaycee consists of one full-time police department, one fire department (complete with two fire stations), and one ambulatory service, which is volunteer-based only. The training that these volunteer firefighters and ambulatory service volunteers receive is unspecified. There is also an ambulatory service and the Wright Volunteer Fire Department, which is stationed out of Wright and provides 24-hour emergency service.

The closest hospitals to the Ruth Remote Satellite are in Casper (83 kilometers [52 miles]) from the satellite boundary). Information about The Wyoming Medical Center in Casper is described in Section 3.10.2.2.5.

3.10.5.2.6 Taxes and Revenues

The state has a 4% sales tax on most retail goods and some services, a county lodging tax ranging from 2 to 4%, and 4% use tax that applies in situations in which sales tax is not collected. None of the counties that are included within the 80 kilometer (50 mile) radius from the project site impose the optional 1% excise tax dedicated to capital improvement projects authorized through public election. **Table 3.10-36, State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of the Ruth Remote Satellite** shows the 2009 sales and use tax revenues for the counties of the satellite area (WDAI EAD 2009).

The Johnson County average 2009 mill levy applied to 2008 mineral production was 67.3, which resulted in a total tax of $108,595,127 assessed on all minerals (Wyoming Department of Revenue, 2010). The severance tax rate for the minerals mined in Johnson County was 2% in 2008. In the 2008 production year, the amount of taxable units of uranium in Johnson County was 1,424,110, which resulted in a taxable valuation of $1,614,781,191.

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3.11 Public and Occupational Health

3.11.1 Major Radiation Exposure Sources and Rates

For a U.S. resident, the average total effective dose equivalent from natural background radiation sources is approximately 3 mSv/yr (300 mrem/yr) but varies by location and elevation (National Research Council of the National Academies, 2006). In addition, the average American receives 0.6 mSv/yr (60 mrem/yr) from man-made sources including medical diagnostic tests and consumer products (National Research Council of the National Academies, 2006). Therefore, the total from natural background and man-made sources for the average U.S. resident is 3.6 mSv/yr (360 mrem/yr). For a breakdown of the sources of this radiation, see **Figure 3.11.1, Radiation Exposure**.

Levels of natural or background radiation can vary greatly from one location to the next. People residing in Wyoming are exposed to more natural background radiation because of higher levels of cosmic radiation at higher altitudes and more terrestrial radiation from soils enriched in naturally occurring uranium. This naturally occurring uranium in the soil also results in a higher exposure to radon gas. Background dose varies by location primarily because of elevation changes and variations in the dose from radon. As elevation increases so does the dose from cosmic radiation and hence the total dose. Radon is a radioactive gas produced from the decay of U-238, which is naturally found in soil. The amount of radon in the soil/bedrock depends on the type, porosity, and moisture content. Areas that have types of soils/bedrock like granite and limestone have higher radon levels than those with other types of soils/bedrock (EPA, 2006).

The total effective dose equivalent is the total dose from external sources and internal material released from licensed operations. Doses from sources in the general environment (such as terrestrial radiation, cosmic radiation, and naturally occurring radon) are not included in the dose calculation for compliance with 10 CFR Part 20, even if these sources are from technologically enhanced naturally occurring radioactive material (TENORM), such as pre-existing radioactive residues from prior mining (Atomic Safety and Licensing Board, 2006).

For the section of Wyoming where the SUA-1548 license areas are located, the average **annual** background radiation dose for the state of Wyoming is used: 3.16 mSvr (316 mremr) (EPA, 2006). This value includes natural and man-made sources, including naturally occurring radon and cosmic radiation.

3.11.2 Major Chemical Exposure Sources and Rates

SUA-1548 operations are located in areas characterized by sparse population and the predominant land uses are agriculture and energy production. The region does not have any industrial activities that constitute a major source of chemical generation. As described in Section 3.0 of the TR, the primary chemical reagents associated with an ISR operation include sodium bicarbonate, carbon dioxide, hydrochloric acid and/or sulfuric acid, hydrogen peroxide, sodium hydroxide and sodium sulfide. Emission rates for these chemicals are typically **less than regulatory limits**. With respect to fugitive dust, the levels are too low to warrant a permit. Section 3.6 and Section 7.2 of the TR address both current and projected air quality conditions, including calculations of fugitive dust. In conclusion, because emissions are all below permitting action levels, the concentrations are protective of the public.

3.11.3 Occupational Health

According to the U.S. Department of Labor, Bureau of Labor Statistics 2009 report on non-fatal workplace injuries and illnesses, non-oil and gas mining and associated support activities employs just over 530,000 people and reported a total of 15.1 recordable illnesses or injuries **(Table 3.11-1, Labor Statistics)**. The mining industry and services associated are Codes 212 and 213 in the National American Industry Classification System.

3.11.4 Summary of Health Effects Studies

Recent studies in Montrose County, Colorado; the Colorado Plateau; Karnes County, Texas; Monticello City, Utah; and Grants, New Mexico areas specifically investigate health status in relation to possible exposure to uranium and vanadium during mining and milling activities. **These studies were all focused on conventional uranium mining and milling activities, which create significantly higher dose rates than ISR. Therefore, the results should be considered very conservative when comparing them with actual historical ISR dose rates**. Summaries are provided below.

- Researchers compared mortality rates between 1950 and 2000 in Montrose County to those in five similar counties. They concluded that there was no evidence that residents in Montrose County experienced an increased risk of dying of cancer or other diseases because of environmental exposures associated with uranium and vanadium milling and mining activities (Boice, et al., 2007).
- Researchers evaluated the mortality experiences of 1,484 men employed in seven uranium mills in the Colorado Plateau for at least one year after January 1, 1940 (Pinkerton, et al., 2004). The study results stated that mortality from all causes and all cancers was less than expected based on U.S. mortality rates. The study found an excess in mortality from hematopoietic and lymphatic malignancies (other than leukemia), trachea, bronchus, and lung cancer, non-malignant respiratory disease, and chronic renal disease. For workers hired prior to 1955, mortality from lung cancer and emphysema was higher, presumably because their exposure to uranium, silica, and vanadium was higher. However, mortality did not increase with employment duration. The researchers' conclusion stated that based on the study's limitations (i.e., small cohort size, inability to estimate individual exposure, lack of smoking data), firm conclusions about the relation of increases in mortality and mill exposures were not possible.
- The same researchers that conducted the Montrose County study described above completed a mortality study for Karnes County, Texas in which they contrasted cancer rates in the county before, during, and after uranium operations (Boice, et al., 2003). The study also compared nearby counties with similar demographic characteristics. In conclusion, the study found that those cancers which might be increased following high exposures to uranium and its decay products were not elevated. The researchers qualified their conclusions with a statement that the ecological nature of the study design tempered the strength of the conclusions.
- The Utah Department of Health Office of Epidemiology completed a follow-up study for Monticello, Utah, where from 1943 to 1960 a mill processed uranium and vanadium in a location immediately adjacent to the town. The site and surrounding properties were placed on the EPA's National Priority List in 1986 and 1989 due to the chemical and radioactive contaminants associated with the mill. The initial health study in 2006 did not find conclusive evidence that the cancer rates were increasing in the Monticello area at a greater

frequency than the rest of Utah. The current study found lung and bronchial cancer significantly elevated **during the study period**. The study's limitations included low statistical power due to Monticello's small population; lack of data prior to 1973; and the lack of adjustment or evaluation for individual factors such as smoking or family history. The study recommended further investigation and/or monitoring of the area due to the elevations of lung and bronchial cancer.

- The mortality rate of uranium mining and milling workers near Grants, New Mexico between 1955 and 1960 was analyzed (Boice, et al., 2008). The study included 2,745 men and women alive after 1978 who were employed for at least 6 months. Increased mortality due to respiratory diseases and cirrhosis of the liver was found among the underground miners, which was likely attributable to the historically high levels of radon in the uranium mines combined with the heavy use of tobacco products. There was no statistically significant elevation in any cause of death among the non-miners. The study notes that although the population was relatively small, the follow-up was long (up to 50 years) and complete.

3.11.5 Smith Ranch Historical Baseline Radiological Survey Results

3.11.5.1 Vegetation and Soils

Annual soil and vegetation sampling were performed at Smith Ranch and Highland prior to 2000. Based on an NRC inspection that stated that the license did not require annual soil and vegetation sampling (IR 40-8857/99-02), the sampling program was terminated. The pre-2000 data could not be recovered. Soil samples were collected from the Reynolds Ranch Satellite for analysis of baseline radionuclide concentrations (Ra-226, Th-230, and U-238) and provided laboratory data for field correlation to the gamma survey described in Section 3.11.5.2. All soil samples were collected from vertical profiles exposed in back-hoe trenches or from auguring to depths less than 30 centimeters (12 inches) below the ground surface. Sample collection, quality assurance/quality control (QA/QC) and analysis began in 1988.

3.11.5.2 Baseline Gamma Survey

A background pre-mining radiological survey of the O-Sand pilot area was conducted and results were submitted in previous applications. Background gamma surveys were conducted on a 60 meter (200 foot) grid pattern for Wellfield Nos. 1 through 4. The results of these surveys show that the average background gamma radiation levels range from **0.10 to 0.17 uSv/hr (10 to 17 μR/hr).** Comparison of these data with historic background data collected from the Smith Ranch and Highland Air Monitoring Stations shows that the gamma measurements are in close agreement.

Three separate surveys were performed in 1985, 1988 and 1989 on lands covering the Highland portion of Smith Ranch. The results of these survey/sampling efforts are provided as Addenda D-10-1 through D-10-3 of Addendum D-10 B3 in Appendix D10 of the Smith Ranch WDEQ Permit. Figure A.8-1 and Figure No. 8-3 of Addendum D-10 B2 in Appendix D10 of the Smith Ranch WDEQ Permit present baseline gamma survey data for the West Highland Amendment area and the Section 14/24 well field area.

A background radiological survey of the Reynolds Ranch portion of Smith Ranch was conducted by SMC as part of their effort to develop a mine permit application for the area in 1989-1990. This survey does not cover the entire proposed area where a significant amount of the mining is expected to occur. Surface gamma levels determined during this survey are consistent with surface gamma surveys conducted previously for the western and eastern portions of the license area. Therefore, Cameco considers this survey representative of the entire license area. Additional baseline radiological surveys will be performed at the Reynolds Ranch portion of the license area as mine unit hydrologic data packages are developed. The survey associated with the Reynolds Ranch portion of the radiological assessment is contained in Addendum D10 C3 of Appendix D10 in the Smith Ranch WDEQ Permit.

3.11.5.3 Thermoluminescent Dosimetry

10 CFR §20.1502 (a)(1) requires exposure monitoring for "adults likely to receive, in one year from sources external to the body, a dose in excess of 10% of the limits in **10 CFR** §20.1201 (a)". Ten percent of the dose limit would correspond to a Deep Dose Equivalent of **5 mSv (0.5 rem).** External radiation exposure was monitored at the Highland facility during the period 1988 through 1993 by the use of Thermoluminescent Dosimeter badges (TLDs) or Optically Stimulated Luminescent dosimeter badges. All employees, except several office personnel that did not enter areas where potential exposures existed, utilized dosimeters. During the period 1988 through 1993 the monitoring data collected from the dosimeters showed that the annual dose to all workers was less than 10% of the 50 mSv (5,000 mrem) annual limit contained in 10 CFR §20.1201(a). Therefore, consistent with 10 CFR §20.1502, beginning on January 1, 1994, individual monitoring devices, such as TLDs, were only used to monitor occupational exposures to CPF operators because they could potentially exceed 10% of the annual limit contained in 10 CFR §20.1201(a). Details regarding personnel dosimetry are provided in Section 5.8.1.1 of the TR.

3.11.5.4 Atmospheric Rn-222

Airborne Rn-222 progeny monitoring was conducted in the Smith Ranch facilities for the periods indicated below (and continue to present) and is discussed in detail in the TR Section 5.8.2:

- Smith Ranch Pilot Plant 1999-2004
- CPP 1999-Present
- Satellite Plant SR-1 1999-Present
- Satellite Plant SR-2 2009-Present
- Satellite Plant 1 2000-Present
- Satellite Plant 2 2000-Present
- Satellite Plant 3 2000-Present
- Selenium Plant 2009-Present
- Header Houses 2000-Present

Occupational airborne radioactivity concentrations at Smith Ranch are routinely monitored at a frequency which allows for timely investigations and corrective actions, if needed, to respond to conditions or practices which result in airborne radioactivity concentrations above the action level of 25% of the derived air concentration (DAC). Annual average air concentrations for natural uranium and Rn-222 progeny are well below this in all cases. Additionally, the annual average air concentrations are less than the 10% of DAC criteria where occupational monitoring of airborne radionuclides is required by 10 CFR §20.1502.

No increasing trends of workplace airborne radioactivity were identified, except at the header houses. The maximum concentration (6% of the DAC) at the header houses was recorded in 2004, but was reduced to 4% of the DAC by 2005. The decreasing trend continued through 2006 and 2007, but has slightly increased (~0.3%) during 2009 and 2010. There were several exceedances of the 25% of the DAC action level for maximum Rn-222 progeny concentrations during the 2008 to 2010 time period at the header houses. Cameco is committed to limiting occupational airborne radioactivity concentrations to levels which are ALARA.

3.11.5.5 Air Particulates

To ensure compliance with 10 CFR §20.1301, §20.1302 and §20.1501, Cameco maintains a continuous ambient air particulate monitoring program at five separate locations at the Smith Ranch **license area**. The remote satellites at North Butte, Gas Hills and Ruth will have air particulate monitoring stations installed early in 2012[1] to collect air particulate data at those locations. An additional air monitoring station will be installed at the Reynolds Ranch satellite facility prior to commencement of operations. This station will be installed to replace the current upgradient station (AS-1, Dave's Water Well). The Highland CPF and the Smith Ranch CPP have the greatest potential for airborne releases **of particulates** to the environment. Two of these stations (AS-4 and AS-5) were used to monitor downwind conditions of the Highland CPF but are inactive as a result of the CPF being placed in standby status in 2002. Monitoring at AS-4 and AS-5 will resume once operations begin again at the refurbished CPF. Data analysis for the particulate monitoring program are reported in semi-annual reports to the NRC. The analyses have been summarized as discussed in Section 5.10.1 of the TR.

Airborne particulate levels at ISR yellowcake processing facilities that employ vacuum dryers are very low since there are no radionuclide emissions (see Section 4.1 of the TR for a description of the vacuum dryers). The primary potential source of airborne uranium is during yellowcake packaging. Between 1999 and 2010 the average and maximum measured concentrations were, excluding the maximum measurement in 1999, well below the DAC for soluble uranium (nat) of 5E-10 μCi/m **(1.85E-05 Bq/m).** Details about the airborne uranium particulate monitoring are found in Section 5.8.2 of the TR.

3.11.5.6 Groundwater Radium-226

Groundwater quality data at Smith Ranch can be found in Section 3.4. More detail and laboratory data sheets can be found in Tables D6-5 through D-6.36 of Addendum D-6 A1 and Tables D6-6 and D6-7 of Addendum D-6 B1 to the WDEQ Permit. Extensive groundwater quality data, including baseline Radium-226 have been collected from each of the two Smith Ranch pilot projects in the western portion of Smith Ranch. These data were previously submitted to NRC and WDEQ in the NRC License Applications and LQD quarterly reports. In addition to sampling at the pilot projects, baseline water quality data was collected from about 30 other wells. These data are representative of the baseline water quality throughout the western portion of Smith Ranch before ISR operations commenced. Typically five samples were collected from each well over a period of 6 to 9 months and analyzed for the full list of WDEQ approved parameters.

A vast amount of baseline groundwater quality data have been collected since ISR activities started at Highland. Baseline groundwater quality data have been collected from the A, B, C, D, E, F, H, I, and J-well field areas as part of required well field development activities. Numerous water quality samples have been collected from the 10, 20, 30, 40, 50 and 60 Sands to document baseline conditions within these well fields. These data are on file with both the WDEQ and NRC.

A baseline water quality comparison was conducted using Smith Ranch, Highland and Reynolds Ranch Satellite historical water quality data. Average concentrations of constituents from Smith Ranch and Highland (Tables D6-5 and D6-6 of Addendum D-6 A1; Tables D6-8 and D6-9 of Addendum D-6 B1 of the Smith Ranch WDEQ Permit) were combined with averages from Reynolds Ranch Satellite Mine Unit 27 to produce Table D6-9 (Appendix D6 of the WDEQ Permit). An average baseline range of parameters were created using Smith Ranch, Highland, and Reynolds Ranch Satellite data and compared to the

[1] **The North Butte air particulate sampling program is continuing with data being provided to NRC with the semi-annual reports. The sampling program at Gas Hills collected baseline data for a period of one year. Sampling has been suspended until project construction commences.**

approved mine unit baseline data. Averages for approved mine unit baseline data were developed from MP wells (i.e., interior production zone wells). A summary of the water quality data mentioned above is presented in Table D6-9 of Appendix D6 of the Smith Ranch WDEQ Permit.

Comparing the approved mine unit data to the baseline average range of parameters, 98 outliers were identified from the hundreds of analyses that were performed. The majority of outliers were just outside the minimum or maximum average. Of note are uranium values for Mine Units C and D which exceed the average range of concentrations with values of 2.1 and 1.1 mg/L **(ppm)**, respectively.

The average water quality results for the approved mine units are similar to the baseline water quality determined for the Smith Ranch, Highland, and Reynolds Ranch Satellite areas. Based on past analyses the Smith Ranch water quality is dominated by calcium-sodium-bicarbonate-sulfate water.

3.11.5.7 Surface Water Radium-226

Surface water use at Smith Ranch is for livestock and wildlife watering. Section 3.4 provides a more specific presentation on water quality. In summary Smith Ranch drainages are ephemeral and flow only in response to snowmelt or major precipitation events. Stock ponds and playas impound the water on a seasonal basis. Exxon regularly analyzed water samples from selected points in the Box Creek drainage during the period of surface mining activities. The data, which historically have been considered to be representative of surface water quality for Smith Ranch, Highland, and Reynolds Ranch Satellite, are included in Table D6-3 in Addendum D-6 B1 of the WDEQ Permit. Sampling locations are shown on Figure D6-1 in Addendum D-6 B2 of the WDEQ Permit.

Sampling for radiological constituents has been conducted at select surface water points within Smith Ranch since 2003 and since 1987 from the Highland area. Figure D6-2 of Appendix D6 of the WDEQ Permit show the radiological surface water sampling locations. The results are summarized in Table D6-2 of Appendix D6 of the WDEQ Permit. Surface water and sediment samples were collected at Reynolds Ranch between August 17 and 18, 2011. In general, surface water radionuclide concentrations meet or exceed state and federal water quality standards. With respect to sediment samples, concentrations of radium-226 and lead-210 average 2.7 pCi/g **(99.9 Bq/kg)**, uranium concentrations average 1.3 pCi/g **(48.1 Bq/kg)**, and thorium-230 concentrations average 0.9 pCi/g **(33.3 Bq/kg)**. The results are described in Section 4.0.

3.11.6 North Butte Historical Baseline Radiological Survey Results

Several baseline sampling programs were implemented at the North Butte Remote Satellite in order to characterize pre-mining radiological conditions. Components of the pre-mining environmental radiological sampling program at the Ruth Remote Satellite include vegetation, soils, sediment, gamma ray survey, TLD, atmospheric Rn-222, groundwater (Ra-226), and surface water (Ra-226).

3.11.6.1 Vegetation

Vegetation samples were collected in June of 1998 at three locations adjacent to the air monitoring sites as shown on Plate D10-1 in Appendix D10 of the North Butte WDEQ Permit. All samples were analyzed for Th-230, Ra-226, Pb-210 and U(nat). The results are listed in Table D10-1 in Appendix D10 of the North Butte WDEQ Permit.

3.11.6.2 Soils

Soil samples were collected at the same three locations as vegetation (Plate D10-1 in Appendix D10 of the North Butte WDEQ Permit). Samples were collected from 0 to 5 centimeters (0 to 2 inches), 5 to 10 centimeters (2 to 4 inches), and 10 to 15 centimeters (4 to 6 inches) and analyzed for Th-230, Ra-226, Pb-210 and U(nat). The results are listed in Table D10-2 in Appendix D10 of the North Butte WDEQ Permit. Addendum D10-1 to Appendix D10 of the North Butte WDEQ Permit presents the results of verification soils sampling conducted in 2010.

3.11.6.3 Gamma Survey

A background gamma radiation survey was conducted on portions of the North Butte Remote Satellite in 2010. A total of 423 gamma readings were recorded in the four selected areas. The plant and well field portions were surveyed on an approximate 15 meter (50 foot) transect interval, the proposed roadway at 46 meters (150 foot) intervals in the road center, and the additional permit area was covered by 15 to 168 meter (50 to 550 foot) transect intervals. No specific features were encountered showing elevated gamma readings, including sandstone outcrops and drainages.

Radionuclide analyses of soil samples collected in 2010 from the top 15 centimeters (6 inches) were consistent with the historical data collected in the 1980s. Table D10-1.1 in Appendix D10 of the North Butte WDEQ Permit summarizes the data collected during both periods. Generally, the 2010 verification field gamma survey data agrees with the data collected in the mid-1980s.

Readings were taken at six locations on and adjacent to the North Butte Remote Satellite with TLDs as shown on Plate D10-1 in Appendix D10 of the North Butte WDEQ Permit. TLDs were changed quarterly. The results are listed in Table D10-6 in Appendix D10 of the North Butte WDEQ Permit.

Radon-222 was continuously monitored at the TLD stations with Trak-Etch radon monitors that were changed quarterly. The six TLD monitoring stations are shown on Plate D10-1 in Appendix D10 of the North Butte WDEQ Permit. The results are listed in Table D10-7 of the North Butte WDEQ Permit.

3.11.6.4 Air Particulates

Radiological air particulates were measured from three locations using Hi-Volume air samplers (Plate D10-1 in Appendix D10 of the North Butte WDEQ Permit). Samples were collected once each month with between 4,000 and 5,000 **cubic meters (m^3)** (140,000 to 175,000 **cubic feet (ft^3)**) of air passing through the sampler. Monthly samples were composited on a quarterly basis and analyzed for Th-230, Ra-226, Pb-210 and U(nat). The results are presented in Table D10-8 in Appendix D10 of the North Butte WDEQ Permit.

3.11.6.5 Groundwater Radium-226

Cameco has sampled groundwater data from 25 wells completed in the ore (A/B and C Sands) and overlying F Sand. Radium-226 values from groundwater samples collected range from <0.2 to 82.4 pCi/l (**0.0074 to 3.05 Bq/l**) with an average of 6.5 pCi/l (**0.24 Bq/l**). The analytical results of groundwater sampling are described in Appendix D-6 of the North Butte WDEQ Permit. Additional data will be collected during the hydrologic testing program and will be used to characterize the aquifer for restoration target values.

3.11.6.6 Surface Water Radium-226

Cameco has established 18 new surface water quality sampling sites in addition to maintaining the three original points established by Uranerz (SWS1, SWS2, and SWS3). The drainages in and around the permit are ephemeral in nature, which complicates Cameco's ability to collect live flowing and representative surface water samples. The surface water quality sampling sites established by Cameco are all at impoundment locations where a berm or dam structure is trapping water creating a holding pond. The location of all 21 sites and water quality data can be found in the WDEQ Permit (Addendum D6 to Appendix D6).

All 21 surface water quality sampling sites were visited during field data collection in August 2010. During this time, the majority of the historic and contemporary water quality sampling sites were dry preventing the collection of water samples for analysis. Three impoundment sites (NBI5, NBI12 and NBI16) contained ponded water and were sampled. Chemical analysis was completed at Energy **Laboratories** for all WDEQ Guideline 8 parameters. Radium-226 concentrations ranged from 1.3 to 3.0 pCi/l (**0.048 to 0.111 Bq/l**).

3.11.7 Gas Hills Remote Satellite Historical Baseline Radiological Survey Results

Much of the land at the Gas Hills Remote Satellite has been previously disturbed by mining activities. A baseline radiological survey was performed to establish the nature of the pre-mining radiological conditions and to document areas exhibiting high radiation as the result of previous conventional mining activities. In addition to a gamma survey, baseline data was collected on the radiological characteristics of soil, air, groundwater and surface water.

3.11.7.1 Gamma Survey

The initial gamma survey was completed at the Gas Hills Remote Satellite in the mid-1990s. The area was divided into a 150 meter (500 foot) grid. A Ludlum model 12S scintillometer was held approximately 1 meter (3 feet) above the surface while traversing a serpentine course over each grid transect. Gamma readings were continuously observed and averaged readings were recorded for each grid square. The survey results are presented on Plates D10-1E and D10-1W in Appendix D10 of the Gas Hills WDEQ Permit.

In addition to the gamma survey completed on a 150 meter (500 foot) grid, a more detailed survey completed on a 30 meter (98.4 foot) grid was done in the vicinity of the Carol Shop. The detailed gamma survey results are shown on Plate D10-2 in Appendix D10 of the Gas Hills WDEQ Permit.

Gamma readings averaged **0.2uSv/hr (20 μR/hr)** across the Gas Hills Remote Satellite which is in line with other Wyoming sites. As was expected, much higher readings were observed in areas previously disturbed by mining activity. More specifically, the areas exhibiting the highest gamma readings are those containing ore and waste rock piles left from previous conventional mining activities. Higher levels were also found on or associated with former ore haul roads (i.e., the Carol Shop Road).

A second evaluation of baseline radiological characteristic was completed in 2008 in response to Condition 9.13 to NRC License SUA-1548 which states:

> *Before engaging in any uranium recovery operations in an undeveloped area, the licensee shall submit a complete evaluation of the area's baseline radiological characteristics for NRC's review and approval.*

Direct gamma radiation measurements were collected at 150 meter (**500 foot**) intervals with a Ludlum Model 19 microR survey meter in four areas designated as Study Areas A, B, C and D (Map 1: Gas Hills Project Area in Appendix A to Addendum D10-1 in Appendix D10 of the Gas Hills WDEQ Permit). Samples were collected 1 meter (3 feet) above the ground surface. Direct radiation measurements taken in Study Area A ranged from **0.17 to 0.73uSv/hr** (17 to 73 μR/hr) with an average of **0.22uSv/hr (22** μR/hr). Direct radiation measurements taken in Study Area B ranged from **0.22 to 1.5 uSv/hr** (22 to 150 μR/hr) with an average of **0.40 uSv/hr** (**40** μR/hr). Direct radiation measurements taken in Study Area C ranged from **0.15 to .19 uSv/hr** (15 to 19 μR/hr) with an average of **0.17 uSv/hr** (**17** μR/hr). Direct radiation measurements taken in Study Area D ranged from **0.16 to 0.28 uSv/hr** (16 to 28 μR/hr) with an average of **0.22 uSv/hr** (**22** μR/hr).

3.11.7.2 Soil

A total of 40 soil samples were collected from 20 sample locations throughout the Gas Hills Remote Satellite **in 1997 as part of the initial WDEQ permitting process**. Samples were collected from 0 to 15 centimeters (0 to 6 inches) and **15 to 30** centimeters (**6** to 12 inches) and analyzed for Th-230, Ra-226, Pb-210 and U(nat).

Sampling results corroborate the results of the gamma survey in that the areas containing high background concentrations of radionuclides are those that have been previously disturbed by conventional mining activities. Sample locations are shown on Plate D10-1 in Appendix D10 of the Gas Hills WDEQ Permit. The results are listed in Table D10-1 in Appendix D10 of the Gas Hills WDEQ **permit application.**

The radiological survey and soil sampling program was supplemented during 2007 in conformance with the guidance provided in Regulatory Guide 4.14, Revision 1. The results of the 2007 survey and sampling program were provided to NRC by letter dated September 4, 2007. NRC's review of the report (letter dated July 5, 2008) concluded that the baseline radiological characteristics for the Gas Hills Remote Satellite had been adequately characterized. The 2007 study report and NRC's review and approval are provided in Addendum D10-1 within Appendix D10 of the Gas Hills WDEQ permit application.

3.11.7.3 Air Characteristics

A pre-operational air monitoring program was established at four locations across the Gas Hills Remote Satellite site for ambient gamma exposure and radon concentrations. Gamma measurements resulted in average exposure rates of approximately 170 mR/year and the average radon concentration was 1.6 pCi/Liter.

3.11.7.4 Groundwater Radium-226

Groundwater samples were collected and analyzed from 47 wells at the Gas Hills Remote Satellite. Uranium concentrations in groundwater are relatively low in all monitoring wells including the ore zone wells. Maximum uranium concentrations were identified at Well BSMP-1 (0.320 mg/l (**ppm**)), Peach MP-1 (0.307 mg/l (**ppm**)), and Veca MW3A (0.209 mg/l (**ppm**)). The BSMP and Peach wells were completed in the ore zone within Mine Unit 2 and 3, respectively. The Veca well is completed downgradient from extensive AML reclamation and reflects an anomalously high increase in dissolved uranium.

Radium-226 concentrations in the groundwater are variable **across the Gas Hills site**. For example, Peach MP-1 (**20 Bq/l** (540 pCi/l)) and MUMP 97-1 (**33 Bq/l** (898 pCi/l)) are completed in ore bodies (Mine Units 3 and 1, respectively). These values exceed the Class **III** standard by 100 to 180 times. Outside the ore bodies, radium levels are significantly lower. Upgradient from these deposits, radium-226 is typically less than **0.18 Bq/l** (5 pCi/l). Downgradient values are higher, but still less than **1.85 Bq/l** (50 pCi/l). Mean values of radium-226 per mine unit are presented on Table D6-3-3 in Appendix D6 of the Gas Hills WDEQ **permit application**. These mean values are skewed on the high end of the spectrum, based on the influence of the ore zone wells. Nevertheless, radionuclide levels within the mine units generally make these waters unsuitable for Class III (livestock use).

3.11.7.5 Surface Water Radium-226

Uranium and radium-226 data collected for surface water sites in 1996 and 1997 are indicative of the extensive surface mining activities in the Gas Hills. Sample sites SW-1 and SW-2 exhibit relatively low uranium contents, ranging from 0.020 to 0.080 mg/l **(ppm).** Sample sites SM-5 and SM-6, located downstream of mining disturbances, show higher variability in uranium concentrations with observations ranging from 0.006 to 3.2 mg/l **(ppm)**. Variability may be due to the timing of the sampling in relation to the time since previous precipitation events.

Radium in surface waters shows significant variation without regard to the mine disturbances. Radium-226 values are typically below **0.018 Bq/l** (5 pCi/l), but elevated **concentrations** have been observed. The maximum **concentration** within the available data is **13.76 Bq/l** (372 pCi/l) recorded at sample site SM-7. Radium **concentrations** in the open pits (Buss 1 and 3) are typically below **0.018 Bq/l** (5 pCi/l). West Canyon Creek has shown similar variability in radium concentrations. Since the monitoring sites were established, radium-226 has generally been **less than 0.037 Bq/l** (1 pCi/l); however, a high of **0.633 Bq/l** (17.1 pCi/l) was measured at sample site WCC-1.

3.11.8 Ruth Remote Satellite Historical Baseline Radiological Survey Results

Components of the pre-mining environmental radiological sampling program at the Ruth Remote Satellite include vegetation, soils, sediment, gamma survey, **gamma exposure rates and** atmospheric Rn-222, groundwater (Ra-226), and surface water (Ra-226). The results of the environmental radiological sampling program are presented in Section 14, Volume 1 of "Supplemental Information for Wyoming D.E.Q. Permit to Mine Application and U.S.N.R.C. Source Materials License Application" (Ruth Supplemental Report) and summarized below.

3.11.8.1 Vegetation

Vegetation samples were collected from four locations at the Ruth Remote Satellite as shown on Figure 14.1, Volume 2 of the Ruth Supplemental Report. All samples were analyzed for Th-230, Ra-226, Pb-210 and U(nat). The results are listed in Table 14.1, Volume 1 of the Ruth Supplemental Report.

3.11.8.2 Soils

Soil samples were collected at the same four locations as vegetation (Figure 14.1, Volume 2 of the Ruth Supplemental Report). Samples were collected from 0 to 5 centimeters (0 to 2 inches), 5 to 10 centimeters (2 to 4 inches), and 10 to 15 centimeters (4 to 6 inches) and analyzed for Th-230, Ra-226, Pb-210 and U(nat). The results are listed in Table 14.2, Volume 1 of the Ruth Supplemental Report.

Surface soil samples were collected every **305** meters **(1,000** feet) along the ore body trend in conjunction with a gamma survey completed in the early 1980s. Soil samples were also collected at upwind and downwind sampling sites on the Ruth Remote Satellite but away from the known ore body. The results are presented in Table 14.6, Volume 1 of the Ruth Supplemental Report.

3.11.8.3 Sediment

Sediment samples were collected at two locations on the Dry Fork of the Powder River (Figure 14.1, Volume 2 of the Ruth Supplemental Report). One sample was collected at SWS-U (upstream of the Ruth Remote Satellite) and four samples were collected at SWS-L (downstream of the Ruth Remote Satellite). Table 14.3, Volume 1 of the Ruth Supplemental Report lists the analytical results of the pre-operational radiological sediment samples and Table 14.4, Volume 1 of the Ruth Supplemental Report lists the analytical results of the R&D pre-operational discharge point sediment samples.

3.11.8.4 Gamma Survey

A gamma survey was completed on a **61** meter **(200** foot) grid overlying the ore body. Two µR/hr meters were used in the survey; a digital meter took readings at fixed points on the grid, and an analog meter took continuous readings both at grid points and between. At each fixed point on the grid three readings were collected and averaged. The analog meter recorded anomalies over the ore body. Both continuous and fixed point readings ranged from **0.09 to 0.14 uSv/hr** (9 to 14 µR/hr) with an average of **0.106**

uSv/hr (10.6 μR/hr) and a standard deviation of **0.007 uSv/hr** (0.7 μR/hr). The results of the gamma survey are listed in Table 14.5, Volume 1 of the Ruth Supplemental Report.

Gamma readings were taken at upwind and downwind sampling sites on the Ruth Remote Satellite but away from the known ore body. The results of this gamma survey are listed in Table 14.2, Volume 1 of the Ruth Supplemental Report.

3.11.8.5 Thermoluminescent Dosimetry

Readings were taken at seven locations on the Ruth Remote Satellite with TLDs as shown on Figure 14.1, Volume 2 of the Ruth Supplemental Report. TLDs were changed quarterly. The results are listed in Table 14.7, Volume 1 of the Ruth Supplemental Report.

3.11.8.6 Atmospheric Rn-222

Radon-222 was continuously monitored at the TLD stations with Trak-Etch radon monitors that were changed quarterly. The seven TLD monitoring stations are shown on Figure 14.1, Volume 2 of the Ruth Supplemental Report. The results are listed in Table 14.8, Volume 1 of the Ruth Supplemental Report.

3.11.8.7 Groundwater Radium-226

Radium-226 values from groundwater samples collected range from **<2.2 to 6,500 mBq/l** (<0.06 to 175 pCi/l) with an average of **607 mBq/l** (16.4 pCi/l). It is typical to see elevated Ra-226 in groundwater in which the aquifer shows significant uranium mineralization as it creates a complex geochemical environment. The analytical results of groundwater sampling are described in Section 10.1.6, Volume 1 of the Ruth Supplemental Report.

3.11.8.8 Surface Water Radium-226

Surface water quality samples were collected at two locations on the Dry Fork of the Powder River (Figure 14.1, Volume 2 of the Ruth Supplemental Report). One sample was collected at location SWS-U (upstream of the Ruth Remote Satellite) and four samples were collected at location SWS-L (downstream of the Ruth Remote Satellite). A total of 18 samples were collected at SWS-L and 14 at SWS-U. The results are listed in Table 10.17, Volume 1 of the Ruth Supplemental Report.

3.11.9 References

National Research Council of the National Academies. 2006. Health Risks from Exposure to Low Levels of Ionizing Radiation – BEIR VII Phase 2. The National Academies Press.

3.12 Waste Management

ISR facilities generate several types of liquid and solid wastes. This section describes the existing sources and types of waste generated by SUA-1548 activities as well as Cameco's current waste management practices.

Liquid wastes include:

1. 11e.(2) Liquids: Refers to all byproduct material liquid wastes resulting from Cameco's ISR processes.
2. Non-11e.(2) Liquids: Refers to all non-byproduct material liquid wastes and includes sanitary waste water and well development and testing water.

Solid wastes include:

1. 11e.(2) Solids: Refers to all solid wastes resulting from Cameco's ISR activities that exceed the NRC limits for unrestricted release.
2. Non-11e.(2) Solids: Refers to all non-hazardous solid waste including domestic trash, construction demolition debris, septic solids, and solid byproduct material that has been determined to meet NRC criteria for unrestricted release; and Resource Conservation and Recovery Act (RCRA) or state-defined hazardous waste that is non-11e.(2) and includes universal hazardous wastes and used oil.

3.12.1 Smith Ranch – Liquid Wastes

Liquid waste streams presently being generated at SUA-1548 facilities include those associated with the operation of the CPP and on-site satellites in addition to the production of domestic (non-11e.(2)) wastes. Domestic wastes may include **sanitary wastes** and any **other** liquids which do not contact process fluids or the processing portion of the uranium extraction operations. The following sections describe the current waste streams at Smith Ranch in addition to current waste management practices.

3.12.1.1 Central Processing Plant and Central Processing Facility

There are five primary process waste water streams (all 11e.(2)) for the Smith Ranch CPP and the proposed CPF:

1. Well field bleed, averaging up to 1.5% of production flow rates (**CPP only**);
2. Groundwater restoration waste water (**CPP only**);
3. Excess water from elution and precipitation circuit;
4. Well work-over water (**CPP only**); and
5. Wash down water.

All of these waste streams will be combined and treated at the CPP or CPF as follows:

1. Filtration to remove suspended solids **and possible reverse osmosis (RO) treatment to reduce waste water volume**;
2. Disposal via a Class I UIC injection well(s).

3.12.1.1.1 Class I UIC Injection Wells

Smith Ranch is permitted for 10 Class I UIC injection wells to dispose of excess water generated by **uranium recovery, well field restoration**, and yellowcake processing operations. **Table 3-7** (in Section 3.6.1.3 of the TR) lists the well ID's, permits, authorized injection rates and analysis requirements for these disposal facilities. The locations of these wells are shown on **Figures 1.3 through 1.9 of the TR**. Cameco will comply with permit conditions identified within the individual UIC permits. **Table 3.12-1, Deep Disposal Well Volumes** lists the volume of fluids disposed at each functioning deep disposal wells.

3.12.1.1.2 Waste Water Storage Ponds

Two small, lined storage ponds are in operation at the CPP. These ponds were initially constructed in 1981 and authorized under the Q-Sand Pilot Project (WWDEQ Permit to Mine 633 and NRC License SUA-1387). These ponds are located just to the north of the CPP, and are used for limited process effluent storage prior to transfer to the injection wells. The capacity of each pond is 962 cubic meters (0.78 acre-feet) of water. Each pond is 30.5 meters x 30.5 meters and 2.4 meters **deep** (100 feet x 100 feet and 8 feet **deep**). During operations, 1 meter (3 feet) of freeboard is maintained in each pond to prevent over topping and to protect the berms from wave action damage due to wind.

Each pond is constructed with a compacted sandy clay base overlain by a 30 mil thick Hypalon liner. The bottom of each pond has a two way slope toward the center. A sand layer is placed over the bottom of the pond with the synthetic liner on top of the sand. For each pond, a perforated polyvinyl chloride (PVC) pipe is installed in the sand layer parallel to the bottom slope. The perforated pipe is connected to a collection sump. The sumps are monitored for leaks of process solutions.

3.12.1.2 Smith Ranch Satellites

There are five primary process waste water streams (all 11e.(2)) at all Smith Ranch satellites:

1. Well field bleed, averaging up to 1% of production flow rates;
2. Groundwater restoration waste water;
3. Well work-over water;
4. RO reject concentrate; and,
5. Wash down water.

All of these liquid waste streams will be combined and treated in the satellite as follows:

1. Filtration to remove suspended solids;
2. **Disposal via a Class I UIC injection well(s); or**
3. **Treatment to remove Ra-226 and selenium prior to land** application.

In addition to the disposal wells, **the following have been installed to assist in the waste water disposal:** radium settling basins **(in the process of being decommissioned), purge storage reservoirs and accompanying land application facilities,** and a selenium treatment facility.

3.12.1.2.1 Class I UIC Injection Wells

During 2009, Class I UIC Permit 09-054 was approved by WQD authorizing the use of two **preexisting and five new** disposal wells; Morton 1-20, Vollman 33-27, and SRHUP #6 through SRHUP #10. The Morton 1-20 is located in NW¼ NW¼, Section 20, T36N, R72W; the Vollman 33-27 is located in NW¼ SE¼ Section 27, T36N, R73W. Both the existing Morton 1-20 well and the Vollman 33-27 are completed in a deep injection zone within intervals from 2,446 to 2,785 meters (8,024 to 9,138 feet) below the surface and are permitted for injection into the Teckla, Teapot and Parkman formations. Table 3.12-1 lists the volume of fluids disposed at each functioning deep disposal wells.

3.12.1.2.2 Satellite 1 Radium Settling Basins

The radium settling basins were constructed in 1987 to settle residual radium-barium sulfate out of the Satellite 1 waste water after filtration and prior to land application. The **settling basins** consisted of two **lined ponds located east of Satellite 1 with a volume of** 3,700 **cubic** meters (3 acre-feet) **each**. Water that passed through these basins then went to the Purge Storage Reservoir 1 (PSR-1) where it was stored prior to periodic land application. The radium settling basins were originally permitted by WQD under Permit 87-042R prior to being amended into the LQD Permit to Mine 603. **The Radium Settling Basins are no longer used and are in the process of being decommissioned.**

The synthetic upper liner, leak detection system and most of the underlying clay liner have been removed and disposed at a NRC-licensed disposal site. **Cameco estimates that approximately 371 cubic meters (485 cubic yards) of remaining clay liner and underlying soil containing low levels of uranium and Ra-226 will need to be removed for disposal at a NRC licensed disposal site. Cameco anticipates that the decommissioning of this facility will be complete by the end of the fourth quarter of 2016.**

3.12.1.2.3 Purge Storage Reservoir No. 1

PSR-1 is located east of Satellite 1 and was used to store treated mine unit purge water and treated water from Mine Units A and B restoration activities. The reservoir **contained 66,615 cubic meters** (54 acre-feet) of water when at full capacity. Water stored in the reservoir was periodically land applied by a center pivot irrigation system on a 23.5 hectare (58 acre) irrigation area when weather conditions permitted. PSR-1 was originally permitted by WQD under Permit No. 93-178, and later by Permit 95-156R. The PSR-1 and associated leakage pump back system are permitted under the LQD Permit to Mine 603. PSR-1 is currently **not in use** and contains no water. There is an on-going investigation at the PSR-1 and associated land application area, including annual sampling of soils and vegetation, to assist in determining the best management of the facilities in the future as well as the reclamation and surety requirements.

The reservoir is underlain by a natural clay soil that contains an average permeability of approximately 1.8E-8 centimeters/second. Use of the reservoir began in January 1988 with the start of production from the Satellite 1 area. The reservoir performed as designed until August 1994, at which time a small amount of leakage was discovered at the two ephemeral drainages located immediately east and south of the reservoir. A Corrective Action Plan (CAP), which addressed the conditions at the reservoir and corrective measures to be implemented, including the installation of two pump back sumps (north and south pump back sumps), was submitted to the NRC and LQD in correspondence dated October 3, 1994. It was determined that the seepage resulted from erosion of the natural clay liner along the eastern most portion of the reservoir. The erosion was caused mostly by wave action. Erosion of the clay liner exposed an underlying sandstone which allowed seepage to move out of the reservoir, to the south and east, where the sandstone outcropped in the ephemeral draws.

On November 9, 1994, the treated excess water was diverted to Purge Storage Reservoir No. 2 (PSR-2) in order that PSR-1 could be dried out and repairs to the liner accomplished. Due to the abnormally wet spring of 1995, construction activities, which included repair of the clay liner and the addition of a geotextile fabric along the eastern side of the reservoir to protect against erosion, were not completed until August 1995. The CAP also included the construction of a 242 meter (800 foot) long interceptor trench approximately 91 meters (300 feet) south of PSR-1 in August 1996. The trench captures subsurface seepage from the south side of PSR-1 and pumps it back into the reservoir. The pumping system is fully automatic and continuously operates. The interceptor trench has been very effective in preventing seepage from PSR-1 from surfacing and entering the drainage south of the system. After the interceptor trench went into service, it was no longer necessary to operate the south pump back sump. Both the interceptor trench and north pump back sump are currently on standby as PSR-1 is not currently in use and contains no water. The system is monitored in accordance with requirements of the WDEQ permit. As part of the CAP, visual inspections, sampling of the seepage water, vegetation monitoring, and soil monitoring are conducted.

Figure 3.34 of the TR shows the details of the interceptor trench and associated pump back sump. The trench is approximately **0.6 to 0.9 meters (2 to 3 feet)** deep depending on the topography. The bottom of the trench intercepts the fractured sandstone unit which transmitted the seepage. Approximately 46 to 61 centimeters (18 to 24 inches) of 2 centimeter (0.75 inch) gravel was placed in the trench **surrounding a** 10 centimeter (4 inch) PVC drain pipe. A plastic liner was installed along the down gradient side of the trench to assist in capturing any seepage. The drain pipe drained seepage to the concrete sump which contains a submersible pump capable of pumping approximately 76 liters/minute (20 gallons/minute). When operational, the pump activates automatically by a float switch, and seepage is pumped back to PSR-1 through a buried 5 centimeter (2 inch) high density polyethylene pipe.

Although the reservoir has not held water for several years, minor seepage continues to enter the pump back system **due to seasonal precipitation events**. Therefore, this part of the system remains operational.

3.12.1.2.4 PSR-1 Land Application

The PSR-1 Land Application Areas 1A and 1B are located east of Satellite 1 near PSR-1. Area 1B has never been used for land application. Area 1A consists of a center pivot irrigation system which covers 23 hectares (58 acres). There has been no land application for several years at this site.

The PSR-1 Land Application Area was originally permitted together with PSR-1 by the WDEQ WQD under Permit No. 92-077 and later by Permit No. 95-156R and was incorporated into WDEQ LQD Permit to Mine No. 603. Monitoring requirements for vegetation, soils, etc. are included in **Table 3-8** in the TR.

3.12.1.2.5 PSR-2 and Associated Land Application Area

The PSR-2 Land Application Area is used for the disposal of well field purge and groundwater restoration fluids from mine units served by Satellites 2 and 3. During months of land application, monthly samples are collected and analyzed for the parameters listed in **Table 3-9** in the TR.

PSR-2 has a capacity of approximately 395,948 **cubic** meters (321 acre-feet) of water. The land application area comprises approximately 47 hectares (116 acres). The locations of Satellite 2, PSR-2, land application area are shown on **Figures 1.3 and 1.4 of the TR**. PSR-2 and its associated land application facility were originally permitted by WQD under Permit 93-410 prior to being amended into the LQD Permit to Mine 603. Similar to PSR-1, PSR-2 is underlain by several low permeability clay units.

The bleed from Satellite 2 to PSR-2 totals **91,288 cubic meters** (74 acre-feet) from June 1, 2010 to April 30, 2011. The bleed from Satellite 3 to PSR-2 totals **62,915 cubic meters** (51 acre-feet) from June 1, 2010 to April 30, 2011. A total of **70,686 cubic meters** (57.3 acre-feet) were moved from PSR-2 and land applied via Irrigator 2 during July and August 2010.

3.12.1.2.6 Selenium Treatment Facility

A selenium treatment facility has been constructed and is operating at a location approximately 13 meters (30 feet) southwest of Satellite 2. The facility is connected to Satellite 2 through buried pipelines and houses the selenium treatment circuit. After selenium treatment the water is returned to Satellite 2 for disposal.

Satellite 2 and the selenium treatment facility both process waste water currently being discharged into PSR-2 for subsequent land application. The selenium treatment facility provides selenium removal to a target concentration not to exceed average selenium levels of 0.1 mg/L (**ppm**). The average selenium concentration of all samples taken from the PSR-2 compositor during the entire operating season (approximately March-October) must not exceed 0.1 mg/L (**ppm**) selenium. The treatment facility includes a radium removal circuit that may potentially replace radium removal currently being done at Satellites 2 and 3.

Waste/remediation water is first treated for radium removal using a barium chloride solution that precipitates radium. The radium compound precipitate is allowed to gravity settle and is then concentrated by a filter press. The filtered solids are disposed at an NRC-licensed disposal facility.

Following radium removal, the remediation stream is **then** processed to **remove selenium. Once the selenium removal media is exhausted and can no longer remove selenium, it is removed from the vessels and** disposed at an NRC-licensed disposal facility.

3.12.1.3 Non-11e.(2) Domestic Liquid Wastes

Domestic liquid wastes from the restrooms and lunchrooms are disposed in an approved septic system that meets the requirements of the State of Wyoming and Converse County. These systems are in common use throughout the United States and the effect of the system on the environment is known to be minimal. Liquid waste from the facility laboratories are disposed at the deep disposal wells. The septic system designs for all SUA-1548 facilities meet all state and/or county requirements.

3.12.1.4 Non-11e.(2) Well Development and Testing Waters

Well development and testing waste waters reflect waste water generated during well development and pumping tests. These tests generally occur following well installation or during hydrologic unit testing programs that precede well field development. This water is non-hazardous, non-byproduct material waste water and does not require treatment before disposal.

3.12.2 Smith Ranch - Solid Waste

Solid waste currently generated at Smith Ranch includes uncontaminated waste material, 11e.(2) or byproduct solid wastes, and hazardous waste.

3.12.2.1 Non-11e.(2) Solid Waste

Waste which is not contaminated with radioactive material or which can be decontaminated and re-classified as uncontaminated waste (non-byproduct) includes piping, valves, instrumentation, and any other items that are not contaminated or which may be successfully decontaminated. If decontamination of waste material is possible, surveys for residual surface contamination are made before releasing the material for unrestricted release. Decontaminated materials must have activity levels lower than those specified in 10 CFR Part 20 for unrestricted release. Methods for decontamination and release of contaminated equipment are discussed in further detail in Section 4.3 of the TR.

Cameco estimates that Smith Ranch produces 2.7 metric tons (3 tons) of non-11e.(2) waste each month. Uncontaminated solid wastes are collected on the respective site and disposed of in the Converse County Landfill. A total of approximately 150 light bulbs, 30 of which are mercury halide are recycled annually by a company named DEC. One 5-gallon bucket of batteries is recycled off site each year by a company named Grainger. No pesticides or antifreeze are stored on site. Used oil is burned for heat and surplus is recycled off site. In 2010, two (500-gallon) barrels of oil were recycled off site. All waste electronics are being stored on site until an adequate recycling vendor is contracted. Tires are periodically picked up from Smith Ranch and recycled at Colorado Tire Recycling. In 2010, approximately 350 tires were recycled. Domestic solid wastes (septage) from the restrooms and lunchrooms are disposed in the **previously** described septic systems, and the effect of the systems on the environment is minimal.

The potential exists for any industrial facility to generate hazardous waste as defined by RCRA. In the State of Wyoming, hazardous waste is governed by WDEQ Hazardous Waste Rules and Regulations. Based on preliminary waste determinations conducted by Cameco in consideration of the processes and materials that are used on the project, Cameco will likely continue to be classified as a Conditionally Exempt Small Quantity Generator, defined as a generator that produces less than 100 kilograms (220 pounds) of hazardous waste in a calendar month and that complies with all applicable hazardous waste program requirements. Cameco's experience to date is that only used waste oil and universal hazardous wastes such as spent batteries, fluorescent light bulbs, etc. will be generated at SUA-1548 properties. Cameco is committed to recycling universal wastes whenever possible.

3.12.2.2 11e.(2) Solid Waste

Solid wastes that have become contaminated with uranium and uranium daughter products as a result of recovering uranium are **classified as** 11e.(2) byproduct material. These types of wastes may include: tanks, vessels, IX resin, filter media, pond liners, decommissioning debris, process piping and equipment, etc. It could also include the solids remaining as a byproduct of the selenium treatment plant or in the surge or evaporation ponds at the end of the project.

All contaminated items that cannot be decontaminated to meet release criteria are properly packaged, transported, and disposed at a disposal site licensed to accept 11e.(2) material. It is estimated that between 38 and **229 cubic** meters (50 and 300 **cubic** yards) of solid 11e.(2) material will be generated each year at the Smith Ranch CPP and its associated contiguous satellite facilities, **including** approximately **150 metric tons (165 tons) of barium sludge waste**. Those materials which cannot be decontaminated (thereby allowing unrestricted release) will be stored in appropriately labeled and covered containers and will be periodically transported to an NRC-licensed disposal facility.

3.12.3 Remote Satellites

All three remote satellites covered under SUA-1548 (North Butte, Gas Hills and Ruth) are not currently (2011) in commercial production.[2] **Section 4.2 of the TR provides a description of the types and quantities of liquid and solid wastes that are estimated to be generated and disposed at the Smith Ranch Remote Satellite sites as well as the disposal methods used to dispose of wastes at each site.**

Cameco **continues to perform development** drilling at the North Butte and Gas Hills Remote Satellites. **These** drilling **activities** result in wastes, including drill cuttings and drilling wastes. Drilling wastes, as defined by EPA (2008) for ISR facilities, include drill muds, other drilling fluids, sludges, or evaporation products collected in excavated pits from waste water produced during drilling.

These are classified as TENORM, the definition of which is provided by EPA (2008):

> *"Naturally occurring radioactive materials that have been concentrated or exposed to the accessible environment as a result of human activities such as manufacturing, mineral extraction, or water processing."*

Drill cuttings and drilling wastes are typically disposed on site in mud pits pursuant to EPA TENORM regulations. The BLM is the land management agency at the Gas Hills and Ruth Remote Satellites. Exploratory and development drilling is also governed by the BLM Plan of Operations (Gas Hills) that is filed with that agency. Prior to any drilling at Ruth, Cameco will coordinate this effort with the BLM as well as the LQD.

3.12.4 References

U.S. Environmental Protection Agency. 2008. Technical Report on Technologically Enhanced Naturally Occurring Radioactive Materials from Uranium Mining, Volume 1: Mining and Reclamation Background, USEPA Office of Radiation and Indoor Air Radiation Protection Division, EPA 402-R-08-005, April 2008.

[2] **The North Butte Remote Satellite commenced operation during the third calendar quarter of 2013.**

4.0 Site Characterization and Description

4.1 Potential Land Use Impacts

4.1.1 Proposed Action

As discussed in Sections 2.2 and 3.1 **of this ER**, the primary land uses at all sites covered under SUA-1548 are energy development and agriculture. While some land is used for wildlife habitat and recreation, it is such a small proportion that these functions are not expected to be impacted from ISR development. ISR production will be compatible with local energy development including oil and gas, coal, CBM, and wind. Surface disturbances and exclusionary fencing will reduce grazing capacity within all SUA-1548 license areas, but the loss will be relatively small compared to the available surrounding rangeland. The maximum area expected to be impacted **at Smith Ranch, North Butte, Gas Hills, and Ruth** by approval of this LRA is approximately 1,**620** hectares (**4,000** acres) **or less than 10% of the total area**. Approximately 40% (624 hectares or 1,542 acres) of the expected surface disturbances have already taken place as of September 2011 (see Section 3.3 for a complete discussion of existing surface disturbances). The additional potential land impacts expected from ISR operations will be less than 5% of the total SUA-1548 license areas and cumulative disturbances will be less than 8%. Disturbance estimates have remained similar since the last LRA and there is no anticipated change in the percent of disturbed area. Because only a small percentage of surface disturbances are anticipated, land use will likely continue to remain largely unaffected from ISR operations.

Potential impacts to land use are intrinsically tied to both the spatial and temporal extent of surface disturbances. ISR operations will include both long-term (more than one year) and short-term (less than one year) surface disturbances. **In general, long-term disturbances include the CPP, CPF, uranium recovery satellite facilities, mine unit header houses, pump stations, and most access roads. Short-term disturbances include the construction of mine unit pattern areas and monitor wells, including drill holes, pipelines, and utility trenches. These short-term disturbance areas will be reclaimed and revegetated as soon as possible after construction has been completed.** Surface reclamation and revegetation occur concurrently with well field construction in order to minimize potential land use impacts. **Individual mine units will be temporarily fenced during the period of production and restoration and will not be available for grazing but the surrounding license area will be open and available for grazing.** After reclamation, revegetated areas will be available for grazing and wildlife habitat for the remaining life of the project. Once production, restoration and reclamation are complete, all areas covered under SUA-1548 will be returned to the pre-ISR mining land use of livestock grazing and wildlife habitat for unrestricted use. Mitigation measures for the loss of agricultural production over the course of the project are discussed in Section 5.1. The following sections identify the specific potential impacts to land use within SUA-1548 and potential cumulative land use effects.

4.1.1.1 Smith Ranch

The Smith Ranch license area totals approximately 16,187 hectares (40,000 acres). The estimated total surface disturbances for the life of the project are expected to be approximately 761 hectares (1,880 acres), or less than 5% of the total area (Reynolds Plan of Operations, BLM, 2011). Currently, approximately 570 hectares (1,410 acres) are already disturbed. The proposed increase in surface disturbance will be approximately **190** hectares (**470** acres), or approximately 1% of the total Smith Ranch license area.

The majority of the long-term disturbances (more than one year) in the Smith Ranch license area **have** been constructed and include the Smith Ranch CPP and Highland CPF, uranium recovery satellite facilities, mine unit header houses, pump stations, powerline corridors, UIC Class I disposal **wells**, and most access roads. Additional access roads and mine units are planned for the Reynolds Ranch Satellite but will be less than 1% of the Smith Ranch license area. **These disturbances constitute approximately 13% of the total disturbed acreage of 99 hectares (244 acres) and will remain for the life of the Project.**

Short-term disturbances (one year or less) **will comprise more than 85% of the mine unit total disturbed acreage of approximately 662 hectares (1,635 acres) and will include** construction of monitor wells, **mine unit patterns**, pipeline and utility trench areas **that** will be reclaimed and revegetated as soon as possible after construction has been completed. **After initial revegetation**, individual mine unit **pattern areas** will be temporarily fenced during the period of production and restoration and will not be available for **livestock** grazing. **The revegetated acreage will be available for wildlife habitat for the life of the project.** Cameco incorporates WDEQ and BLM guidelines into their fencing programs to ensure wildlife friendly fencing. Not only is the estimated loss of grazing and wildlife habitat less than 5% of the total area at Smith Ranch, but the exclusions associated with ISR development will be temporary.

Therefore, for the projected operational life of the Smith Ranch Project, it is estimated that approximately 99 hectares (244 acres) of the approximate 16,187 hectare (40,000 acre) project area will be completely removed from use until final reclamation. This represents less than 1% of the total permitted acreage. Mine unit areas (approximately 662 hectares [1,635 acres]) will be fenced to prohibit livestock entry. At the end of the Project, the entire 16,187 hectares (40,000 acres) will be returned to the pre ISR use of wildlife habitat and livestock grazing.

Other identified land uses at Smith Ranch include the development of other natural resources, including uranium, coal, oil and gas, and wind energy. Currently all of these land uses are present within or adjacent to the license area and approval of the proposed action will not affect these land uses.

4.1.1.2 North Butte Remote Satellite

The primary land use at the North Butte Remote Satellite is rangeland and grazing. The North Butte Remote Satellite consists of approximately 409 hectares (1,010 acres). It is anticipated that a total of approximately 162 hectares (400 acres) will be disturbed during the life of the project. Current (**2011**) surface disturbances total about 12 hectares (30.5 acres), primarily from boreholes and monitor wells. Additional short- and long-term surface disturbances will include mine unit pattern areas during well field construction, surge ponds, IX recovery and water treatment facilities, mine unit piping distribution centers, pipelines, booster pump stations, **UIC Class I disposal wells** and access roads. The proposed development is expected to disturb approximately 150 hectares (370 acres). Mine unit pattern areas will be temporarily fenced during the period of production and restoration and will not be available for **livestock** grazing. As **with** Smith Ranch, Cameco will incorporate WDEQ and BLM guidelines into their fencing to ensure wildlife friendly fencing. Since restoration, final reclamation and interim surface stabilization occur contemporaneously with development and production, the total disturbed area will not be more than approximately 162 hectares (400 acres) at any single point in time. In reality, this number will be even smaller since revegetation will immediately follow mine unit pattern establishment. Past experience at Smith Ranch suggests that vegetation will become well established within 3 years of initial disturbance. The potential impacts to land use are in all cases temporary and reversible by returning the land to its former grazing use through post-ISR surface reclamation. There will be no potential long-term impacts or institutional controls following site decommissioning.

Other land uses in the North Butte Remote Satellite area include the development of other natural resources such as oil, gas, uranium, and CBM. Currently all of these land uses are **occurring within and** adjacent to the license area and approval of the proposed action will not affect these land uses.

4.1.1.3 Gas Hills Remote Satellite

The Gas Hills Remote Satellite is predominately on public lands administered by the BLM, and is leased for sheep and cattle grazing. The license area is approximately 3,440 hectares (8,500 acres), but less than 20% (607 hectares or 1,500 acres) of the license area is expected to be disturbed throughout the lifespan of the project. Existing buildings, drill holes and access roads are present within the license area and currently account for approximately 40 hectares (98 acres) of the expected total disturbance. Surface disturbances will be similar to other satellite locations and will include mine unit pattern areas during well field construction, evaporation ponds, IX recovery and water treatment facilities, mine unit piping distribution centers, pipelines, booster pump stations, UIC Class I disposal wells and roads. Mine unit pattern areas will be temporarily fenced during the period of production and restoration and will not be available for **livestock** grazing. Fencing will be wildlife friendly in accordance with WDEQ and BLM guidelines. Because construction and development is done in stages and reclamation follows each construction project, the disturbed area at any given time will be less than the projected total of approximately 516 hectares (1,275 acres). All land disturbances can be reclaimed and returned to unrestricted pre-ISR uses when mining ceases.

Other identified land uses at **the** Gas Hills Remote Satellite include the development of other natural resources, including uranium, and oil and gas, as well as recreational usage of BLM land for hunting. Currently all of these land uses are present within or adjacent to the license area and approval of the proposed action will not affect these land uses.

4.1.1.4 Ruth Remote Satellite

The Ruth Remote Satellite is predominantly located on private grasslands. The license area is approximately 572 hectares (1,414 acres), although only a portion of this area will be disturbed similar to the other satellite locations. Surface disturbances will include mine unit pattern areas during well field construction, surge ponds, IX recovery and water treatment facilities, mine unit piping distribution centers, pipelines, booster pump stations and roads. Current disturbances at this site cover approximately 1.7 hectares (4.3 acres). Reclamation will follow all development projects and ensure that the disturbed area at any given time is kept to a minimum.

Other land uses within and adjacent to the Ruth Remote Satellite include the development of other natural resources such as oil, gas, uranium, and CBM. Currently all of these land uses are present **within and** adjacent to the license area and approval of the proposed action will not affect these land uses.

4.1.2 Potential Impacts of the No-Action Alternative

The no-action alternative would result in no additional potential land use impacts within SUA-1548 **license areas**. All current ISR production at Smith Ranch would cease and the current, though minimal potential land use impacts (fencing and restricted grazing) would slowly decrease as decommissioning, reclamation and restoration continue. The additional existing surface disturbances at the remote satellites will also need to be reclaimed. The total area within SUA-1548 **license areas** that will need to be restored and reclaimed is approximately 624 hectares (1,542 acres). These lands will return to grazing and other energy development land uses.

4.1.3 Potential Impacts of the Alternative Action

Conventional underground and/or open pit mining represent the two available alternatives to ISR for the uranium deposits at SUA-1548 **license areas**. Both of these alternatives involve significantly greater potential short- and long-term impacts to land use and have historically taken place within **each** license area. As compared to ISR, conventional mining practices include large areas of mining, especially open pit mining, large stockpile areas, roads, processing facilities and large tailings disposal areas. Compared to the proposed action, conventional open pit mining could increase the acreage of disturbance by a factor of 100. Such lands disturbed by conventional mining would be removed from grazing for the life of the mine and often 10 years or more past reclamation. Conventional underground mining would result in an increase in land disturbance over ISR operations, but not as significant as conventional open pit mining. While the shaft and mill associated with underground mining is a smaller land disturbance, evaporation ponds and/or heap leach footprints can be substantial. In either case, the impact on land use would be far more significant if conventional mining methods were employed when compared to the proposed action.

4.1.4 Cumulative Effects of the Proposed Action

As discussed in Sections 2.2 and 3.1 **of this ER**, the primary land use within and adjacent to **the** SUA-1548 **license areas** is energy development (oil and gas, coal, CBM, ISR and wind) and agriculture (cattle and sheep grazing). No major changes in land use are expected in the foreseeable future. Cameco's ISR operations have been and will continue to be compatible with energy development in the region and will only minimally disturb land surfaces and agricultural uses. It is estimated that less than **10%** of the total SUA-1548 licensed acreage will be disturbed throughout the life of the project, and ongoing efforts to minimize potential land use impacts will be taken (see Section 5.1). Cattle and sheep grazing will be temporarily limited as a result of construction and operation, but all land within SUA-1548 will be reclaimed and restored to its original use. Potential impacts to wildlife habitat and recreation will also be small because of the limited disturbance to the land. As a result, potential cumulative land use impacts from SUA-1548 are expected to be minimal in the Powder River Basin and Wind River Basin (see Section 2.2). Additional information regarding environmental effects of land use are discussed in Sections 7.1.2 and 7.2.3 of the TR.

4.2 Potential Transportation Impacts

4.2.1 Proposed Action

Selection of the proposed action will result in **minimal** potential impacts to transportation based on current traffic loading estimates (WYDOT, 2010) and transportation accidents impacts. Transportation activities associated with SUA-1548 include employee commuting, supply shipments, waste transportation, IX resin transport, and yellowcake transportation. ISR operations will increase local traffic volumes, but the change will be relatively small compared to local traffic volumes in the region. **Less traffic disturbance is predicted during the construction, aquifer restoration, and decommissioning phases than during the operational phase. To reduce the potential impacts from a traffic accident,** materials and supplies will be transported according to NRC and DOT regulations. Specific and quantifiable estimates of the potential impacts of the proposed action on local and regional transportation corridors are provided below. Mitigative measures, including emergency response plans and procedures, implemented to decrease potential impacts to transportation are discussed in Section 5.2 **of this ER**.

4.2.1.1 Smith Ranch

Most of the Smith Ranch license area is currently in operation so no major changes in workforce vehicle traffic are expected. There will be an increase in workforce at the remote satellites ranging from 50 to 60 people at North Butte to 75 people at Gas Hills. **Potential** yellowcake slurry **shipments** from the **Gas Hills Remote Satellite** to the CPF and/or the CPP will increase as well as dried yellowcake shipments from Smith Ranch to the conversion **facilities** in **Metropolis, Illinois or** Port Hope, Ontario, **including anticipated shipments to either the Smith Ranch CPP or the Highland CPF due to toll milling of resin or yellowcake slurry received from Cameco's remote satellites or other NRC licensees.** North Butte is expected to ship 170 truckloads of uranium-laden resin to Smith Ranch each year, while Gas Hills is expected to ship 447 truckloads of uranium-laden resin or yellowcake slurry to Smith Ranch each year. The number of shipments from these remote satellites is relatively small, with North Butte having an average daily truckload of 0.45 and Gas Hills having an average daily truckload of 1.2 relative to **reported** traffic loading estimates (WYDOT, 2010 and ER Section 3.2). The Ruth Remote Satellite would likely be similar to North Butte and ship less than one truckload per day to Smith Ranch. The addition of two to three truckloads between the remote satellites and Smith Ranch will not increase traffic rates on local roads by more than 1% and will likely be negligible. Specific traffic routes are discussed in further detail in Section 3.2 **of this ER**.

4.2.1.2 North Butte

In the Powder River Basin, the primary potential traffic impacts from resin transfers between the North Butte Remote Satellite and Smith Ranch CPP or CPF will be realized on State Highway 387 between State Highway 50 and Highway 259. The increase in traffic will be less than 0.25%. Project-related traffic will be greatest from the operations and construction workforce which will be housed in surrounding communities. This workforce will commute to and from worksites and travel within worksites during work hours. A total of **33** vehicles are expected to commute to the North Butte Remote Satellite each day with approximately 75% coming from Gillette and 25% coming from Casper. The percent increase on State Highway 50 coming from Gillette and the percent increase on State Highway 259 and 387 from Casper would be less than 3% and less than 1%, respectively.

4.2.1.3 Gas Hills

The Gas Hills Remote Satellite will increase traffic along **the following routes**: State Highway 136 between Riverton and the Gas Hills; Gas Hills Road from the satellite to State Highway 20 at Waltman; State Highway 26 north of Riverton to Shoshoni; and State Highway 20/26 from Shoshoni to Casper. Cameco estimates that ISR operations will increase travel to and from the Gas Hills Remote Satellite each day by approximately 20 to 30 vehicles and its greatest impact will be on traffic counts on the Gas Hills Road. Eighty percent are expected to travel from Riverton and **20%** from Casper for the lifespan of the Gas Hills Remote Satellite. The percent increase on State Highway 136 would be 23% and the increase on State Highway 20/26 east of Casper would be less than 2% (WYDOT, 2010). Although the relative increase in traffic along State Highway 136 is large, the road capacity of this state highway can easily accommodate this increase. At one time Wyoming 136 (Gas Hills Road) had the transportation capacity to accommodate workers for three to four simultaneously operating conventional mines and mills (Pathfinder, Umetco, Energy Fuels and American Nuclear). This transportation capacity remains and has been significantly underutilized since the mid-1980s.

4.2.1.4 Ruth

Similar to North Butte, Ruth will likely have their workforce come from either Gillette or Casper. Increases in traffic are likely to be similar to North Butte and will not likely increase traffic from either

Gillette or Casper by more than 3%. If both satellites operate simultaneously the net increase in traffic on Highway 50 could be approximately 5%.

4.2.2 Potential Transportation Accident Impacts

Resin, yellowcake slurry, dried yellowcake and 11e.(2) byproduct material shipments are made in accordance with DOT, NRC, and Transport Canada (when applicable) regulations. Transportation of hazardous materials to and from SUA-1548 can be classified as follows:

- Shipments of uranium-laden resin and/or yellowcake slurry from SUA-1548 satellites **or third party uranium recovery facilities** to the CPP or CPF for processing.
- Shipments of process chemicals or fuel from suppliers to any SUA-1548 facility.
- Shipment of dried yellowcake from the CPP or CPF to a conversion facility.
- Shipments of 11e.(2) byproduct material from the CPP or CPF and satellites to a NRC licensed disposal facility.

SUA-1548 is an operating license, and approval of the proposed action will allow transportation of the above types of materials to continue. Transportation accident risks may increase as the number of shipments increase, but mitigation measures such as transportation training, compliance with current and future transportation regulations and hazardous waste clean-up preparedness and training will reduce this accident risk and impact of any accidents. Accident risks involving potential transportation occurrences are discussed in the following sections. Mitigation and control measures to eliminate or minimize potential environmental impacts due to transportation accidents are discussed in Section 5.2.

4.2.2.1 Potential Accidents Involving Ion Exchange Resin or Yellowcake Slurry Shipments

IX resin **will be** transported to and from the CPP or CPF in 15 **cubic meter** (4,000 gallon) capacity **exclusive-use** tanker trailers. As many as **two** loads of uranium-laden resin may be transported **from the remote satellites to the CPP or CPF** on a daily basis. **The transport of yellowcake slurry will be in a tanker trailer with an approximate volume of 17 cubic meters (4,500 gallons). The slurry shipments will be at a frequency of approximately four shipments per month or 48 per year. This transport of uranium** will occur on a combination of private, county, and state roads.

For shipments of IX resin **or yellowcake**, NRC determined that the probability of an accident involving such a truck **would be** 0.009 in any year **for loaded resin and 0.04 for dried yellowcake** (NRC, 2009). **In NRC's Supplemental EIS for the Lost Creek ISR Project, NRC determined that the annual accident risk for yellowcake slurry would be less than that evaluated in the GEIS because (1) the wet yellowcake slurry would be less concentrated and less dispersible in air than dry yellowcake; (2) the shipment distance evaluated in the GEIS is considered bounding for potential yellowcake drying locations; and (3) the number of proposed shipments would be less that that evaluated in the GEIS. Therefore, the radiological accident risk associated with the shipment of yellowcake slurry would be bounded by the GEIS analysis (NRC, 2011). Cameco considers that the rationale NRC used to evaluate risk of yellowcake slurry transport accidents for the Lost Creek Project is applicable to evaluating the risk of an accident resulting from the transport of yellowcake slurry from the Gas Hills Remote Satellite to the Smith Ranch CPP.**

To further ensure that the risk of an accident involving yellowcake slurry will be minimal, Cameco will transport the slurry in exclusive use specially designed DOT approved vehicles and will adhere to existing transportation regulations in 49 CFR 171-189 and 10 CFR 71. All drivers will be properly

licensed and trained in the transport requirements of yellowcake and how to properly respond to accidents involving yellowcake slurry or resin. Cameco staff will be the primary responder to any accident involving resin or yellowcake slurry and will be responsible for cleaning up any spilled material at an accident site.

The worst case accident scenario involving resin **or slurry** transportation would be an accident involving the transport truck and tanker trailer where the **entire** tanker contents were spilled. **In the event of an accident involving uranium laden IX resin, the fact that** the uranium is ionically-bonded to the resin and the resin is in a **moist** condition during shipment, **minimizes** the potential radiological and environmental impacts of such a spill. **Similarly for yellowcake slurry, the fact that the material is moist and will not disperse into the air as dry yellowcake would, the potential impacts from such a spill would also be minimal. The viscosity of the slurry or resin will reduce the chances of spill migration away from the accident site and potentially reaching a waterway prior to containment. The primary environmental impact associated with either type of accident would be the removal of soils impacted by the spill area and the subsequent damage to the topsoil and vegetation structure. In the event of a transportation accident a**reas impacted by the removal of **spilled material, including impacted** soils **and vegetation would be replaced with imported clean soils,** graded and revegetated.

4.2.2.2 Potential Accidents Involving Shipments of Process Chemicals and Fuel

It is estimated that approximately four bulk chemical, fuel, and supply deliveries are made per working day throughout the operational life of SUA-1548. Types of deliveries include carbon dioxide, oxygen, salt, soda ash, hydrogen peroxide, sulfuric acid, hydrochloric acid and fuel. All shipments are made in accordance with the applicable DOT hazardous materials shipping provisions.

4.2.2.3 Potential Accidents Involving 11e.(2) Byproduct Material

11e.(2) byproduct material, including unusable contaminated equipment generated during operations, will be transported to a NRC licensed disposal site. Because of the low levels of radioactive concentrations involved, these shipments are considered to have minimal potential environmental impact in the event of an accident. Shipments are generally made bulk in sealed roll off containers in accordance with the applicable NRC and DOT hazardous materials shipping provisions.

4.2.2.4 Potential Accidents involving Dry Yellowcake Transportation

NRC and others have previously analyzed the hazards associated with dried yellowcake transportation for both the generic case (Mackin, et al., 2001; NRC, 1980, NRC, 1977) and in site-specific environmental assessments (e.g., in NRC, 1997). These analyses are conservative and tend to overestimate potential impacts (e.g., release model, accident rates, dosimetry selections, exposed population density); however, they are appropriate for screening-level calculations. The NRC concluded that the risk analyses combined with past experience show estimated and actual consequences of such accidents are small, due in part to the appropriate use of safety controls and emergency response protocols on the part of the Licensee (NRC, 2009).

4.2.3 No-Action Alternative

The selection of the no-action alternative would result in a short term increase in 11e.(2) byproduct material transportation, but in general and over the long term a reduction in overall potential transportation impacts would occur as the workforce and shipments decrease. There may be some yellowcake shipments during restoration activities; however, overall construction activities, employee access and transportation of ISR-related fuels and supplies to the licensed facilities or waste materials away from facilities will cease following reclamation of existing SUA-1548 disturbances. Access roads, buildings and existing wells and well fields at Smith Ranch (approximately 570 hectares or 1,409 acres), North Butte (12 hectares or 30 acres), Gas Hills (39 hectares or 97acres) and Ruth (1 hectare or 4 acres) will all need to be reclaimed. This will result in a temporary increase in construction traffic over current levels, but will result in overall reduction in potential transportation impacts as the workforce decreases.

4.2.4 Alternative Action

The alternative action would include a conventional underground or surface uranium mine **and mill**. The selection of this alternative would result in a significant increase in potential transportation impacts. A conventional **mill** may include processing facilities such as a new plant, tailings ponds or a conventional heap leach. A conventional open pit mine would include a significantly greater work force given the size of the operation and potential labor needs. Whereas ISR facilities require drilling rigs (2-3 men per rig) and facility operating staff travelling to the header houses, satellites and inspection of pipelines, a conventional mine/**mill** requires either contract or company labor to drive scrapers, dozers, trucks and shovels. To strip 7,646 meters (10,000 yards) per day, an operation would likely require eight scrapers, four trucks, and two shovels as well as management and supervisory staff. Geologic and mine planning conditions would dictate the acreage stripped to meet production goals. Additionally, for any operation, ISR or conventional, personnel are required to meet needs at the plant, including engineers, chemists, environmental and safety staff, etc. For an equivalent conventional operation, one might anticipate two to three times the impact on roads that one would see with an ISR operation. A conventional **mill** will also require hazardous materials to be transported to customers or to an off-site location for processing. For the purposes of this analysis and assuming production goals are the same, it is assumed that shipping hazardous materials would be equivalent for both ISR and conventional mine operations.

4.2.5 Cumulative Effects of the Proposed Action

Cumulative effects from transportation at SUA-1548 are not anticipated to be significant. The existing and additional ISR operations during the renewal period will only minimally impact local road traffic within and adjacent to SUA-1548 license areas and when considered on a cumulative basis with regional energy development will have a negligible impact. ISR recovery at SUA-1548 **facilities** will contribute a proportionally small portion of additional traffic to area roads as compared to other energy development and agricultural activities. The SUA-1548 sites are remote and local transportation networks include agricultural traffic, and the workers associated with other ISR operations, CBM, conventional oil and gas as well as wind development. Smith Ranch is an ongoing operation and approval of this LRA will result in an increase of the number of personnel to **approximately** 170. The remote satellites will require additional personnel during initial construction, but this number will be reduced during operational periods. The majority of roads utilized by ISR operations are already built and additional roads will have relatively low rates of traffic so potential impacts to agriculture, recreation and wildlife are expected to remain small.

4.2.6 References

U.S. Nuclear Regulatory Commission. 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (NUREG-1910). Page last reviewed/updated Sunday, March 13, 2011.

U.S. Nuclear Regulatory Commission. 2011. Supplemental Environmental Impact Statement for the Lost Creek ISR Project in Sweetwater County, Wyoming.

Wyoming Department of Transportation (WYDOT). 2010. Automatic Traffic Recorder Report – 2010. Prepared in cooperation with U.S. Department of Transportation, Federal Highway Administration.

4.3 Potential Geology and Soils Impacts

4.3.1 Proposed Action

Potential geologic and soil impacts associated with ISR operations are significantly less than conventional underground or open pit mining. SUA-1548 geologic impacts have been in the past and are anticipated to continue to be negligible, and soil impacts will be minimal as well. The following sections describe the potential impacts to geology and soils associated with the proposed action.

4.3.1.1 Potential Geologic Impacts

Smith Ranch and the North Butte and Ruth Remote Satellites

Potential geologic impacts at Smith Ranch and the North Butte and Ruth Remote Satellites are expected to be minimal, if any. Unlike conventional uranium mining, ISR does not remove formation material from the aquifer, minimizing the chance of subsidence. No significant matrix compression or ground subsidence has been observed during 25 years of ISR operations at Smith Ranch, nor is it expected to result in the future from the proposed action.

Historical seismic activity within and around SUA-1548 **sites** are summarized by county in Section 3.3 **of this ER**, and have been reviewed and evaluated by the NRC Staff during previous licensing actions for Cameco and other licensees operating in the region. While seismic activity has occurred, the earthquakes have been relatively small with minimal impacts. Additionally, no active faults with a surficial expression have been documented at Smith Ranch or the North Butte and Ruth Remote Satellites. As a result, potential environmental impacts from seismic activity are expected to be minimal. Mitigation measures to reduce potential impacts from seismic activity are discussed in Section 5.3 **of this ER**.

Gas Hills Remote Satellite

Potential geologic impacts from subsidence are expected to be minimal at the Gas Hills Remote Satellite for the same reasons as cited above for Smith Ranch, North Butte and Ruth Remote Satellites. Because ISR does not remove formation material from the aquifer, no subsidence or matrix compression is anticipated.

Section 3.3 **of this ER** summarizes historical seismic activity within and around the Gas Hills Remote Satellite. In general, there has been minimal expression of regional earthquakes. The closest **major** fault **system**, the Green Mountain segment of the South Granite Mountain Fault System, is located about 45 kilometers (28 miles) from the Gas Hills Remote Satellite. This fault was analyzed deterministically to estimate ground motion at the Gas Hills Remote Satellite. Results from this study indicated that horizontal ground acceleration at Gas Hills would be approximately 6%g for a magnitude 6.75 earthquake (see Section 3.3 **of this ER**). With seismic activity anticipated to be small, potential impacts at the Gas Hills Remote Satellite are also anticipated to be minimal. Mitigation measures, as described in Section 5.3 **of this ER** will minimize potential impacts from seismic activity at the Gas Hills Remote Satellite.

4.3.1.2 Potential Soils Impacts

The principal impact to **soils** at SUA-1548 **sites** will be from earthmoving activities associated with construction of ISR facilities. Earthmoving activities include:

- Clearing of ground or topsoil and preparing surfaces for the satellite facilities, pump houses, access roads, drilling sites, and associated structures;
- Excavating and backfilling trenches for pipelines and electrical cables;

- Excavating evaporation ponds and developing evaporation pond embankments; and
- Removal of potentially contaminated soils, if present, **resulting** from casing or pipeline leaks, surface spills from wells or header houses, and leakage from lined ponds or land application facilities.

Construction activities may increase the potential for erosion from both wind and water due to the removal of vegetation and the physical disturbances from vehicle and heavy equipment traffic. Likewise, compaction of soils and removal of vegetation resulting from construction activities may increase the potential for surface runoff and sedimentation in local drainages and streams outside disturbed areas. Section 3.8.**3** of the TR describes topsoil management practices, topsoil stockpiling, erosion control methods, and the use of surface water diversions and best management practices (BMP) to minimize potential soil impacts associated with ISR operations.

Most soil disturbances associated with ISR are short-term. Topsoil and land recovery is initiated as soon as possible following construction. In general, soil disturbance of mine units typically lasts approximately 6 months. Compared to conventional mining practices, ISR surface disturbances are small and potential impacts are minimized by implementing appropriate mitigation measures (see Section 5.**3.2 of this ER**).

Although unlikely, an unexpected spill could impact soils. The monitoring plan designed by Cameco quickly detects and responds to spills to minimize potential impacts. Should a spill occur, potential impacts are expected to be localized and short-term. Further information regarding potential spills and associated impacts are discussed in Sections **3.12 and 5.3.2 of this ER** and **Sections 3.10 and** 4.2 of the TR. Mitigation measures to reduce the chance of a spill from occurring are presented in Section 5.0 of this ER.

Smith Ranch

It is estimated that construction and operations associated with the development of mine unit pattern areas will disturb approximately 761 hectares (1,880 acres), or less than 5% of the total Smith Ranch license area during the renewal period. Due to current operations, much of the Smith Ranch license area used for well field development has already been disturbed and subsequently reclaimed; existing disturbances cover approximately 570 hectares (1,409 acres) or 75% of the expected total. Therefore, additional potential impacts to the topsoil resource within the license area are anticipated to be minor. In the 14 years between 1996 and 2010, approximately 7 hectares (17 acres) have been disturbed by pipeline spills, well or header house leaks. Since 2008 Cameco has significantly upgraded their leak detection systems, QA/QC of pipeline construction and welds as well as header house inspection and spill control (see Section 3 of the TR). During this license period, it is anticipated that the impact of spills to the topsoil resource will be significantly less than the 7 hectares (17 acres), which has already occurred.

North Butte Remote Satellite

The North Butte license area consists of approximately 409 hectares (1,010 acres). It is anticipated that a total of approximately 162 hectares (400 acres) of soil will be disturbed during the life of the project. Current surface disturbances total about 12 hectares (30.5 acres), primarily from boreholes and monitor wells (**Figure 1.10, Proposed Site Layout** in the TR). Because restoration, final reclamation and interim surface stabilization occur contemporaneously with development and production, at any given time the total area disturbed will be less than the projected figures. All system upgrades mentioned above for Smith Ranch will be applied at all of the remote satellites. During this license renewal period, it is anticipated that the impact of spills to the topsoil resource will be insignificant.

Gas Hills Remote Satellite

The Gas Hills Remote Satellite license area is about 3,440 hectares (8,500 acres), but less than 20% (607 hectares or 1,500 acres) of the Gas Hills Remote Satellite license area is expected to be disturbed throughout the lifespan of the project. Existing buildings, drill holes and access roads present at the Gas Hills Remote Satellite currently account for approximately 40 hectares (98 acres) of the expected total soil disturbances. Most of the disturbances will be short-term as revegetation and reclamation will immediately follow construction activities. To reduce potential impacts, topsoil will be stockpiled and erosion control measures will be implemented (see Section 3.7 of the TR). When considering potential soil impacts, pipeline spills and header house/wellhead leaks are a potential impact. As discussed above, Cameco will adapt updated engineered leak detection procedures and construction practices to all of their remote satellites. During this renewal period, it is anticipated that the impact of spills to the topsoil resource will be insignificant.

Ruth Remote Satellite

Similar to the other remote satellite locations, soils at the Ruth Remote Satellite will likely be minimally impacted from the planned ISR operations. The Ruth Remote Satellite license area contains 572 hectares (1,414 acres) and only a small portion of this area will be disturbed. Assuming a similar ratio as North Butte, one can assume that approximately 113 hectares (280 acres) of soils may be disturbed. Current disturbances at this site cover approximately 2 hectares (4 acres). Reclamation will follow all development projects and ensure that the disturbed area at any given time is kept to a minimum.

Although operating plans have not yet been developed for the Ruth Remote Satellite, these plans will be made available to NRC before ISR operations commence. The anticipated disturbances will likely be a small fraction of the license area, similar to development at the other remote satellite locations.

4.3.2 No-Action Alternative

The no-action alternative would not increase potential geology or soil impacts at SUA-1548 **sites**. Decommissioning and reclamation would involve aquifer restoration and heavy equipment used to complete reclamation. No new areas would be disturbed and the current uranium recovery operations at Smith Ranch would be terminated. Neither the decommissioning of Smith Ranch nor the reclamation of the current surface disturbances at the remote satellites will influence potential impacts to geology. Under the no-action alternative, soils that have been impacted by the construction of the existing disturbances (buildings, roads, ponds and mine units) would be reclaimed and restored at Smith Ranch and the remote satellites (North Butte, Gas Hills and Ruth).

4.3.3 Alternative Action

Potential geologic impacts associated with conventional underground or open pit mining **and milling** are more severe compared to ISR. Conventional open pit mining removes all topsoil, overburden and the rock matrix and structure where the uranium is located. By removing, stockpiling and/or processing all of these rock materials, the entire geologic strata is radically disturbed. At the end of mining, the overburden material is indiscriminately returned to the mine pit as backfilled spoils. The natural horizontal and vertical stratification is destroyed. In the event of conventional underground mining, the overlying rock strata may collapse into the mining zone resulting in subsidence of the overlying strata.

Potential soil impacts associated with conventional underground or open pit mining have a greater footprint and are more long-term than soil impacts from ISR. In open pit mining, a significant proportion of soil is disturbed because topsoil has to be removed before any overburden can be removed. The storage of the overburden and tailings piles further impacts soils. While most potential soil impacts from

ISR are short-term, most soil impacts from conventional underground or open pit mining are long-term. In conventional mining, the soils remain degraded throughout the life of the mining project because they cannot be reclaimed until the entire mining operation is completed. In contrast, ISR operations reduce potential soil impacts by reclaiming and restoring surface disturbances contemporaneously with development and operations throughout the project life.

4.4 Potential Water Resources Impacts

4.4.1 Proposed Action

4.4.1.1 Surface Water

Potential impacts to surface water bodies and wetlands as a result of constructing and operating the **SUA-1548** ISR facilities may include:

- Water quality degradation from temporary increases in suspended solids concentrations above background levels during the construction of roads or well fields adjacent to drainages, as well as runoff from disturbed lands. With the exception of road crossings, no construction will occur within stream channels.
- Increased sedimentation in water bodies resulting from construction of roads or well fields adjacent to drainages or construction activities on adjacent upland areas.
- Channel and bank modifications that affect channel morphology and stability.
- Reduced flow in drainages where fill has occurred.
- Water quality degradation in water bodies, impoundments, or surface water supplies from spills or leaks of fuel, lubricants, or hazardous materials during construction, operation, or transportation of such materials.
- Filling and destruction of wetland areas (NRC, 2009).

During operations, surface water could be impacted by accidental spills from the facility or by permitted discharges. Spills from the CPP or mine unit wells, as well as spills during transportation, could impact surface waters by contaminating available surface water or by contaminating surficial aquifers that are hydraulically connected to surface waters (NRC, 2009).

There **have** been minimal impacts to surface water at Smith Ranch as a result of past and ongoing ISR operations. It is anticipated that impacts will continue to be minimal during the next renewal period. A Storm Water Pollution Prevention Plan has been developed and will continue to be implemented for all construction and operations activities to protect surface waters. Cameco has and will continue to utilize BMP to ensure that all disturbed surface runoff is contained and treated **(see Section 3.8.3 Erosion Control Methods of the TR).** Mine unit construction disturbances are short term and are revegetated as soon as practicable following construction **(see Section 4.5 of this ER).** There has been and will continue to be little to no discharge to surface drainages of sediment-laden water produced by production or construction activities. Culverts are and will continue to be used to pass surface water flow below roads and facilities, and as such, there will be no retention or impounding of surface water.

All wastewater is disposed via permitted UIC Class I disposal wells, evaporation ponds or land application facilities. During operations, surface waters could be impacted by accidental spills from the facility. Cameco has a rigorous monitoring and inspection program that allows for the monitoring of mine unit well and pipeline pressures remotely as well as daily inspections to header houses and mine unit pattern areas. This monitoring program ensures that should a leak occur, it will be contained and cleaned up immediately upon discovery. Such impacts are short term and controlled and will not likely impact surface water.

To monitor surface water impacts from ISR operations, routine sampling has been **performed** and will continue **for the duration of the Project** (see Sections 3.4 and **6.2 of this ER**, and Section 5.9 of the TR). This surface water quality sampling will ensure that residual source material from leaks or spills do not reach surface waters.

4.4.1.1.1 Smith Ranch

ISR operations are ongoing at Smith Ranch and there have been no negative impacts to area surface waters during the past 25 years of operations. Surface waters within Smith Ranch are predominately ephemeral. Streams generally flow in response to snowmelt and heavy rains. Seasonal flows, stock ponds, and impounded surface water are used for stock watering and are utilized by wildlife. **Cameco does not utilize surface waters for any project related production or non-production uses**. Samples are routinely collected at selected surface water locations and analyzed for certain radiological constituents to ensure that surface water is not being impacted by the ISR operations (see Section 3.4 **of this ER**). Based on the past data, and the fact that operational processes at Smith Ranch will not change within the next renewal period, it is anticipated that surface water impacts at Smith Ranch will continue to be minimal and insignificant.

All wastewater at Smith Ranch is disposed via permitted disposal wells or land application. From 1996 through 2010, approximately 6.7 hectares (16.5 **acres**) at Smith Ranch have been impacted by spills from pipeline leaks and leaks from header houses. None of these spills have affected surface water resources. Cameco has a rigorous monitoring and inspection program that allows for the monitoring of mine unit well and pipeline pressures remotely as well as daily inspections to header houses and mine unit pattern areas. This monitoring program ensures that should a leak occur, it will be contained and cleaned up immediately upon discovery. Such impacts are short term and controlled and will not likely impact the surface water. Spills from the CPP or during transportation of IX resin, yellowcake or waste materials will be closely monitored, and any spills will be cleaned up immediately (see Section 3.0 of the TR). It is anticipated that continual improvements in leak detection and alarm systems will make impacts from well field spills and leaks even less during the next renewal period.

4.4.1.1.2 Remote Satellites (North Butte, Gas Hills and Ruth)

Surface water within the remote satellite license areas for North Butte, Gas Hills and Ruth are generally ephemeral and flow in response to snowmelt or large rain events. There are two active springs that provide intermittent flow to stream courses within the Gas Hills Remote Satellite license area. All 16 surface water rights at North Butte are for reservoirs and stock reservoirs. These reservoirs contain water during a wet spring and/or following a significant rainfall/runoff event. Both the Gas Hills and Ruth Remote Satellites have all but one surface water right allocated to livestock and wildlife use, and both satellites also have one industrial allocation. **Cameco does not anticipate using surface waters at any of the remote satellite locations for any project related production or non-production use.**

At North Butte and Ruth, all wastewater will be disposed via permitted UIC Class I disposal wells. At the Gas Hills Remote Satellite, Cameco anticipates **the use** of evaporation ponds **while the use of** UIC Class I disposal wells **is being studied**. Although pipeline or header house spills could impact surface water resources, it is very unlikely. Cameco will continue their rigorous monitoring and inspection program at each remote satellite. This will allow monitoring of mine unit well and pipeline pressures remotely. Daily inspections will provide additional protection against larger volume spills. This monitoring program ensures that should a leak occur, it will be contained and cleaned up immediately upon discovery. Such impacts are short term and controlled and will not likely impact the surface water.

4.4.1.2 Groundwater

Potential impacts to groundwater as a result of ISR operations may include the following:

- Consumptive use of the ore zone aquifer (lowering of the water table/potentiometric surface via "bleed") during operations and groundwater restoration;
- Movement of lixiviant outside the mine unit monitor well ring or within aquifers above or below the production zone due to excursions;
- Inadequate groundwater restoration after ISR operations are complete; and
- Adverse effects on groundwater in shallow aquifers, if present, from casing or pipeline leaks, surface spills from wells or header houses, and leakage from lined ponds or land application facilities (NRC, 2009).

Groundwater modeling of the production zones at Smith Ranch and the North Butte and Gas Hills Remote Satellites has been completed and has determined that consumptive use of groundwater will have negligible impact on area use of groundwater resources. Since the approval of the last SUA-1548 LRA in May of 2001, there has been no defined diminution of groundwater resources to local area water users within and surrounding Smith Ranch. Based on operating history and the recent groundwater modeling, it is anticipated that impacts due to consumptive use of groundwater will continue to be negligible.

An excursion of production fluid beyond the monitor well ring or to an overlying or underlying aquifer could occur due to:

- An injection well casing failure;
- Failure to control well field pressures and/or flows;
- Uncontrolled movement of production fluids through an unidentified improperly abandoned drill hole; or
- Inadequate groundwater restoration after ISR operations are completed.

Although any of these potential impacts are possible over the life of an ISR operation, they are considered short term and local. Control of the ISR fluids and groundwater restoration is required by the regulatory agencies. Cameco is required by license condition to perform mechanical integrity testing of all Class III injection wells to ensure that the wells are constructed properly. During operations, production fluid is removed from the aquifer at a slightly greater rate than what is injected, thereby maintaining an inward flow direction. Monitoring wells are installed in a manner that allows the identification of an excursion before the excursion can migrate beyond the production zone or exempted aquifer. Prior to putting a mine unit into operation, hydrologic testing is conducted to quantify aquifer properties and injection rates, and identify any improperly abandoned drill holes. Finally, the ability to restore groundwater quality within an ISR mine unit at Smith Ranch has been demonstrated in the Q-Sand pilot restoration program, followed by the successful production and restoration of Mine Unit A. Mine Unit B groundwater restoration has been approved by the WDEQ but **an ACL application submitted by Cameco is** under NRC Staff evaluation. These restorations, as well as successful restorations at other ISR sites, show that groundwater can be returned to a water quality standard that is protective of public health, safety, and the environment.

Past recoveries of excursions show that any impact from an excursion will be limited in aerial extent and to the volume of water which must be removed to restore the groundwater quality. The excursion would be short-term and controlled. The magnitude of the impact to the regional groundwater supply will be much less than impacts that have occurred during dewatering of conventional mining operations. In conclusion, long term impacts on groundwater quality are not anticipated. Excursion prevention and control measures are described in Section **3 of the TR**. Groundwater restoration of impacted groundwater to baseline conditions is required by both WDEQ and NRC regulations using BPT which will also negate any potential impacts to groundwater caused by ISR operations (see Section 6 of the TR). Finally, shallow aquifers may be adversely impacted following well casing or pipeline leaks, surface spills from wells or header houses, and leakage from lined ponds or land application facilities. As mentioned previously, Cameco has instituted a rigorous monitoring and inspection program that allows the monitoring of injection/production well and pipeline pressures and flows remotely, as well as daily inspections to header houses and mine unit pattern areas. All evaporation ponds are double lined and contain a leak detection system. Failure of these ponds or pond liners and the ultimate release of fluids into the environment are unlikely to occur. In the event that a pond leak does occur, the leak will be immediately corrected and cleanup efforts will restore the local environment to ensure that the impacts are short term and isolated.

The operational groundwater **sampling** of monitor wells and nearby domestic and stock wells will ensure that there will be no impacts to nearby groundwater users due to excursions.

4.4.1.2.1 Smith Ranch

The affected groundwater aquifers at Smith Ranch are described in Section 3.4 **of this ER**. Cameco recognizes how important these aquifers are to the regional groundwater **regime** in that they can yield sufficient fresh water for beneficial use. Based on the available data and operational experience, drawdown impacts from SUA-1548 operations are expected to be minimal.

Aqui-Ver Inc. utilized consumptive use models and conservative (Theis) assumptions to assess potential hydrologic impacts from the ISR operations at Smith Ranch and concluded that ISR operations have in the past and will continue to have minimal impact on regional groundwater resources. Results from the Smith Ranch report predict that drawdown in the shallow water-table aquifer will be less than approximately 3 meters (10 feet) in stock and domestic well locations throughout the additional 33-year projected lifespan of the project. Only one stock watering and domestic supply well is expected to exceed 3 meters (10 feet) during the 33-year model period. Drawdown in this well, Mason #3, is expected to reach a maximum of approximately 6 meters (22 feet), because it is completed in the deeper production sand aquifer and is in close proximity to the Smith Ranch license boundary. Aqui-Ver's Cumulative Hydrologic Impact assessment for Smith Ranch and the Reynolds Ranch Satellite are included in **Appendix E, Cumulative Hydrologic Impact Analysis Report for Smith Ranch, North Butte, and Gas Hills. Section 3.4 of this ER discusses Cameco's use of ground water for production and non-production related purposes**.

During ISR operation, production fluid is removed from the aquifer at a slightly greater rate than what is injected, thereby maintaining an inward flow direction. Monitoring wells exist at each well field and have the capacity to identify an excursion. Cameco has successfully recovered excursions that have gone beyond the production zone and no groundwater contamination has occurred. Finally, the ability to restore groundwater quality within an ISR mine unit has been demonstrated in the Q-Sand pilot restoration program, followed by the successful production and restoration of Mine Unit A. These restorations, as well as successful restorations at other ISR sites, show that groundwater can be returned to a water quality standard that is protective of public health, safety, and the environment.

4.4.1.2.2 Remote Satellites (North Butte, Gas Hills and Ruth)

The affected groundwater aquifers at the remote satellites are described in Section 3.4 **of this ER**. Based on the available data and operational experience, drawdown impacts from operations at the remote satellites are expected to be minimal.

Aqui-Ver Inc. (Aqui-Ver Inc., 2011b) utilized consumptive use models and conservative (Theis) assumptions to assess hydrologic impacts from ISR at the North Butte and Gas Hills Remote Satellites and concluded that ISR operations will have minimal impact on regional groundwater resources at both locations. At the North Butte Remote Satellite, impacts to the shallow water-table aquifer are expected to be negligible. Stock and domestic wells in the production (B-sand) zone were found to be most likely impacted during the 16-year model period. The projected maximum drawdown will likely occur at the Pfister Ranch southeast of the North Butte Remote Satellite and is expected to be approximately 6 meters (22 feet). Wells completed in the overlying and underlying sands (C-Sand and A-Sand) at the North Butte Remote Satellite show maximum drawdowns of approximately 3 meters (10 feet). **Although these drawdowns appear to be substantial, the modeling study, in addition to addressing North Butte operational impacts, also addresses the cumulative impacts of three additional existing and planned nearby ISR facilities (Willow Creek, Nichols Ranch and the Hank facility) as well as CBM operations located within proximity to the North Butte Remote Satellite.**

As a practical matter, predicted hydrologic impacts associated with ISR and CBM development are typically not significant in magnitude. The potential impacts of the North Butte operation are even less when considered alone. Predicted drawdown from the North Butte ISR operation on its own are less than 8% of the available water column in wells having the greatest predicted drawdown impacts, and therefore would not adversely impact well yield. Equally important, wells having the greatest predicted North Butte drawdown are deep domestic and stock watering wells; these are typically low-yield wells which will not suffer loss of production given the small demand. In the event the predicted small drawdowns should cause a significant impact on any domestic well yield, Cameco would resolve this matter by providing an alternative or supplemental water supply for the well owner.

Results of the groundwater modeling study demonstrate that the proposed 1% bleed during production will be more than adequate to provide hydraulic containment of mining solutions at the North Butte Remote Satellite (e.g. inward hydraulic gradient across the well field at all times during the mine unit lifecycle). Furthermore, as the North Butte Remote Satellite matures and mine units are placed into restoration, the overall average facility bleed rate will increase significantly given relatively higher bleed rates approaching 5% during restoration. Higher future facility bleed rates will result in an overall increase of hydraulic containment of well field fluids. The Aqui-Ver report on the Cumulative Hydrologic Impact Assessment for **the** North Butte **Remote Satellite** is included **in Appendix E.**

Hydrologic impacts due to the Gas Hills ISR development were simulated using a three-dimensional groundwater flow model. Hydrologic impacts were evaluated over an estimated 20 year ISR development and restoration period. The drawdown impact computed by the groundwater flow model was evaluated at 45 water well and spring locations within a 16 kilometer (10-mile) radius of the Gas Hills facility.

In general, maximum drawdown impacts are predicted to occur around Development Years 8 and 9, corresponding to the period of maximum groundwater withdrawals. Maximum on-site drawdown impacts are predicted to be approximately 3 meters (10 feet) at the permit boundaries within the production sand aquifer. Impacts to all domestic and stock wells are predicted to be less than 0.3 meters

(1-foot) over the life of the mine development, with no measurable decrease in spring flow. Drawdown impacts are predicted to be relatively small primarily because stock and domestic wells are installed in the shallow water-table aquifer and are hydraulically isolated from the underlying production sand aquifer by lower permeability sediments. Drawdown in the production sand aquifer is also limited by the presence of pit lakes with large storage capacity, areas of higher transmissivity across the eastern portion of the facility, and the location of the facility adjacent to the Beaver Rim groundwater recharge area. Although not simulated, the presence of abandoned underground mine workings within Mine Units 2, 3, 4 and 5 should also act to reduce drawdown impacts due to the high conductivity and storage capacity of the workings. **The Aqui-Ver report on the Cumulative Hydrologic Impact Assessment for the Gas Hills Remote Satellite is included in Appendix E**.

Based on the hydrologic modeling performed at the remote satellites plus the fact that operational controls and constraints will be the same as are used at Smith Ranch, Cameo does not anticipate impacts to private domestic wells due to aquifer drawdown during ISR operations. Should problems be identified with any domestic well within 2 kilometers (1 mile) of the license boundary, Cameco commits to providing an alternate source of water to the water user.

4.4.2 No-Action Alternative

The no-action alternative will not have any positive or negative direct, indirect, or cumulative impacts on water resources. Site reclamation and restoration activities will commence. There will be a short term surface disturbance as buildings, roads, and ponds are removed. Existing well fields at Smith Ranch will enter restoration and groundwater impacts to the extent that they have occurred will decline over time as restoration is achieved.

4.4.3 Alternative Action

Selection of the alternative action (conventional underground and/or open pit mining) would result in an increase in disturbance to all water resources when compared to ISR. Surface water impacts are far more pronounced with respect to conventional open pit mining, where the footprint of the disturbed area includes the mine pit, adjacent spoil dumps, topsoil stockpiles, roads, and facilities typically requiring diversions of streams and drainages around the disturbed area. The potential for sediment runoff from conventional mining facilities is much greater and of a longer duration than what will occur with the proposed action. ISR results in significantly smaller land disturbance than conventional uranium mining and has significantly less impact on both surface and groundwater conditions.

With the alternative action, there would be a significant impact to groundwater. Both underground and open pit mining impact the groundwater by causing aquifers that were previously separated by confining layers to comingle. In an effort to mine the uranium ore, mine dewatering is necessary which results in a significant consumption of groundwater. Dewatered groundwater is often discharged to surface water and results in erosion and sediment transport downstream. During the dewatering and mining process, there is a net consumption of water and an overall drawdown of the aquifer. The volume of water permanently removed (consumed) and discharged from the aquifer is significantly greater than that associated with ISR. During the mine reclamation phase, unclassified overburden is indiscriminately backfilled into the mine pit. This results in not only a commingling of discrete sandstone aquifers, but may also result in elevated water quality parameters. Conventional mining causes the oxidation of the ore zone in air, which may result in the long term development of acid conditions in the pit or underground workings and will generally result in an overall change in groundwater and/or surface water quality. For example, oxidation of the ore zone, host rock and other mineralized areas (once groundwater recovers) will generally result in degradation of water quality due to an increase in total dissolved solids, sulfates and dissolved metals such as iron, manganese, aluminum, molybdenum, selenium, and boron. Backfilling of the mine pit may also introduce other mineral constituents associated with accidental spills and/or surface contamination.

4.4.4 Cumulative Effects of the Proposed Action

Cumulative effects on water resources associated with SUA-1548 ISR operations have been and are anticipated to continue to be small. Nominal surface water impacts are expected from ISR operations in both the Powder River and Wind River Basins, and cumulative impacts from other regional energy development (CBM, oil and gas, wind, uranium, and coal) are also expected to be insignificant. The majority of surface waters within **the** SUA-1548 license areas meet the State of Wyoming Class III **or IV** standards for livestock and approval of the proposed action will not significantly impact surface water quantity or quality.

Although impacts will likely be greater for groundwater than surface water, cumulative effects on groundwater are still anticipated to be relatively small for the lifespan of the sites. The hydrologic assessments conducted at Smith Ranch and the Gas Hills and North Butte Remote Satellites examined cumulative impacts to groundwater resources. For Smith Ranch, the production of formation fracturing (frack) water associated with development of the Niobrara Shale **oil resource** was added to the model, and groundwater impacts were still deemed insignificant (Aqui-Ver Inc., 2011a). For the North Butte Remote Satellite, impacts from ISR operations and CBM development outside of the North Butte Remote Satellite area were also taken into consideration. Results indicated that 23 of the 81 wells studied would have cumulative drawdown over 3 meters (10 feet) and two wells would have cumulative drawdown over 6 meters (20 feet). Drawdown is expected to be greatest in wells nearest the proposed ISR operations and in wells screened across equivalent horizons to ISR production sands. Despite anticipated drawdowns in some surrounding North Butte Remote Satellite wells, Aqui-Ver Inc. (2011b) concluded that ISR operations at the North Butte Remote Satellite will not impact nearby ISR facilities at Willow Creek, Hank, or Nichols Ranch, nor will it interfere with containment of ISR fluids at the North Butte Remote Satellite. In addition, cumulative impacts to water resources from ISR will be significantly less than those likely to occur from conventional underground or open pit uranium mining.

4.4.5 References

Aqui-Ver Inc., 2011a. Cumulative Hydrologic Impact Assessment: Cameco Resources, Smith Ranch-Highland and Reynolds Ranch Facilities, Converse County, Wyoming. Wheat Ridge, CO.

Aqui-Ver Inc. 2011a. Cumulative Hydrologic Impact Assessment: Cameco Resources North Butte Facility, Campbell County, Wyoming. Wheat Ridge, CO.

U.S. Army Corps of Engineers (USACE). "Nationwide Permits Effective March 19, 2007, Expire on March 19, 20102." Fort Worth, Texas: Fort Worth District. 2007a. http://www.swf.usace.army.mil/pubdata/environ/regulatory/permitting/nwp/2007/index.asp> (4 December 2007).

USACE. "Nationwide Permit 14: Linear Transportation Projects." Effective Date: March 19, 2007) (NWP Final Notice, 72 FR 11181, para.3). Fort Worth, Texas: Fort Worth District. 2007b. http://www.swf.usace.army.mil/pubdata/environ/regulatory/permitting/nwp/2007/07nw14.pdf> (4 December 2007)

USACE. "Nationwide Permit 12: Utility Line Activities." Effective Date: March 19, 2007 (NWP 40 Final Notice, 72 FR 11182, para. 12). Fort Worth, Texas: Fort Worth District. 2007c

<http://www.swf.usace.army.mil/pubdata/environ/regulatory/permitting/nwp/2007/07nw12.pdf> (December 4, 2007).

4.5 Potential Ecological Resources Impacts

4.5.1 Proposed Action

The type of disturbance associated with ISR operations will not result in large expanses of habitat being dramatically transformed from its original character as in conventional mining and milling operations. Additionally, all disturbed areas will be reclaimed either at the completion of construction or during decommissioning. The following sections address potential impacts to ecological resources at SUA-1548 **facilities** by location.

4.5.1.1 Smith Ranch

4.5.1.1.1 Vegetation Communities and Habitat

Grasslands make up approximately 82% of the vegetation cover with some shrubs (less than 8%) and forbs (less than 5%) are also present (Appendix D8 of the WDEQ Permit). ISR operations will temporarily reduce vegetation within the Smith Ranch license area. Both short- and long-term disturbances will be revegetated as soon as possible to mitigate environmental impacts. Cameco will continue to employ active revegetation measures, utilizing native grasses and forbs as soon as possible after disturbance. Revegetation seed mixes are approved by appropriate state and federal agencies and live seed (pounds of live seed) are tested and certified. In some instances, the landowner may allow rapid colonization by annual and perennial species followed or intermixed with a native seed mix. The revegetation program considers not only erosion control but also plant succession, plant density and diversity. Current and ongoing revegetation efforts typically restore a robust vegetative cover within the first and second growing season. **Reclamation techniques can be found in Section 6.2.4 of the TR, while reclamation goals, performance criteria, and evaluation methods are provided in Section 6.2 of the TR and Section 3.5.3 of the Smith Ranch WDEQ Reclamation Plan. Monitoring methods are consistent with baseline collection methods for comparative analysis. Methods are detailed in Appendix D8 of the WDEQ Smith Ranch application, Addenda to Appendix D8, and WDEQ/LQD Guideline 2- Vegetation.**

Open grassland or shrub steppe communities are relatively resilient and will not be significantly impacted by ISR production (NRC, 2009). Long-term disturbances within the Smith Ranch **license area** are expected to be small, and short-term disturbances will be quickly restored with local plant species. The total area contained within the Smith Ranch license area is approximately 16,187 hectares (40,000 acres). Currently, disturbed surfaces cover 570 hectares (1,410 acres) of the Smith Ranch license area (see Section **4.1 of this ER**). The proposed expansion is expected to disturb no more than an **approximate** additional **190** hectares (**470** acres), or less than 1.2% of the total Smith Ranch license area.

Wetland communities are a small percentage of the **Smith Ranch** license area. Cameco (Hayden-Wing and Associates, LLC) identified 19 potential wetlands (**Appendix A**) and in general, wetland regions are avoided by ISR operations. If a wetland region needs to be disturbed, Cameco will follow the appropriate measures prior to development to obtain the necessary permits to comply with Section 404 of the Clean Water Act.

4.5.1.1.2 Threatened and Endangered Plant Species

Two potential T&E plant species in Converse County are the Ute ladies'-tresses and blowout penstemon (USFWS, 2010). However, neither of these species nor any other T&E species were observed within the

Smith Ranch license area during numerous field surveys. It is unlikely that any protected plant species are present on the permit area and accordingly, the impact to T&E species will be negligible.

4.5.1.1.3 Noxious Weeds

Eleven species of noxious weeds were encountered during the vegetation studies conducted at Smith Ranch including western ragweed, white-leaved ragweed, common burdock, Canada thistle, poverty weed, field bindweed, quackgrass, Russian knapweed, hounds tongue, tansy mustard and wild oat. The occurrence of these noxious species within Smith Ranch is limited, and they do not occur in such abundance or distribution as to make them a serious range management problem.

Construction activities, increased soil disturbance, and higher traffic volumes could stimulate the introduction and spread of undesirable and invasive, non-native species within the license areas. These species often out-compete desirable species, including special-status species, rendering an area less productive as a source of forage for livestock and wildlife. Additionally, sites dominated by invasive, non-native species often have a different visual character that may negatively contrast with surrounding undisturbed vegetation. Construction activities at **the** Smith Ranch **license area** have not resulted in a noxious weed problem. Weed control and spraying activities occur as necessary and are conducted by licensed professionals. Mitigation measures to lessen impacts on native vegetation and control state-designated **noxious** weeds are discussed in Section 5.5 **of the ER and Sections 6.2 and 7.2.8 of the TR**.

4.5.1.1.4 Wildlife

Although wildlife habitat may see limited impact from ISR activities, reclamation and revegetation of disturbed sites will mitigate the temporary loss of wildlife habitat. In general, most wildlife, including the larger and more mobile animals, will disperse from the disturbed area as construction activities intensify. These displaced species will colonize in adjacent, undisturbed areas or return to their previously occupied habitats after construction ends and suitable habitats are reestablished. No T&E or sensitive species are anticipated to be adversely affected and overall impacts to wildlife are expected to be minimal.

In accordance with WDEQ/LQD regulations Cameco consults with the USFWS and WGFD, and BLM when applicable, to create a wildlife monitoring plan to provide proper protection and mitigation measures to ensure no negative impacts are made on wildlife. The purpose of this Wildlife Monitoring Plan is to set forth protocols and schedules for monitoring the status of wildlife species identified by the regulatory agencies as species of concern that may occur in or proximal to the Smith Ranch License Area. The plan is designed to obtain data in sufficient detail to evaluate the effect of ISR on the wildlife species in question and to develop mitigation proposals. This plan has been tailored to meet the specific wildlife monitoring needs of specific sites and does not address species that are unlikely to occur within the survey area. Target wildlife species are chosen based on the following criteria: species designated as Threatened or Endangered; Proposed Species; Candidate Species; Species of High Federal Concern by the USFWS; Species of Greatest Conservation Need by WGFD; and, species on the BLM's Sensitive Species List. Potential impacts to wildlife have historically been minimal at the Smith Ranch site with no adverse impacts. The following wildlife protection measures have been implemented at Smith Ranch: reflective marking of power lines near PSR-2 and the land application pivot site to minimize collisions by waterfowl; USFWS recommended seasonal and spatial protection buffers for raptor nests and bald eagle winter roost sites; conformance with the Wyoming Governor's Sage-grouse Executive Order which includes spatial and seasonal protection buffers; WGFD recommended protective buffers around active swift fox dens; and, waste water disposal site monitoring. Appendix D9 of the Smith Ranch-Highland WDEQ Permit to Mine provides a complete

species list and detailed information regarding the results of wildlife surveys and also contains the Wildlife Monitoring Plan.

4.5.1.2 North Butte Remote Satellite

4.5.1.2.1 Vegetation Communities and Habitat

According to the "Cleveland-Cliffs North Butte Vegetation Report" (Attachment D8-1 in Appendix D8 of the North Butte WDEQ Permit), vegetation cover at the North Butte Remote Satellite is approximately 62.2% sagebrush-grassland, 34.5% grassland, 2.5% bottomland and 0.8% juniper-sagebrush. Similar to the Smith Ranch license area, small portions of the vegetation cover will be disturbed during ISR development. Cameco will employ an active revegetation program following disturbance and most areas will begin to recover within six months of initial disturbance. The anticipated disturbances (operational life) to North Butte are about 150 hectares (370 acres) or 37% of the total area (409 hectares [1,010 acres]). All disturbed areas will be revegetated as soon as construction and/or production are completed to minimize ecological impacts.

Appendix D11 of the North Butte WDEQ Permit identifies two wetlands at the North Butte Remote Satellite. Sample Point 1 in Attachment D11-1 shows a small stock pond (0.02 hectares [0.05 acres]) which is the only wetland present within the proposed disturbance area. If this wetland cannot be avoided for ISR production, then Cameco will obtain the necessary permits to comply with Section 404 of the Clean Water Act before any disturbance to the wetland occurs.

4.5.1.2.2 Threatened and Endangered Plant Species

According to the most recent surveys completed at the North Butte Remote Satellite, no T&E plant species were observed; therefore, no impacts are anticipated. Updated surveys for T&E plant species will be conducted during operations and will be made available to NRC upon completion. For additional information on T&E plant species in the North Butte license area see Section 3.5.3 **of this ER**.

4.5.1.2.3 Noxious Weeds

The presence of two state-designated weeds, Canada thistle and field bindweed, were observed at the North Butte Remote Satellite during the baseline surveys. Increased development at the North Butte Remote Satellite could increase the spread of noxious weeds or introduce another non-native species. To protect the ecological integrity of the site, mitigation measures to lessen impacts on native vegetation and control state-designated weeds will be taken and are discussed in Section 5.5 **of this ER and 7.2.8 of the TR**.

4.5.1.2.4 Wildlife

In accordance with WDEQ/LQD regulations Cameco consults with the USFWS and WGFD to create a wildlife monitoring plan to provide proper protection and mitigation measures to ensure no negative impacts are made on wildlife. The purpose of this Wildlife Monitoring Plan is to set forth protocols and schedules for monitoring the status of wildlife species identified by the regulatory agencies as species of concern that may occur in or proximal to the North Butte License Area. The plan is designed to obtain data in sufficient detail to evaluate the effect of ISR activities on the wildlife species in question and to develop mitigation proposals. This plan has been tailored to meet the specific wildlife monitoring needs of the North Butte Remote Satellite and does not address species that are unlikely to occur in the survey area. Target wildlife species are chosen based on the following criteria: Species designated as Threatened or Endangered; Proposed species; Candidate species; Species of High Federal Concern by the USFWS; and, Species of Greatest Conservation Need by WGFD. Potential impacts to wildlife are anticipated to be minimal at the North Butte Remote Satellite with no adverse impacts. The following wildlife protection measures have been implemented at the North Butte

Remote Satellite to minimize the potential impacts to wildlife; USFWS recommended seasonal and spatial protection buffers for raptor nests; conformance with the Wyoming Governor's Sage-grouse Executive Order which includes spatial and seasonal protection buffers; and, WGFD recommended protective buffers around active swift fox dens. Appendix D9 of the North Butte WDEQ Permit to Mine application provides a complete species list and detailed information regarding the results of wildlife surveys and also contains the Wildlife Monitoring Plan.

4.5.1.3 Gas Hills Remote Satellite

4.5.1.3.1 Vegetation Communities and Habitat

Approximately 86% of the Gas Hills Remote Satellite is covered with sagebrush-grassland, rough breaks, bottomland sagebrush and upland grassland (see Section 3.**5.5 of this ER**). A small portion of these plant communities will be temporarily impacted with the onset of ISR production. Additional surface disturbances at the Gas Hills Remote Satellite are expected to be less than 20% of the total area of 607 hectares (1,500 acres) or about 476 hectares (1,177 acres) and will be reclaimed as stated in Section **6.2.4 of the TR**.

Potential wetlands cover no more than 0.3% of the license area (about 28 acres). Similar to other locations within SUA-1548 **license areas**, these wetlands will be avoided, **if possible**. Wetlands will be delineated and proper mitigation measures will be taken if ISR production is expected to impact these sensitive regions.

4.5.1.3.2 Threatened and Endangered Plant Species

The 2010 survey of the Gas Hills Remote Satellite did not identify any federally listed T&E plant species. Possible plants of concern within the license area are **Rocky Mountain** twinpod, cedar rim thistle, and Nelson's milkvetch. Because these species are not likely present at the Gas Hills Remote Satellite, no impact to T&E plant species is anticipated from ISR operations.

4.5.1.3.3 Noxious Weeds

The noxious weeds musk thistle, Canada thistle, hairy whitetop, field bindweed, tansymustard, little blue mustard, and American licorice are present at the Gas Hills Remote Satellite (see Section 2.8.1.1 of the Gas Hills Environmental Assessment, NRC, 2004). Similar to the other SUA-1548 license locations, noxious weeds are often limited to previously disturbed sites and are controlled by Cameco. To prevent the future introduction and spread of noxious weeds at the Gas Hills Remote Satellite, Cameco will follow mitigation plans described in Section 5.5 **of the ER and Section 7.2.8 of the TR**.

4.5.1.3.4 Wildlife

In accordance with WDEQ/LQD regulations Cameco consults with the USFWS, WGFD and/or BLM to create a wildlife monitoring plan to provide proper protection and mitigation measures to ensure no negative impacts on wildlife. The purpose of this Wildlife Monitoring Plan is to set forth protocols and schedules for monitoring the status of wildlife species identified by the regulatory agencies as species of concern that may occur in or proximal to the Gas Hills Remote Satellite License Area. The plan is designed to obtain data in sufficient detail to evaluate the effect of ISR activities on the wildlife species in question and to develop mitigation proposals. This plan has been tailored to meet the specific wildlife monitoring needs of the Gas Hills Remote Satellite and does not address species that are unlikely to occur in the survey area. Target wildlife species are chosen based on the following criteria: species designated as Threatened or Endangered; Proposed Species; Candidate Species; Species of High Federal Concern by the USFWS: Species of Greatest Conservation Need by WGFD: and, species on the BLM's Sensitive Species List. Potential impacts to wildlife are anticipated to be minimal with no adverse impacts. The following wildlife protection measures will be implemented at the Gas

Hills Remote Satellite to minimize the potential impacts to wildlife; USFWS and BLM recommended seasonal and spatial protection buffers for raptor and burrowing owl nest sites; conformance with the Wyoming Governor's Sage-grouse Executive Order which includes spatial and seasonal protection buffers; and, BLM recommended protection for occupied mountain plover habitat patches. Appendix D9 of the Gas Hills WDEQ Permit to Mine provides a complete species list and detailed information regarding the results of wildlife surveys and also contains the Wildlife Monitoring Plan.

4.5.1.4 Ruth Remote Satellite

4.5.1.4.1 Vegetation Communities and Habitat

According to Section 12, Volume 1 of the Ruth Supplemental Report, sprayed sagebrush-grassland and sagebrush-grassland accounted for 81.5% or about 466 hectares (1,152 acres) of the satellite area. Drainage bottomland and grassland made up the remaining 14.6% and 3.9%, respectively. These vegetation communities will be temporarily disrupted with the onset of construction. However, Cameco is not actively pursuing development of the Ruth Remote Satellite at the time of this LRA (January 2012). Prior to commencement of ISR activities, supplemental baseline data will be collected and compared with the original information for inclusion in an amendment proposal to the NRC.

4.5.1.4.2 Threatened and Endangered Plant Species

No studies have identified T&E plant species at the Ruth Remote Satellite location to date. Prior to ISR activities, vegetation studies identifying local T&E species along with other sensitive species will be conducted and the results will be presented to NRC for review and approval. The lack of T&E species at nearby locations (Smith Ranch and the North Butte Remote Satellite) suggest that potential future impacts to T&E species will be negligible. Additional surveys will be performed prior to the initiation of ISR operations at the Ruth Remote Satellite.

4.5.1.4.3 Noxious Weeds

Four noxious weed species were identified within the Ruth license area in 1989 including Canada thistle, quackgrass, perennial ragweed and wild licorice. Before ISR operations commence at the Ruth Remote Satellite, a vegetation study will be conducted to obtain current information about noxious weeds. Noxious weed study results will be presented to NRC and mitigation methods will parallel those used at other sites within the SUA-1548 license area.

4.5.1.4.4 Wildlife

According to the 1989 Ruth Supplemental Report, no big game migration routes or critical habitat were known to occur on the Ruth Remote Satellite area. Additionally, no T&E species were found living on or adjacent to the site. The bald eagle, peregrine falcon and the black-footed ferret could potentially live within the license area. To determine if any T&E or other sensitive species reside within the license area, a wildlife survey update will be conducted before pursuing ISR operations at the Ruth Remote Satellite. Cameco will amend the Ruth environmental impact analysis and provide an updated mitigation plan as required.

4.1.2 No-Action Alternative

The no-action alternative would prevent additional land from being disturbed. Reclamation of existing facilities would be required and may have a temporary impact on ecological resources. Developed sites such as Smith Ranch, will enter well field restoration and site reclamation, and as such, there will be a small but temporary additional impact to ecological resources. This impact will be mitigated when all ISR operations cease and land is reclaimed to support both native vegetation and wildlife.

4.1.3 Alternative Action

Adverse impacts to both vegetation and wildlife resources are directly related to the degree of disturbance to the land surface. Either open pit or underground mining would require a significant increase in the amount of land disturbance needed to mine the uranium deposits. The additional disturbance to the land surface would inevitably increase the impacts to ecological resources. Both underground and open pit mining would require the removal of large acreages of topsoil, including long term stockpiles of topsoil and overburden. The degree of disturbance to ecological resources under this alternative action will be significantly greater. A large open pit would remain for the life of the mine and possibly for many years after and as such vegetation, wildlife and wetlands will remain disturbed for upwards of 20 to 25 years or more.

4.1.4 References

Nuclear Regulatory Commission. 2004. Environmental Assessment for the Operation of Gas Hills Project Satellite In Situ Leach Uranium Recovery Facility.

Nuclear Regulatory Commission. 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (NUREG-1910). Page last reviewed/updated Sunday, March 13, 2011.

4.6 Potential Air Quality Impacts

4.6.1 Proposed Action

4.6.1.1 Gaseous and Airborne Particulates

The selection of the proposed action will result in continued operations at Smith Ranch and continued ISR development at the remote satellites. The current release of gaseous and airborne particulates from ISR operations at Smith Ranch are below the allowable limits for the State of Wyoming. As a result, environmental impacts from these air emissions are minimal. The primary source of gaseous emissions and airborne particulates from ISR operations are from the process plant satellites and associated equipment and traffic. The most significant radioactive airborne effluent is Rn-222, which is released from the CPP, CPF, satellites, header houses, and the well fields (see 7.3 of the TR). The IX vessels are pressurized downflow IX columns which keep the Rn-222 in solution so as not to be released to the atmosphere. There will be minor releases of Rn-222 during the air blow down prior to resin transfer to the resin trailer. The air blow down and the gas released from the vent during column filling are vented to the sumps and then to the atmosphere. The RO units used to treat restoration fluids also may emit Rn-222 during membrane maintenance or other activities that require opening the membrane chambers. At the CPP and the CPF, uranium particulate effluents are limited to the yellowcake drying and packaging unit. Because of the vacuum dryers, minimal uranium particulate emissions occur during the drying process. For additional details on the potential impacts associated with gaseous and airborne particulates and mitigative measures, please see Section 4.1 of the TR.

Non-radiological particulates, particularly fugitive dust, are the major air quality concern at SUA-1548. Unpaved roads are the largest contributor to fugitive dust in the United States, and the construction of new roads and an overall increase in traffic will increase the amount of fugitive dust produced. Calculations of estimated fugitive dust from SUA-1548 **license areas** indicate that emissions have been and will remain below the State of Wyoming standards. To mitigate the potential release of fugitive dust, mitigation measures such as watering the roads or applying chemical treatments will be implemented as needed as stated in Section 5.6 **of this ER and Sections 3.8.5, 7.1.1, and 7.2.1 of the TR**.

Cameco does not monitor for air pollutants included in the NAAQS, as promulgated in 40 CFR Part 50. The NAAQS define acceptable ambient air concentrations for six common non-radiological air pollutants: nitrogen oxides, ozone, sulfur oxides, carbon monoxide, lead, and particulates. Primary

NAAQS are established to protect public health, and secondary NAAQS are established to protect public welfare by safeguarding against environmental and property damage. NAAQS compliance attainment status is typically determined at the county level. Each NAAQS pollutant is designated into one of the following categories: attainment, nonattainment, or maintenance.

The NAAQS and Wyoming Ambient Air Quality Standards (WAAQS) set upper limits for concentrations of specific air pollutants at all locations that have public access. WDEQ, AQD limits incremental emissions increases to specific levels defined by the classification of air quality in an area. The PSD rule is designed to prevent deterioration of air quality and to limit incremental increases in concentration of nitrogen dioxide, sulfur dioxide, and particulate matter less than 10 microns in diameter (PM_{10}) to a legally defined baseline level based on the area's classification. PSD Class I areas include areas with special natural, recreational, scenic, or historic value (national parks or wilderness areas) and have the most stringent set of allowable increments. No PSD Class I areas were identified within or near the Smith Ranch facilities. The Smith Ranch project areas are all located in PSD Class II areas and are designated as attainment for all NAAQS and WAAQS. Areas are designated as attainment if atmospheric concentrations for a particular pollutant meet NAAQS and WAAQS.

The regional air quality data complies with applicable local, state, and national air quality rules and regulations. Since the 1970's, the WDEQ/AQD Monitoring Program has been working actively to evaluate monitoring requirements and use available resources effectively for the State of Wyoming. The Air Quality Resource Management Program serves the Division by looking at monitored data in conjunction with emission inventory trends and planned development to shape the AQD's air quality management policies in the future. Not only does the AQD run the State and Local Air Monitoring Sites to monitor public health, but also runs or oversees several special purpose monitors to track impacts from the many industrial sources that reside in Wyoming. For example, a significant number of monitoring stations are located in the Powder River Basin and are utilized to monitor the effects of extensive coal mining. Regional ambient air quality standards were provided by WDEQ/AQD (Table 4.6-1, Selected National and Wyoming Air Quality Standards) and the Division provides an annual summary of the air quality monitoring results for all monitoring stations. A review of the Wyoming Ambient Air Monitoring Annual Network Plan 2011 data collected at the AQD monitoring stations through 2010 shows that all monitors are attaining NAAQS for PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO. Currently all of the AQD monitors, except for Boulder (Sublette County), are attaining the NAAQS for ozone. The primary potential airborne pollutant within the Smith Ranch project areas is particulate matter in the form of fugitive dust generated from natural and human sources. The WAAQS and NAAQS limits, ambient air quality data for the region, and PSD I and II increments are presented in Table 4.6-1.

4.6.1.2 Construction

The NRC evaluated potential air quality impacts from ISR facilities in NUREG-1910 (NRC 2009), and concluded that construction air quality impacts of ISR facilities are small. Construction activities at SUA-1548 have and will continue to cause minimal short-term effects on local air quality. Construction activities will cause an increase in suspended particulates from vehicular traffic on unpaved roads, fugitive dust from wind erosion of areas cleared of vegetation, and diesel emissions from construction equipment. However, once construction is finished, topsoil will be replaced on disturbed sites and revegetation will take place. Each disturbed site will be reclaimed to reduce the potential for long-term air quality impacts. Surface disturbances and construction traffic will decline once construction ends and operations begin. Therefore, the anticipated air quality impacts from construction at SUA-1548 license areas are expected to be small.

4.6.1.3 Operations

Operations (including restoration activities) at Smith Ranch currently result in minimal air quality emissions, and emissions at the North Butte, Gas Hills and Ruth Remote Satellites will also likely be minimal. Because the majority of air quality emissions from ISR operations are small and occur outdoors, impacts are considered to be minimal and temporary. Similar to the construction phase, fugitive dust is the primary source of air quality emissions during operations. Emissions such as Rn-222 and NOx are also possible from ISR operations and although small, are discussed below.

As described above, small concentrations of Rn-222 are released from the CPP, satellites and mine unit header houses during operations (see Section 4.1 of the TR). Impacts from gaseous Rn-222 are minimal. Because the vacuum dryers are designed to have zero emissions, no particulate emissions are generated, and only a small amount of water vapor is produced. Current gaseous emissions at **the** Smith Ranch **license area** are approximately 0.58 metric tons (0.64 tons) per year and are below allowable limits for the State of Wyoming. Gaseous emissions monitoring and mitigation measures are taken to ensure Rn-222 emissions are minimal, as discussed in Section **4.1 of the TR**. Exhaust from drilling equipment and vehicular traffic causes some emissions such as NOx, but these emissions are small and do not have any significant impacts. For additional information about NOx emissions, see Section 7.2 of the TR. As discussed above, the primary source of emissions is fugitive dust from vehicular traffic on unpaved access roads and in the well field areas. Fugitive dust calculations were performed in Section 3.6.**6 of this ER** according to the EPA AP-42 methodology. Current ISR operations at the Smith Ranch **license area** produce approximately 71 tonnes (78 tons) per year. With the addition of the Reynolds Ranch Satellite, fugitive dust is expected to increase to 141 tonnes (156 tons) per year when Smith Ranch is operating at full capacity. Estimates for fugitive dust emissions from the North Butte and Gas Hills Remote Satellites are approximately 95 and 130 tonnes (95 and 143 tons) per year, respectively. Cameco has not developed an operating plan for the Ruth Remote Satellite at the time of this LRA (January 2012). Once this plan has been developed, fugitive dust emissions will be calculated for this site as well. Fugitive dust emissions for all SUA-1548 license areas are well below allowable limits for the State of Wyoming, and therefore do not pose a significant environmental risk. In addition, the release of fugitive dust from operations will be significantly reduced by periodic watering or by chemically treating unpaved roads. Mitigation methods such as these will be used as necessary to reduce fugitive dust (see Section 5.6 **of this ER**).

Approval of the proposed action will not result in adverse impacts to air quality. Anticipated emissions are all below state of Wyoming regulations and will likely be minimal and temporary.

4.6.2 No-Action Alternative

Approval of the no-action alternative would not cause any additional impacts on air quality at SUA-1548 **licensed facilities**. Emissions associated with the current ISR operations would slowly decrease as ground water restoration and reclamation nears completion. Construction activities would continue as facilities and well fields are reclaimed and restored. Fugitive dust at the remote satellites may temporarily increase as reclamation activities commence and then return to below current conditions. Air pollution from traffic related activity **will** continue until SUA-1548 **licensed facilities are** restored and reclaimed.

4.6.3 Alternative Action

Approval of the alternative action would result in a significant increase in fugitive dust and air quality impacts relative to the approval of the proposed action. Air quality impacts associated with conventional underground or open pit uranium mining are significantly greater than those associated with ISR (NRC

2009). Topsoil stripping and overburden removal are ongoing processes throughout the development of a conventional mine. Conventional mining employs a significantly larger fleet of construction equipment (dozers, scrapers, loaders, haul trucks) as well as a significantly larger work force to operate the mine. Air quality impacts caused by wind erosion of ore stockpiles, overburden stockpiles, tailings disposal facilities, and crushing and grinding operations associated with conventional mining, can cause high concentrations of particulate matter as well as Rn-222 to be released into the atmosphere. Tailings piles from underground or conventional open pit uranium mining **and milling** are considered long-term hazards since they continually emit Rn-222. By utilizing ISR recovery methods, the need for stockpiles and tailings is omitted which greatly reduces impacts on air quality.

4.6.4 Cumulative Effects of the Preferred Action Alternative

Cumulative effects from airborne gaseous and particulate emissions are expected to be minimal. SUA-1548 operations will contribute a proportionally small portion of additional traffic to area roads as compared to other energy development and agricultural activities. The SUA-1548 sites are remote and air quality contributions include agricultural traffic, other ISR project emissions, CBM continued development, conventional oil and gas and wind energy development. **The** Smith Ranch **facility** is an ongoing operation and approval of the proposed action will result in an increase of the number of personnel to **approximately** 170. The remote satellites will provide additional personnel during construction but this number will be reduced during operational periods. Air quality may be impacted during construction, but these impacts are localized and short-term as all disturbances are revegetated and reclaimed once construction ends.

According to the Coal Review, the existing regional air quality conditions generally are very good. Modeling completed in 2002 (base year for the Coal Review analysis) showed that there was a concern about some impacts of particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) emissions within the near-field receptors of both Montana and Wyoming. Air quality at SUA-1548 **sites** is within ambient air quality standards, and the analysis presented above indicates that continued ISR operations at Smith Ranch and the remote satellites will not adversely impact air quality. The primary potential impact will be fugitive dust from construction **and operational** activities and traffic on local gravel roads.

Table 5.3-2 of NUREG-1910 (NRC, 2009) lists 15 coal mining projects in the Wyoming Powder River Basin. All have intensive air quality monitoring programs and all are deemed "in compliance" with all applicable standards by WDEQ/AQD. The regional mines are not expected to cause cumulative air quality impacts on the SUA-1548 sites in the Powder River Basin given the minimal air quality impacts associated with ISR operations. Section 4.6 **of this ER** presents the anticipated quantifiable air quality impact associated with SUA-1548 **licensed activities** and its relative contribution to state wide particulate emissions. More than 99% (99.7%) of the total impact to air quality is from estimated fugitive dust emissions, calculated as worst case without any dust control measures applied. SUA-1548 **license areas are** anticipated to contribute less **than** 0.1% to statewide particulate estimates. Cumulative effects from the proposed action will be much less than those expected from conventional underground or open pit mining.

4.6.5 References

Bureau of Land Management (BLM). 2009. Update of the Task 2 Report for the Powder River Basin Coal Review Past and Present and Reasonably Foreseeable Development Activities. Prepared by AECOM, Inc. BLM High Plains District Office and Wyoming State Office. December 2009.

U.S. Nuclear Regulatory Commission (NRC). 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (NUREG-1910). Page last reviewed/updated Sunday, March 13, 2011.

4.7 Noise Impacts

4.7.1 Proposed Action

Smith Ranch

ISR, conventional mining, rangeland, pasture, and wildlife habitat have been the primary land uses within the surrounding 3 kilometer (2 mile) radius of the Smith Ranch license area. Other land uses include oil and gas exploration, CBM development, and wind farming. The noise impacts associated with these other uses include increased construction traffic and equipment noises such as drilling, generators and pumps. The closest residence to Smith Ranch is the Vollman Ranch, which is located within the license boundary and is occupied year-round. As a result of the remote location of the project, its historic and current uranium recovery operations, and the low population density of the surrounding area, impacts from noise or congestion within the project area or in the surrounding 3 kilometer (2 mile) area have not created problems in the past and are not anticipated to cause problems in the future. Additionally, since the maximum increase of new workers associated with the proposed action is anticipated to be insignificant, noise and congestion impacts are not anticipated in Converse or any neighboring counties.

Cameco conducted tests in 2010 at Smith Ranch to determine the level of noise (in dBA) that is produced by ISR activities from six different locations throughout the license area. The loudest instrument was identified by these tests, and the level of noise at each testing site was recorded. These six locations included: Satellite No. 1, the selenium treatment facility, header house 2-2 in Mine Unit 2, a vacuum-truck, a wood or PVC chipper, and personnel sampling (transfer truck). **Table 4.7-1, Peak Noise Levels for Equipment Used at the SUA-1548 Project Sites and the Noise Levels at the Six Smith Ranch Testing Sites** describes the peak decibel levels determined for each of these test sites. Because the highest noise level determined from these tests was 125 dBA, produced by the wood (PVC) chipper at the PVC chipper test site, this noise level was examined further to determine the maximum noise impact from within the 3 kilometer (2 mile) surrounding area to determine the effect it would have on the nearest resident at Vollman Ranch (Cameco, 2010). According to Table 14-16 in the US Department of the Interior, Bureau of Reclamation and Freeport Regional Water Authority, when the distance of the reference sound level is approximately 50 feet the basic sound level drop-off is 6 dBA per doubling distance (US Department of the Interior, 2003). Therefore, up to 3 kilometers (2 miles) away from the site boundary, the highest level of noise created by ISR activities at Smith Ranch is approximately 77 dBA. This implies that ISR activities can be heard from 3 kilometers (2 miles) away, as well as beyond this point up to a certain distance. However, a noise level of 77 dBA can be likened to the same noise level as a dishwasher, barking dog, or a vacuum cleaner, and therefore the noise impact is not considered extreme (NetWell, 2011). Furthermore the typical noise levels are significantly less than 125 dBA at the source, so the proportionate decrease in noise levels will be less than that described above.

North Butte Remote Satellite

Rangeland, pasture and wildlife habitat have been the primary land uses within the surrounding 3 kilometer (2 mile) radius of the North Butte Remote Satellite. Other land uses within the general area include uranium ISR recovery (16 kilometers [10 miles]) away, oil and gas exploration (5 to 10 kilometers [3 to 6 miles]), and coal bed natural gas development (adjacent to and within the license boundary). The noise impacts associated with these other uses include increased construction traffic, heavy machinery involved in either well field construction or reclamation of well fields as well as drilling and pipeline construction activities. Approval of the preferred action alternative will present similar types of impacts as described above.

Within close proximity of the North Butte Remote Satellite is one occupied unit, the Pfister Ranch house, located approximately 1 kilometer (0.5 mile) south of the site boundary and is occupied year-round. Any noise created by the North Butte Remote Satellite is expected to increase with increased uranium recovery and processing activity, and noise levels would indeed be higher for those individuals living near the North Butte Remote Satellite area, such as at the Pfister Ranch. However, the noise levels will decrease further away from the noise source. According to the tests conducted by Cameco and assuming the worst case noise generator (PVC chipper), the calculated noise level at a location 3 kilometers (2 miles) from the noise source would be 77 dBA. Because of the low population (very few noise receptors) within the 3 kilometer (2 mile) surrounding area and the low population that exists beyond that area, noise impacts will be insignificant. Additionally, since the maximum increase of new workers associated with the proposed action is anticipated to be relatively low, noise and congestion impacts are not anticipated in Campbell or any neighboring counties.

Gas Hills Remote Satellite

Approximately 19 kilometers (12 miles) northeast of the Gas Hills Remote Satellite boundary is the JE Ranch. The Gas Hills Remote Satellite will be using the same type of equipment as Smith Ranch and North Butte during the construction, operations and reclamation/decommissioning phases of the project. Using similar noise source assumptions as above (PVC chipper) and ideal noise propagating meteorological conditions, the nearest occupied housing unit (distance of approximately 19 kilometers [12 miles] from the site boundary) may hear noise from the ISR activities at a level of approximately 35 dBA or less (US Department of the Interior, 2003). This level of noise can be likened to the typical noise level of a humming refrigerator (NetWell, 2011). Furthermore the JE Ranch lies within a protected valley and is isolated topographically from any construction activities within the Gas Hills Remote Satellite. As a result of the remote location of the Gas Hills Remote Satellite and the low population density of the surrounding area, impacts to noise or congestion within the satellite area or in the surrounding 3 kilometers (2 miles) are not anticipated. Additionally, since the maximum increase of new workers associated with the proposed action is anticipated to be relatively low, noise and congestion impacts are not anticipated in Fremont or Natrona Counties.

Ruth Remote Satellite

There are no occupied housing units within 3 kilometers (2 miles) of the Ruth Remote Satellite. However, located approximately 10 kilometers (6 miles) west of Ruth is the town of Linch which had a population of approximately 40 people according to the 2000 U.S. Census. Based on the Bureau of Reclamation (US Department of Interior, 2003) calculations on sound drop off, noise level contribution of the site will be negligible within 5 kilometers (3 miles) of the site and will be insignificant at the town of Linch. As a result of the remote location of the Ruth Remote Satellite and the low population density of the surrounding area, impacts to noise or congestion within the satellite area or in the surrounding 3 kilometers (2 miles) are not anticipated. Additionally, since the maximum increase of new workers associated with the preferred action alternative is anticipated to be relatively low, noise and congestion impacts are not anticipated in Johnson or Campbell Counties.

4.7.2 No-Action Alternative

Under the no-action alternative, the licensee would be required to reclaim all existing ISR disturbances at Smith Ranch and the remote satellites. All facilities under SUA-1548 are considered to be remotely located with relatively low ambient noise levels. Any increase in construction activities, even the no-action alternative, would result in an increase in noise levels. Construction activity under the no-action alternative would include reclamation of any existing buildings, restoration of operating mine units, well abandonment and reclamation of well fields, and removal of all ponds, treatment plants and roads. In every case, heavy construction equipment such as bulldozers, scrapers, loaders, drill rigs, PVC chippers, and seeding equipment will be required.

The greatest noise levels will occur at Smith Ranch where the existing condition disturbance is greatest. At this location the no-action alternative would result in the shutdown of an operating mine, the immediate restoration of all operating well fields and the reclamation of all disturbed lands. Some of these disturbances include the existing 18 buildings (e.g. the CPP, the CPF, satellite buildings, the yellowcake warehouse, deep disposal well buildings, and several others), access roads, a parking area, over 11,000 wells (i.e., monitoring wells, production wells, and injection wells), underground pipelines, storage ponds, and a salvage/boneyard area. These facilities would need to be decommissioned and effectively demolished. The disturbed ground underneath would need to be decontaminated if necessary with topsoil and seeded. The wells would need to be plugged and covered with soil, then seeded. Road surfaces would be dozer-ripped, gravel material salvaged, covered with topsoil and seeded. Where miles of pipeline exist within the ground, these areas would need to be reopened with trenching equipment and pipelines removed, then the trenches backfilled and reclaimed. All storage ponds would undergo natural or enhanced evaporation; all solid 11e.(2) byproduct materials would be removed and transported to a NRC licensed disposal facility. In each case, liners would have to be removed and similarly transported to the licensed disposal facility. Following clean up and decommissioning, these ponds would need to be refilled with subsoil and spread with topsoil, leveled, and seeded as well as other reclamation processes necessary to bring the existing landscape back to its original condition. These reclamation methods require equipment such as scrapers, dozers and graders (to tear up the access roads and spread out the soil), dozers and farm discs (to loosen the packed soil), bulldozers, loaders and dump trucks (for filling reservoirs with dirt and to push topsoil into place), drill rigs (to plug the monitoring wells), jack hammers (to break up the concrete foundations for the warehouses/shops), backhoes and PVC chippers (to break up the PVC pipe into smaller, manageable pieces), pickup trucks (to help remove the fences within the project site), cranes (to help tear down the building structures, such as the satellite buildings, CPP, CPF, etc.), pipe trailers (to remove the pipeline pieces), pull trucks (to take down the power lines), flatbed trucks (for hauling), and dump trucks (to remove the rubble). Overall, the equipment noise level ranges from approximately 74 to 125 dBA, the loudest being the PVC or wood chipper at 125 dBA. **Table 4.7-1** provides the related noise levels for the other pieces of equipment used at SUA-1548, according to the U.S. Department of Transportation.

In the event that the no-action alternative is chosen, reclamation and decommissioning of the ISR facilities at Smith Ranch will result in noise levels of up to 125 dBA. Because of the concentrated activities of bulldozers, jack hammers and other heavy equipment, noise levels will increase over existing conditions. At a distance of 3 kilometers (2 miles) away, the noise levels will be dampened to approximately 77 dBA. As noted above, a noise level of 77 dBA can be likened to the same noise level as a dishwasher, barking dog, or a vacuum cleaner, and therefore the noise impact is not considered extreme (NetWell, 2011).

Implementation of the no-action alternative at the remote satellite sites will also result in the reclamation of existing disturbances. At each remote satellite facility, there are buildings, monitor wells and roads which will require reclamation. At the Ruth Remote Satellite there are also lined ponds which will need to be decommissioned. Since none of these remote satellites are operational, groundwater restoration of well fields will not be required. In the event that the no-action alternative is chosen, reclamation and decommissioning of the current facilities will result in noise levels of up to 125 dBA. Because there are not as many buildings, roads and existing wells at these remote satellite facilities, the duration of the increased noise levels will be less than what might be anticipated at Smith Ranch.

4.7.3 Alternative Action

Under the alternative action, the licensee would mine uranium ore using either conventional underground or conventional open pit mining. Within SUA-1548, a conventional mining approach would result in significantly higher noise levels and would extend for a greater period of time. Because of the depth of the ore, it is possible both surface and underground methods would need to be employed. Such mining methods historically occurred at Smith Ranch and the Gas Hills Remote Satellite.

From a noise perspective, conventional mining will require the use of a diverse assemblage of heavy equipment including scrapers, loaders, haul trucks, drill rigs, draglines, bulldozers, road graders, generators, fans, compressors and a diverse number and types of support vehicles. Construction and ultimately reclamation of buildings and processing plants will still be required. Blasting may also be required and would result in the largest instantaneous decibel levels. Overall, the individual equipment noise level for a conventional mine ranges from approximately 74 to 125 dBA. Because of the large concentration of equipment within the operating mine pit, the combined noise may achieve levels of 135 dBA at peak periods of construction and if all equipment was operating at maximum power at the same time. A more reasonable noise level for the alternative action would be 90 to 100 dBA. Given the remoteness of SUA-1548 and the distance to occupied residences, noise levels will vary across the sites depending on the location of specific mine features: mine pits; mine shafts; operating plants; and, waste dumps. In general at a distance of 3 kilometers (2 miles) away, the noise levels (assuming 135 dBA at the source) will be dampened to approximately 87 dBA. Because there are not as many buildings, roads and existing wells at these remote facilities, the duration of the increased noise levels will be less than what might be anticipated at Smith Ranch. A noise level of 87 dBA can be likened to the same noise level as a snow blower or lawn mower (NetWell, 2011).

4.7.4 Cumulative Impacts

Rangeland, pasture, oil and gas exploration, CBM development, and wildlife habitat have been the primary land uses within the surrounding 3 kilometers (2 miles) of SUA-1548. Specific to Smith Ranch, ISR is ongoing and wind farming is a recent development. The noise impacts associated with these land uses include intermittent use of heavy equipment during initial phases of construction or reclamation as well as the ongoing noise associated with increased construction traffic and ongoing equipment noises such as drilling, generators and pumps. As a result of the remote locations associated with the SUA-1548 license area and the low population density of the surrounding area, the cumulative impact related to noise within the surrounding 3 kilometers (2 miles) is not anticipated to be significant. Using worst case assumptions on increased traffic loading and ongoing construction, cumulative noise levels at the source will likely be in the 50 to 70 dBA levels. At a 3 kilometer (2 mile) distance the cumulative noise level increase would be negligible. If a PVC chipper was operating at the same time as the cumulative level of increased traffic and drilling, the individual chipper would dominate the noise calculation. In this case the cumulative impact with an operating PVC chipper would likely remain at 125 dBA.

Additionally, since the maximum increase of new workers associated with the preferred action alternative is anticipated to be relatively low, noise and congestion impacts are not anticipated to affect any of the surrounding counties including: Converse, Campbell, Johnson, Fremont or Natrona.

4.7.5 References

Cameco Resources Smith Ranch-Highland Operation: *Hearing Conservation Hazard Assessment Report.* July 2010.

NetWell Noise Control. *Decibel Chart*. 2011. [Web Page] http://www.controlnoise.com/decibel-chart

US Department of Commerce, Bureau of the Census. 2000. [Web Page] http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

US Department of the Interior, Bureau of Reclamation and Freeport Regional Water Authority. *Freeport Regional Water Project: Environmental Impact Report/Environmental Impact Statement*. July 2003. [Web Site] http://www.freeportproject.org/nodes/explore/draft_eir_eis_v1/14_chapter.pdf.

US Department of Transportation: Federal Highway Administration-Office of Planning, Environment, & Realty (HEP). *Highway Traffic Noise: Construction Noise Handbook*. Sect. 9.0: Construction Equipment Noise Level and Ranges. 2001. Locate at: www.fwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

4.8 Potential Historic and Cultural Resources Impacts

NRC confidentiality requested – Information provided separately as confidential Appendix F.

4.9 Potential Visual and Scenic Resources Impacts

4.9.1 Proposed Action

During ISR operations, there are temporary, short-term and long-term visual effects. The temporary and short-term visual effects occur during the construction phase of mine unit well field development which includes header house construction, well installation, well field access road construction, pipe and power line installation, etc. Following completion of well field installation, the temporarily disturbed areas are reclaimed. Only the long-term visual effects associated with operations and maintenance will remain during operations and are described below. SUA-1548 is an ongoing ISR operation and approval of the proposed action will continue the operations at Smith Ranch and allow new operations to commence at the remote satellites.

Long-term visual effects result from the addition of structures to the landscape that will exist over the life of the project. Within the SUA-1548 license areas, long-term visual disturbances consist of buildings, well field areas, access roads, fences, lighting, and related ancillary infrastructure such as storage ponds, salvage areas, and pipe and power line corridors. The visual disturbances at Smith Ranch include 18 buildings (e.g., the CPP, the CPF, satellite buildings, warehouse, maintenance/construction shop, selenium treatment facility, and deep disposal well buildings), individual well fields (mine units) and header houses, access roads, a parking area, storage ponds, fencing surrounding the mine units, and a salvage/boneyard area. Additional well fields, monitoring wells, UIC Class I disposal wells and a Reynolds Ranch Satellite building will be constructed during the license renewal period. **Cameco mitigates the visual impacts by ensuring that these structures as well as those constructed at the remote satellite**

facilities blend in with their surroundings as much as possible, including painting them a neutral color to help them blend into the natural environment. At the end of ISR operations, all of these facilities will be removed and the land surface reclaimed.

The existing visual disturbances described above range in size from large building structures to wells within the well field areas. The Smith Ranch CPP is the largest building structure at approximately 122 by 30 meters (400 by 100 feet) in size followed by the Highland CPF facility at approximately 86 by 54 meters (288 by 176 feet). The satellite IX buildings average approximately 15 by 30 meters (50 by 100 feet) each. The well field areas comprise similar visual disturbances including booster station buildings, header houses, wells, power and pipe line corridors, and access roads. The booster station buildings, deep disposal well buildings, and header houses are the largest building structures in the well field. These larger structures are accompanied by smaller metal buildings, which are less than 15 by 30 meters (50 by 100 feet) in size. The booster station houses pumps necessary to move water from the well fields to the processing facilities. The header houses contain electrical components and injection and production headers connecting the wells to the pipelines. Each building is connected by an access road and is characterized by a small disturbance area to provide adequate access for operations and maintenance activities. Electric power lines connect these buildings to the main electric distribution poles. The electric distribution poles represent the tallest structure in the well field and are approximately 6 meters (20 feet) high. The smallest visual disturbance in the well field area is the well. Each operational well is encased in a weatherproof cover which is approximately 1 by 0.6 meters (3 by 2 feet) in size and come in a variety of shapes from cylindrical to pyramid. Under the proposed action, Cameco will maintain the same design for any new facilities that are constructed at Smith Ranch or any of the remote satellites. **The fencing surrounding the mine unit pattern areas represents the largest visual impact in terms of overall length. There are approximately 100,000 meters (336,000 feet) of total fencing surrounding the mine units at the Smith Ranch project site, and an additional 30,500 meters (100,000 feet), to be constructed later with the addition of the proposed mine units at the project site.**

At the North Butte Remote Satellite, Cameco will initially construct three buildings (one satellite building, two UIC Class I injection well buildings), two surge ponds, additional monitoring wells, well field areas and header houses, electrical distribution lines, fencing, and access roads. Approval of the proposed action would allow these visual disturbances to be constructed during the license renewal period. At the end of ISR operations, all of these facilities will be removed and the land surface will be reclaimed. **Although there is fencing present at the North Butte project site, there is less present at this site than at the Smith Ranch project site. Specifically, there are approximately 7,700 meters (25,000 feet) of fencing currently (2011) at the North Butte project site. An additional 1,100 meters (36,000 feet) are expected to be constructed as the proposed mine units are developed**.

At the Gas Hills Remote Satellite, the Carol Shop, approximately 40 monitoring wells, the radium treatment building, a settling basin and several miles of roads and drilling-related disturbances and site reclamation exist. Additionally, disturbances associated with historical conventional mining (both underground and surface) and reclamation, exist and represent the affected environment for the assessment of long-term visual impacts. Under the proposed action, Cameco will construct five mine units and associated well fields, header houses, upgrade and construct new roads, four to six evaporation ponds, UIC Class I injection wells and possibly an additional satellite facility. **The amount of acreage fenced off at the Gas Hills will be approximately 400 hectares (1,000 acres).** Approval of the proposed action would allow existing long-term visual disturbances to remain and these additional visual disturbances to be constructed during the license period. At the end of ISR operations, all of these facilities will be removed and the land surface reclaimed.

At the Ruth Remote Satellite, there are three existing buildings (the processing plant, one warehouse, and a generator building), three monitoring wells, one two-celled evaporation pond and one access road. A detailed operations plan has not yet been completed for the Ruth Remote Satellite, so it is yet to be determined whether Cameco will remove and reclaim several of these existing visual disturbances and replace them with new facilities. Cameco anticipates starting development of the Ruth Remote Satellite near the end of the renewal period and will provide an updated operating plan and environmental analysis at that time.

Exterior lighting will be necessary for safe and secure operations throughout the SUA-1548 operations. Cameco will use both continuous and intermittent lighting systems at each project site, with continuous lighting used in locations such as at the front door of the header houses and in front of major buildings including warehouses, the CPP, and Carol Shop. This continuous lighting will be used during the nighttime for safety purposes. Intermittent lighting will also be used periodically where Cameco personnel may be required as well as in parking areas. Historically, light pollution has not been an issue or concern at the SUA-1548 project sites, resulting in no complaints from the local residents or passers-by since the start of the Cameco operations. Therefore, Cameco does not foresee an issue with the lighting at the present time nor with the development of future projects. Surrounding topography and the distance of the project sites from nearby towns and housing developments play an important role in limiting the potential light pollution that may be caused by Cameco operations. Due to the rural locations of each of the SUA-1548 project sites and the surrounding topography of high rolling hills that surround each site, the amount of light pollution is extremely limited. However, because Cameco is aware that there may be some possible concerns with light pollution, some alternatives have been addressed to further limit the amount of the potential light pollution present at each project site. Some of these alternatives include using downward lighting, adding shielding to the lights to direct the light only towards the work area and make it less visible from a distance, using lighting of minimal intensity (in lumens), using lighting sources on timers or activated by sensors so they are off when not in use, to examine alternative fixtures to decrease the amount of visible light, fitting building windows with shutters (if and where appropriate) to block light emissions, and placing lighting systems behind structures that will block the light emissions, such as behind trees or already-existing man-made structures. The potential for light pollution impacts beyond the immediate area (more than 6.4 kilometers [4 miles] from the project site boundaries) is highly unlikely due to landforms and topography outside of 6.4 kilometers (4 miles), which effectively limit the visual impact of major lighting sources such as the CPP at the Smith Ranch project site. Exterior lighting is and will be necessary to safely produce uranium at the proposed SUA-1548 project sites. However, natural conditions provided by topography, landforms, and vegetation reduce the impacts tremendously.

During final decommissioning and reclamation, all structures will be removed thereby removing any visual impacts created by these structures. Any structures built for the purpose of the ISR operation are expected to have very little impact on the overall visual quality of the surrounding area.

4.9.2 No-Action Alternative

The no-action alternative for Smith Ranch would require the reclamation of all visible structures that currently exist at the site. Construction activity under the no-action alternative would include reclamation of any existing buildings, restoration of operating mine units, well abandonment and reclamation of well fields, and removal of all ponds, treatment plants and roads. The buildings would need to be decommissioned and effectively demolished. The disturbed ground underneath would need to be covered with topsoil and seeded. The wells would need to be plugged and covered with soil, then seeded. Road surface would need to be dozer-ripped, gravel material salvaged, covered with topsoil, and seeded. Buried pipelines would need to be removed using trenching equipment and the trenches backfilled and reclaimed. All storage ponds would undergo natural and enhanced evaporation, and regulated solids would be removed and transported to a NRC-licensed disposal facility. In each case, liners would have to be removed and disposed at a NRC-licensed disposal facility. Following clean up and decommissioning, these ponds would need to be backfilled with subsoil, leveled, spread with topsoil and seeded.

At the North Butte Remote Satellite, there is currently (January 2012) no structures, well fields, and limited access roads. Under the no-action alternative, no new structures would be constructed and all existing ISR disturbance (e.g., monitor wells and access roads) would be removed and reclaimed.

At the Gas Hills Remote Satellite, the visual structures include the Carol Shop, more than 40 monitoring wells, the radium treatment building, and existing access roads. Under the no-action alternative, no new structures would be constructed and all existing structures, monitor wells and access roads would be removed and reclaimed.

At the Ruth Remote Satellite, the visible structures include three buildings (the processing plant, one warehouse, and a generator building), three monitoring wells, one two-celled evaporation pond and one access road. Under the no-action alternative, no new structures would be constructed and all existing structures, access roads, the pond, monitor wells and a small well field **area would** be decommissioned and reclaimed.

4.9.3 Alternative Action

The visual and scenic resource impacts of the alternative action would be greater than those of the proposed action. Under the alternative action, the overall land disturbance would be significantly greater and will include large conventional open pit and/or underground mine facilities. The long-term visual disturbance would include large mine dumps, topsoil stockpiles, multiple roads, multiple buildings, dewatering wells and facilities as well as conventional milling and tailings facilities. Open pit mining would remove and stockpile hundreds of cubic yards of overburden before reaching the ore zone. Underground mines would also have hoist house structures that would be taller than any of the proposed project buildings. The larger size of a conventional mill will have greater long-term visual impact relative to the proposed action.

4.9.4 Cumulative Impacts

The cumulative impacts to the visual/scenic resources of SUA-1548 **licensed activities** are not expected to be significant. The project sites are located in remote areas that are primarily on private and BLM-administered lands and a small amount of state-owned land, with limited or no access. This restricts the number of people that will be able to see the operations. On a cumulative basis, the adjacent existing landscape includes features associated with other energy development enterprises including wind energy generators, CBM well fields, conventional oil and gas drilling pads and ponds, as well as ancillary roads and buildings. The cumulative impact of an ISR operation within these remote areas will be insignificant. Cameco proposes certain mitigation measures that include painting processing facilities, office and maintenance buildings, well casing covers, and any other visible structures with neutral colors to blend in with the natural landscape. Power lines will be laid underground whenever possible to limit the number of poles and overhead lines. Well field revegetation will alleviate any potential visual/scenic impact that may temporarily occur due to well field construction and installation.

4.10 Potential Socioeconomic Impacts

4.10.1 Proposed Action

The construction and operating workforce for the proposed action will come from the region surrounding each site; primarily Converse, Campbell, Fremont, and Johnson Counties. Smith Ranch is located in Converse County and is an ongoing operation. Much of the current and ongoing effects to housing, public and other community services, recreation, county and municipal finances, crime, and the local transportation network occur within Converse and Natrona Counties. With respect to the remote satellite operations at North Butte, Gas Hills, and Ruth; Campbell County, Fremont County, and Johnson County would likely experience similar, but to a lesser extent socioeconomic impacts.

It is anticipated that the overall effect of the proposed action on the local and regional economy for these counties and the state as a whole would be beneficial. Purchases of goods and services by the project and project employees would contribute directly to the economy. Local, state, and federal governments would benefit from taxes paid by the ISR operations and its employees. Indirect impacts, resulting from the circulation and recirculation of direct payments through the economy, would also be beneficial. These economic effects would further stimulate the economy, resulting in the creation of additional jobs. Beneficial impacts to the local and regional economy provided by the ISR operation would continue for the life of SUA-1548, which, if the proposed action is approved, may result in an additional 36 years for Smith Ranch, 20 years for the North Butte Remote Satellite, 20 to 25 years for the Gas Hills Remote Satellite, and 10 years for the Ruth Remote Satellite. Economic impacts of the proposed action are discussed in further detail in Sections **3.10 and 7.0 of this ER**.

4.10.1.1 Construction

The construction phase of an ISR project causes a temporary, moderate impact on the local economy resulting from the purchases of goods and services directly related to construction activities. Impacts to community services in Converse, Campbell, Fremont, and Johnson Counties, such as roads, housing, schools, and energy costs, would be minor to non-existent.

When construction commences at the Ruth Remote Satellite, it is anticipated that the majority of the workers will be hired from communities located within Campbell and Johnson Counties; and when construction commences at the Gas Hills Remote Satellite, it is anticipated that the majority of **the estimated 20 required employees** will be hired from communities located within Fremont County **(eg., Riverton and Lander)**.

Most construction work available to the local construction labor pool consists of temporary contract work that varies in duration, depending on the scope of each construction project. The number of unemployed construction workers does not represent the number of workers that would be available to the project from the local construction labor pool. The "unemployed" number is an annual average that does not take into account monthly variations in the available construction labor pool from construction start-ups and completions. Cameco will likely hire from the local construction labor pool. The actual number of construction workers available for SUA-1548 sites draws from the entire construction labor pool of approximately 7,100 (2010 estimate). This pool will fluctuate as construction activities from some active projects conclude and new workers become available for construction activities under the proposed action.

4.10.1.2 Operations Workforce

An estimated 153 full-time employees are currently employed at Smith Ranch for operations and restoration activities. This number is expected to increase to 170 full time employees under the proposed action. **An approximate** operating base of 32 employees **will be** employed at the North Butte Remote Satellite facility. It is anticipated that approximately **65 employees will be required** for the **operational phase of the** Gas Hills Remote Satellite facility. It is not known how many of the required operations workforce would be hired from outside of Converse, Campbell, Fremont, Natrona and Johnson Counties. In the event that the entire operations workforce and their families relocated to the counties within which the projects are located, the population increase would be a maximum of 360 in Converse County, 144 in Campbell County, 180 in Fremont County, and 48 in Johnson County based on the 2010 average Wyoming household size of approximately two people. This increase would account for less than 1% of the population of Converse, Campbell, and Johnson Counties, and approximately 1% for Fremont County. These increases are smaller than the projected annual growth rate. Therefore, there would be little to no effect on the vacancy rates of any type of housing in the affected counties.

4.10.1.3 Restoration Workforce

When operations cease at Smith Ranch and groundwater restoration is the only activity, the workforce will likely shrink from the approximate 170 employees to approximately 85. As restoration of well fields continue to be successful, it is anticipated that the number of employees will slowly continue to decline until, at the time of final decommissioning and reclamation the workforce will comprise approximately 50 employees.

At the time the North Butte Remote Satellite ceases production and is completely in groundwater restoration, it is anticipated that the number of employees will be reduced to approximately 16. The number of employees will continue to slowly decline as restoration continues until at the time of final decommissioning and reclamation, Cameco estimates that approximately 10 employees will remain at the site.

At the time the Gas Hills Remote Satellite ceases production and is completely in a restoration mode, it is anticipated that the number of employees will drop from 65 to approximately 50. As mine units continue to be restored, it is anticipated that the workforce numbers will continue to slowly decline until at the time of final decommissioning and reclamation, the number of employees will be approximately 40.

4.10.1.4 Effects to Housing

Smith Ranch is within commuting distance of Glenrock and Douglas in Converse County, and Casper in Natrona County. The North Butte and Ruth Remote Satellites are within commuting distance of Gillette and Wright in Campbell County; Midwest, Edgerton and Casper in Natrona County; and, Kaycee in Johnson County. The Gas Hills Remote Satellite is within commuting distance of Riverton and Shoshoni in Fremont County and Casper in Natrona County. Therefore, workers from these counties would likely commute from their homes. There would be no impact on temporary housing located within commuting distance (approximately 1 to 2 hours) of the **SUA-1548** license areas.

In the event that temporary workers from other states are hired for construction at SUA-1548 **license areas**, temporary housing such as motel/hotel rooms and RV sites located within commuting distance would be required, as no on-site housing is available or planned. The available stock of motel/hotel rooms for Smith Ranch and the remote satellites would accommodate relocating workers.

It is recognized, however, that the coal, CBM, oil and gas, and other uranium projects in the area are presently a dominant influence on temporary housing, and the workforce employed in these industries occupy much of the temporary housing that is currently available. Wyoming counties are often faced with a shortage of temporary housing and have adapted to this shortage by the construction of new temporary facilities.

It is anticipated that only a few members of the construction workforce would purchase or rent housing of any type. Therefore, there would be no effects on the costs of any type of housing in the affected counties. Because rental housing usually requires a long-term lease (generally a minimum of six months), only long-term employees would likely enter into this type of lease agreement. Under a hiring scenario that assumes all of the proposed operations workforce would need to relocate to the area, approximately 210 housing units would be required over the life of the project for Smith Ranch, approximately 144 for the North Butte Remote Satellite project, approximately 180 for the Gas Hills Remote Satellite project, and approximately 28 for the Ruth Remote Satellite project. Since Smith Ranch is an operating uranium ISR facility, the need for 210 housing units is unrealistic. In 2010, there were a total of 2,513 vacant housing units in Converse and Campbell Counties combined, and 3,112 vacant housing units in Fremont and Johnson Counties. When combined and assuming the above worst case assumptions, this would meet the future demand for housing in these four counties from anticipated population growth. There would be little to no effect to the rental rates of any type of housing in the affected counties

4.10.1.5 Effects to Services

It is likely that both the construction and operating workforce for the project would be from Converse, Campbell, Fremont, and Johnson Counties, or other nearby communities, and would not require permanent or temporary housing. In the event that up to 50% of the construction and operating workforce are non-local workers, it is anticipated that there would be less than a 1% increase in the population of the affected counties from the permanent relocation of the workers and their families. Most non-local workers are anticipated to utilize temporary housing. Because existing mobile home and RV parks will be used for a majority of the temporary housing, the project will not require new water, sewer, electrical lines, or other infrastructure. There will be no additional demands or increases in service levels for local infrastructure, such as police, fire, water, or utilities. In addition, there would be little measurable increase in non-basic employment, as these jobs are generated from ongoing employment of the existing base of construction workers, and would be maintained through the continued employment of local construction workers. Therefore, construction and operation of SUA-1548 **facilities** during the renewal period would not significantly affect the various public and non-public facilities and services described above from the influx of workers for non-basic employment opportunities.

Families moving into the affected county school districts as a result of SUA-1548 operations would not stress the current school system because it is presently under capacity in each of the affected counties.

4.10.1.6 Economic Impact Summary

Economic impacts are discussed in detail in the benefit-cost analysis in Section 7.0.

4.10.2 No-Action Alternative

The no-action alternative would result in a negative economic impact to local towns and counties by reducing the sales tax revenue for goods and services in Converse, Campbell, Fremont, and Johnson Counties. Selection of this alternative would impede any chance of further boost to the economy for the towns that would provide housing and services for workers associated with SUA-1548. The no-action alternative overall would create no additional jobs and would inhibit any positive effects that the project has and would have continued to have on the economy at the local, state, and federal level.

The no-action alternative would; however, increase the number of available housing units (temporary or permanent) in the cities and towns that are within commuting distance of the SUA-1548 license areas since they would not be occupied by the Cameco employees. Also, the no-action alternative would prevent an increase in the number of students that would occupy the local schools, and would increase the vacancy levels at nearby mobile home communities and RV parks. However, based on the number of workers anticipated for each of the SUA-1548 license areas, the no-action alternative is unlikely to have a positive effect on local housing or the local school system.

4.10.3 Alternative Action

The socioeconomic impacts of conventional mining would be similar, though possibly greater than those associated with the proposed action. In particular, the labor force associated with a conventional mine and the upfront capital requirements would be greater. Because of the increase in labor, the overall demand for housing and school will be higher and additional housing may need to be created. Tax revenue from a conventional mine is likely to be greater, both in the number of employee's spending money locally as well as the significantly larger capital investment in equipment, materials, fuel and supplies. Additionally, more out-of-area/state workers may be required to fill all of the open positions of an open pit or underground mining operation.

4.10.4 Cumulative Impacts

The proposed action will provide an overall positive contribution to cumulative socioeconomic impacts in the region. The affected counties are all "energy affected counties" and the energy specialized workforce is in place. The cumulative jobs associated with approval of the proposed action are all high paying jobs and will likely be similar to those associated with conventional oil and gas, wind energy, shale fracking, other uranium ISR operations, coal, and CBM. The proportion of new jobs associated with the NRC approval of the proposed action will be insignificant relative to the cumulative nature of energy development within the region. On a cumulative basis, the energy development within these counties has provided jobs, wages, and tax revenues to the state and surrounding communities without adverse impacts to local infrastructures like hospitals, schools, and community services. In fact, the cumulative taxes associated with mineral and resource recovery has provided funding for capital improvements, including critical infrastructure improvements on a statewide basis. If the proposed action is approved by the NRC Staff, the positive socioeconomic effects will be accentuated.

4.11 Potential Environmental Justice Impacts

4.11.1 Proposed Action

Based on the data provided in this section, no large populations of **Native Americans, other** minorities, or people living below the poverty level are located near any of the SUA-1548 license areas. Therefore, it is concluded that the ISR operations are not now nor will they in the future create any adverse environmental justice impacts on **any** of these populations. Except for scattered ranches, the majority of the population nearest to Smith Ranch and its contiguous satellites live in Casper, Glenrock, Rolling Hills, Douglas and other smaller communities along the I-25 corridor. Similarly, the majority of the population near the North Butte and Ruth Remote Satellites reside in Gillette, Wright and other smaller communities along Highways 387, 50 and 59. The majority of the population near the Gas Hills Remote Satellite resides in Riverton, Lander and Casper. These cities, towns, and communities also possess a low percentage of minority and low-income populations compared to the state as a whole (U.S. Department of Commerce, **2010b**).

While opportunities for developed and dispersed recreation exist throughout the regions surrounding all SUA-1548 license areas, there are limited recreational uses within the license areas or in the surrounding 3 kilometer (2 mile) area. Private lands within the license areas allow limited hunting opportunities. Public lands within and adjacent to the Gas Hills Remote Satellite are used for pronghorn antelope hunting and limited other recreational interests; North Butte, Ruth, and Smith Ranch public lands are used for antelope and deer hunting and limited other recreational interests. Section 3.1.3 of this ER describes all state and federal recreational lands within 80 kilometers (50 miles) of all SUA-1548 sites. There have not nor will there be any significant impacts on recreational opportunities as a result of SUA-1548 operations. The physical remoteness of the sites and the lack of proximity to any well recognized federal or state site of recreational interest indicate that there are no significant long-term impairments to recreational values from expanding SUA-1548 operations.

Hunting activities on and near the permit area are primarily limited to pronghorn and mule deer. Since the permit area surface is predominantly under private ownership, hunting is controlled by the landowners. Under agreements with the individual landowners, hunting activities are precluded within NRC restricted areas (i.e., CPP and satellite facilities). Mine unit areas on public land are open to hunting. Cameco requests that all hunters check in at the Smith Ranch or remote satellite office prior to hunting in these areas.

4.11.1.1 Smith Ranch

The **2010** U.S. Census Decennial Population program provides race and poverty characteristics on a census tract basis. Based on a **6.4** kilometer (**4** mile) radius, Smith Ranch consists of **only one** potentially-impacted census **tract:** Converse **County Tract 9566**.

As summarized in **Table 4.11-1, 2010 Race Characteristics of the Population for the Census Tract Included in the 6.4 kilometer Radius Surrounding Smith Ranch**, the **total** population of **Converse County Tract 9566** was approximately **3,200**, according to the 2010 U.S. Census (U.S. Department of Commerce, 2010b). The State of Wyoming minority and low-income housing data was compared to the **Converse County** tract ~~totals~~ to demonstrate how the minority and low-income populations **of the tract** directly compare to **the state as a whole.** There are approximately **230** minorities (approximately **0.4%** of the total state population) living **in Converse County Tract 9566**, whereas there are approximately 80,000 minorities (approximately 14% of the total state population) living in the entire state of Wyoming (U.S. Department of Commerce, 2010b).

The **Converse County Tract 9566** census ~~tracts~~ exhibits a smaller percentage of the population living below the poverty level than the state as a whole. The approximate poverty level population **is 7%,** whereas the state overall has a poverty level average of approximately 11%. **Table 4.11-2, 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding Smith Ranch** summarizes the median household income, per capita income, and population below the poverty level for each of the impacted census tracts as well as the state as a whole. No disproportionate adverse Environmental Justice impacts have been identified for low-income populations within the census tracts due to the operations at Smith Ranch.

4.11.1.2 North Butte and Ruth Remote Satellites

Because of their close proximity to one another (**the** Ruth **Remote Satellite** is approximately 13 to 16 kilometers (8 to 10 miles) southwest of **the** North Butte **Remote Satellite**), the Environmental Justice impacts of these two facilities have been analyzed together.

As summarized in **Table 4.11-3, 2010 Race Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the North Butte Remote Satellite** and **Table 4.11-4, Race Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the Ruth Remote Satellite**, the combined population of **Campbell County Tract 1 and Johnson County Tract 9551** is approximately **11,400**, according to the 2010 U.S. Census (U.S. Department of Commerce, 2010b). Of that population total, there are approximately **830** minorities (approximately **0.14%** of the **total state** population) living within the **two** census tracts, whereas there are approximately 80,000 minorities (approximately 14% of the state population) living in the state of Wyoming (U.S. Department of Commerce, 2010b).

The **Campbell County Tract 1 and Johnson County Tract 9551** census tracts exhibit a **lower** percentage of the population living below the poverty level than the state as a whole. Their approximate poverty level populations, respectively, are **5% and 7%,** whereas the state has an overall poverty level population of approximately 11%. **Table 4.11-5, 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the North Butte Remote Satellite** and **Table 4.11-6, 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the Ruth Remote Satellite** summarize the median household income, per capita income, and population below the poverty level for each of the impacted census tracts as well as the state of Wyoming.

4.11.1.3 Gas Hills Remote Satellite

According to the 2010 U.S. Census, and summarized in **Table 4.11-7, 2010 Race Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the Gas Hills Remote Satellite**, the combined approximate population of the **two** census tracts **included in this area (Natrona County Tract 18 and Fremont County Tract 3)** was **8,600** (U.S. Department of Commerce, 2010b). Of that total, there are approximately **700** minorities (approximately **0.12%** of the total **state** population) living within the **two** census tracts, whereas there are approximately 80,000 minorities (approximately 14% of the state population) living in the entire state of Wyoming (U.S. Department of Commerce, 2010b).

The percentage of the population residing within Fremont County Tract 3 and Natrona County Tract 18 census tracts exhibit fewer people living below the poverty level than the rest of the state. Their approximate poverty level populations are **both 7%. Table 4.11-8, 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the Gas Hills Remote Satellite** summarizes the median household income, per capita income, and population below the poverty level for each of the impacted census tracts and the entire state.

4.11.2 No-Action Alternative

Under the no-action alternative, a number of workers would be required to decommission (including groundwater restoration) and reclaim the SUA-1548 license areas back to their original pre-ISR condition. At Smith Ranch, approximately 75 employees would be necessary to successfully carry this out. At the North Butte Remote Satellite, approximately 30 employees would be needed to complete decommissioning and reclamation activities. At the Gas Hills Remote Satellite, approximately 38 employees would be needed; and at the Ruth Remote Satellite, approximately 10 workers would be necessary. During the decommissioning and reclamation process, the number of required workers at each of the SUA-1548 license areas will decrease as the process progresses and tasks are completed. As demonstrated with the proposed action (see Section 4.11.1 **above**), there is not now, nor will there be in the future, any disproportionate potential adverse impacts to minority and low-income populations from the operation of SUA-1548 **license areas**. Therefore, the number of employees and activities necessary to successfully decommission and reclaim each of the four sites would exhibit less of an impact on the minority and low-income populations than the proposed action.

4.11.3 Alternative Action

Under the alternative action, Cameco would mine the uranium ore using conventional underground or open pit mining methods. A conventional mining approach would result in a significantly larger work force. The greater number of employees and contract labor workers required for each of the SUA-1548 license areas would likely reside in the same cities and towns described for the proposed action. Housing is somewhat limited in these communities (see Section 4.10 **of this ER**) and additional housing may need to be created. The increased demand in housing may result in higher rents and/or availability of housing to the minority and poverty level populations. This increased stress on the community housing and infrastructure could cause potential adverse impacts on the minority and poverty level populations that would not exist with the proposed action.

4.11.4 Cumulative Impacts

The SUA-1548 license areas are located in remote areas of the state surrounded by rural populations with no significant minority or low-income populations. The average salary, including salaries of the proposed action, for the areas within 6.4 kilometers (4 miles) of each of the SUA-1548 license areas, is significantly higher than the poverty level. This fact alone indicates that the proposed action will have a positive impact on any minority and low-income individuals living in communities surrounding the SUA-1548 license areas by making available additional high salary jobs to the people of Wyoming. Therefore, based on an analysis of the impacts caused by the existing Smith Ranch operation and publicly available statistics, it is not anticipated that the proposed action will result in any adverse Environmental Justice impacts on the surrounding local communities or the State of Wyoming.

4.12 Potential Public and Occupational Health Impacts

4.12.1 Proposed Action

ISR operations under the proposed action pose a low risk to public and occupational health. To ensure risk levels from non-radiological and radiological impacts remain low, Cameco has instituted standard operating procedures for handling, processing, storing, transporting or disposing of source and byproduct and hazardous materials. Approval of the proposed action will not result in significant risk to public and occupational health.

4.12.1.1 Smith Ranch

Non-Radiological Impacts

The proposed action includes continued operations at Smith Ranch and expansion to the Reynolds Ranch Satellite. Non-radioactive airborne effluents at Smith Ranch are limited to fugitive dust from access roads and mine unit activities and non-radioactive NOx particulate emissions from the CPP yellowcake vacuum dryer and packaging room scrubber system. Non-radioactive particulates from the CPP have been negligible in the past and are anticipated to continue to be so. During construction, non-radiological impacts are those associated with fugitive dust from access roads and mine unit activities along with gasoline and diesel emissions from construction equipment and field vehicles. Fugitive dust would result from land disturbance activities associated with construction as well as vehicular traffic. **Impacts from these emissions are** expected to remain small due to both the short duration of the release and the fact that emissions are readily dispersed into the atmosphere (NRC, 2009). A summary of the estimated annual fugitive dust emissions is provided in Section 7.2.1 of the TR and indicates that the fugitive dust emission estimates are well below the allowable limits of the State of Wyoming. For additional information on the non-radiological impacts associated with Smith Ranch please see Section 4.6 of this ER and **Section** 7.4 of the TR.

No highly hazardous chemicals, toxics, or reactives listed in Appendix A to 29 CFR 1910.119 are used at **SUA-1548 facilities**. While some hazardous chemicals are used at ISR facilities, small risks are expected in the use and handling of these chemicals during normal operations (NRC, 2009). However, accidental releases of these hazardous chemicals can produce significant consequences and impact public and occupational health and safety. Mitigation measures as described in Section 5.12 **of this ER and Section 7.5 of the TR** are used by Cameco to reduce the chance of such an accident. If an accident did occur, Cameco has established emergency response plans and procedures **for transportation accidents (see Section 5.2.1.1 of the TR)** that will minimize the risks and impacts. For additional information on the non-radiological impacts associated with hazardous materials at Smith Ranch, please see Sections **5.2.1.2 and** 7.5 of the TR.

Non-11e.(2) liquid and solid wastes will be properly disposed to prevent any significant impacts to public and occupational health. The different types of wastes are characterized as follows:

Non-11 e.(2) Liquid Wastes:

- Liquid wastes not affected or contaminated by uranium processing. Reagents and fuels stored outside and near the facilities are placed within bermed areas to provide secondary containment and meet requirements of the Spill Prevention Control and Countermeasures (SPCC) regulations. Contained spills are then removed for appropriate disposal.
- Domestic liquid wastes from restrooms and lunchrooms are disposed in an approved septic system that meets the requirements of the State of Wyoming. Liquid wastes from the facility laboratories are disposed at UIC Class I disposal wells.
- Storm water management is controlled under WYPDES permits issued by the WDEQ/WQD. Facility drainage is designed to route storm water away or around buildings, ancillary buildings and parking areas, chemical and fuel storage areas. Refer to Section 4.0 of the TR **and Section 3.12 of this ER** for more information on Non-11-e.(2) liquid wastes.

Non-11 e.(2) Solid Wastes:

Solid materials which are not contaminated with radioactive material or which can be decontaminated to unrestricted release criteria. To be released for unrestricted use, decontaminated materials must have activity levels lower than those specified in NRC guidance titled *"Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials"*, September 1984.

Waste management and potential impacts related to these materials are provided in greater detail in Section 4.2 of the TR **and 3.12 of this ER**.

Radiological Impacts

During typical ISR operations, there is a small potential for radionuclides to be released to the environment. Rn-222 can be emitted from IX facilities, the CPP and the mine unit header houses during operations. However, ISR activities do not release significant amounts of gaseous or airborne particulates (see Section 4.6 **of this ER**). Specific information relating to the radiological impacts associated with Smith Ranch, including all MILDOS modeling, pathway assessment, and public and occupational exposure information can be found in Section 7.3 of the TR. Information related to the radiological impacts associated with spills at Smith Ranch can be found in Section 7.5 of the TR.

Under the proposed action, yellowcake processing will be performed at the Smith Ranch CPP and CPF facilities. The primary potential source of airborne uranium occurs during yellowcake packaging. Packaging of the yellowcake will be confined to the dryer room, which will be closed and posted as an airborne radioactivity area. Within the yellowcake drying and packaging areas at the CPP and CPF, the potential exists for exposure to yellowcake dust. However, airborne particulate levels at ISR plants that employ vacuum dryers are very low since there are no radionuclide emissions from the dryer. Cameco utilizes vacuum dryers rather than calciner type dryers (yellowcake roasted at 800 °C [1,472 °F] in a gas fired furnace) to reduce migration of air particulates from the drying process. Drying takes place in a vacuum. Material is sucked into the canister so particulates are not allowed to escape into the environment.

In the slurry unloading area, the potential for exposure to airborne uranium is considerably less than in the drying and packaging areas as slurry unloading will be performed on an infrequent basis. Dryer operators are required to wear precautionary respiratory protection during yellowcake packaging operations to provide another layer of protection from the potential release of airborne uranium during this procedure.

Cameco uses downflow pressurized IX columns instead of open columns to minimize exposure to Rn-222. All facilities have ventilation systems that remove released radon from building units **and discharge it** to the atmosphere. These and other measures ensure **that the radiological** impacts to **the** public and **workers** from **ISR** are ALARA.

Cameco performs extensive **testing to** monitor the potential for radiological impacts to public and occupational health. External gamma radiation surveys are regularly performed at worker occupied stations and areas of potential gamma source exposure such as tanks and filters at Smith Ranch. Area samples are collected and analyzed at specified sample locations **in accordance with standard operating procedures** (see **Figures 5.2, 5.3, 5.4, 5.5, Figure 5.6** in the TR). Workers are also monitored to ensure they receive less than 10% of the dose limits for internal or external radiation. Lastly, occupational airborne radioactivity concentrations at Smith Ranch are monitored daily, weekly and monthly to allow for timely investigations and corrective actions, if needed, to respond to conditions or practices resulting in airborne radioactivity concentrations above the action level of 25% of the DAC. For additional information about current activities and mitigation measures, see Sections 3.12 and 5.13 of this ER and Section **5 of the TR**.

4.2.1.2 Remote Satellites (North Butte, Gas Hills, and Ruth)

Non-Radiological Impacts

Approval of the proposed action at the remote satellites will allow the commencement of uranium recovery operations at these facilities. Construction and operations at the remote satellites will have similar safeguards as those utilized at Smith Ranch. **Therefore**, potential impacts on public and occupational health at the remote satellite locations are expected to be small. Increases in fugitive dust levels as construction and operation activities commence are anticipated, but impacts on local air quality will be minimal (see Section 4.6 **of this ER and Section 7.0 of the TR**). Measures to reduce dust from vehicular traffic include applying water or chemically treating unpaved roads. Estimated fugitive dust emissions during construction of ISR facilities are less than 2% of the NAAQS for $PM_{2.5}$ and less than 1% for PM_{10} (NRC, 2009).

Hazardous materials use will be kept to a minimum and handling of these materials will be according to standard operating procedures. Should an accident or spill occur, emergency response plans will be followed to minimize potential health impacts. Non-radiological impacts are discussed in further detail in Section 7.5 of the TR.

Waste management procedures are in place at Smith Ranch, and reflect those approved in the 2001 license renewal, to reduce public and occupational health impacts from liquid and solid wastes. Monitoring and sampling of waste effluent show that **these** management **procedures** are successful as levels are within acceptable values. These management and sampling procedures will also be used at the remote satellites. Information regarding potential impacts from waste management is discussed in Section 4.2 of the TR and **Sections 3.12 and 5.13** of this ER. At this time, site planning and proposed construction activities for the Ruth Remote Satellite have not been finalized. Consequently, impacts from construction and operations will not be experienced at the Ruth Remote Satellite until future operational details are finalized.

Radiological Impacts

Airborne effluents from ISR operations at the remote satellites are anticipated, but constituent concentrations will likely be minimal. In particular, Rn-222 is the main potential radioactive effluent expected during operations. Potential sources include plant buildings evaporation ponds (if utilized) and well field locations. Although these sources do provide a transfer mechanism to the atmosphere, anticipated levels of airborne Rn-222 is small and will immediately be dispersed in the atmosphere further reducing any potential concentrations.

Similar to Smith Ranch, once construction and operations begin at the remote satellites, Cameco will closely monitor radiological levels of its workers, site locations and air quality to reduce potential impacts to public and occupational health. Conversely, upon completion of ISR activities, equal attention will be given to decommissioning and restoration efforts. Section **5.0 of this ER and Sections 5.0 and 6.0 of the TR** provide detailed information regarding mitigation measures. Measures include cleanup criteria for structures, which includes radiological surveys and sampling of all facilities, equipment, materials, and soils to determine the level of contamination and resultant mitigation efforts. As part of this process, appropriate safety measures will be initiated to protect both workers and the environment through the decommissioning process. Gamma exposure rate surveys are performed in accordance with standard operating procedures. **Proposed in-plant monitoring locations for the North Butte and Gas Hills remote satellite buildings are shown on Figure 5.6A and Figure5.6B of the TR, respectively.** Gamma survey instruments will be checked prior to each day's use in accordance with the manufacturer's instructions. Surveys will be performed in accordance with the guidance contained in NRC Regulatory Guide 8.30.

4.12.2 No-Action Alternative

Under the no-action alternative there would be no significant impacts on public and occupational health at SUA-1548. Both non-radiological and radiological public and occupational health impacts at Smith Ranch would remain at current levels and diminish over time as decommissioning and restoration activities were completed. There would be construction activities at the remote satellites as existing disturbances are reclaimed and, as such, there may be a temporary increase in fugitive dust or other non-radiological emissions.

4.12.3 Alternative Action

Non-radiological impacts to public and occupational health are significantly less at an ISR operation than conventional underground or open pit uranium mining. The larger work force and scale of conventional underground and open pit mining would cause a major increase in the amount of gaseous and airborne particulates, particularly from fugitive dust. In addition, the structure and design of an ISR facility also decreases potential public and occupational health hazards that are present in conventional mining operations. Hazardous structures exist not only with underground, but also open pit mining and increase the potential for health impacts. In contrast, ISR recovery has no open pits, shafts or other potentially hazardous structures reducing the chance of injuries.

Radiological exposure is also greater from conventional uranium mining than ISR. At an ISR facility, operating personnel are not exposed to the radionuclides present in and emanating from the ore and tailings. Conventional mill tailings can contain all of the Ra-226 originally present in the ore, whereas ISR operations may have less than 5% of the original Ra-222 in the ore zone (Energy Metals Corporation, 2007). The alternative action will result in greater public and human health impacts than the proposed action.

4.12.4 References

Crow Butte Resources, Inc. "License Renewal Application: SUA-1534." Crawford Nebraska: Crow Butte Resources, Inc. 2007.

Energy Metals Corporation, U.S. "Application for NRC Source Material License Moore Ranch Uranium Project, Campbell County, Wyoming: Environmental Report." Casper, Wyoming: Energy Metals Corporation, U.S. [ADAMS Accession Number: ML072851249]. September 2007.

U.S. Nuclear Regulatory Commission. 2006. "Environmental Assessment for the Addition of the Reynolds Ranch Mining Area to Power Resources, Inc.'s Smith Ranch/Highlands Uranium Project Converse County, Wyoming." Source Material License No. SUA–1548. Docket No. 40-8964. Washington, DC: NRC.

U.S. Nuclear Regulatory Commission. 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (NUREG-1910). Page Last Reviewed/Updated Sunday, March 13, 2011.

5.0 Mitigation Measures

In accordance with the guidance provided in NUREG-1748, this section describes those mitigation measures that Cameco uses and will continue to use to reduce potential adverse impacts from operations at SUA-1548. An analysis of the anticipated effectiveness of the mitigation measures and any residual potential impacts or unavoidable potential impacts caused by the mitigation measures is also provided. Finally, the technical feasibility and cost-benefit of applying the mitigation measures is discussed.

In 40 CFR 1508.20, the CEQ defines mitigation as:

1. Avoiding the potential impact altogether by not taking a certain action or parts of an action.
2. Minimizing potential impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectifying the potential impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the potential impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the potential impact by replacing or providing substitute resources or environments.

Mitigation measures can take the form of both general BMP and more site-specific management actions. A BMP, in the most general terms, is a method or technique found to be the most effective and practical means in achieving an objective (in this case preventing or minimizing potential adverse impacts to the environment) while optimizing resource use. Cameco is committed to meeting the highest standards in health and environmental performance. The following sections describe the mitigation measures that will be or already are implemented at all locations covered under SUA-1548.

5.1 Land Use

This section addresses the final decommissioning methods of disturbed lands including mine unit well fields, satellite facility areas and the central processing facilities at Smith Ranch and the remote satellite facilities. The section also discusses general procedures to be used during final decommissioning as well as the decommissioning of a particular well field area.

NRC regulations at 10 CFR 40.42(h) 1 and 2 states that decommissioning of the site or a portion of the site is required within 2 years following the commencement of decommissioning activities. Similarly, when decommissioning involves the entire site, a request for license termination is required within 2 years following the initiation of decommissioning activities, unless an extension or exemption has been applied for and approved by NRC Staff.

Following is a list of general decommissioning activities:

- Plugging and abandonment of all wells.
- Determination of appropriate cleanup criteria for structures.
- Radiological surveys and sampling of all facilities, process related equipment and materials on site to determine their degree of contamination and identify the potential for personnel exposure during decommissioning.

- Decontamination of items to be released for unrestricted use to levels consistent with NRC requirements.
- Surveying of excavated areas for contamination and decontamination or removal of the contaminated materials to another operational portion of SUA-1548, or removal to another NRC-licensed facility for reuse or disposal.
- Performance of final site soil radiation surveys.
- Replacement of topsoil and recontouring of the surface, as needed.
- Establishment of permanent revegetation on all disturbed areas.

5.1.1 Surface Reclamation and Decommissioning

NRC regulations at 10 CFR 40.42(d)1 - 4 state that upon termination of the license, permanent ceasing of principal activities or in the absence of principal activities for a 2-year period, Cameco is required to provide written notification of decommissioning to the NRC. "Decommissioning" includes groundwater restoration. It is the goal of surface reclamation to return all disturbed areas to its pre-operational land use of livestock grazing and wildlife habitat (unrestricted use) unless an alternative use is justified, in concurrence with the landowner desires and approved by the WDEQ and NRC. For example, if the landowner desires to retain certain roads or buildings, this will be addressed with the regulatory agencies. Interim and final reclamation mitigates the initial disturbance to land use. For complete information on surface reclamation and decommissioning including well plugging and abandonment, surface disturbances, and surface reclamation, please see Section 6.2 of the TR.

5.2 Transportation

5.2.1 Traffic

The highest levels of project-related traffic are from the operations and construction workforce, which are housed in surrounding communities and limited to travel to and from the sites and on site during the work shift. As stated in Section 4.2 traffic rates on all adjacent and regional roadways are anticipated to increase by less than 5% as the result of SUA-1548 activities. No mitigation measures have been necessary in the past and are not anticipated to be necessary in the future.

5.2.2 Transportation Accidents

Transportation of hazardous materials associated with SUA-1548 can be classified as follows:

- Shipments of uranium-laden resin from SUA-1548 satellites to the CPP or CPF for processing.
- **Shipments of yellowcake slurry from SUA-1548 satellites to the CPP or CPF for processing.**
- Shipments of process chemicals or fuel from suppliers to any of the SUA-1548 sites.
- Shipment of processed yellowcake from the CPP or CPF to a conversion facility.
- Shipments of 11e.(2) byproduct material from the CPP or CPF and satellites to a NRC-licensed disposal facility.

Resin, yellowcake slurry, dried yellowcake and 11e.(2) byproduct material shipments are made in accordance with DOT and NRC regulations. Shipments will be handled as low specific activity (LSA) material. General shipping procedures are outlined as follows:

- The materials described above are shipped as "Exclusive Use Only". This requires the outside of each **transport truck and trailer** to be marked "Radioactive LSA" and **a radioactive 7 placard placed on all four sides of the transport vehicle**.

- A bill of lading **must be included** for each shipment (including eluted resin). The bill of lading will indicate **the proper shipping name, hazard class, UN number and total activity of the load**.
- Before each shipment of LSA material, the exterior surfaces of the trailer will be surveyed for alpha contamination **and dose rate**. In addition, **dose rates will be obtained from 2 meters and inside the cab of the tractor. All of the survey results will accompany the bill of lading.**
- Properly licensed and trained drivers **will** transport the material between SUA-1548 satellites and the CPP or CPF. Dried yellowcake and 11e.(2) byproduct material is shipped by contract carrier.

Cameco has developed an emergency response plan for yellowcake and other transportation accidents to or from all SUA-1548 license areas, which has been in place since the initial license was approved. Cameco personnel receive initial and annual refresher training for responding to a transportation accident.

In the event of a transportation accident involving resin or yellowcake slurry transportation between SUA-1548 sites, Cameco will implement its emergency response plan for transportation accidents. Additionally, to reduce the risk of a potential accident and to minimize potential impacts from such an accident, the following procedures are followed:

- Each truck is equipped with a communication device that allows the driver to communicate with either the shipper (i.e., satellite) or receiver (i.e., CPP or CPF). In the event of an accident and spill, the driver is able to communicate with either site to obtain help.
- A check-in and check-out procedure is required where the driver notifies the receiving facility prior to departure from his location. If the resin or slurry shipment fails to appear within a set time, an emergency response team will respond and search for the vehicle. This system will assure reasonably quick response time in the case that the driver is incapacitated in the accident.
- Each transport vehicle is equipped with an emergency spill kit, which the driver can use to begin containment of any spilled material. The kit includes plastic sheeting to cover spilled material until cleanup operations can begin.
- Both the shipping and receiving facilities are equipped with emergency response kits to quickly respond to a transportation accident.
- Personnel and truck drivers receive specialized training to handle an emergency response to a transportation accident.

5.3 Geology and Soils

5.3.1 Geology

Potential geologic impacts from the proposed action license areas have been in the past and are anticipated to continue to be minimal, if any. No significant matrix compression or ground subsidence has been observed from existing ISR operations and none are anticipated. Further, once production and restoration operations are completed, groundwater levels return to near original conditions under a natural gradient and exist at their pre-mining water quality. Potential impacts to deep geologic structures from disposal of fluids via UIC Class I disposal wells have not created any potential geologic impacts to the receiver formations in the last 25 years of operating experience at Smith Ranch. Injection rates are limited by regulatory and permit requirements so that formation fracture pressures that could cause geologic instability are not exceeded. Based on past operating history, it is not anticipated that potential geologic impacts will occur in the next renewal period due to continued operation of existing UIC wells or additional wells that may be installed and operated during the renewal period.

5.3.2 Soils

The Smith Ranch is operational whereas the Reynolds Ranch Satellite, North Butte, Gas Hills, and Ruth Remote Satellites are not. The topsoil management and erosion control methods employed at each facility are similar. Section 3.8 of the TR details the most current BMP being employed at SUA-1548 in the areas of: topsoil management, erosion control methods, surface water diversions, and the construction quality assurance plan.

Potential soil impacts will occur as topsoil is removed from drill pads, roads, building footprints, ponds and similar ISR operations. Potential impacts to soils will be mitigated by the temporary nature of the disturbance, proper stockpiling and protection of topsoil resources and careful replacement and reseeding of topsoil on the reclaimed land surface. The majority of topsoil disturbances at an ISR facility are generally short term and include the six month period of well field development or the near simultaneous trenching and reclamation of pipeline trenches. In both cases, reclamation occurs shortly after the disturbance.

Although unlikely, an unexpected spill could potentially impact soils. The monitoring plan designed by Cameco quickly detects and responds to spills to minimize potential impacts. Should a spill occur, potential impacts are expected to be localized and short term. Information regarding potential spills and associated potential impacts are discussed as part of waste management in Section 4.12 of this ER and 4.2 of the TR. Cameco has demonstrated, through existing operations at Smith Ranch, both prompt and efficient methods for addressing spills. Furthermore, Cameco's Spill Committee review process has proven effective investigating causes of spills and recommending and implementing engineering and operational changes to eliminate or reduce the risk of spills occurring in the future. Section 3.10 of the TR provides additional information on potential impacts of historical spills at Smith Ranch.

5.4 Water Resources

5.4.1 Surface Water

There will be minimal potential impacts to surface waters at all SUA-1548 license areas as a result of the planned or ongoing ISR operations. A Storm Water Pollution and Prevention Plan has been implemented for all construction and operational activities. Cameco has and will continue to utilize BMP to ensure that all disturbed land runoff is contained and treated. Well field construction disturbances are revegetated as soon as practicable following the end of construction. There has been and will continue to be little to no discharge of sediment laden water produced by production or construction activities to surface drainages. Properly designed culverts are used to pass surface water flow below roads and facilities, and as such, there is minimal retention or impounding of surface water.

All process related wastewater generated at SUA-1548 is disposed via permitted UIC Class I disposal wells, land application or solar and enhanced evaporation. During operations, surface waters could be potentially impacted by accidental spills from the facility. Cameco has a rigorous monitoring and inspection program that allows for the monitoring of production and recovery wells and pipeline pressures remotely as well as daily inspections of header houses and well field pattern areas. This monitoring program ensures that should a leak occur, it will be contained and cleaned up immediately upon discovery. Such potential impacts are short term and controlled and will not likely impact surface water. Spills from the CPP, CPF, satellites or during transportation of resin, slurry, dried yellowcake or

11e.(2) byproduct materials are closely monitored, and any spills are cleaned up before they can contact surface water. With the exception of isolated spring-fed reaches of West Canyon Creek, there are no perennial or intermittent surface waters within SUA-1548 license areas.

5.4.2 Groundwater

Cameco has operated SUA-1548 in a manner to limit the number of excursions to a very small number relative to the number of mine units operated and the number of wells monitored. As discussed in the NRC's "*Staff Assessment of Groundwater Impacts from Previously Licensed In-Situ Uranium Recovery Facilities*" (Miller, 2009), the number of excursions reported and the duration of the excursions at Smith Ranch constitute a small percentage of the total number of samples analyzed. For example, at the Smith Ranch site, approximately 1,000 wells have been sampled and analyzed twice a month for excursion parameters since the previous license renewal in 1999, compared to confirmed excursions of 12 wells (1% of the wells). Approximately 240,000 monitor well samples have been analyzed for excursion parameters, of which 12 wells have been confirmed to be on excursion status. Only five of the 16 mine units that are operational, or in restoration, have had excursions during the license renewal period. Detailed information on the location and extent of excursions can be found in Section 3.9.2 of the TR. Additionally, the above mentioned NRC Staff assessment report on groundwater impacts states that for most excursion events, the licensees were able to control and reverse the excursions through pumping and extraction at nearby wells. The excursions have not resulted in environmental impacts. This has been true at Smith Ranch in that Cameco has been able to successfully mitigate the impact of the limited number of excursions through corrective actions such as rebalancing flow throughput of nearby wells.

Following detection of an excursion, actions are immediately taken to mitigate potential migration of production fluids. These actions include immediately shutting off the injection wells in the vicinity of the excursion, thereby drawing in production fluids and creating a negative hydraulic gradient. The negative hydraulic gradient, or cone of depression, prevents further migration of production fluids. Excursion mitigation practices like these have proven to bring a well on excursion status back to non-excursion status in a timely fashion.

5.5 Ecological Resources

5.5.1 Vegetation

Mitigation of potential vegetation impacts consist of temporary and permanent surface revegetation of disturbed areas. Revegetation practices will be conducted in accordance with applicable state and federal requirements with agency approved seed mixes. Disturbed areas will be seeded to establish a vegetative cover to minimize wind and water erosion and the invasion of undesired plant species. For complete information on revegetation efforts see Section 6.2 of the TR.

5.5.2 Wildlife

Potential impacts to wildlife are described in detail in Section 4.5.2. Construction activities in ISR well fields will result in a temporary and limited loss of wildlife habitat. This loss of habitat is minimized as disturbed areas are reseeded when construction is completed in that area. Furthermore, Cameco employs wildlife friendly fencing wherever fences are required.

The likelihood for the impacts resulting in injury or mortality for wildlife is greatest during the construction phase due to increased levels of traffic and physical disturbance during that period. Traffic will persist during production, but should occur at a reduced, and possibly more predictable level. Speed limits are enforced during all construction, operation and maintenance activities to reduce potential impacts to wildlife throughout the year, but particularly during the breeding season.

In accordance with state and federal requirements, Cameco conducts surveys for T&E species, MBHFI or other raptors from late April through May of each year to identify any new nests and to assess whether known nests are being used. The survey covers all areas of planned activity for the life of the Project and a 1-mile area around the proposed area of activity. These surveys are primarily intended to protect against unforeseen conditions, such as the construction of a new nest in an area where construction and/or operations activities may take place. Results of wildlife surveys conducted within the last 10 years have shown little to no changes in wildlife population or of individual species within or near any operational area of SUA-1548. In the event that it becomes necessary to disturb a T&E or MBHFI nest, Cameco will consult with LQD, BLM, USFWS and WGFD to develop an appropriate mitigation action plan.

Cameco takes various precautions to limit potential adverse impacts to wildlife at all SUA-1548 license areas. Impacts to wildlife as a result of SUA-1548 operations are insignificant for the following reasons:

1. No unique or critical habitats are present within the permit areas.
2. No important wildlife migration routes are contained within the permit area.
3. ISR activities disturb relatively minor amounts of land surface compared to conventional open pit mining methods.
4. Areas disturbed by well field activities are quickly revegetated after well field construction and are used by wildlife throughout production activities.
5. Restrictive fencing is limited to isolated areas which do not significantly impede wildlife movements.
6. Vehicular traffic is limited and reduced speed limits are utilized for safety purposes and to decrease the potential for vehicle-wildlife collisions.

Observations over the 25 years of operation show that wildlife are not impacted, and both deer and pronghorn readily utilize the operating areas. It is likely that wildlife are attracted to the fenced well field areas due to the abundant vegetative growth which offers food and cover.

5.6 Air Quality

The primary source of emissions from SUA-1549 is fugitive dust from vehicular traffic on unpaved access roads and in the well field areas. Fugitive dust calculations provided in Section 3.6 were performed in accordance with the EPA AP-42 methodology. Current ISR operations at Smith Ranch produce approximately 71 tonnes (78 tons) per year of fugitive dust. With the proposed expansion at Smith Ranch, fugitive dust is expected to increase to 141 tonnes (156 tons) per year when Smith Ranch is operating at full capacity. Estimates for fugitive dust emissions from the North Butte and Gas Hills Remote Satellites are approximately **97** and 130 tonnes (**107** and 143 tons) per year, respectively. Although operational plans for the Ruth Remote Satellite have not yet been developed, it is anticipated that fugitive dust emissions from this site will be less than what is anticipated for the North Butte Remote Satellite.

Construction and operational activities within SUA-1548 cause a minimal increase in fugitive dust emissions. Radiation measurements from soils at Smith Ranch show low levels of radionuclides (NRC, 2006). Accordingly, the inhalation of fugitive dust will not result in any significant radiological dose. Fugitive dust emissions are minimized by adherence to site speed limits. Vehicle speed has a linear effect on the production of total suspended particulates (Crow Butte, 2010). Speed limits at the current operation are 25 mph or less and will remain as such at all new satellite and remote satellite locations. Fugitive dust releases during operations can be reduced by at least half by periodic watering or chemical treatment of the unpaved roads which is implemented as needed at all SUA-1548 license areas. If possible, dust-producing activities are coordinated in a manner that reduces maximum fugitive dust exposure. As mentioned in Section 5.1, disturbed areas are reclaimed and revegetated as soon as possible. Less exposed ground means less fugitive dust created by wind.

The potential impacts associated with vehicle and construction equipment exhaust are also minimal. There are also several mitigation measures in place to reduce vehicle exhaust impacts even further. All fossil fuel vehicles will meet applicable emission standards, all diesel-powered construction equipment will be properly tuned and maintained, and Cameco avoids leaving equipment unnecessarily idling or operating.

5.7 Noise

As a result of the remote location of the project and the low population density of the surrounding area, potential impacts from noise or congestion within the project area or in the surrounding 3 kilometers (2 miles) area are not anticipated. The highest levels of project-related traffic are from the operations and construction workforce, which are housed in surrounding communities and limited to travel to and from the sites and on site during the work shift. The projected increase in traffic levels is minor (Section 4.2). Potential noise and congestion impacts are not anticipated in any of the counties where SUA-1548 facilities are located. No mitigation measures have been necessary in the past and are not anticipated to be necessary in the next renewal period.

5.8 Historical and Cultural Resources

NRC confidentiality requests – Information provided separately as confidential **Appendix F.**

5.9 Visual and Scenic Resources

Long-term effects result from the addition of structures to the landscape, such as the CPP, CPF and associated structures, satellites and associated structures, deep disposal well buildings, land application facilities, header houses, wellhead covers, access roads, and electric distribution lines. Effects from long-term activities will occur over the life of the renewal and beyond. Mitigation measures are meant to minimize adverse contrasts of project facilities with the existing landscape. The measures are applied to all facilities. Mitigation enables project facilities to harmonize with the surrounding landscape to the extent feasible.

In addition to selecting paint colors that harmonize with the surrounding landscape, several other measures would minimize adverse effects of project facilities in the landscape.

- Using existing vegetation and topographic features to screen wells, facilities, and roads;
- Avoiding straight line-of-sight road construction;
- Aligning roads with the contours of the topography rather than cutting straight across contours to header houses, although this method of aligning the roads may result in a greater area of disturbance;
- Constructing clearings to appear as natural clearings by rounding corners and feathering the vegetation interface between the clearing and the surrounding grasses and shrubs (in those areas where the existing vegetation is dense, clearings should be irregular in shape); and,

- Removing construction debris immediately because it creates undesirable textural contrasts with the landscape.

5.10 Socioeconomic

As is discussed in Section 7.0, the potential socioeconomic impacts associated with this LRA are and will continue to be beneficial. The operation will continue to accrue monetary benefits to the surrounding communities from local expenditures and state and local taxes paid by the project. Continuing operation at Smith Ranch and developing the remote satellites as ISR facilities will add employment to the local communities. Effects on housing, schools and municipal services are anticipated to be minimal (see Section 4.10). No mitigation measures have been necessary in the past and are not anticipated to be necessary during the renewal period.

5.11 Environmental Justice

Discussion presented in Section 4.11 determined that there would be no disproportionate potential adverse environmental impacts for populations living below the poverty level within the census tracts due to the LRA. No mitigation measures have been necessary in the past and are not anticipated to be necessary during the renewal period.

5.12 Public and Occupational Health

The potential impacts to public and occupational health from the LRA are described in Section 4.12 and include fugitive dust from construction activities and vehicle travel, the release of Rn-222 from IX facilities, the CPP, CPF, mine unit well fields and header houses, and any potentially adverse impact associated with a spill or accident.

Mitigation measures to minimize the potential impacts associated with potential spills during transportation are discussed in Section 5.2. Mitigation measures to address fugitive dust from construction and operation activities are discussed in detail in Section 5.6.

5.12.1 Radiation Health and Safety: Corporate Structure

The release of Rn-222 from IX facilities, the CPP, CPF and the mine unit well fields and header houses is being responsibly mitigated at the existing SUA-1548 facilities. Cameco has implemented procedures, training, and Management Actions designed to mitigate the risk of radiation exposure to both the public and the employees. Examples include the use of vacuum driers as opposed to calciner dryers and using down-flow pressurized IX columns instead of open columns. Additionally, all of the facilities provide ventilation systems that remove any released Rn-222 from the buildings to the atmosphere.

Cameco is committed to providing a safe work environment for visitors, contractors, and permanent employees alike. Accordingly, Cameco has implemented an ALARA Policy to keep all exposures to radioactive and other hazardous materials as low as possible and to as few personnel as possible. The ALARA Policy takes into account the state of technology and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of nuclear energy in the public interest.

Section 5.1 of the TR describes the responsibilities of management, the radiation safety officer, supervisors and employees within the framework of the ALARA Policy. The successful implementation of the ALARA Policy relies on the cooperation and dedication at all levels within Cameco. Section 5.3 of the TR describes the successes of Cameco's ALARA Policy. The results of the annual audits exemplify the commitment to investing time and resources into continually improving safety at SUA-1548. In addition to the annual ALARA audits, inspections of radiation safety are made on a daily, weekly and monthly basis (Section 5.3 of the TR). The same standard of commitment and innovation is carried forward to all SUA-1548 facilities.

The maximum TEDEs reported for workers at Smith Ranch are well below applicable standards, are consistent with doses the NRC indicates to be representative of uranium ISR facilities, and have been stable over the 10-year period since the last license renewal submittal (RAMC, 1999). This is in part due to the efforts put forth by **Cameco's staff and management** as described in Section 5.2 of the TR.

As described in Section 5.2 of the TR, specific actions taken as a result of the infrastructure described above include the development of Standard Operating Procedures for all operational activities involving source and 11e.(2) byproduct materials that are handled, processed, stored or transported by employees or outside contractors. Radiation Work Permits are also required in the case that employees are required to conduct activities of a non-routine nature for which there is the potential for significant exposure to radioactive materials and no Standard Operating Procedure exists. Additionally, any area, room or enclosure will be designated an "Airborne Radioactivity Area" as defined in 10 CFR 20.1003, if at any time the uranium concentration exceeds **1.85E-8Bg/m^3** (5E-10 pCi/L) for soluble uranium or **7.4E-10 Bg/m^3** (2E-11 pCi/L) for insoluble uranium.

5.12.2 Radiation Health and Safety: Training

All site employees and contractor personnel at SUA-1548 facilities participate in a training program covering radiation safety, radioactive material handling, and radiological emergency procedures. The training program is administered in keeping with standard radiological protection guidelines and the guidance provided in NRC Regulatory Guide 8.29, NRC Regulatory Guide 8.31, and NRC Regulatory Guide 8.13. Additional details relating to the content of the Radiation Safety Training Program for visitors, contractors and permanent employees as well as the associated testing requirement, on the job and refresher training can be found in Section 5.5 of the TR.

5.12.3 Radiation Health and Safety: Security

Measures to secure NRC-licensed material from unauthorized access or removal are in place at all SUA-1548 facilities. The operating facilities are manned 24 hours per day, 7 days per week, and in controlled and/or unrestricted areas, surveillance is maintained through the presence of the operators and workers on site. All licensed material is stored in secured areas and clearly marked with signs. Specific details relating to the implementation of security protocols are discussed in Section 5.7 of the TR.

5.12.4 Radiation Health and Safety: Controls and Monitoring

Cameco has a strong corporate commitment to and support for the implementation of the radiological control program at all SUA-1548 facilities. This corporate commitment to maintaining personnel exposures ALARA is incorporated into the radiation safety controls and monitoring programs described in Section 5.8 of the TR. Components of the radiation safety controls and monitoring program include an external radiation exposure monitoring program, an airborne radiation monitoring program, a respiratory protection program, a bioassay program, the establishment of an administrative action level, and a contamination control program.

5.13 Waste Management

Although less than conventional mining, ISR facilities produce airborne effluents, liquid wastes, and solid wastes that must be properly handled and disposed.

5.13.1 Gaseous Airborne and Particulate Emissions

The radiological effluents of concern at ISR operations include the release or potential release of radon gas (radon-222), radionuclides in liquid process streams, and dried yellowcake particulates at the CPP and CPF.

Section 4.1 of the TR discusses the mitigation measures to control potential gaseous and airborne particulate impacts.

5.13.2 11e.(2) Liquid Waste

11e.(2) wastes produced at ISR operations include liquid process wastes from the production and restoration processes, water collected from well field releases, water collected from header house releases, water collected from sumps of the CPP, CPF and the satellites, and water collected at the UIC Class I disposal well sumps. Section 4.2 of the TR contains specific information regarding the handling of 11e.(2) liquid wastes.

5.13.3 Non-11e.(2) Liquid Waste

Non-11e.(2) liquid wastes include those collected from bulk reagent storage facilities, domestic liquid wastes and storm water runoff. Section 4.2 of the TR provides specific information regarding the handling of non-11e.(2) liquid wastes.

5.13.4 11e.(2) Solid Wastes

11e.(2) solid wastes (i.e., byproduct materials) may include tanks, vessels, IX resin, filter media, process piping and equipment, evaporation and surge pond solid residues or any other material or equipment that cannot be decontaminated to meet the unrestricted release criteria. All 11e.(2) solid waste materials are transported to and disposed at a NRC-licensed disposal facility (see Section 4.2 of the TR).

Production of 11e.(2) byproduct materials is primarily minimized through process design, decontamination and volume reduction. For example, filter media for production and restoration equipment is selected based on filtration efficiency so that fewer replacements are needed. Whenever possible, equipment and buildings are decontaminated so that they can be released for unrestricted use. Volume reduction is accomplished by crushing piping and other materials using a grinder or chipper.

Methods for decontamination and release of contaminated equipment and materials are discussed in further detail in Sections 5, 6.2 and 6.3 of the TR.

Additional details associated with waste management mitigation measures can be found in Sections 4, 6.3 and 6.4 of the TR.

5.13.5 Non-11e.(2) Solid Wastes

Non-11e.(2) wastes may include office wastes, domestic trash, construction debris, empty reagent containers and uncontaminated or decontaminated non-repairable equipment. These materials are typically disposed of in a municipal landfill. Section 4.2 of the TR provides additional information related to the handling and disposal of non-11e.(2) waste materials.

Potential impacts resulting from the management and disposal of non-11e.(2) solid wastes is the impact on the local landfill capacity. To date, this impact has been small. Potential waste management impacts from hazardous solid waste management and disposal include potential releases to the land surface, surface water and groundwater if not correctly stored and disposed. Potential impacts from domestic waste management and disposal include surface disturbance during construction of septic leach fields, transportation accidents during transport of chemical toilets, and contamination of shallow groundwater from leach field effluents. These potential impacts have been minimal in the past and are anticipated to be very small during the next renewal period. Cameco will employ waste minimization and recycling to reduce the quantity of solid waste generated.

5.14 Financial Assurance

Cameco maintains NRC-approved financial surety arrangements in the form of letters of credit issued for each individual project licensed under SUA-1548. Consistent with 10 CFR 40, Appendix A, Criterion 9, which states in part: "...In order to avoid unnecessary duplication and expense, the Commission may accept financial sureties that have been consolidated with financial or surety arrangements established to meet requirements of other federal or state agencies...", the NRC has accepted and approved letters of credit issued to the WDEQ as the "beneficiary" and/or the WDEQ and the BLM, together as "co-beneficiaries". The amounts of the License Conditions are based on surety estimates that assume third-party costs and incorporate reclamation obligations for both existing operations and planned expansions within the upcoming year. The term "reclamation" encompasses all groundwater restoration, facility decommissioning and surface reclamation activities, including the off-site disposal of 11e.(2) byproduct material.

License Condition 9.5 of SUA-1548 requires submittal of a revised financial surety arrangement within three months of NRC approval of a revised closure plan (if the estimated costs exceed the amount covered in the existing License Condition(s)). It is Cameco's understanding that this condition does not apply until final decommissioning activities are performed on a project-by-project basis.

License Condition 9.5 also requires that Cameco provide annual financial surety updates consistent with the requirements of 10 CFR 40, Appendix A, Criterion 9. Proposed annual updates to the surety amounts for each project are submitted to the NRC at least 90 days prior to the anniversary dates listed in License Condition 9.5. These dates coincide with the WDEQ Permit to Mine Annual Report and Surety Estimate Update due dates and allow for coordination and submittal of the annual updates to multiple agencies (NRC, WDEQ and BLM) at one time. Cameco's **surety instruments** are issued on an annual auto-renewal basis to ensure that the surety arrangement is extended for one year in the event NRC has not approved a proposed surety update within 30 days of the License Condition's expiration (i.e., auto-renewal) date. Cameco's annual updates include the necessary supporting documentation and detail showing a breakdown of costs and basis for cost estimates, including adjustments for inflation (e.g., based on Consumer Price Index) and maintenance of a minimum 15% contingency.

In the event of plans for expansion or operational changes that were not included in the previous year's surety update, an updated surety is submitted for NRC approval at least 90 days prior to the commencement of construction activities. In addition to coordinating submittal of the annual updates to both agencies (NRC and WDEQ), Cameco forwards copies of the WDEQ's surety review(s) and final surety arrangements **to NRC** upon WDEQ approval. The annual surety estimate updates identify NRC-related aspects (e.g., decontamination, decommissioning, 11e.(2) byproduct disposal, etc.) and are consistent with the groundwater restoration, facility decommissioning and surface reclamation portions of the license applications for each project. The annual estimates are also consistent with Appendix C to NUREG-1569. Section 6.5 of the TR provides additional information related to financial surety requirements.

5.15 No-Action Alternative

Smith Ranch is operational and exploratory drilling and construction is taking place at the Reynolds Ranch Satellite as well as the North Butte and Gas Hills Remote Satellites. Under the no-action alternative, production and exploration activities would cease and all existing well fields would enter restoration. Site reclamation of all ISR facilities would begin. The mitigation measures described above will remain in practice until all production, restoration and reclamation activities have ended.

5.16 Alternatives

In comparison with the alternatives of conventional open pit and underground mining with associated uranium mills, operations at Smith Ranch have demonstrated that an ISR facility, implementing appropriate safety checks and environmental mitigation measures has minor impact on the environment. Large evaporation and tailings ponds used in conventional mining and milling operations are not utilized at ISR facilities. Overburden removal from open pit mining and ore stockpiles associated with conventional mining operations does not occur at ISR projects. These types of activities related to conventional mining and milling result in unavoidable adverse impacts and residual impacts even after mitigation measures have been implemented. The amount of surface and subsurface disturbance at conventional mining sites is such that even after mitigation measures have been utilized, the area remains impacted. Open pits leave large scars on the land and allow intermingling of previously separated aquifer systems thereby changing the water quality. Sometimes entire local aquifer systems are destroyed due to the massive dewatering of these types of mines that is necessary to access the ore. Large tailings basins require institutional controls and legacy management by the U.S. government for an undetermined period of time, during which, the land surface cannot be utilized for domestic or industrial purposes. SUA-1548 has not in the past and will not in the future result in any major impacts to the surface or subsurface matrices, including groundwater quality and quantity.

5.17 References

Energy Metals Corporation US. 2007. Application for NRC Source Material License – Moore Ranch Uranium Project, Campbell County, Wyoming. Environmental Report.

U.S. Nuclear Regulatory Commission. 2009. Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities (NUREG-1910). Page Last Reviewed/Updated Sunday, March 13, 2011.

Wyoming Department of Environmental Quality, Land Quality Division, Guideline No. 10, Fencing, August 1994.

Wyoming Department of Environmental Quality, Land Quality Division, Rules and Regulations Chapter 11. NonCoal In Situ Mining, May 2005.

Wyoming Department of Environmental Quality, Land Quality Division, Rules and Regulations, Chapter 3, Environmental Protection Performance Standards, April 2006.

6.0 Environmental Measurements and Monitoring Programs

Baseline environmental monitoring (radiological, groundwater, surface water, soil, sediment, vegetation, wildlife and air quality) is conducted to establish baseline conditions and as a precursor to operations at all SUA-1548 license areas. The results of operational environmental monitoring are provided to both the LQD and NRC Staff in various reports. A brief summary of the various environmental measurement and monitoring programs is provided below with references to specific sections of the TR where they are described in detail.

6.1 Radiation Safety Monitoring

Cameco has undertaken a sampling program to evaluate a variety of radiation protection measures at SUA-1548 license areas, such as the potential for exposure to certain uranium daughter products that have not been evaluated in the past by uranium recovery operations. NRC Staff have requested this evaluation based on their experience at other ISR facilities. The SUA-1548 baseline radiological sampling plan was initiated in early 2012 and will last for one year. At that time, the data collected will be evaluated in coordination with NRC Staff to determine if additional sampling is needed or the program can be discontinued. The sampling plan is provided in **Table 6-1, 2012 Smith Ranch Radiological Sampling Plan**. The sampling plan identifies the sample type, location, equipment frequency/duration and lower limit of detection. In addition, the sampling plan presents objectives and purposes, components of the dose assessment and a decision rule/path forward. The sampling plan will be updated to include the Reynolds Ranch satellite once it becomes operational. A similar sampling plan will be developed for each of the remote satellites.

In summary, the sampling plan will provide site-specific data to evaluate:

- Dose to public;
- Dose to office workers, lab workers, well field workers and well field construction personnel;
- Implications to work dose from in-growth of short-lived beta-emitting isotopes;
- Implication of short-lived beta-emitting isotopes to contamination control, for both personal contamination and for free release of objects;
- Implications of isotope mixtures in establishing the site-specific DAC; and,
- Potential to use Ra-226 concentrations in pregnant lixiviant as a component of 10 CFR 40.64 effluent reporting.

As elements of the sampling plan are completed, Cameco will provide data and propose program revisions where necessary to NRC staff. Following deliberation, appropriate license amendments will be prepared. Because the existing program will continue until the various sampling activities are complete and concurrence is reached with NRC staff as to appropriate program modifications, the program descriptions in the TR reflect current practice.

Section 5.8 of the TR presents both program descriptions and historic results of the radiation safety monitoring program. The specific components include:

- Personnel Dosimetry;
- Gamma Surveys;
- Airborne Uranium Particulate Monitoring;
- Radon Daughter Monitoring;

- Calculation of Exposure;
- Bioassay Program; and,
- Contamination Control Program.

6.1.1 Quality Assurance

Cameco has established a Quality Assurance Program for all radiological, non-radiological effluent and environmental (including groundwater) monitoring programs SUA-1548. This Quality Assurance Program addresses elements discussed in NRC Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) —Effluent Streams and the Environment."

Quality assurance comprises those planned and systematic actions which are necessary to provide adequate confidence in the results of a monitoring program. Quality control includes those quality assurance actions that provide a means to control and measure the characteristics of measurement equipment and processes to established requirements. Therefore, quality assurance includes quality control.

The overall objectives of the Quality Assurance program are:

- To identify deficiencies in the sampling and measurement processes to those responsible for these operations so that corrective action can be taken.
- To obtain a measure of confidence in the results of the monitoring programs to assure regulatory agencies and the public that the results are valid.

The first step of any reliable Quality Assurance Program is a formal delineation of the organization structure, management responsibilities, and training requirements for management personnel. These items are described in detail in Sections 5.1 through 5.7 of the TR.

Section 5.9 of the TR presents the quality assurance policies for the environmental monitoring programs including:

- Radiological and Environmental Monitoring Procedures;
- Duplicative Sampling and Inter and Intra Laboratory Analyses;
- Instrument Calibrations;
- In-house Laboratory QA/QC;
- Records; and,
- Audits.

6.2 Operational Monitoring

The following sections summarize the monitoring programs in place during operations. As the focus of the TR is on operational policies and protocols, the majority of the details are located in the TR and specific references to pertinent sections are provided below.

6.2.1 Air Particulate Monitoring

Cameco has a strong corporate commitment to, and support for, the implementation of the radiological control program at all SUA-1548 license areas as has been shown by Cameco's record of compliance over the past 25 years. To ensure compliance with 10 CFR 20.1301, 20.1302 and 20.1501, Cameco maintains a continuous ambient air particulate monitoring program at five separate locations at Smith Ranch. An additional air monitoring station is proposed for the Reynolds Ranch Satellite facility. This station will be installed to replace the current upgradient station (AS-1, Dave's Water Well). The CPF and

CPP have the greatest potential for airborne releases to the environment. Two of these stations (AS-4 and AS-5) were used to monitor downwind conditions at the CPF but are inactive as a result of the CPF being placed in standby status. Monitoring at AS-4 and AS-5 will resume once operations begin again at the CPF.

The monitoring program at Smith Ranch is effective in monitoring potential airborne effluent releases and gamma exposure rates resulting from site activities and is consistent with the recommendations contained in NRC Regulatory Guide 4.14, Revision 1, "Radiological Effluent and Environmental Monitoring at Uranium Mills". The results of this program show that airborne releases of radionuclides are well below the ECL, which are contained in 10 CFR 20 Appendix B and used for compliance purposes by Cameco. The gamma exposure levels are well below the 0.05 rem per year requirement contained in 10 CFR 20 Subpart D. To show the extent of the airborne monitoring program, Cameco has collected more than 300 samples for particulates, Rn-222 and gamma analysis. See Section 5.10.1.1 of the TR for additional details relating to sampling locations, constituents measured, sampling procedures and a summary of results from existing operations at Smith Ranch.

6.2.2 Soil and Vegetation Sampling at Air Particulate Monitoring Stations

Annual soil and vegetation sampling was performed at Smith Ranch and Highland prior to 2000. Based on an NRC inspection that stated that the license did not require annual soil and vegetation sampling (IR 40-8857/99-02), the sampling program was terminated.

6.2.3 Surface Water Sampling Programs

Surface water sampling takes place at all SUA-1548 license areas. Quarterly sampling of surface water in stock ponds, reservoirs and drainages takes place to the extent that water is available to sample. Due to the ephemeral nature of surface waters at SUA-1548 license areas, samples are not always available for collection. Surface water sampling programs are described in Section 5.10 of the TR.

6.2.4 Groundwater Monitoring Programs

A groundwater environmental monitoring program has been approved for Smith Ranch and will be implemented at the Reynolds Ranch Satellite and the North Butte, Gas Hills and Ruth Remote Satellites. All domestic and livestock wells and naturally existing groundwater springs within **1** kilometer (0.6 mile) of each SUA-1548 license area **operating mine unit** are sampled quarterly **for uranium and Ra-226**. Groundwater monitoring programs are described in the TR in detail for: Smith Ranch (Section 5.10.3.1), the North Butte Remote Satellite (Section 5.10.3.2), the Gas Hills Remote Satellite (Section 5.10.3.3) and the Ruth Remote Satellite (Section 5.10.3.4).

6.2.5 Wastewater and Land Application Monitoring Program

To assist in assessing impacts of irrigating treated wastewater at the Smith Ranch-Highland Satellite No. 1 and Satellite No. 2 Wastewater Land Application Facilities (Irrigation Areas) the irrigation water, soil, and vegetation are monitored for various constituents including uranium and radium-226. This monitoring program has been in place since the start of each facility. Results of the monitoring program are reported to the NRC in the Semi-Annual Report. Specific components of the wastewater and land application monitoring program are discussed in Section 5.10 the TR.

6.2.6 Ecological Monitoring

6.2.6.1 Smith Ranch

Cameco has a strong corporate commitment to and support for the implementation of wildlife monitoring at all SUA-1548 license areas.

In consultation with state and federal agencies, Cameco developed a Wildlife Monitoring Plan for each of the sites, which is provided in WDEQ Appendix D9. The Wildlife Monitoring Plan provides the methodology and frequency of monitoring as well as the specific target species to be monitored. In accordance with state and federal requirements, the Wildlife Monitoring Plan has been designed to obtain sufficient data to allow the evaluation of the effects of the ISR operation on wildlife species of concern and to develop mitigation plans for those effects.

The entirety of the Wildlife Monitoring Plan for Smith Ranch is located in the Supplemental Information attached to Appendix D9 of the Smith Ranch WDEQ Permit.

6.2.6.2 North Butte Remote Satellite

The purpose of the North Butte Remote Satellite Wildlife Monitoring Plan is to set forth protocols and schedules for monitoring the status of wildlife species identified by the regulatory agencies as species of concern that may occur in or proximal to the North Butte Remote Satellite. The Wildlife Monitoring Plan was prepared after the 2010 wildlife survey update. This plan has been tailored to meet the specific wildlife monitoring needs of Cameco's North Butte Remote Satellite and does not address species that are unlikely to occur in the survey area.

Species-specific details, the wildlife monitoring survey schedule and a discussion of the monitoring of ISR disturbance and the effectiveness of reclamation in wildlife habitats can be found in Addendum D9-2 to Appendix D9 of the North Butte WDEQ Permit.

6.2.6.3 Gas Hills Remote Satellite

Addendum D9-E to Appendix D9 of the Gas Hills WDEQ Permit contains the wildlife monitoring plan for the Gas Hills Remote Satellite. The plan was developed after consultation with the LQD and BLM during 2009. The Plan has been reviewed and approved by WGFD and USFWS and provides the methodology and frequency of the annual monitoring as well as the specific target species to be monitored. The Plan is reviewed with BLM on an annual basis to address any necessary changes, such as reducing number of surveys or eliminating surveys altogether for those species that are not present in the permit area.

6.2.6.4 Ruth Remote Satellite

Section 13.4.1 of the Ruth Supplemental Report contains the Wildlife Management Plan developed for the Ruth Remote Satellite in 1988. Cameco is not actively pursuing development of the Ruth Remote Satellite at the time of this LRA (January 2012). Prior to commencement of ISR activities, baseline environmental data, environmental assessment and the operating plan (including a wildlife management plan) will be updated and provided to NRC Staff.

6.3 Groundwater Restoration Monitoring

Upon completion of groundwater restoration, Cameco will request regulatory **approval to enter into** a one-year stability monitoring period to demonstrate that the **restored water quality will be** adequately maintained. The NRC requires monitoring at all M-, MO- and **MU**-wells until the restoration is approved by the NRC. Section 6.1 of the TR contains detailed information on both operational monitoring and restoration stability sampling.

6.4 Reporting Procedures

6.4.1 Semi-Annual Effluent and Environmental Monitoring Report

Pursuant to 10 CFR 40.65 and SUA-1548 License Condition No. 11.1, a report is submitted to the NRC on a semi-annual basis outlining the results of the effluent and environmental monitoring programs and any other information that may be required by license condition, including monthly averages of injection rates, recovery rates and injection trunk line pressures for each satellite.

6.4.2 Non-Routine Reports

In the event that a report of a non-routine incident becomes necessary (eg. well field excursion, pond leak, etc.), Cameco will follow specific reporting procedures for that incident as identified by the particular regulatory agency. In most cases, both the WDEQ and NRC are notified by telephone or e-mail within 24 hours of verified monitor well excursions, pond leakage, significant spills, tank ruptures, or any other incident that would trigger the reporting requirements provided in 10 CFR 20, Subpart M. Written reports will be provided to the NRC within 30 days of the non-compliance event. Monthly reports will be provided to NRC until the non-compliance incident has been corrected.

6.5 General Records Compliance

Records maintenance and retention comply with 10 CFR 20, Subpart L. All effluent and environmental monitoring measurements and calculations records are maintained on site until license termination.

7.0 Cost Benefit Analysis

7.1 Environmental Impacts

There is a general need for uranium to supply operating nuclear power reactors. In reactor licensing evaluations, the benefits of the energy produced are weighed against the related environmental costs. These incremental costs or impacts are balanced against the benefits derived from the power generation and economic growth provided to surrounding communities. Similarly, it is appropriate to review the specific site-related benefits and costs of the proposed action.

The renewal of SUA-1548 will benefit the surrounding communities through local expenditures and state and local taxes paid by Cameco. Expansion of operations at Smith Ranch in addition to the development of the remote satellites will also provide employment to local communities.

Environmental impacts are, and will continue to be, minimal. See Section **4.0 of this ER** for an expanded discussion of the anticipated environmental impacts associated with the proposed action. Groundwater will be returned to as near pre-ISR quality as possible, as has been demonstrated by Cameco at Smith Ranch and groundwater restoration efforts completed to date by other operators. The radiological impacts have been and will continue to be small as the amount of solid 11e.(2) byproduct materials produced is small and such materials are transported off-site for disposal at an NRC-licensed disposal facility. The surface disturbances have been and will continue to be small relative to the disturbance footprint of a conventional mining operation, and are temporary as the surface is reclaimed back to its pre-ISR land use. Benefits from ISR operations and the resulting power generation are considered to offset the relatively small risks associated with environmental impacts.

An analysis of the economic impacts associated with SUA-1548 was completed by the University of Wyoming, Department of Agriculture and Applied Economics. The primary focus of the analysis was the economic aspects of uranium production in Wyoming and Cameco's expansion plans (North Butte, Gas Hills and Ruth Remote Satellites) in particular. Cameco retains the right to not provide or to limit the use of any information that is considered confidential.

The analysis measured the impact of jobs, employee income, government revenues, purchases of goods and services, contractor payments, production royalties, and other economic contributions from SUA-1548 on the Wyoming economy. Where possible, benefit and cost estimates were monetized; however, reliable monetary estimates for some potential impacts were not readily available, so the narrative examines several factors in non-monetary or qualitative terms.

The analysis evaluated all of the costs and benefits associated with Smith Ranch, the North Butte Remote Satellite and the Gas Hills Remote Satellite. Cameco has not completed an operations plan for the Ruth Remote Satellite at the time of this LRA (January 2012). Prior to commencement of ISR operations, additional baseline environmental data, additional environmental impact and cost benefit analyses in addition to the operations plan will be developed and provided to NRC.

7.2 Alternatives and Assumptions

7.2.1 Proposed Action

The proposed action would result in the renewal of SUA-1548 for an additional 10 years. Development of mine units and satellite facilities at Smith Ranch (including the Reynolds Ranch Satellite) will continue during the next renewal period. The North Butte, Gas Hills and Ruth Remote Satellites will be developed as well. These new satellite facilities will produce IX resin and/or yellowcake slurry, which will be transported to the Smith Ranch CPP or Highland CPF for processing into yellowcake.

7.2.2 Impact Scope

A critical step in any Cost Benefit Analysis is establishing a viable scope of impact and thus establishing who will be affected by the operation. **At the time of the study in 2010,** Cameco has a total of three separate facilities in Wyoming including: 1) Smith Ranch near Douglas, 2) an Exploration and Development Office in Casper, and 3) Cameco's U.S. Headquarters in Cheyenne. The University of Wyoming analysis described above considered the contribution of all three facilities to the Wyoming economy.

The analysis included data regarding the number of employees, employee payrolls, taxes paid, fees paid, contractor payments, rents, royalties, and other necessary company information. The year 2009 was the latest for which complete operating expenditures were available. This information was supplemented with 2009 operating expenditure for the U.S. Headquarters adjusted for the new location in Wyoming.

The operating information was disaggregated into appropriate sectors and entered into a 2008 IMPLAN model for the State of Wyoming (MIG, 2010) to estimate economic impacts in terms of direct and secondary employment, labor earnings, and industry production. IMPLAN is an economic modeling system used to create complete and detailed models of local economies for in-depth analyses of regional economies. The model considers both direct impacts and secondary impacts from re-spending by businesses and employees to provide estimates of the total economic impact of an economic activity in the region.

7.2.2.1 Non-Monetary Impacts

Conventional Cost Benefit Analysis uses monetary values to compare goods and services derived from a project or program. The values of goods and services represent their relative importance so that if the total value of the benefits is greater than the total value of the costs, the project is desirable. The standard result is a quantified benefit-cost ratio (BCR), equal to a project's total net benefits divided by its total cost. BCR's above one, have positive net economic impacts. While many inputs in the SUA-1548 BCR are goods and services (eg. skilled labor, construction materials, etc.) that are regularly traded in markets at well-known and predictable prices, others (eg. changes to land or water, aesthetic impacts, etc.) are not directly traded and are more difficult to value. Where reliable monetary values are not available, a qualitative approach based on the best available information is required.

7.2.3 Economic Benefits of Project Construction, Operation, Restoration and Decommissioning

7.2.3.1 Current Economic Benefits

Cameco's presence in Wyoming has grown substantially over time. As shown in **Table 7-1, Trends in Wyoming Expenditures by Cameco Resources**, the company's expenditures in Wyoming totaled $16M in 2005. By 2009, expenditures in Wyoming had increased by over 2.5 times to $40.3M. Approximately two-thirds of this increase was due to additional purchases from Wyoming vendors, with about 25% from increased payroll, and approximately 10% from increased Wyoming taxes and royalty payments. Wyoming taxes and royalties was the fastest growing of the expenditure category, increasing by 2.7 times between 2005 and 2009. The Wyoming taxes included in the taxes and royalty expenditure category were use taxes, ad valorem taxes, severance taxes, and property taxes. Other Wyoming taxes such as payroll and sales taxes are included in the payroll and Wyoming vendor amounts. Federal taxes paid by the company were not considered in the analysis. Total expenditures in Wyoming by Cameco over the 5-year period were $139.6M.

In 2009, the total Wyoming expenditures by Cameco were $40.3M (**Table 7-1,**). Of this total, approximately 26% ($10.5M) was payroll. This represents the wage and salary payments for 155 workers in the state. Wyoming taxes and royalties represented 9% of this total ($3.7M) and purchases from Wyoming vendors represented 65% of the total ($26M). The composition of Wyoming taxes included in this expenditure category was discussed above. Royalty payments represent production royalties paid to private landowners and the State of Wyoming. Expenditures with Wyoming vendors represent purchases of goods and services from companies and individuals located in Wyoming. This includes payments to 50 drilling contractors plus purchases from 328 other businesses located in Wyoming. The largest Wyoming expenditures were payments to drilling contractors, capital equipment purchases, payments to utility companies, and purchases of well casing and other drilling materials and supplies. In 2010, with the relocation of the U.S. Headquarters from Denver to Cheyenne, total annual operating expenditures in Wyoming for Cameo are estimated to be $42.8M.

The current total operating expenditure estimate of $42.8M was disaggregated into the appropriate sectors and entered into a statewide IMPLAN model of Wyoming in order to estimate the current economic impacts of Cameco's uranium operations in the state. The economic impact of each expenditure category will be discussed individually below, followed by an overall economic impact summary.

Cameco's current payroll in Wyoming is estimated to be $12.5M. As shown in **Table 7-2, Current Economic Impact of Cameco's Wyoming Payroll** this represents direct employment of 169 people (preliminary estimates for 2010 employment show an increase to 185 employees). Secondary employment, resulting from spending by Cameco employees with other businesses in the state, is estimated to have added an additional 69 jobs to the Wyoming economy for a total employment impact of 238 jobs. Nearly 95% of the secondary employment is in the service and trade sectors of the Wyoming economy.

The labor income associated with the 69 secondary jobs generated by the company's payroll is estimated to add $2.2M in labor income. When this amount is combined with the $12.5M in direct labor income, the total labor income impact is estimated to be $14.7M. Over 95% of the secondary labor income is from the services, trades, and transportation/information/public utilities sectors of the Wyoming economy.

The $12.5M in payroll also generates an estimated $7.8M in secondary output due to spending by Cameco employees with other businesses in Wyoming. Combined with the $12.5M in direct labor earning, which in this case is also the direct output, the total output impact is estimated to be $20.3M.

The current Wyoming taxes and royalty payments for Cameco are estimated to be $3.7M. This amount includes production royalties paid to private landowners and the State of Wyoming plus use, ad valorem, severance, and property taxes paid to state and local governments in Wyoming. As shown in **Table 7-3, Current Economic Impact of Cameco's Wyoming Taxes and Royalties**, this spending supports an estimated 26 jobs in the Wyoming economy. This employment represents only the jobs associated with the tax revenue since royalty payments do not generate any direct employment because they represent a transfer payment to households. Secondary employment, resulting from spending of royalty payments by households and by spending of tax revenue by state and local governments in Wyoming, is estimated to have added an additional 19 jobs to the Wyoming economy for a total employment impact of 45 jobs. Over 95% of the secondary employment is in the service and trade sectors of the Wyoming economy. **Table 7-3.1, Distribution of Cameco's Tax Expenditures shows the type of tax collected (use, severance, and ad valorem production and property) and the distribution of those taxes to local governments, the State of Wyoming, and to schools. Use taxes are split between local (44.6%) and state (55.4%) governments, while the severance tax goes predominantly to the State (96.7%). Ad valorem taxes are distributed to local governments (27%) and schools (73%). In 2009, tax expenditures for Cameco totaled $1.64M.**

The labor/household income resulting from the direct employment associated with Wyoming tax revenue and royalty payments to landowners by Cameco is estimated to be $3.4M. The labor income from the 19 secondary jobs is estimated to be over $613,000. Nearly 90% of the secondary income is in the service and trade sectors of the Wyoming economy. The combined total labor/household income is estimated to be $4M.

The $3.7M in Wyoming taxes and royalty payments also generates an estimated $2.1M in secondary output in the Wyoming economy due to spending by state and local governments and landowner households in Wyoming. The combined total output impact is estimated to be $5.9M.

Currently it is estimated that Cameco purchases $26.1M from Wyoming vendors annually. This amount includes payments to 50 drilling contractors plus purchases from 328 other businesses located in Wyoming. As shown in **Table 7-4, Distribution of Cameco's Economic Impact in Wyoming**, these purchases support an estimated 105 jobs in the Wyoming economy. Secondary employment in Wyoming, resulting from spending by these vendors and their employees supports an additional 56 jobs in the Wyoming economy for a total employment impact of 162 jobs. Over 90% of the secondary employment is in the service and trade sectors of the Wyoming economy.

The labor income resulting from the direct employment associated with these vendor purchases is $6.2M. The labor income from the 56 secondary jobs is estimated to be $2.1M for a total labor income impact of $8.4M. Over 90% of the secondary labor income is in the service, trade, or transportation/information/public utilities sectors of the Wyoming economy.

The $26M in Wyoming vendor purchases by Cameco directly impacts most of the individual sectors of the Wyoming economy (**Table 7-5, Current Economic Impact of Cameco's Wyoming Vendor Purchases**). The largest purchases are from construction ($12M), trade ($9.7M), and transportation/ information/public utilities ($4M). In addition, these direct expenditures also generate an estimated $6.9M in secondary output in the Wyoming economy due to spending by the vendors and their employees. The combined total output effect is estimated to be $32.9M.

Table 7-6, Current Economic Impact Summary for Cameco in Wyoming summarizes the current economic impact of Cameco's uranium operations in Wyoming. In terms of direct impacts, the company's expenditures for payroll, Wyoming taxes and royalties, and purchases from Wyoming vendors supports over 300 direct jobs, $22.1M in direct labor/household income, and $42.3M in direct economic activity in Wyoming.

The secondary impacts from Cameco's expenditures in Wyoming include 144 secondary jobs, $5M in secondary labor income, and $16.8M in secondary economic activity in the state. When both direct and secondary impacts are considered, Cameco's total economic impact in Wyoming is 445 jobs, $27.2M in labor/household income, and $59.1M in economic activity in the state.

Table 7-6, shows that employment associated with Cameco's uranium operations in Wyoming tends to be good paying jobs. For the 169 jobs directly with Cameco, the average salary per job is approximately $74,000. For the 301 direct jobs associated with Cameco's expenditures in Wyoming, the average salary per job is approximately $67,000. Because the secondary employment tends to be more service oriented, the average earnings for these jobs are somewhat lower at slightly less than $35,000. Still, the overall average for all jobs associated with Cameco's operations in Wyoming is more than $56,000. This is 25% higher than the Wyoming average ($45,106) and 12% above the U.S. average ($50,259) in 2008.

The results from this analysis indicate that for every direct uranium job in the mining sector there are 1.6 other jobs elsewhere in the Wyoming economy. The results also indicate that for every $1.00 of uranium job income in the mining sector there is $1.20 of income in other sectors of the Wyoming economy. **Table 7-4** summarizes the total distribution of economic activity from Cameco's uranium operations among the major sectors of the Wyoming economy. In terms of employment, the largest impacts are in mining (38%), service (22%), construction (19%), and trade (11%). In terms of income, the largest impacts are in mining (46%), construction (17%), government (13%), and service (12%). Finally, in terms of output, the largest impacts are in mining (22%), trade (22%), construction (21%), and service (20%). As can be seen in **Table 7-4** Cameco's uranium operations in Wyoming have a positive economic impact on every major sector of the state's economy.

7.2.4 Proposed Expansion

Approval of this LRA will also approve further development of Cameco's uranium operations in Wyoming to include, **North Butte Remote Satellite[1]**, Gas Hills Remote Satellite and Ruth Remote Satellite. Two aspects of the economic impact of this further development are considered in the analysis. One is the economic impact of the construction expenditures associated with the expansions. The other is the economic impact of the increased production from facilities once the expansion is completed. The current economic impacts of Cameco's uranium operations in Wyoming were used as a basis to project what the economic impacts of operations would be with the planned expansions in the future.

In terms of construction, Cameco is planning to spend a total of $82M to expand its uranium production facilities in Wyoming over the next three years including $17M in 2011, $30M in 2012, and $35M in 2013 (**Table 7-7, Economic Impact of Construction Expenditures**). Depending on how this money is spent, it could support up to 656 job-years of total employment in Wyoming over the three-year period. The total labor income resulting from this employment could be up to $34.3M and the total economic activity could be up to $52.3M. The average salary per job would be more than $52,000. This economic impact would continue for the duration of the 3-year construction period.

With the expansion of production facilities, Cameco is planning to eventually increase uranium production from the current level of **709** tonnes (1.9 million pounds) per year to **1,344** tonnes (3.6 million pounds) per year. **Table 7-8, Economic Impact of Cameco's Expanded Production** summarizes the economic impact of **1,344** tonnes (3.6 million pounds) of production on the Wyoming economy based on the current economic impact estimates for the company. The expanded level of production would increase expenditures in Wyoming to $80.2M per year including: $23.7M in payroll, $7.1M in Wyoming taxes and production royalties, and $49.4M in vendor purchases. The increased expenditures in Wyoming would support a total employment of 843 jobs. The labor/household income at that level of

[1] As described in Footnote 1 of Section 1 of this ER, operations at the North Butte Remote Satellite facility were approved by SERP in November 2012.

expenditure would be $51.5M and the total economic activity in the state's economy with the expansion would be $112.1M.

7.3 External Costs of Project Construction and Operation

In this section of the analysis, external costs of the SUA-1548 expansion are identified and addressed. Both short-term and long-term external costs that may affect the interest of people other than the owners and operators of SUA-1548 are also identified and described.

7.3.1 Short Term External Costs

7.3.1.1 Housing Shortages

Approximately 70% of the total construction and operating work force for SUA-1548 **licensed facilities** would likely come from Converse and Campbell Counties. The remaining workforce would likely be based in Casper (Natrona County) or Riverton (Fremont County). The IMPLAN model results show that **licensed activities are** expected to generate 656 new jobs over the next three years. Once the expansion is completed, the increased expenditure in Wyoming would support a total employment of 843 jobs.

Since Smith Ranch lies within commuting distance of Natrona County, no impacts on the housing situation in nearby cities or towns are anticipated. In the event that workers from out-of-state are hired for the short-term construction phase of SUA-1548 **expansion**, the present available stock of motel/hotel rooms would accommodate the temporary workers. See Section 3.10 **of this ER** for additional housing information.

7.3.1.2 Impacts on Schools and Other Public Services

Smith Ranch is located within Converse County School District #2, which serves approximately half of Converse County. The nearest Converse County community that provides educational services to residents in the vicinity of Smith Ranch is Glenrock, which is located approximately 29 kilometers (18 miles) southwest of Smith Ranch on State Highway 20. Three schools are located in Glenrock: Grant Elementary School serves K-4; Glenrock Middle School serves grades 5-8; and, Glenrock High School serves grades 9-12 (Converse County School District 2, 2011).

The North Butte Remote Satellite is located within Campbell County School District #1, which serves all of Campbell County. The nearest Campbell County community that provides educational services to residents in the vicinity of the remote satellite is Wright, which is located approximately 40 kilometers (25 miles) east of the remote satellite on State Highway 387. Two schools are located in Wright: Cottonwood Elementary School serves K-6 and the Wright Junior & Senior High School serves grades 7-12. The Ruth Remote Satellite employees may also utilize the school system in Wright since it is only approximately 10 kilometers (6 miles) southwest of the North Butte Remote Satellite.

The Gas Hills Remote Satellite is located in Fremont County School District #25, which serves approximately one-fifth of Fremont County. The nearest Fremont County community that provides educational services to residents in the vicinity of the remote satellite is Riverton, which is located 80 kilometers (50 miles) northwest of the remote satellite on State Highway 136. There is one high school (Riverton High School), one middle school (Riverton Middle School), and four elementary schools (Aspen Park Elementary, Jackson Elementary, Ashgrove Elementary, and Rendezvous Elementary) located in Riverton. Riverton High School serves grades 9-12; Riverton Middle School serves grades 6-8, and the four elementary schools serve grades K-5.

The Ruth Remote Satellite is located within Johnson County School District #1, which serves all of Johnson County. The nearest Johnson County community that provides educational services to residents in the vicinity of the remote satellite is Kaycee, which is located 48 kilometers (30 miles) northwest of the remote satellite on State Highway 1002 (Highway 192). Three schools are located in Kaycee: Kaycee Elementary School, which serves grades K-5; Kaycee Jr. High School, which serves grades 6-8; and Kaycee High School, which serves grades 9-12. Total enrollment in these three schools for the 2009-2010 school year was 54 in the elementary school, 34 in the junior high school, and 49 in the high school (School Digger, 2010).

At least three of the four SUA-1548 project sites could possibly utilize the school system in Natrona County, such as the **Casper schools and the** Midwest School, which provides classes for students from preschool through grade 12. Enrollment for the 2005-2006 school year was 229 (Natrona County, 2011).

Families moving into the Natrona and Converse County school districts as a result of SUA-1548 operations would not stress the current school system because it is presently under capacity.

There is no significant change anticipated from the no-action alternative in the demand for other public services such as fire, police, water and utilities. The maximum population increase resulting from the permanent migration of workers into Wyoming represents only 0.4% of the total state population (2009).

Please refer to Section 3.10 **of this ER** for additional information on the aforementioned schools.

7.3.1.3 Impacts on Noise and Congestion

Smith Ranch and the North Butte Remote Satellite are the two project sites that have residents within 3 kilometers (2 miles) from the project site. **Three residences are located within 3 kilometers (2 miles) of Smith Ranch: the Fowler Ranch, the Sundquist Ranch, and the Vollman Ranch. The** Vollman Ranch is located within the site boundary and is occupied year-round. **The Fowler and Sundquist Ranches are located near the Smith Ranch license area boundary (see Section 3.1 of this ER for further land use and ownership information).** For the North Butte Remote Satellite, the closest residence is the Pfister Ranch house, located approximately 1 kilometer (0.5 mile) south of the site boundary and is also occupied year-round. As a result of the remote location of the project, its historic and current uranium recovery operations and the low population density of the surrounding area, impacts from noise or congestion within the project area or in the surrounding 3 kilometer (2 mile) area have not created problems in the past and are not anticipated to cause problems in the future. Open rangeland is the primary land use within and surrounding 3 kilometer (2 mile) area. Other land uses include oil and gas production facilities, CBM facilities, and wind farms. Please refer to Section 4.7 **of this ER** for more information on the impacts of anticipated noise levels on the SUA-1548 Project sites.

7.3.1.4 Impairment of Recreational and Aesthetic Values

While opportunities for developed and dispersed recreation exist throughout the regions surrounding all SUA-1548 license areas, there are limited recreational uses within the license areas or in the surrounding 3 kilometer (2 mile) area. Private lands within the license area allow limited hunting opportunities. Public lands within and adjacent to the Gas Hills Remote Satellite are used for antelope hunting and limited other recreational interests. Section 3.1.3 **of this ER** describes all state and federal recreational lands within 80 kilometers (50 miles) of all SUA-1548 sites. There have not nor will there be any significant impacts on recreational opportunities as a result of SUA-1548 operations. The physical remoteness of the sites and the lack of proximity to any well recognized federal or state site of recreational interest indicate that there are no significant long-term impairments to recreational values from expanding SUA-1548 operations.

7.3.1.5 Land Disturbance

Smith Ranch and its satellites and remote satellites have been used historically for grazing, prospecting, CBM, and oil and gas development, among other land uses described in Section 3.1 **of this ER**. Therefore, it is unlikely that any true undisturbed land area currently exists. Pre-existing land disturbance includes grazing activities and facilities (stock tanks, fences), oil production facilities, wind farms, historic conventional uranium mining, natural gas production facilities, and infrastructures that support these activities. Oil and gas field infrastructure within the North Butte and Ruth Remote Satellites and the surrounding 3 kilometer (2 mile) review area includes access roads, overhead electric distribution lines, and cleared rights-of-way for underground utilities, which are generally found along access roads. There would be negligible changes in land cover or land use from existing conditions outside of the 3 kilometer (2 mile) review area. Oil and gas field infrastructure, conventional uranium mining disturbances and abandoned mine reclamation within the Gas Hills Remote Satellite are evident within the surrounding 3 kilometer (2 mile) review area. Such disturbances include access roads, overhead electric distribution lines, acres of reclaimed lands, existing and, in several cases, reclaimed pit lakes. Development of the Gas Hills Remote Satellite would result in negligible changes in land cover or land use from the existing condition.

Smith Ranch and its satellite facilities use ISR rather than conventional mining techniques. ISR results in less land surface disturbance than any conventional resource recovery alternative. Land surface disturbance associated with mine unit development is short term as interim stabilization with native vegetation species is implemented as soon as construction activities are complete and maintained through the life of the mine unit. No tailings or waste rock are generated. The CPP, satellites and private access roads will continue to be confined to clearly delineated areas on site. While there will be some land use changes from the existing conditions, potential impacts will be minimal.

7.3.1.6 Habitat Disturbance

Currently, there are no federal- or state-designated wildlife reserves located within SUA-1548 **license areas.** Because of the revegetation practices at ISR sites and wildlife friendly fencing, wildlife habitats are not seriously impacted. No long-term losses to wildlife habitat relative to the existing conditions will result from the continued construction and operation at SUA-1548 **license areas. At the Smith Ranch project site, approximately 5,000 acres of mine unit pattern area are currently fenced, preventing livestock from grazing within those areas. Although there are upwards of 5,000 acres currently fenced off at the Smith Ranch project site, this land will only be sectioned off from its surroundings over the duration of the project. At the North Butte project site, approximately 120 acres are currently fenced off from the surrounding land because of the mine units present. In addition to the currently fenced areas at the SUA-1548 license areas, there are additional proposed mine units located at both the Smith Ranch site and the North Butte Remote Satellite that require fencing. At the Smith Ranch site, there will be approximately 1,200 additional acres of land fenced off, and at the North Butte Remote satellite there will be approximately 190 additional acres fenced off preventing livestock from grazing. The amount of acreage fenced off at the Gas Hills will be approximately 1,000 acres.**

Further development is needed at the Ruth Remote Satellite before an estimate of fenced acreage can be made. Nevertheless, no long-term losses to wildlife habitat relative to the existing conditions are anticipated from the continued construction and operation at SUA-1548 license areas.

7.4 No-Action Alternative

If the NRC denies the renewal of SUA-1548, Cameco would be required to cease uranium recovery operations at Smith Ranch and complete groundwater restoration, decontamination and decommissioning, and reclamation in a timely manner, leaving a valuable mineral commodity undeveloped. This would also result in no further development at the North Butte, Gas Hills and Ruth Remote Satellites. Reclamation of existing disturbances would begin. Denial of this LRA would also result in the loss of all uranium production and the sale of uranium as fuel. Currently Cameco sells SUA-1548 uranium for use as fuel for nuclear reactors. Finally, denial of this license renewal request would result in significant adverse financial and economic growth impacts to Converse, Campbell, Fremont, and Natrona Counties due to the loss of tax revenues and jobs. Financial impact to Wyoming would likely exceed $42M per year once restoration is completed. Over a 30-year period assuming no increase in rates or costs of uranium recovery activities, NRC denial of the LRA could result in a $1.26 billion loss to the State of Wyoming.

7.5 Alternative Action

If Cameco were to employ a conventional mining alternative, uranium recovery operations would continue. However, the environmental and socioeconomic impacts of this alternative action would be far greater than the proposed action. Specifically, the physical land disturbance would be greater and the number of workers required to accomplish the proposed action would be far greater. Although there would be greater payrolls, tax revenues and jobs, the sale of nuclear fuel would not likely increase and mineral royalty payments to the state would remain the same or be lower.

8.0 Summary of Environmental Consequences

The status of the affected environment of SUA-1548 has been characterized and presented in Section 3.0. SUA-1548 is an operating license, and as such, the affected environment continues to change. For that reason, and upon agreement with NRC Staff, Cameco has defined on-site conditions (the Affected Environment) effective at the end of September 2011. This is especially important when one evaluates water uses, since new wells are being drilled for adjacent energy interests (CBM, shale fracking, etc.) on a monthly basis. The potential positive and negative environmental consequences in addition to cumulative impacts to land use, transportation, water resources, air quality, noise and socioeconomics are discussed in detail in Section 4.0. Mitigation measures taken to lessen environmental impacts are discussed in Section 5.0.

Impacts to land use resulting from the renewal of SUA-1548 are limited to the loss of grazing access in impacted areas for the life of the operation. The additional land impacts expected from this renewal will be less than 5% of the total license area, and cumulative disturbances will be less than 8% of the total license area. Because only a small percentage of the land surface will be disturbed, land use will likely remain largely unaffected by the renewal of SUA-1548. Once production, restoration and reclamation are complete, all areas covered under this license will be released for unrestricted use.

Impacts to transportation resulting from the renewal of SUA-1548 are minimal compared to current traffic levels. The predicted increase in traffic volumes on all adjacent and regional roadways are anticipated to increase by less than 5% as the result of the proposed action. No mitigation measures are proposed to address transportation impacts.

Geologic impacts resulting from the renewal of SUA-1548 are expected to be minimal. ISR does not remove formation material from the aquifer, therefore no subsidence or matrix compression is anticipated. The principal impact to soils will be from earthmoving activities associated with construction of additional ISR facilities. Currently (January 2012), approximately 3% of the available soils within the licensed areas have been disturbed, and the majority of these disturbed soils have been reclaimed (i.e., mine unit well fields). With the proposed action, an additional approximate 5% of soils will be disturbed. Most soil disturbances are short-term and reclamation and vegetation is initiated as soon as possible following construction.

There will be minimal impacts to surface waters at all SUA-1548 license areas as a result of the proposed action. A Storm Water Pollution Prevention Plan has been implemented for all construction and operational activities. Cameco has and will continue to utilize BMP to ensure that all disturbed land runoff is minimal.

Potential impacts to groundwater include: 1) consumptive use of the ore zone aquifer; 2) contamination outside the mineralized zone or within aquifers above or below the production zone due to excursions; 3) contamination due to inadequate restoration after ISR operations are complete; and, 4) contamination of shallow aquifers, if present, from casing or pipeline leaks, surface spills from wells or header houses, and leakage from lined ponds or land application facilities. Based on groundwater modeling of the SUA-1548 license areas, consumptive use of groundwater will have a negligible impact on area use of groundwater resources. Since the last renewal of SUA-1548 (May 2001), there has been no defined diminution of groundwater resources to local area water users.

The types of disturbances associated with operations at all SUA-1548 license areas will not result in large expanses of habitat being dramatically transformed from its original character. Similar to impacts to land use resulting from the proposed action, the additional land disturbances will be minimal and will represent less than 5% of the total licensed area. The majority of this land disturbance will be revegetated and will remain accessible to wildlife during the remaining operational period. No substantial impairment of ecological stability or species diversity is anticipated. Mitigation measures include wildlife friendly fencing and Cameco's commitment to reclaim the majority of disturbances after well field construction or immediately following restoration and decommissioning.

Impacts to air quality resulting from the proposed action will be negligible and will be related to a minimal impact from fugitive dust caused by construction activities and vehicle traffic on gravel roads. The expected release of gaseous and airborne particulates from SUA-1548 license areas will remain below the allowable limits for the State of Wyoming and will be less than 200 tons per year. To mitigate the release of fugitive dust and other particulates, mitigation measures such as watering the roads or applying chemical treatment will be implemented.

Noise impacts resulting from the proposed action will come from increased vehicle travel and the operation of construction equipment during the construction phase of the project. All SUA-1548 license areas are remote and noise receptors are typically far away. Noise from construction equipment could raise noise levels slightly during the construction phase of the project. According to the tests conducted by Cameco and assuming a worst case noise source (PVC chipper), the calculated noise level at a location 3 kilometers (2 miles) from the noise source would be 77 dBA. A noise level of 77 dBA can be likened to the same noise level as a dishwasher, barking dog, or a vacuum cleaner. Therefore, the noise impact is not considered extreme.

Construction and operation land-disturbing activities resulting from the proposed action will be localized. Because of this localized nature of land-disturbing activities for ISR production and the fact that ISR operations will avoid historic and cultural resources, impacts to these resources are expected to be negligible to non-existent. Overall, impacts to cultural and historical resources during operations are expected to be less than those during construction, as operations are generally limited to previously disturbed areas (e.g., access roads, CPF, and well sites). Additionally, should an unanticipated cultural resource discovery be made during construction or operational activities, License Condition 9.9 of SUA-1548 requires that work in the area cease and the artifacts be inventoried and evaluated in accordance with 36 CFR Part 800. No disturbance of the area of discovery will occur until authorization to proceed has been received from the NRC. The proposed action will continue to cause short-term and long-term visual effects. The short-term visual effects will occur during the construction phase of mine unit well fields, which includes header house construction, well installation, access road construction, pipe and power line installation, etc. Following each well field installation, the temporarily disturbed areas are reclaimed and visual effects are mitigated. Long-term visual effects result from the construction and utilization of buildings to operate the ISR and process the uranium-laden IX resin and the resultant uranium products. These buildings will exist within the landscape over the life of the project, but are limited in their number and density. Buildings and well heads will be painted a color that will blend with the natural surroundings. Overhead power lines will be kept to the minimum necessary. Power lines within the well fields will be buried, whenever possible. At the end of resource recovery, the buildings and all remaining well fields will be removed, and the land surface will be reclaimed, thereby removing all visual impacts caused by the ISR operation.

It is anticipated that the overall effect of the proposed action on the local and regional economy and the state as a whole will be beneficial. Purchases of goods and services by the project and project employees will contribute directly to the economy. Local, state, and federal governments will benefit from taxes paid by Cameco and its employees. Indirect impacts, resulting from the circulation and recirculation of direct payments through the economy, will also be beneficial. These economic effects will further stimulate the economy, resulting in the creation of additional jobs. If this LRA is approved, these beneficial impacts to the local and regional economy provided by the continued ISR operation could continue for an additional 36 years for Smith Ranch, 20 years for the North Butte Remote Satellite, 20 to 25 years for the Gas Hills Remote Satellite, and 10 years for the Ruth Remote Satellite.

ISR operations associated with SUA-1548 are not now nor will they in the future create any adverse environmental justice impacts on large populations of minorities or people living below the poverty level. Except for scattered ranches, the majority of the population nearest to Smith Ranch and its contiguous satellites live in Casper, Glenrock, Rolling Hills, Douglas, and other smaller communities along the I-25 corridor. Similarly, the majority of the population near the North Butte and Ruth Remote Satellites reside in Gillette, Wright, and other smaller communities along Highways 387, 50, and 59. The majority of the population near the Gas Hills Remote Satellite resides in Riverton, Lander, and Casper. These cities, towns, and communities also possess a low percentage of minority and low-income populations compared to the state as a whole.

The potential impacts to public and occupational health from SUA-1548 operations are described in Section 4.12 and include fugitive dust from construction activities and vehicle travel, the release of Rn-222 from IX facilities, the CPP, the mine unit header houses, well fields and any potentially adverse impact associated with a spill or accident. To ensure risk levels from non-radiological and radiological impacts remain low, Cameco has instituted standard operating procedures for handling, processing, storing, transporting and disposing of source and 11e.(2) byproduct materials and other potentially hazardous materials. The majority of the radioactive uranium daughter products are not removed with the uranium and remain underground. Additionally, the use of modern vacuum dryers for yellowcake production reduce the potential for radiological air particulate releases to insignificant levels

SUA-1548 operations produce airborne effluents, liquid and solid wastes that must be properly handled and disposed. Potential waste impacts from solid or liquid waste management and disposal include potential releases to the land surface, surface water, and groundwater if not correctly stored and disposed. Potential impacts from domestic waste management and disposal include surface disturbance during construction of septic leach fields, transportation accidents during transport of chemical toilets, and contamination of shallow groundwater from leach field effluents. Cameco has and will continue to employ proper waste management procedures at all SUA-1548 license areas and will also continue to properly transport, treat and dispose of 11e.(2) liquid and solid wastes and by so doing, reduce the impacts of waste generation.

All impacts are short term, meaning that the life of the impact will be less than or equal to the length of time between construction and final decommissioning of SUA-1548 license areas. No significant long-term impacts that would extend beyond the duration of the project have been identified.

Tables

SECTION 1.0

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SECTION 7.0

Table 1-1 Smith Ranch Required Permits as of May 2014

Permit or License	Regulatory Agency*	Status	Permit #
Source Material License SUA-1548	NRC	Approved – renewal pending	**SUA-1548**
Permit to Mine No. 633 and 603	WDEQ/LQD	Approved	**633**
Public Water Supply	WDEQ/WQD, EPA	Approved	**WY5601500**
WYPDES Stormwater Discharge (Construction)	WDEQ/WQD	Approved	**WYR104157**
WYPDES Stormwater Discharge (Industrial)	WDEQ/WQD	Approved	**WYR000648**
UIC Aquifer Exemption	WDEQ/LQD, EPA	Approved	**8WM-DW**
Radio Communications Permit	FCC	Approved	**FRN 0001607944**
Transport License/Permit	DOT	Approved	**Reg. No. 082012 550 070UW**
UIC Class I Injection Wells (10)	WDEQ/WQD	Approved (8 are operational and 2 to be drilled)	**RR No. 1 04-611** **SRHUP 6 09-054** **SRHUP 7 09-054** **SRHUP 8 09-054** **SRHUP 9 09-054** **SRHUP 10 09-054** **Morton 09-054** **Vollman 09-054** **SR 1 09-623** **SR 2 09-623**
Domestic Sewage (7 permits)	Converse County and/or WDEQ/WQD	Approved (Highland Uranium Project CPF and Satellite No. 1 inactive)	**Permit 07-147 (Office Building)** **Permit 11-127 (Shop)**
Air Quality (2 permits)	WDEQ/AQD	Approved	**2012 - MD-13966** **1991 - CT-957**
Ground Water Appropriation (Numerous Block and Water Well Permits)	WSEO	Approved	**Numerous well permit numbers cannot be listed in this table**
CPP Storage Ponds	WSEO/WDEQ/WQD	Approved	**East Storage Pond for Permit: 633**
Satellite No. 1 Radium Settling Basins	WSEO/WDEQ/WQD	Approved (inactive)	**N/A**
Satellite No. 1 PSR	WSEO/WDEQ/WQD	Approved (inactive)	**9289 Res. (9/2/87)**
Satellite No. 1 Land Application 1A & 1B	WDEQ/WQD	Approved (inactive)	**N/A**
PSR-2	WDEQ/WQD	Approved	**10045 Res. (11/18/94)**
PSR-2 Land Application	WDEQ/WQD	Approved	**Permit No. 93-410**
County Development	Converse County	Approved	**File #CC 3-86-8**

***Note:**

NRC = US Nuclear Regulatory Commission
WDEQ = Wyoming Department of Environmental Quality
LQD = Land Quality Division
WQD = Water Quality Division
AQD = Air Quality Division
EPA = US Environmental Protection Agency
FCC – Federal Communications Commission
DOT = US Department of Transportation
WSEO = Wyoming State Engineer's Office
SHWD = Solid and Hazardous Waste Division

Table 1-2 North Butte Required Permits as of May 2014

Permit or License	Regulatory Agency*	Status	Permit #
Source Material License SUA-1548	NRC	Approved – renewal pending	**SUA-1548 Docket No. 40-8964**
Permit to Mine	WDEQ/LQD	Approved	**632**
Aquifer Exemption	WDEQ/LQD, EPA	Exemption received	**632**
UIC Deep Disposal Well	WDEQ/WQD	In Renewal	**UIC 02-050**
Surge Pond	WDEQ/WQD	N/A	**N/A (under LQD Permit to Mine)**
Air Quality Permit	WDEQ/AQD	Approved	**CT-13660**
Permit to Construct (septic)	WDEQ/WQD	Approved	**12-201**
WYPDES Stormwater Discharge (Construction)	WDEQ/WQD	Approved	**WYR104286**
WYPDES Stormwater Discharge (Industrial)	WDEQ/WQD	Approved	**WYR001379**
Permit to Appropriate Ground Water (UW5), Statement of Completion (UW6) and Beneficial Use (UW8) (Well PW-1)	WSEO	Complete	**UW 192394**
Permit to Appropriate Ground Water (UW5), Statement of Completion (UW6) and Beneficial Use (UW8) (Well WW-1)	WSEO	Complete	**UW 197425**
County Development	Campbell County Planning Commission	N/A (No county requirement)	**N/A**
Spill Prevention, Control and Countermeasures Plan	EPA	Approved	**N/A**
Public Water System	EPA	Approved	**WY5601667**
Surge Pond	WSEO	Approved	**13908R**

***Note:**
NRC = US Nuclear Regulatory Commission
WDEQ = Wyoming Department of Environmental Quality
LQD = Land Quality Division
WQD = Water Quality Division
EPA = US Environmental Protection Agency
FCC – Federal Communications Commission
WSEO = Wyoming State Engineer's Office
N/A = Not Applicable

Table 1-3 Gas Hills Required Permits as of May 2014

Permit or License	Regulatory Agency*	Status	Permit #
Source Material License SUA-1548	NRC	Approved – renewal pending	**SUA-1548**
Permit to Mine	WDEQ/LQD	Approved	**687**
Aquifer Exemption	WDEQ/LQD, EPA	Exemption received	**N/A**
UIC Class V – Permit for 2 Test Wells	WDEQ/WQD	Approved	**11-310**
UIC Class I Permit for 2 Deep Disposal Wells	WDEQ/WQD	Approved	**13-262**
Evaporation pond	WDEQ/LQD, WQD, WSEO	To be prepared	
Surface Discharge	WDEQ/WQD	To be prepared	
Groundwater Appropriation	WSEO	To be prepared	
Public Water Supply	WSEO, EPA	To be prepared	
Air Quality Permit (Construction and Operations for fugitive dust and particulates)	WDEQ/AQD	To be prepared	
Domestic Sewage	WDEQ/WQD	To be prepared	
Stormwater Discharge (Construction)	WDEQ/WQD	Approved	**WYR103870**
Stormwater Discharge (Industrial)	WDEQ/WQD	To Be Prepared	
County Development	Natrona and Fremont Counties Planning Commissions	To be prepared	
Radio Communications	FCC	Permit Received	**0017354101**
Plan of Operations	BLM	Approved	**WYW-140590**

***Note:**

NRC = US Nuclear Regulatory Commission
WDEQ = Wyoming Department of Environmental Quality
LQD = Land Quality Division
WQD = Water Quality Division
AQD = Air Quality Division

EPA = US Environmental Protection Agency
FCC – Federal Communications Commission
WSEO = Wyoming State Engineer's Office
BLM = US Bureau of Land Management

Table 1-4 Ruth Required Permits as of May 2014

Permit or License	Regulatory Agency*	Status	Permit #
Source Material License SUA-1548	NRC	Amendment received – Operating Plan update to be prepared and submitted at a later date	**SUA-1548**
Permit to Mine	WDEQ/LQD	Permit received – Permit update required	**631**
Aquifer Exemption	WDEQ/LQD, EPA	Exemption received	**8RWM-DW**
UIC Class I Permit for Deep Disposal Wells	WDEQ/WQD	To be prepared	**N/A**
Evaporation pond	WDEQ/LQD, WQD, WSEO	To be prepared	**N/A**
Surface Discharge	WDEQ/WQD	To be prepared	**N/A**
Groundwater Appropriation	WSEO	To be prepared	**N/A**
Public Water Supply	WSEO, EPA	To be prepared	**N/A**
Air Quality Permit (Construction and Operations for fugitive dust and particulates)	WDEQ/AQD	To be prepared	**N/A**
Domestic Sewage	WDEQ/WQD	To be prepared	**N/A**
Stormwater Discharge (Construction and Operational)	WDEQ/WQD	To be prepared	**N/A**
County Development	Johnson County Planning Commission	To be prepared	**N/A**
Radio Communications	FCC	To be prepared	**N/A**
Plan of Operations	BLM	To be prepared	**N/A**

***Note:**

NRC = US Nuclear Regulatory Commission
WDEQ = Wyoming Department of Environmental Quality
LQD = Land Quality Division
WQD = Water Quality Division
AQD = Air Quality Division

EPA = US Environmental Protection Agency
FCC – Federal Communications Commission
WSEO = Wyoming State Engineer's Office
BLM = US Bureau of Land Management

Table 1-5 Agency Consultations*

Facility	Agency Consulted	Date	Content
Smith Ranch/Highland and Reynolds	US Army Corps of Engineers	April 8, 2011	Review of survey protocol for aquatic resource inventory.
Smith Ranch/Highland and Reynolds	Wyoming Game and Fish Department	April 15, 2011	Species of concern list; review of draft wildlife and vegetation survey plans.
Smith Ranch/Highland	Wyoming Game and Fish Department	June 3, 2010	Review of the Combined Permit.
Smith Ranch/Highland	US Fish and Wildlife Service	June 23, 2010	Review of the Combined Permit.
Reynolds	US Fish and Wildlife Service	December 20, 2007	Information on threatened and endangered species, migratory birds, and wetlands.
Reynolds	US Fish and Wildlife Service	July 20, 2009	Review of Reynolds amendment to Permit 633.
North Butte	Wyoming State Historic Preservation Office	November 5, 2010	Review of project report.
North Butte	Wyoming Game and Fish Department	December 17, 2010	List of recommended wildlife surveys.
North Butte	US Fish and Wildlife Service	August 19, 2010	Presence of threatened and endangered species; protective measures for migratory birds.
North Butte	US Army Corps of Engineers	January 24, 2011	Verification of wetland delineation.
Gas Hills	Wyoming Game and Fish Department	October 29, 2008	Review of BLM Environmental Assessment.
Gas Hills	US Bureau of Land Management	April 6, 2010	Approval of Wildlife Plan (email) incorporating Wyoming Game and Fish Department comments.
Gas Hills	US Army Corps of Engineers	October 30, 1998	Recommendations for avoidance of wetlands.
Gas Hills	Wyoming Game and Fish Department	October 14, 1996	Comments on Wildlife Appendix of the WDEQ Permit to Mine.
Gas Hills	Wyoming Game and Fish Department	May 13, 1999	Wildlife baseline data requirements.
Gas Hills	US Bureau of Land Management	May 1, 2007	Record of site visit and recommendation for archeological clearance.
Gas Hills	Wyoming State Historic Preservation Office	August 23, 2000	Determination of site eligibility and recommendations.
Gas Hills	Wyoming State Historic Preservation Office	August 17, 2000	Determination of site eligibility and recommendations.
Gas Hills	US Bureau of Land Management	January 21, 1993	Review of archeological report.
*No agency consultations were located for Ruth			

Table 2-1 Major Uranium Recovery Licensing Applications

Company	Site Under Consideration	Design	Estimated Application Date	Date Accepted	State	Status	Letter of Intent
			Fiscal 2007 Applications				
Uranium One	Willow Creek	ISR – Restart	Received April 2007		WY	Completed 9/08	None
Cameco (Crow Butte Resources)	North Trend	ISR – Expansion	Received June 2007	08/28/2007	NE	Tech Review Ongoing	None
Cameco (Crow Butte Resources)	Plant Upgrade	ISR – Expansion	Received Oct 2006		NE	Completed 12/07	None
			Fiscal 2008 Applications				
Lost Creek ISR, LLC	Lost Creek	ISR – New	Resubmitted Mar 2008	06/10/2008	WY	Completed 8/17/11	*05/23/07*
Uranerz Energy Corp.	Hank and Nichols	ISR – New	Received December 2007	04/14/2008	WY	Completed 7/19/11	*06/27/07*
Uranium One	Moore Ranch	ISR – New	Received October 2007	12/20/2007	WY	Completed 9/30/10	*05/31/07*
			Fiscal 2009 Applications				
Powertech Uranium Corporation	*Dewey Burdock*	*ISR – New*	*Resubmitted 8/09*	*Oct-09*	*SD*	*RAI Responses*	*01/26/07*
			Fiscal 2010 Applications				
			Fiscal 2011 Applications				
Strata Energy, Inc.	Ross	ISR - NEW	Rec. January 2011	Jun-11	WY	Tech Review Ongoing	*01/08/10*
			Fiscal 2012 Applications				
Lost Creek ISR, LLC	Lost Creek	ISR – Expansion	Oct-11		WY		*01/06/10*
Cameco (Crow Butte Resources)	Marsland	ISR – Expansion	Oct-11		NE		*11/09/10*
Cameco (Power Resources, Inc.)	Smith Ranch/Highland CPP	ISR – Expansion	Dec-11		WY		*01/14/10*
Uranium One	Allemand-Ross	ISR – Expansion	Dec-11		WY		*10/08/10*
AUC LLC	Reno Creek	ISR – New	Jan-12		WY	Pre-Sub Audit 11/11	*11/03/10*
Titan Uranium USA, Inc.	Sheep Mountain	Heap Leach – New	Jan-12		WY	Pre-Sub Audit/10/11	*11/11/10*
UR-Energy Corp.	Lost Soldier	ISR – Expansion	Mar-12		WY		*11/01/10*
Neutron Energy	Juan Tafoya	Conv. – New	Jun-12		NM		*11/16/10*
The Bootheel Project LLC	Bootheel	ISR-New (Satellite)	Jul-12		WY		*08/09/10*
Strathmore Minerals Corporation	Gas Hills	Conv. – New	Sep-12		WY		*11/19/10*
Strathmore Minerals Corporation	Roca Honda	Conv. – New	Sep-12		NM		*11/19/10*
Uranium Company of Nevada, LLC	Apex Mill	Conv. – New	Sep-12		NV		*11/11/10*
Rio Grande Resources	Mt. Taylor	Conv. – New	TBD		NM		*11/10/10*
Uranium One	Ludeman	ISR – New	Withdrawn, Resubmit 10/11		WY		*10/08/10*
			Fiscal 2013 Applications				
Cameco (Power Resources, Inc.)	Ruby Ranch	ISR – Expansion	FY 2013		WY		*01/14/10*
Uranerz Energy Corp.	Jane Dough	ISR – Expansion	Nov-12		WY		*10/07/11*
Cameco (Crow Butte Resources)	Three Crow	ISR – Expansion	Rec.08/10, Resubmit FY 13		NE	Review Deferred	*01/11/10*
Uranium One	Jab and Antelope	ISR – New	Rec. 07/08, Resume FY 13	Mar-09	WY	Review Deferred	*05/31/07*
Wildhorse Energy	West Alkali Creek	ISR – New	TBD		WY		*01/07/10*
Uranium Energy Corporation	Grants Ridge	Heap Leach – New	TBD		NM		*01/15/10*
			Other Major Licensing Actions				
Cameco (Crow Butte Resources)	Crawford, NE	ISR – Lic. Renew.	Received Dec. 2007		NE	Draft License Issued	
Uranium One	Willow Creek	ISR – Lic. Renew.	Received May 2008		WY	Tech Review Ongoing	
Cameco (Power Resources, Inc.)	Smith Ranch/Highland	ISR – Lic. Renew.	Received 08/2010		WY	Pre-Sub Audit Comp.	
Hydro Resources, Inc.	Crownpoint	ISR – Lic. Renew.	Rec. 8/02, on hold until 2011		NM		
Cameco (Power Resources, Inc.)	North Butte	ISR – Ops Plan	Jan-12		WY		*09/09/10*
Cameco (Power Resources, Inc.)	Gas Hills	ISR – Ops Plan	Jan-12		WY		*09/09/10*
Cameco (Power Resources, Inc.)	Ruth	ISR – Ops Plan	Jun-13		WY		*09/09/10*
					No. of New Facility Applications =	**16**	
					No. of Restart/Expansion Applications -	**12**	
					No. of Other Actions	**7**	
					Total No. of Licensing Actions	**35**	

ISR = In Situ Recovery Facility — Conv = Conventional Uranium Mill
TBD – To Be Determined — FY – Fiscal Year

Table 2-2 Wyoming Powder River Basin Coal Development by Subregion

Subregion	Annual Production for Most Recent Report Year (million tons)	Cumulative Disturbed Area for Year (acres)	Cumulative Permanently Reclaimed Areas through Most Recent Report Year (acres)	Cumulative Unreclaimed Areas Available for Reclamation Through Most Recent Report Year (acres)	Cumulative Unreclaimed Areas Unavailable for Reclamation through Most Recent Report Year (acres)	Total Employment for Report Year	Annual Water Consumption (mm gpy)	Actual Water Production (acre-feet)
Lower Production Scenario								
Subregion 2	77	21,249	6,783	6,107	8,359	861	544	447
Subregion 3	232	35,498	11,401	13,992	10,105	3,090	1,709	748
Total for 2003 Actual	**309**	**56,747**	**18,184**	**20,099**	**18,464**	**3,951**	**2,253**	**1,195**
Subregion 2	100	23,630	6,441	12,353	9,273	1,424	544	447
Subregion 3	250	45,542	15,785	31,577	11,941	3,077	1,709	748
Total for 2007 Actual	**350**	**69,172**	**22,226**	**43,930**	**21,214**	**4,501**	**2,253**	**1,195**
Subregion 2	95	28,021	12,183	6,830	9,008	1,323	50	675
Subregion 3	254	55,410	27,751	16,588	11,070	3,153	1,115	1,419
Total for 2010	**349**	**83,431**	**39,934**	**23,418**	**20,078**	**4,476**	**1,165**	**2,094**
Subregion 2	112	32,356	15,683	7,314	9,359	1,369	458	675
Subregion 3	281	67,423	38,851	16,983	11,589	3,186	1,277	1,419
Total for 2015	**393**	**99,779**	**54,534**	**24,297**	**20,948**	**4,555**	**1,735**	**2,094**
Subregion 2	126	36,994	19,683	7,589	9,723	1,476	72	675
Subregion 3	291	80,720	51,351	17,243	12,124	3,215	1,334	1,419
Total for 2020	**417**	**117,714**	**71,034**	**24,832**	**21,847**	**4,691**	**1,406**	**2,094**
Upper Production Scenario								
Subregion 2	77	21,249	6,783	6,107	8,359	861	544	447
Subregion 3	232	35,498	11,401	13,992	10,105	3,090	1,709	748
Total for 2003 Actual	**309**	**56,747**	**18,184**	**20,099**	**18,464**	**3,951**	**2,253**	**1,195**
Subregion 2	100	23,630	6,441	12,353	9,273	1,424	544	447
Subregion 3	250	45,542	15,785	31,577	11,941	3,077	1,709	748
Total for 2007 Actual	**350**	**69,172**	**22,226**	**43,930**	**21,214**	**4,501**	**2,253**	**1,195**
Subregion 2	117	29,279	13,416	7,536	8,328	1,375	58	675
Subregion 3	284	57,258	27,951	18,236	11,070	3,153	1,184	1,419
Total for 2010	**401**	**86,537**	**41,367**	**25,772**	**19,398**	**4,528**	**1,242**	**2,094**
Subregion 2	138	35,624	18,616	8,248	8,760	1,431	75	675
Subregion 3	301	70,431	39,451	19,391	11,589	3,186	1,333	1,419
Total for 2015	**439**	**106,055**	**58,067**	**27,639**	**20,349**	**4,617**	**1,408**	**2,094**
Subregion 2	148	42,981	25,016	8,758	9,206	1,444	86	675
Subregion 3	307	84,797	51,651	21,021	12,124	3,215	1,437	1,419
Total for 2020	**455**	**127,778**	**76,667**	**29,779**	**21,330**	**4,659**	**1,523**	**2,094**

Table 2-3 Projection of Conventional Oil and Gas Activity

Wells and Production	Actual		Projected		
	2003	2007	2010	2015	2020
Annual Gas Production (BCF)	39.9	22.0	42.7	39.0	35.1
Annual Oil Production (million barrels)	12.9	11.4	15.7	14.3	12.9
Active Wells	5,067[1]	3,857[2]	6,503	5,115	4,625
Inactive Wells	1,994	0[3]	954	563	332

Notes:

1. The total includes approximately 1,500 seasonally active wells
2. The total includes approximately 1,500 seasonally active wells and an unknown number of inactive wells.
3. Unknown.

Table 2-4 Projection of Coal Bed Methane Activity

Wells and Production	Actual		Projections		
	2003	2007	2010	2015	2020
Annual Production (BCF)	338	432	708	1,005	1,026
Active Wells	14,758	20,408	31,943	42,980	42,108

Table 2-5 Powder River Basin Livestock Grazing - 2007

	Converse County	Campbell County	Johnson County
Cattle and Calves	52,072	76,835	45,534
Sheep and Lambs	68,065	31,792	31,505
Horses and Ponies	2,108	4,427	3,060
Source: NASS 2007 Census of Agriculture			

Table 2-6 Wind River Basin Livestock Grazing - 2007

	Freemont County	Natrona County
Cattle and Calves	96,758	54,575
Sheep and Lambs	22,793	39,412
Horses and Ponies	12,857	2,978
Source: NASS 2007 Census of Agriculture		

Table 2-7 Predicted Environmental Impacts

Impacts of Operation	No-Action Alternative	Proposed Action	Alternative Action (Conventional Open Pit or Underground Mining)
Land Use	Any existing land use impacts associated with operations at Smith Ranch will be reclaimed and returned to pre-ISR conditions.	Loss of agricultural production (grazing) in the impacted area for the life of the mine or mine unit. Acreage taken out of livestock production is limited.	Compared to the preferred alternative, conventional open pit mining would increase the acreage of disturbance by a factor of 100. Grazing would be restricted. Conventional underground mining would result in an increase in land disturbance over ISR operations, but not as significant as conventional open pit mining. The entire mine site can be returned to its original land use more rapidly with ISR mining methods than those of underground or open pit mining methods.
Transportation	Any existing transportation impacts associated with SUA-1548 will begin to taper as operations cease and reclamation progresses.	Minimal impacts predicted compared to current traffic levels. Predicted increase on traffic on regional roads is generally less than 5%.	Additional staff and machinery are required for the operation of conventional open pit or underground mining as compared to the proposed action. For an equivalent conventional operation, one might anticipate two to three times the impact on roads that one would see with an ISR operation.
Geology and Soils	None.	Minimal geologic impacts are expected because ISR does not remove formation material from the aquifer, no subsidence or matrix compression is anticipated. The principal impact to soils under SUA-1548 will be from earthmoving activities associated with construction of ISR facilities. Most soil disturbances are short term. Topsoil and land recovery is initiated as soon as possible following construction.	Geologic impacts associated with conventional underground or open pit mining are more severe than ISR mining in that they both remove the rock matrix and structure where the uranium is located. Reclamation and restoration of soils for conventional underground or open pit mining also takes a longer time than ISR mining since ISR mining methods can reclaim and restore soil disturbances.
Water Resources	Any existing water resource impacts associated with operations at Smith Ranch will begin to taper as restoration objectives are achieved.	No surface water impacts. A limited quantity of groundwater is consumed during ISR production and restoration. Groundwater quality is affected within the Aquifer Exemption area. These impacts are temporary and the aquifer will be restored following the completion of uranium recovery.	Both open pit and underground mining affect groundwater by commingling aquifers that were discretely separated by confining layers. A large volume of groundwater is consumed by dewatering (and discharged to the surface) during conventional mining. Groundwater quality can be affected following water table recovery as redox conditions change and additional constituents go into dissolution.
Ecological Resources	None.	Temporary loss and/or disruption of wildlife usage and vegetation production during well field construction. Impacts are short term. Wildlife friendly fencing will allow wildlife usage of well field areas. No substantial impairment of ecological stability or species diversity.	Adverse impacts to both vegetation and wildlife resources are directly related to the degree of disturbance to the land surface. Compared to the preferred alternative, conventional open pit mining would increase the acreage of disturbance by a factor of 100. Conventional underground mining would result in an increase in land disturbance over ISR operations, but not as significant as conventional open pit mining.
Air Quality	Any existing air quality impacts associated with SUA-1548 will begin to taper as operations cease and reclamation progresses.	Minimal increase in total dust emissions from construction activities and vehicle traffic on gravel roads. Fugitive dust at each location covered under SUA-1548 is expected to be less than 200 tons per year.	Air quality impacts relate to the size and nature of the construction disturbance. In addition to the significantly larger disturbed land footprint, the nature of conventional mining will result in large out-of-pit stockpiles and tailings.
Noise	Any existing noise impacts associated with SUA-1548 will begin to taper as operations cease and reclamation progresses.	Noise impacts will be barely perceptible over background levels.	Noise impacts relate to the size and nature of the construction disturbance. In addition to the significantly larger disturbed land footprint, the nature of conventional mining will result in larger mobile equipment including dozers, scrapers, loaders, haul trucks, and draglines. Noise impacts of conventional mining are significantly greater than that from ISR.

Table 2-7 Predicted Environmental Impacts

Impacts of Operation	No-Action Alternative	Proposed Action	Alternative Action (Conventional Open Pit or Underground Mining)
Historic and Cultural Resources	None.	None.	Increases in ground disturbance significantly increase the risk of adverse impacts to historical and cultural resources over the proposed action. Compared to the preferred alternative, conventional open pit mining would increase the acreage of disturbance by a factor of 100. Conventional underground mining would result in an increase in land disturbance over ISR operations, but not as significant as conventional open pit mining.
Visual and Scenic Resources	Any existing visual resource impacts associated with SUA-1548 will begin to taper as operations cease and reclamation progresses.	The temporary and short-term visual effects occur during the construction phase of well field development. Long-term visual resource impacts from industrial buildings will be minimal.	Open pits and tailings piles left by mining significantly change the landscape as compared to the proposed action.
Socioeconomic	Direct and indirect economic benefit provided by SUA-1548 will begin to taper as operations cease and reclamation progresses.	The purchasing of goods and services, taxes paid and direct payments will benefit local and regional communities. It is anticipated that the overall socioeconomic effect of the SUA-1548 Project on the surrounding counties and the state as a whole would be beneficial.	This requires more labor than the proposed action, increasing the number of jobs available. The quality of the ore mined must be higher and there is a higher capital investment and lead time.
Public and Occupational Health	Any existing public and occupational health impacts associated with SUA-1548 will begin to taper as operations cease and reclamation progresses.	In-situ mining activities under SUA-1548 pose a low risk to public and occupational health. To ensure risk levels from non-radiological and radiological impacts remain low, Cameco has instituted standard operating procedures for handling, processing, storing, transporting or disposing of potentially hazardous materials.	Radiation exposure at an ISR operation is significantly less than that associated with conventional mining and milling. Operating personnel are not exposed to the radionuclides present in and emanating from the ore and tailings. Conventional mill tailings can contain all of the radium-226 originally present in the ore, whereas ISR operations may have less than 5% of the radium in the ore zone being brought to the surface through the recovery process.
Waste Management	Any existing waste management impacts associated with SUA-1548 will begin to taper as operations cease and reclamation progresses.	ISR facilities produce airborne effluents, liquid and solid wastes that must be properly handled and disposed of. All ongoing and future ISR operations covered under SUA-1548 will continue to properly transport, treat and dispose of liquid wastes and by so doing, reduce the impacts of waste generation.	The waste management impacts associated with underground or conventional open pit uranium mining are significantly greater than those associated with the proposed ISR activity. Large quantities of radiological solid wastes, or tailings, are generated at a conventional mine. These wastes are generally disposed into a conventional tailings pond, in-pit disposal facility and evaporation ponds, or a conventional heap leach or IX facility.

Table 3.1-1 Regional Ownership

Owner	Acreage	Percentage
Smith Ranch, Highland and Reynolds Ranch		
Bureau of Land Management	488,073	10
State of Wyoming	473,487	10
Private	3,477,948	70
Department of Defense	9,351	0.2
Bankhead Jones	164,594	3
US Forest Service	228,448	5
Bureau of Reclamation	108,244	2
North Butte		
Bureau of Land Management	783,722	16
State of Wyoming	374,248	8
Private	3,526,181	71
Department of Defense	9,351	0.2
Bankhead Jones	144,067	3
US Forest Service	126,311	3
Gas Hills		
Bureau of Land Management	3,159,444	63
State of Wyoming	438,724	9
Private	1,257,928	25
US Fish and Wildlife Service	13,420	0.3
Bureau of Indian Affairs	141,215	3
Ruth		
Bureau of Land Management	953,458	19
State of Wyoming	397,488	8
Private	3,408,365	67
US Fish and Wildlife Service	221,104	4
Department of Defense	9,351	0.2
Bankhead Jones	116,862	2
Wyoming Game and Fish	5,590	0.1

Table 3.2-1 Smith Ranch Material Shipments and Deliveries

Transported Material	Annual Estimated Frequency
Process Chemicals	
Carbon Dioxide	50
Hydrogen Peroxide	48
Oxygen (liquid)	24
Propane	64
Hydrochloric Acid	48
Sodium Bicarbonate	48
Sodium Hydroxide	50
Soda Ash	48
Sulfuric Acid	24
Sodium Sulfide	10
Sodium Chloride	50
Nitrogen	60
Argon	6
Fuel	
Unleaded Gasoline	50
Dyed Diesel	48
Byproduct and Waste	
Pipe, Trash, Sludge, etc.	40
Yellowcake	
Regular Shipments	52
Toll Shipments	6

Table 3.2-2 Estimated North Butte Shipments

	2013*	2014**	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Round-trip Resin Loads to/from SRH	87	237	279	249	249	228	267	211	208	217	213	220	218
O_2	25	54	63	56	56	51	60	47	47	49	48	49	49
CO_2	25	30	35	31	31	28	33	26	26	27	27	27	27
HCL	0	2	2	2	2	2	2	2	2	2	2	2	2
Sodium Bicarb	40	48	56	50	50	46	53	42	41	43	42	44	44
Fuel	5	5	5	5	5	5	5	5	5	5	5	5	5

Notes:
* Only six months operations in 2013
** First four months actual and last eight estimated
2015-2025 estimated shipments and deliveries

Table 3.4-1 Reynolds Ranch Surface Water Quality Data

Sample Name	Sample Date	Radiometrics Dissolved (pCi/L)					Radiometrics Suspended (pCi/L)				
		Lead-210 (210Pb)	Uranium (mg/L) (NatU)	Radium-226 (226Ra)	Thorium-230 (230Th)	Polonium-210 (210Po)	Lead-210 (210Pb)	Uranium (mg/L) (NatU)	Radium-226 (226Ra)	Thorium-230 (230Th)	Polonium-210 (210Po)
Spring #1	8/17/2011	2.30	0.170	0.80	<0.2	<1	<1	0.0055	0.60	<0.2	<1
Windmill Impoundment	8/17/2011	2.20	0.111	0.30	230.0	<1	<1	<0.0003	1.40	<0.2	<1
White Rock Springs	8/18/2011	2.40	0.043	0.30	<0.2	<1	<1	<0.0003	<0.2	<0.2	<1
Impoundment #6	8/18/2011	<1	0.012	<0.2	<0.2	<1	1.40	0.0006	0.20	<0.2	<1
	n =	3	4	3	1	0	1	2	3	0	0
	Average	2.30	0.084	0.47	230	<1	1.40	0.0031	0.73	<0.2	<1
	Standard Deviation	0.10	0.071	0.29	-	-	-	0.0035	0.61	-	-
	Minimum	2.20	0.012	0.30	230	<1	1.40	0.0006	0.20	<0.2	<1
	Maximum	2.40	0.170	0.8	230	<1	1.40	0.0055	1.40	<0.2	<1

Table 3.4-2 Reynolds Ranch Sediment Quality Data

Sample Name	Sample Date	Radiometrics Totals (pCi/g-dry)			
		Uranium (NatU)	Lead-210 (210Pb)	Radium-226 (226Ra)	Thorium-230 (230Th)
Impoundment #2	8/17/2011	0.60	4.3	15.3	0.6
Impoundment #6	8/18/2011	0.60	6.4	0.8	0.4
Sediment #1	8/17/2011	1.00	0.8	0.4	<0.2
Sediment #2	8/17/2011	0.90	1.2	1.4	0.7
Sediment #3	8/17/2011	0.80	1.9	0.9	0.5
Sediment #4	8/17/2011	3.00	6.2	2.7	1.5
Sediment #5	8/17/2011	0.60	2.4	1.3	0.8
Sediment #6	8/18/2011	0.70	1.4	1.5	0.4
Sediment #7	8/18/2011	4.10	3.3	4.8	4.0
Sediment #9	8/18/2011	1.30	3.2	1.2	0.4
Sediment #10	8/18/2011	2.20	3.6	2.4	2.2
Sediment #10	8/18/2011	3.10	1.8	1.7	0.4
Sediment #11	8/18/2011	1.00	1.8	1.6	1.1
Sediment #12	8/17/2011	1.60	5.7	27.7	1.3
Sediment #14	8/17/2011	0.80	1.9	2.0	0.8
Sediment #15	8/17/2011	0.70	2.2	1.7	1.4
Sediment #16	8/17/2011	0.50	5.4	0.8	0.7
Sediment #16	8/17/2011	0.60	1.5	1.7	0.8
Sediment #17	8/17/2011	0.40	1.2	1.0	0.7
Sediment #18	8/17/2011	1.10	2.1	1.0	0.7
Sediment #19	8/17/2011	0.40	1.2	0.7	0.3
Sediment #20	8/17/2011	0.80	4.6	0.9	1.1
Sediment #21	8/18/2011	0.90	2.2	1.4	1.1
Sediment #22	8/18/2011	3.40	3.4	1.1	0.4
Sediment #23	8/18/2011	0.50	1.5	1.3	0.8
Sediment #24	8/18/2011	0.50	1.5	1.1	1.1
Sediment #25	8/18/2011	1.00	3.0	1.5	1.4
Sediment #26	8/18/2011	0.50	1.1	0.8	0.3
Spring #1	8/17/2011	3.10	2.5	1.2	0.3
White Rock Springs	8/18/2011	1.00	1.1	1.2	0.5
Windmill Impoundment	8/17/2011	2.70	1.9	1.6	1.1
	n =	31	31	31	30
	Average	1.3	2.7	2.7	0.9
	Standard Deviation	1.0	1.6	5.3	0.7
	Minimum	0.4	0.8	0.4	0.3
	Maximum	4.1	6.4	27.7	4.0

Table 3.4-3 Surface Water Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Source Name	Longitude	Latitude
P10045.0R	07/20/1994	Complete	Satellite No. 2 Purge Storage	FLO; IND; TEM	036N	073W	12	SW1/4SW1/4	Bob Draw	-105.573781	43.102558
P1007.0S	12/09/1954	Complete	Ridgeway No. 1 Stock Reservoir	STO	036N	073W	26	SE1/4NE1/4	Ridgeway Draw	-105.577756	43.0651
P10398.0S	06/13/1988	Unadjudicated	AML 15-II Site 30 Stock Reservoir	STO	037N	073W	16	SW1/4NE1/4	Solar Draw	-105.627802	43.181019
P10429.0S	07/22/1988	Fully Adjudicated	Dave Johnston Mine SP-8 Stock Reservoir	STO	036N	075W	34	NW1/4SW1/4	North Platte River	-105.847697	43.046163
P10431.0S	07/22/1988	Fully Adjudicated	Dave Johnston Mine SP-17 Stock Reservoir	STO	035N	075W	11	SW1/4NW1/4	North Platte River	-105.827564	43.02115
P10434.0S	08/01/1988	Unadjudicated	Betty Lou Stock Reservoir	STO	037N	073W	09	SE1/4SE1/4	Betty Lou Draw	-105.622831	43.188248
P1322.0S	12/16/1955	Complete	Lehman #1 Stock Reservoir	STO	035N	073W	05	SE1/4NW1/4	Lehman Draw	-105.646719	43.035839
P1456.0S	07/09/1956	Complete	Layton Pit No. 1 Stock Reservoir	STO	034N	074W	02	NE1/4NE1/4	Layton Draw	-105.6949	42.952039
P1562.0S	09/17/1956	Complete	Bobby #1 Stock Reservoir	STO	036N	072W	15	SE1/4SW1/4	Bobby Draw	-105.487806	43.087833
P1615.0S	10/22/1956	Complete	Whipple #1 Stock Reservoir	STO	036N	073W	14	SW1/4NW1/4	Whipple Draw	-105.592506	43.09415
P1616.0S	10/22/1956	Complete	Stratton #1 Stock Reservoir	STO	036N	072W	06	SE1/4NW1/4	Stratton Draw	-105.546833	43.123611
P1632.0S	10/25/1956	Complete	Mart #1 Stock Reservoir	STO	036N	073W	34	NE1/4SE1/4	Marts Draw	-105.597506	43.046772
P16808.0D	04/28/1924	Fully Adjudicated	Harland Ditch	IRR	037N	074W	11	SW1/4NE1/4	Brown Springs Creek	-105.707114	43.194948
P17330.0D	01/28/1928	Unadjudicated	Judson No. 2 Ditch	IRR	037N	074W	33	SE1/4SE1/4	Brown Springs Creek	-105.740561	43.130329
P17548.0S	12/27/2005	Unadjudicated	Dave Johnston Mine SP-38 Stock Reservoir	STO	035N	075W	24	SE1/4NW1/4	SP-38 Draw	-105.802731	42.99185
P17549.0S	12/27/2005	Complete	Dave Johnston Mine SP-19 Stock Reservoir	STO	035N	075W	11	NE1/4SW1/4	East Fork Sand Creek (South)	-105.822581	43.01755
P17550.0S	12/27/2005	Unadjudicated	Dave Johnston Mine SP-18 Stock Reservoir	STO	035N	075W	11	NE1/4SW1/4	SP-18 Draw	-105.822581	43.01755
P17551.0S	12/27/2005	Complete	Dave Johnston Mine SP-1 Stock Reservoir	STO	035N	075W	03	NE1/4SW1/4	Bishop Draw	-105.842519	43.031661
P17552.0S	12/27/2005	Complete	Dave Johnston Mine SP-7A Stock Reservoir	STO	036N	075W	34	SE1/4SW1/4	Herkimer Draw	-105.842769	43.042531
P1878.0D	07/08/1898	Fully Adjudicated	Williams No. 1 Ditch	IRR; STO	036N	074W	33	NW1/4SW1/4	Sage Creek (12-33-73)	-105.750828	43.044736
P1879.0D	07/08/1898	Fully Adjudicated	Williams No. 2 Ditch	IRR; STO	036N	074W	33	SE1/4SW1/4	Sage Creek (12-33-73)	-105.745775	43.041581
P1881.0D	07/08/1898	Fully Adjudicated	White Rock Spring and Pipeline	DOM; STO	035N	074W	06	NW1/4SW1/4	White Rock Springs	-105.788827	43.031628
P1882.0D	07/08/1898	Fully Adjudicated	Willow Springs	DOM; STO	035N	073W	04	SE1/4NE1/4	Willow Springs Creek	-105.616722	43.035675
P1883.0D	07/08/1898	Fully Adjudicated	Lake Springs and Pipeline	DOM; STO	036N	073W	32	NE1/4SE1/4	Lake Spring	-105.6369	43.046608
P1952.0S	04/16/1957	Expired	Crouch No. 3 Stock Reservoir	STO	035N	074W	06	NE1/4NE1/4	North Platte River	-105.774336	43.038964

Table 3.4-3 Surface Water Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Source Name	Longitude	Latitude
P1965.0S	04/15/1957	Fully Adjudicated	Federal No. 1 Stock Reservoir	STO	035N	074W	29	SW1/4SE1/4	Federal Draw	-105.758917	42.970125
P1966.0S	04/15/1957	Fully Adjudicated	Bruce Mine Stock Reservoir	STO	035N	074W	30	SW1/4SW1/4	Bruce Mine Draw	-105.788256	42.96995
P23404.0D	02/19/1970	Fully Adjudicated	Amspoker No. 1 Ditch	IRR	035N	074W	02	SE1/4SE1/4	Amspoker Draw	-105.695929	43.028069
P25312.0D	02/02/1976	Fully Adjudicated	Brown Springs Pipeline No. 1	STO	036N	074W	04	SW1/4SE1/4	Hornbuckle Draw	-105.740533	43.115577
P25313.0D	09/09/1976	Fully Adjudicated	Brown Springs Pipeline No. 2	STO	036N	074W	04	NW1/4SE1/4	Brown Spings Creek	-105.739778	43.119309
P25463.0D	04/06/1976	Unadjudicated	Exxon Drainage Ditch	RES	036N	072W	20	NE1/4SW1/4	Fowler Draw	-105.526899	43.076667
P2597.0R	02/16/1914		Sage Creek No. 2 Reservoir	IRR	035N	074W	02	SW1/4NW1/4	Sage Creek (12-33-73)	-105.710371	43.035395
P2718.0S	04/29/1959	Complete	Leland #1 Stock Reservoir	STO	036N	074W	30	SW1/4NW1/4	Leland Draw	-105.789339	43.064158
P4380.0S	09/26/1961	Unadjudicated	West Skunk #1 Stock Reservoir	STO	037N	072W	33	NW1/4NW1/4	West Skunk Creek	-105.517536	43.141927
P4541.0S	04/25/1962	Unadjudicated	Jeff #1 Stock Reservoir	STO	037N	073W	16	NW1/4NE1/4	South Fork Brush Creek	-105.627795	43.184624
P4656.0R	05/24/1937	Unadjudicated	Smith Reservoir	STO	035N	074W	07	SE1/4SE1/4	Blackjack Draw	-105.774149	43.013411
P4703.0R	05/20/1937	Fully Adjudicated	Morton Reservoir	STO	035N	072W	04	SE1/4SE1/4	Dry Draw	-105.497545	43.029455
P5241.0S	11/08/1963	Fully Adjudicated	Genevieve No. 1 Stock Reservoir	STO	037N	072W	31	SE1/4SW1/4	Genevieve Draw	-105.551239	43.130815
P654.0S	01/04/1954	Complete	Vollman #1 Stock Reservoir	STO	035N	073W	05	NW1/4SE1/4	Vollman Draw	-105.641606	43.032236
P8097.0S	02/02/1976	Fully Adjudicated	Brown Springs No. 1 Stock Reservoir	STO	037N	074W	33	NE1/4SE1/4	Brown Springs Creek	-105.741564	43.133579
P8098.0S	02/02/1976	Fully Adjudicated	Brown Springs No. 2 Stock Reservoir	STO	037N	074W	33	SE1/4NE1/4	Brown Springs Creek	-105.741585	43.137183
P8821.0R	04/03/1984	Unadjudicated	UPS-1 Reservoir	FLO; MIS; TEM	035N	075W	13	SE1/4NE1/4	SP-36 Draw	-105.793832	43.00623
P8823.0R	04/03/1984	Unadjudicated	UPS-3 Reservoir	FLO; MIS; TEM	035N	075W	12	SE1/4SW1/4	UPS-3 Draw	-105.803	43.013665
P8824.0R	04/03/1984	Unadjudicated	UPS-5 Reservoir	FLO; MIS; TEM	035N	075W	12	SW1/4NW1/4	SP-20 Draw	-105.807911	43.021043
P8828.0R	04/03/1984	Unadjudicated	SP-35 Reservoir	IND; MIS; TEM	035N	075W	14	NE1/4NE1/4	SP-22 Draw	-105.812645	43.010188
P8829.0R	04/03/1984		SP-36 Reservoir	IND; MIS; TEM	035N	075W	13	SW1/4NW1/4	SP-36 Draw	-105.807738	43.006469
P8830.0R	04/03/1984	Unadjudicated	SP-37 Reservoir	IND; MIS; TEM	035N	075W	24	NW1/4NW1/4	SP-37 Draw	-105.807611	42.99554
P8861.0R	08/30/1984	Unadjudicated	UPS-6 Reservoir	FLO; MIS; TEM	035N	075W	02	SE1/4SE1/4	North Platte River	-105.812895	43.028348
P8862.0R	08/30/1984	Unadjudicated	UPS-7 Reservoir	FLO; MIS; TEM	035N	075W	02	NE1/4SW1/4	Bishop Draw	-105.822866	43.03189
P8863.0R	08/30/1984	Unadjudicated	UPS-8 Reservoir	FLO; MIS; TEM	035N	075W	02	NW1/4NW1/4	UPS-8 Draw	-105.827965	43.038931
P9485.0R	05/15/1989	Unadjudicated	SP-39 Reservoir	IND; TEM	035N	075W	24	NE1/4SE1/4	SP-39 Draw	-105.793069	42.98808
Water rights information collected from Wyoming State Engineer e-permit database.											

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P102267.0W	05/08/1996	Complete	Shideler #1	DOM	034N	075W	04	NW1/4NE1/4	2	235	90	-105.85656	42.95194
P106068.0W	05/28/1997	Complete	Mary #1	DOM	034N	075W	04	NW1/4NE1/4	25	431	77	-105.85656	42.95194
P52104.0W	05/15/1980	Complete	Adams #2	DOM	035N	075W	04	NE1/4NE1/4	5	480	350	-105.85257	43.0389
P40916.0W	11/18/1977	Complete	Ursey #1	DOM	035N	075W	28	SE1/4NE1/4	10	170	150	-105.8518	42.97724
P42925.0W	04/19/1978	Complete	Van Buskirk #1	DOM	035N	075W	28	SW1/4NE1/4	10	120	70	-105.85669	42.97727
P181469.0W	06/11/2007		Grose No. 1	DOM	035N	075W	33	SE1/4NE1/4	25			-105.85164	42.96274
P32956.0W	04/20/1976	Complete	Gurwell #1	DOM	035N	075W	33	NE1/4SE1/4	12	340	120	-105.85161	42.95913
P161415.0W	08/19/2004	Complete	ENL. Scholtz #1	DOM	035N	075W	34	NW1/4NW1/4	0	50	15	-105.84675	42.96635
P128950.0W	09/01/2000	Complete	Bull Pasture	DOM	036N	071W	31	SW1/4SW1/4	15	80	35	-105.43419	43.0442
P16286.0P	12/21/1946	Complete	Fowler #1	DOM	036N	072W	09	SE1/4SE1/4	8.5	212	182	-105.49739	43.10232
P6988.0P	12/31/1925	Complete	Vollman #6	DOM	036N	073W	27	NW1/4NE1/4	5	180	165	-105.60257	43.06862
P23698.0W	08/01/1973	Complete	Baker #1	DOM	037N	073W	10	NE1/4NW1/4	6	300	20	-105.61322	43.19907
P68591.0W	09/25/1984	Complete	Baker 10 A	DOM	037N	073W	10	SE1/4NW1/4	13	300	50	-105.61317	43.19545
P35031.0W	09/27/1976	Complete	Duck Creek #2	DOM	037N	073W	22	SE1/4NE1/4	1.5	400	0	-105.60313	43.1666
P9162.0P	10/31/1949	Complete	Reynolds #22	DOM	037N	073W	22	SE1/4NE1/4	3	375	-6.00	-105.60313	43.1666
P17313.0P	09/21/1928	Complete	Mason #1	DOM	037N	074W	35	SW1/4SE1/4	3	118	75	-105.70683	43.13013
P2493.0W	04/11/1969	Fully Adjudicated	Highland #3	DOM; IND	036N	072W	20	NE1/4SE1/4	150	298	129	-105.51714	43.0767
P2600.0W	05/29/1969	Fully Adjudicated	Highland #6	DOM; IND	036N	072W	29	NE1/4NW1/4	100	400	50	-105.52708	43.06937
P32562.0W	07/21/1975	Incomplete	Scholtz #2	DOM; IRR; STK	035N	075W	34	NW1/4NW1/4	100	56	16	-105.84675	42.96635
P106711.0W	07/15/1997	Complete	Shideler #2	DOM; STK	034N	075W	04	NW1/4NE1/4	15	434	380	-105.85656	42.95194
P5003.0P	12/21/1925	Complete	Smith #30	DOM; STK	035N	074W	13	SW1/4SE1/4	8	110	80	-105.68065	42.99934
P43002.0W	04/10/1978	Complete	Williams #1	DOM; STK	035N	075W	04	NW1/4NE1/4	3	380	110	-105.85749	43.03891
P177382.0W	09/25/2006	Complete	Hoyer #1	DOM; STK	035N	075W	28	SE1/4SE1/4	10	345	165	-105.85169	42.96996
P190926.0W	07/07/2009	Complete	Loyd #1	DOM; STK	035N	075W	28	SE1/4SE1/4	25			-105.851717	42.969464
P192855.0W	04/30/2010	Incomplete	Heinen Well 2	DOM; STK	035N	075W	28	SW1/4NE1/4	25			-105.856664	42.976806
P40792.0W	11/09/1977	Complete	Leyrer #1	DOM; STK	035N	075W	28	SE1/4SE1/4	12	420	40	-105.85169	42.96996
P90259.0W	12/09/1992	Complete	Popskull 28-2	DOM; STK	035N	075W	28	NW1/4NE1/4	13	800	225	-105.85673	42.98094
P141652.0W	12/26/2001	Complete	Mooren # 1	DOM; STK	035N	075W	33	SW1/4SE1/4	12	500	160	-105.8565	42.95553
P175369.0W	07/05/2006	Complete	Rolling Hills #2	DOM; STK	035N	075W	34	SW1/4SW1/4	25			-105.846669	42.955519
P33796.0W	04/20/1976	Complete	Hornbuckle #20	DOM; STK	036N	074W	04	NE1/4SW1/4	15	120	13	-105.74532	43.11913
P19185.0P	06/21/1922	Complete	North	DOM; STK	036N	074W	18	NE1/4SW1/4	3	40	30	-105.78462	43.08964
P38165.0W	05/31/1977	Complete	Mason #3	DOM; STK	037N	074W	35	NE1/4SW1/4	5	310	180	-105.71183	43.1337
P118307.0W	07/29/1999	Complete	Wellfield 4 NE/NW/2	IND	035N	074W	02	NE1/4NW1/4	75	780	209	-105.70558	43.03915
P118308.0W	07/29/1999	Incomplete	Wellfield 4 NW/NE/2	IND	035N	074W	02	NW1/4NE1/4	30	781	178.8	-105.70065	43.03917
P118309.0W	07/29/1999	Complete	Wellfield 4 NE/NE/2	IND	035N	074W	02	NE1/4NE1/4	75	780	189	-105.69328	43.03834
P118310.0W	07/29/1999	Complete	Wellfield 4 SW/NE/2	IND	035N	074W	02	SW1/4NE1/4	75	760	189	-105.7006	43.03725
P70296.0W	05/21/1985	Complete	O 2 296	IND	035N	074W	02	NW1/4NE1/4	35	760	214.5	-105.70065	43.03917
P114745.0W	03/31/1999	Incomplete	SW/SE 18-36-72; (75 Wells)	IND	036N	072W	18	SW1/4SE1/4	10	550	375	-105.54181	43.08567
P114748.0W	03/31/1999	Incomplete	SW/NW 18-36-72; (53 Wells)	IND	036N	072W	18	SW1/4NW1/4	10	575	342	-105.55252	43.09444
P114749.0W	03/31/1999	Incomplete	NW/SE 18-36-72; (5 Wells)	IND	036N	072W	18	NW1/4SE1/4	10	560	340	-105.54166	43.09144
P114750.0W	03/31/1999	Incomplete	SE/SW 18-36-72; (6 Wells)	IND	036N	072W	18	SE1/4SW1/4	10	560	380	-105.54695	43.08644
P114752.0W	03/31/1999	Incomplete	NE/SW 18-36-72; (39 Wells)	IND	036N	072W	18	NE1/4SW1/4	10	560	345	-105.54686	43.0914
P124117.0W	03/20/2000	Incomplete	NW/NW 18-36-72 (5 wells)	IND	036N	072W	18	NW1/4NW1/4	75	570	344	-105.55249	43.09808
P124118.0W	03/20/2000	Incomplete	SE/NW 18/36/72 (3 Wells)	IND	036N	072W	18	SE1/4NW1/4	10	540	352	-105.54681	43.09458
P112931.0W	11/12/1998	Incomplete	NE/NE 19-36-72; (26 Wells)	IND	036N	072W	19	NE1/4NE1/4	10	510	360	-105.53675	43.08401
P112932.0W	11/12/1998	Incomplete	NW/NE 19-36-72; (49 Wells)	IND	036N	072W	19	NW1/4NE1/4	10	540	360	-105.54183	43.08402

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P112933.0W	11/12/1998	Incomplete	SE/NE 19-36-72; (35 Wells)	IND	036N	072W	19	SE1/4NE1/4	10	510	360	-105.53677	43.08022
P96482.0W	06/24/1994	Incomplete	SE/SE 21-36-73: (30 Wells)	IND	036N	072W	21	SE1/4SE1/4	10	630	350	-105.49772	43.07317
P114746.0W	03/31/1999	Incomplete	SE/NE 13-36-73; (3 Wells)	IND	036N	073W	13	SE1/4NE1/4	10	570	348	-105.55804	43.09433
P114747.0W	03/31/1999	Incomplete	NW/NE 13-36-73; (74 Wells)	IND	036N	073W	13	NW1/4NE1/4	1110	590	335	-105.56292	43.09797
P114751.0W	03/31/1999	Incomplete	NE/NW 13-36-73; (59 Wells)	IND	036N	073W	13	NE1/4NW1/4	885	600	335	-105.56776	43.09796
P124116.0W	03/20/2000	Incomplete	NE/NE 13-36-73 (81 wells)	IND	036N	073W	13	NE1/4NE1/4	1215	580	342	-105.55802	43.09799
P42769.0W	08/19/1977		North Morton #1 Shaft	IND	036N	073W	14	SE1/4SW1/4	100	741	663	-105.58753	43.08685
P86020.0W	08/08/1991	Incomplete	SW/SW 14-36-73 (40 Wells)	IND	036N	073W	14	SW1/4SW1/4	400	585	309	-105.59288	43.08851
P86021.0W	08/08/1991	Incomplete	SE/SE 15-36-73 (65 Wells)	IND	036N	073W	15	SE1/4SE1/4	525	615	369	-105.59749	43.0877
P28245.0W	09/27/1974	Incomplete	Highland #28	IND	036N	073W	20	SE1/4SE1/4	34	835	400	-105.63691	43.072
P109624.0W	04/19/1998	Incomplete	NE/SW 21-36-73; (9 Wells)	IND	036N	073W	21	NE1/4SW1/4	10	730	370	-105.62704	43.07575
P28246.0W	09/27/1974	Incomplete	Highland #29	IND	036N	073W	21	SE1/4SW1/4	35	780	390	-105.62703	43.0721
P96481.0W	06/24/1994	Incomplete	NE/SE 21-36-73: (140 Wells)	IND	036N	073W	21	NE1/4SE1/4	10	620	354	-105.61723	43.07766
P96483.0W	06/24/1994	Incomplete	NW/SE 21-36-73: (50 Wells)	IND	036N	073W	21	NW1/4SE1/4	10	630	364	-105.62047	43.07765
P109623.0W	04/19/1998	Incomplete	NW/SW 22-36-73; (20 Wells)	IND	036N	073W	22	NW1/4SW1/4	10	720	360	-105.61233	43.07591
P129013.0W	09/01/2000	Complete	NW/SE 22-36-73; 19 Wells	IND	036N	073W	22	NW1/4SE1/4	45	690	370	-105.60252	43.07589
P129014.0W	09/01/2000	Incomplete	NE/SW 22-36-73; 27 Wells	IND	036N	073W	22	NE1/4SW1/4	45	670	375	-105.60743	43.0759
P129015.0W	09/01/2000	Complete	SW/NE 22-36-73; 31 Wells	IND	036N	073W	22	SW1/4NE1/4	45	680	370	-105.60248	43.07952
P129016.0W	09/01/2000	Incomplete	SE/NW 22-36-73; 3 Wells	IND	036N	073W	22	SE1/4NW1/4	45	680	375	-105.6074	43.07953
P82943.0W	07/13/1990	Incomplete	NE/NE 22-36-73; 60 Wells	IND	036N	073W	22	NE1/4NE1/4	10	664	395.06	-105.59753	43.08317
P82944.0W	07/13/1990	Incomplete	SE/NE 22-36-73; 50 Wells	IND	036N	073W	22	SE1/4NE1/4	10	685	390	-105.59757	43.07951
P86355.0W	10/02/1991	Incomplete	NE/NE 22-36-73 (12 Wells)	IND	036N	073W	22	NE1/4NE1/4	10	597.8	377	-105.59753	43.08317
P86357.0W	10/02/1991	Incomplete	NE/NW 22-36-73 (15 Wells)	IND	036N	073W	22	NE1/4NW1/4	0	607	314	-105.60736	43.08316
P86358.0W	10/02/1991	Incomplete	SW/NE 22-36-73 (10 Wells)	IND	036N	073W	22	NE1/4NW1/4	100	645	350	-105.60736	43.08316
P86359.0W	10/02/1991	Incomplete	SW/NW 22-36-73 (15 Wells)	IND	036N	073W	22	SW1/4NW1/4	10	560	339	-105.61231	43.07954
P86457.0W	10/10/1991	Incomplete	SE/NW 22-36-73 (90) Wells	IND	036N	073W	22	SE1/4NE1/4	10	609.5	336	-105.59757	43.07951
P91514.0W	04/13/1993	Incomplete	NE/SE 22-36-73 (52 Wells)	IND	036N	073W	22	NE1/4SE1/4	520	625	350	-105.59761	43.07588
P91515.0W	04/13/1993	Incomplete	SE/NE 22-36-73 (76 Wells)	IND	036N	073W	22	SE1/4NE1/4	760	640	346	-105.59757	43.07951
P93089.0W	08/05/1993	Incomplete	SW/NW 22-36-73: (50 Wells)	IND	036N	073W	22	SW1/4NW1/4	10	614.2	362	-105.61231	43.07954
P82945.0W	07/13/1990	Incomplete	NW/NW 23-36-73; 100 Wells	IND	036N	073W	23	NW1/4NW1/4	10	680	381	-105.59254	43.08309
P82946.0W	07/13/1990	Incomplete	SW/NW 23-36-73; 125 Wells	IND	036N	073W	23	SW1/4NW1/4	1250	680	374	-105.59261	43.07953
P91513.0W	04/13/1993	Incomplete	NW/NW 23-36-73 (8 Wells)	IND	036N	073W	23	NW1/4NW1/4	80	620	342	-105.59254	43.08309
P155779.0W	12/30/2003	Complete	SW/SE 24-36-73(25Wells)	IND	036N	073W	24	SW1/4SE1/4	10	660	415	-105.56299	43.07112
P155780.0W	12/30/2003	Complete	SE/SW 24-36-73 (93 Wells)	IND	036N	073W	24	SE1/4SW1/4	10	660	406	-105.56789	43.07113
P155781.0W	12/30/2003	Complete	SW/SW 24-36-73 (31 Wells)	IND	036N	073W	24	SW1/4SW1/4	10	670	440	-105.572817	43.071208
P155782.0W	12/30/2003	Complete	NW/SE 24-36-73 (87 Wells)	IND	036N	073W	24	NW1/4SE1/4	10	620	366	-105.562867	43.076139
P155783.0W	12/30/2003	Complete	NE/SW 24-36-73(104 Wells)	IND	036N	073W	24	NE1/4SW1/4	10	660	402	-105.56785	43.07608
P155784.0W	12/30/2003	Complete	NW/SW 24-36-73(16 Wells)	IND	036N	073W	24	NW1/4SW1/4	10	650	440	-105.572814	43.076039
P41450.0W	11/23/1977	Incomplete	Solution Mine Wells #451 1025	IND	036N	073W	24	NW1/4SE1/4	900	554	440	-105.56297	43.07613
P109625.0W	04/19/1998	Incomplete	SW/NE 29-36-73; (8 Wells)	IND	036N	073W	29	SW1/4NE1/4	10	825	360	-105.64176	43.06473
P109626.0W	04/19/1998	Incomplete	SE/NW 29-36-73; (9 Wells)	IND	036N	073W	29	SE1/4NW1/4	10	810	360	-105.64669	43.06474
P136150.0W	06/13/2001	Complete	Wellfield 2 SW/SW/25	IND	036N	074W	25	SW1/4SW1/4	2400	867	363	-105.69092	43.05737
P136151.0W	06/13/2001	Complete	Wellfield 2 NW/SW/25	IND	036N	074W	25	NW1/4SW1/4	30	930	391	-105.69089	43.06231
P136153.0W	06/13/2001	Complete	Wellfield 2 SE/SW/25	IND	036N	074W	25	SE1/4SW1/4	30	861	325	-105.6851	43.05842
P136154.0W	06/13/2001	Complete	Wellfield 2 NE/SW/25	IND	036N	074W	25	NE1/4SW1/4	30	895	343	-105.68598	43.06098
P70290.0W	05/21/1985	Complete	0 25 581	IND	036N	074W	25	NE1/4SE1/4	35	900	482.3	-105.67624	43.06095

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P70291.0W	05/21/1985	Complete	0 25 582	IND	036N	074W	25	NE1/4SE1/4	35	920	485.3	-105.67624	43.06095
P70292.0W	05/21/1985	Complete	0 25 583	IND	036N	074W	25	NE1/4SE1/4	35	923	469.7	-105.67624	43.06095
P70293.0W	05/21/1985	Complete	0 25 584	IND	036N	074W	25	SE1/4SE1/4	50	921	479	-105.67622	43.05732
P70294.0W	05/21/1985	Complete	O 25 591	IND	036N	074W	25	SE1/4NE1/4	35	983	539.3	-105.67625	43.06459
P70295.0W	05/21/1985	Complete	0 25 592	IND	036N	074W	25	NE1/4NE1/4	35	960	533	-105.67627	43.06823
P136152.0W	06/13/2001	Complete	Wellfield 2 NE/SE/26	IND	036N	074W	26	NE1/4SE1/4	30	850	377	-105.69582	43.0623
P136155.0W	06/13/2001	Complete	Wellfield 2 SE/SE/26	IND	036N	074W	26	SE1/4SE1/4	1300	862	335	-105.69584	43.05737
P136156.0W	06/13/2001	Complete	Wellfield 2 SW/SE/26	IND	036N	074W	26	SW1/4SE1/4	30	761	309	-105.70078	43.05735
P113366.0W	12/09/1998	Complete	Wellfield 4 SE/SE/33	IND	036N	074W	33	SE1/4SE1/4	30	820	217	-105.73506	43.04273
P113367.0W	12/09/1998	Incomplete	Wellfield 4 NE/SE/33	IND	036N	074W	33	NE1/4SE1/4	210	830	223.96	-105.73508	43.04638
P113369.0W	12/09/1998	Complete	Wellfield 4 NW/SW/34	IND	036N	074W	34	NW1/4SW1/4	750	830	223.24	-105.73017	43.04639
P113370.0W	12/09/1998	Complete	Wellfield 4 NE/SW/34	IND	036N	074W	34	NE1/4SW1/4	840	965	335.85	-105.72528	43.04639
P113371.0W	12/09/1998	Complete	Wellfield 4 SE/NW/34	IND	036N	074W	34	SE1/4NW1/4	30	946	390.36	-105.7253	43.05004
P113372.0W	12/09/1998	Complete	Wellfield 4 SW/NE/34	IND	036N	074W	34	SW1/4NE1/4	720	1015	393.15	-105.7203	43.05004
P113373.0W	12/09/1998	Complete	Wellfield 4 SE/NE/34	IND	036N	074W	34	SE1/4NE1/4	856	855	262.45	-105.71576	43.05004
P113374.0W	12/09/1998	Complete	Wellfield 4 NW/SE/34	IND	036N	074W	34	NW1/4SE1/4	120	1015	385.73	-105.72029	43.0464
P113375.0W	12/09/1998	Complete	Wellfield 4 NE/SE/34	IND	036N	074W	34	NE1/4SE1/4	60	830	240.95	-105.71574	43.04641
P70286.0W	05/21/1985	Complete	M 34 529	IND	036N	074W	34	NE1/4SE1/4	35	821	274	-105.71574	43.04641
P113376.0W	12/09/1998	Complete	Wellfield 4 NW/SW/35	IND	036N	074W	35	NW1/4SW1/4	0	825	244	-105.71056	43.04641
P113377.0W	12/09/1998	Complete	Wellfield 4 SW/NW/35	IND	036N	074W	35	SW1/4NW1/4	60	825	247	-105.71058	43.05005
P118304.0W	07/29/1999	Complete	Wellfield 4 NW/SW/35	IND	036N	074W	35	NW1/4SW1/4	550	780	205	-105.71056	43.04641
P118305.0W	07/29/1999	Complete	Wellfield 4 NE/SW/35	IND	036N	074W	35	NE1/4SW1/4	150	779	200	-105.70564	43.04641
P118306.0W	07/29/1999	Complete	Wellfield 4 SE/SW/35	IND	036N	074W	35	SE1/4SW1/4	1050	775	212	-105.70563	43.04276
P118311.0W	07/29/1999	Complete	Wellfield 4 SW/SE/35	IND	036N	074W	35	SW1/4SE1/4	150	770	209	-105.70072	43.04278
P70297.0W	05/21/1985	Complete	M 35 736	IND	036N	074W	35	SE1/4SW1/4	35	799	238	-105.70563	43.04276
P70298.0W	05/21/1985	Complete	M 35 737	IND	036N	074W	35	SE1/4SW1/4	35	800	228	-105.70563	43.04276
P70299.0W	05/21/1985	Complete	M 35 738	IND	036N	074W	35	SE1/4SW1/4	35	801	245	-105.70563	43.04276
P70300.0W	05/21/1985	Complete	M 35 739	IND	036N	074W	35	SE1/4SW1/4	35	795	239	-105.70563	43.04276
P15500.0W	09/14/1972	Incomplete	Section 36 36 74 #2	IND	036N	074W	36	NE1/4NW1/4	850	-1	-1.00	-105.68603	43.05369
P2574.0W	05/19/1969	Complete	Section 36 #1	IND	036N	074W	36	NW1/4NE1/4	50	474	254	-105.68343	43.05551
P70285.0W	05/21/1985	Complete	Q 36 1048	IND	036N	074W	36	SW1/4NE1/4	35	488	372	-105.68111	43.05006
P70287.0W	05/21/1985	Incomplete	Q 36 1045	IND	036N	074W	36	SE1/4NW1/4	35	507	424	-105.68601	43.05006
P70288.0W	05/21/1985	Complete	Q 36 1046	IND	036N	074W	36	SE1/4NW1/4	35	540	451	-105.68601	43.05006
P70289.0W	05/21/1985	Complete	Q 36 1047	IND	036N	074W	36	SW1/4NE1/4	35	520	421	-105.68111	43.05006
P78083.0W	08/25/1988	Complete	SMC1054	IND	037N	074W	36	SW1/4NW1/4	70	834	295	-105.69696	43.13739
P78084.0W	08/25/1988	Incomplete	SMC1055C	IND	037N	074W	36	SW1/4NW1/4	70	834	295	-105.69696	43.13739
P78085.0W	08/25/1988	Incomplete	SMC1056C	IND	037N	074W	36	SW1/4NE1/4	70	525	233	-105.68707	43.13744
P78086.0W	08/25/1988	Incomplete	SMC1057	IND	037N	074W	36	NE1/4NW1/4	70	604	294	-105.69203	43.141
P78087.0W	08/25/1988	Incomplete	SMC1060	IND	037N	074W	36	SW1/4NW1/4	70	785	250	-105.69696	43.13739
P78088.0W	08/25/1988	Incomplete	SMC1061	IND	037N	074W	36	SW1/4NW1/4	70	785	249	-105.69696	43.13739
P78089.0W	08/25/1988	Incomplete	SMC1063	IND	037N	074W	36	SW1/4NE1/4	70	523	224	-105.68707	43.13744
P78090.0W	08/25/1988	Incomplete	SMC1064	IND	037N	074W	36	SW1/4NE1/4	70	525	235	-105.68707	43.13744
P78091.0W	08/25/1988	Incomplete	SMC1065	IND	037N	074W	36	SW1/4NE1/4	70	514	235	-105.68707	43.13744
P78092.0W	08/25/1988	Incomplete	SMC1066C	IND	037N	074W	36	SW1/4SE1/4	70	437	212	-105.68705	43.13022
P78093.0W	08/25/1988	Incomplete	SMC1067C	IND	037N	074W	36	SW1/4SW1/4	70	763	283	-105.69692	43.13018

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P182216.0W	06/20/2007	Incomplete	SE/SE 7-35-74 (11 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	07	SE1/4SE1/4	165			-105.77416	43.01524
P182214.0W	06/20/2007	Incomplete	SE/SW 8-35-74 (113 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	08	SE1/4SW1/4	1695			-105.76426	43.01349
P182215.0W	06/20/2007	Incomplete	SW/SW 8-35-74 (76 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	08	SW1/4SW1/4	1140			-105.76921	43.01527
P172662.0W	09/21/2005	Complete	SW/SW 10-35-74 (2 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	SW1/4SW1/4	10	540	277.8	-105.729817	43.013719
P172663.0W	09/21/2005	Complete	SE/SW 10-35-74 (92 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	SE1/4SW1/4	10	560	272.8		
P172664.0W	09/21/2005	Complete	SW/SE 10-35-74 (110 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	SW1/4SE1/4	10	540	252.8		
P172665.0W	09/21/2005	Complete	SE/SE 10-35-74 (63 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	SE1/4SE1/4	10	530	271.8		
P172666.0W	09/21/2005	Complete	NW/SW 10-35-74 (50 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	NW1/4SW1/4	750			-105.72979	43.01736
P172667.0W	09/21/2005	Complete	NE/SW 10-35-74 (104 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	NE1/4SW1/4	10	460	187.8	-105.724894	43.017447
P172668.0W	09/21/2005	Complete	NW/SE 10-35-74 (94 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	NW1/4SE1/4	10	420	177.5		
P172669.0W	09/21/2005	Complete	NE/SE 10-35-74 (114 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	NE1/4SE1/4	1710			-105.715028	43.017342
P172671.0W	09/21/2005	Complete	SW/NW 10-35-74 (31 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	SW1/4NW1/4	10	470	209.1	-105.729858	43.022156
P172672.0W	09/21/2005	Complete	SE/NE 10-35-74 (65 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	10	SE1/4NE1/4	10	420	151.3		
P172670.0W	09/21/2005		NW/SW 11-35-74 (3 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	11	NW1/4SW1/4	45			-105.7125	43.0173
P172673.0W	09/21/2005		SW/NW 11-35-74 (7 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	11	SW1/4NW1/4	105			-105.7125	43.0203
P185942.0W	02/26/2008	Incomplete	Enl. SW/NW 11-35-74 (90 Wells) - Mine Unit 15A	IND; MIS	035N	074W	11	SW1/4NW1/4	1350			-105.710061	43.020428
P185943.0W	02/26/2008	Incomplete	Enl. NW/SW 11-35-74 (60 Wells) - Mine Unit 15A	IND; MIS	035N	074W	11	NW1/4SW1/4	900			-105.712517	43.016772
P185944.0W	02/26/2008	Incomplete	SW/SW 11-35-74 (87 Wells) Mine Unit 15A	IND; MIS	035N	074W	11	SW1/4SW1/4	1305			-105.712503	43.013881
P185945.0W	02/26/2008	Complete	SE/NW 11-35-74 (36 Wells) Mine Unit 15A	IND; MIS	035N	074W	11	SE1/4NW1/4	10	500	177.78	-105.706711	43.019789
P185946.0W	02/26/2008	Complete	NE/SW 11-35-74 (17 Wells) Mine Unit 15A	IND; MIS	035N	074W	11	NE1/4SW1/4	10	500	178.17	-105.706769	43.018772
P191225.0W	06/22/2009	Incomplete	NE/NW 11-35-74 (24 Well) Mine Unit 15A (I&P Wells)	IND; MIS	035N	074W	11	NE1/4NW1/4	360			-105.705228	43.024147
P191226.0W	06/22/2009	Incomplete	NW/NE 11-35-74 (3 Wells) Mine Unit 15A (I&P Wells)	IND; MIS	035N	074W	11	NW1/4NE1/4	45			-105.701044	43.024669
P191227.0W	06/22/2009	Incomplete	SW/NE 11-35-74(128 Wells) Mine Unit 15A(I&P Wells)	IND; MIS	035N	074W	11	SW1/4NE1/4	1920			-105.700633	43.021019

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P191228.0W	06/22/2009	Incomplete	SE/NE 11-35-74(16 Wells) Mine Unit 15A(I&P Wells)	IND; MIS	035N	074W	11	SE1/4NE1/4	240			-105.695747	43.021353
P191229.0W	06/22/2009	Incomplete	NW/SE 11-35-74(1 Well) Mine Unit 15A(I&P Wells)	IND; MIS	035N	074W	11	NW1/4SE1/4	15			-105.700233	43.018472
P191230.0W	06/22/2009	Incomplete	Enl. SE/NW 11-35-74 (55 Wells) Mine Unit 15A	IND; MIS	035N	074W	11	SE1/4NW1/4	1365			-105.70515	43.022036
P191231.0W	06/22/2009	Incomplete	Enl. NE/SW 11-35-74 – Mine Unit 15A	IND; MIS	035N	074W	11	NE1/4SW1/4	1155			-105.705169	43.016856
P172660.0W	09/21/2005	Complete	NW/NW 15-35-74 (2 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	15	NW1/4NW1/4	10	540	290.8		
P172661.0W	09/21/2005	Complete	NE/NW 15-35-74 (24 Wells) Mine Unit 15 (I&P Wells)	IND; MIS	035N	074W	15	NE1/4NW1/4	10	540	267.8		
P193384.0W	07/12/2010	Incomplete	SW/NW 16-35-74-(94 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	16	SW1/4NW1/4	525			-105.751733	43.006147
P193385.0W	07/12/2010	Incomplete	NW/SW 16-35-74 (54 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	16	NW1/4SW1/4	300			-105.751669	43.002456
P193386.0W	07/12/2010	Incomplete	NE/SW 16-35-74 (35 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	16	NE1/4SW1/4	195			-105.7443	43.002503
P182208.0W	06/20/2007	Incomplete	SW/NW 17-35-74 (32 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	17	SW1/4NW1/4	480			-105.7691	43.00637
P182211.0W	06/20/2007	Incomplete	NE/NW 17-35-74 (87 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	17	NE1/4NW1/4	1305			-105.76423	43.01009
P182212.0W	06/20/2007	Incomplete	NW/NW 17-35-74 (72 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	17	NW1/4NW1/4	1080			-105.76916	43.00958
P193380.0W	07/12/2010	Incomplete	SW/NW 17-35-74 (55 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	17	SW1/4NW1/4	300			-105.769189	43.005839
P193381.0W	07/12/2010	Incomplete	SE/NW 17-35-74 (99 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	17	SE1/4NW1/4	525			-105.764144	43.005958
P193382.0W	07/12/2010	Incomplete	SW/NE 17-35-74 (51 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	17	SW1/4NE1/4	270			-105.759261	43.006103
P193383.0W	07/12/2010	Incomplete	SE/NE 17-35-74 (114 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	17	SE1/4NE1/4	615			-105.754247	43.006008
P194112.0W	10/06/2010	Incomplete	NW/SW 17-35-74 (15 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	17	NW1/4SW1/4	225			-105.769008	43.002242
P182204.0W	06/20/2007	Incomplete	SE/SW 18-35-74 (12 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	SE1/4SW1/4	120	930	546.2	-105.785714	43.000367
P182205.0W	06/20/2007	Incomplete	SW/SW 18-35-74 (53 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	SW1/4SW1/4	795			-105.78862	42.99893
P182206.0W	06/20/2007	Complete	NW/SE 18-35-74 (45 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	NW1/4SE1/4	450	930	464.5	-105.779225	43.003681
P182207.0W	06/20/2007	Complete	NE/SW 18-35-74 (51 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	NE1/4SW1/4	510	950	502.8	-105.783731	43.001433
P182209.0W	06/20/2007	Incomplete	SE/NE 18-35-74 (85 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	SE1/4NE1/4	1275			-105.77405	43.00567
P182210.0W	06/20/2007	Complete	SW/NE 18-35-74 (11 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	SW1/4NE1/4	110	950	467.1	-105.777047	43.004747

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P182213.0W	06/20/2007	Incomplete	NE/NE 18-35-74 (2 Wells) Mine Unit 9 (I&P Wells)	IND; MIS	035N	074W	18	NE1/4NE1/4	30			-105.77413	43.00995
P193375.0W	07/12/2010	Incomplete	SW/SW 18-35-74 (69 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	18	SW1/4SW1/4	405			-105.788603	42.9984
P193376.0W	07/12/2010	Incomplete	SE/SW 18-35-74 (92 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	18	SE1/4SW1/4	450			-105.783972	42.998472
P193377.0W	07/12/2010	Incomplete	NE/SW 18-35-74 (21 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	18	NE1/4SW1/4	90			-105.7839	43.002089
P193378.0W	07/12/2010	Incomplete	NW/SE 18-35-74 (93 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	18	NW1/4SE1/4	405			-105.77865	43.002203
P193379.0W	07/12/2010	Incomplete	NE/SE 18-35-74 (57 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	18	NE1/4SE1/4	300			-105.774131	43.002225
P193374.0W	07/12/2010	Incomplete	NW/NW 19-35-74-(26 Wells) MU 10 (I&P Wells)	IND; MIS	035N	074W	19	NW1/4NW1/4	120			-105.788519	42.994847
P186527.0W	04/02/2008	Incomplete	D.J. MINE #2	IND; MIS	035N	075W	03	SE1/4NW1/4	0			-105.842558	43.034914
P20002.0W	02/05/1973	Fully Adjudicated	Highland #13	IND; MIS	036N	072W	17	SE1/4SE1/4	60	691	330	-105.5168	43.08764
P20013.0W	02/05/1973	Fully Adjudicated	Highland #24	IND; MIS	036N	072W	17	SW1/4SW1/4	100	740	340	-105.52994	43.08574
P2491.0W	04/11/1969	Fully Adjudicated	Highland #1	IND; MIS	036N	072W	17	SE1/4SE1/4	40	442	245	-105.5168	43.08764
P14378.0W	06/23/1972	Fully Adjudicated	Highland #11	IND; MIS	036N	072W	20	SE1/4SW1/4	150	710	185.25	-105.52694	43.07303
P20007.0W	02/05/1973	Fully Adjudicated	Highland #18	IND; MIS	036N	072W	20	SE1/4SE1/4	150	581	-1.00	-105.51722	43.07305
P20009.0W	02/05/1973	Fully Adjudicated	Highland #20	IND; MIS	036N	072W	20	SW1/4SW1/4	125	541	284	-105.5318	43.07302
P20010.0W	02/05/1973	Fully Adjudicated	Highland #21	IND; MIS	036N	072W	20	NW1/4SW1/4	90	601	-1.00	-105.53178	43.07665
P20011.0W	02/05/1973	Fully Adjudicated	Highland #22	IND; MIS	036N	072W	20	SW1/4NW1/4	125	681	260	-105.53176	43.08028
P20012.0W	02/05/1973	Fully Adjudicated	Highland #23	IND; MIS	036N	072W	20	NE1/4NW1/4	50	741	260	-105.52682	43.08394
P20003.0W	02/05/1973	Fully Adjudicated	Highland #14	IND; MIS	036N	072W	21	NW1/4NW1/4	65	692	330	-105.51208	43.08402
P20004.0W	02/05/1973	Fully Adjudicated	Highland #15	IND; MIS	036N	072W	21	SW1/4NW1/4	50	633	285	-105.51178	43.08066
P20005.0W	02/05/1973	Fully Adjudicated	Highland #16	IND; MIS	036N	072W	21	SW1/4NW1/4	100	593	183	-105.51178	43.08066
P20006.0W	02/05/1973	Fully Adjudicated	Highland #17	IND; MIS	036N	072W	21	NW1/4SW1/4	80	490	260	-105.51158	43.07497
P172013.0W	12/07/2005	Complete	14-1-3673 WW	IND; MIS	036N	073W	14	SW1/4NE1/4	23	900	536	-105.582361	43.094336
P172014.0W	12/07/2005	Complete	NW1/4 NE1/4 SEC 14-36-73 45 Wells (C-Wellfield)	IND; MIS	036N	073W	14	NW1/4NE1/4	675	590	306	-105.582597	43.09875
P172015.0W	12/07/2005	Incomplete	NE1/4 NE1/4 SEC 14-36-73 250 Wells (C-Wellfield)	IND; MIS	036N	073W	14	NE1/4NE1/4	3750	570	308	-105.577364	43.098003
P172016.0W	12/07/2005	Complete	SE1/4 NW1/4 SEC 14-36-73 25 Wells (C-Wellfield)	IND; MIS	036N	073W	14	SE1/4NW1/4	375	593	300	-105.587769	43.094281
P172017.0W	12/07/2005	Complete	SW1/4 NE1/4 SEC 14-36-73 225 Wells (C-Wellfield)	IND; MIS	036N	073W	14	SW1/4NE1/4	3375	581	326	-105.582381	43.094147
P172018.0W	12/07/2005	Complete	SE1/4 NE1/4 SEC 14-36-73 125 Wells (C-Wellfield)	IND; MIS	036N	073W	14	SE1/4NE1/4	1875	600	315	-105.577672	43.094375
P172019.0W	12/07/2005	Complete	NE1/4 SW1/4 SEC 14-36-73 130 Wells (C-Wellfield)	IND; MIS	036N	073W	14	NE1/4SW1/4	1950	557	318	-105.587886	43.090597
P172020.0W	12/07/2005	Complete	NW1/4 SE1/4 SEC 14-36-73 130 Wells (C-Wellfield)	IND; MIS	036N	073W	14	NW1/4SE1/4	1950	572	322	-105.582611	43.090547
P172021.0W	12/07/2005	Complete	SE1/4 SW1/4 SEC 14-36-73 85 Wells (C-Wellfield)	IND; MIS	036N	073W	14	SE1/4SW1/4	1275	585	360	-105.587639	43.086914
P172022.0W	12/07/2005	Complete	SW1/4S E1/4 SEC 14-36-73 25 Wells (C-Wellfield)	IND; MIS	036N	073W	14	SW1/4SE1/4	375	570	360	-105.582303	43.086931

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P47368.0W	03/01/1979		NMX - 9	IND; MIS	036N	073W	14	SE1/4NE1/4	50	280	250	-105.57749	43.09424
P171403.0W	09/13/2005		SW/SW 17-36-73 (19 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	17	SW1/4SW1/4	285			-105.6519	43.08754
P171404.0W	09/13/2005		SE/SW 17-36-73 (60 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	17	SE1/4SW1/4	900			-105.64693	43.08657
P171398.0W	09/13/2005		SE/NE 19-36-73 (7 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	19	SE1/4NE1/4	105			-105.65674	43.07928
P171394.0W	09/13/2005		SW/SW 20-36-73 (20 Wells) Mine Unit J (I&PWells)	IND; MIS	036N	073W	20	SW1/4SW1/4	300			-105.65164	43.07204
P171395.0W	09/13/2005		SE/SW 20-36-73 (10 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	SE1/4SW1/4	150			-105.6467	43.07203
P171396.0W	09/13/2005		NW/SW 20-36-73 (7Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	NW1/4SW1/4	105			-105.65171	43.07567
P171397.0W	09/13/2005		NE/SW 20-36-73 (23 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	NE1/4SW1/4	345			-105.64676	43.07566
P171399.0W	09/13/2005		SW/NW 20-36-73 (39 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	SW1/4NW1/4	585			-105.65175	43.07801
P171400.0W	09/13/2005		SE/NW 20-36-73 (78 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	SE1/4NW1/4	1170			-105.64682	43.0793
P171401.0W	09/13/2005		NW/NW 20-36-73 (73 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	NW1/4NW1/4	390			-105.64959	43.08294
P171402.0W	09/13/2005		NE/NW 20-36-73 (75 Wells) Mine Unit J (I&P Wells)	IND; MIS	036N	073W	20	NE1/4NW1/4	1125			-105.64688	43.08294
P178360.0W	11/07/2006		NW1/4 NW1/4 30-36-73 (44 Wells) - Mine Unit K (I&P Wells)	IND; MIS	036N	073W	30	NW1/4NW1/4	660			-105.67157	43.06824
P178362.0W	11/07/2006		SW1/4 NW1/4 30-36-73 (45 Wells) - Mine Unit K (I&P Wells)	IND; MIS	036N	073W	30	SW1/4NW1/4	675			-105.67153	43.0646
P179592.0W	02/14/2007		NW/SW 30-36-73 (7 Wells) Mine Unit K (I&P Wells)	IND; MIS	036N	073W	30	NW1/4SW1/4	105			-105.6715	43.06096
P183440.0W	09/26/2007		Enl. SW1/4 NW1/4 30-36-73 (21) - Mine Unit K (I&P Wells)	IND; MIS	036N	073W	30	SW1/4NW1/4	315			-105.67153	43.0646
P183442.0W	09/26/2007		Enl. NW/SW 30-36-73 (29 Wells) - Mine Unit K (I&P Wells)	IND; MIS	036N	073W	30	NW1/4SW1/4	435			-105.6715	43.06096
P178359.0W	11/07/2006		NE1/4 NE1/4 25-36-74 (40 Wells) - Mine Unit K (I&P Wells)	IND; MIS	036N	074W	25	NE1/4NE1/4	600			-105.67627	43.06823
P178361.0W	11/07/2006		SE1/4 NE1/4 25-36-74 (114 Wells) - Mine Unit K (I&P Wells)	IND; MIS	036N	074W	25	SE1/4NE1/4	1710			-105.67625	43.06459
P179591.0W	02/14/2007		NE/SE 25-36-74 (27 Wells) Mine Unit K (I&P Wells)	IND; MIS	036N	074W	25	NE1/4SE1/4	405			-105.67624	43.06095
P183441.0W	09/26/2007		Enl. NE/SE 25-36-74 (98 Wells) Mine Unit K (I &P Wells)	IND; MIS	036N	074W	25	NE1/4SE1/4	1470			-105.67624	43.06095
P183443.0W	09/26/2007	Complete	SE/SE 25-36-74 (71 Wells) Mine Unit K (I&P Wells)	IND; MIS	036N	074W	25	SE1/4SE1/4	1065			-105.67622	43.05732
P194954.0W	01/20/2011	Incomplete	WW-35-1	IND; MIS	037N	074W	35	NE1/4SE1/4	40			-105.704211	43.133225
P29604.0W	04/04/1975		DM 1	IND; MIS; STK	036N	073W	14	SE1/4SW1/4	83	716	333.5	-105.58753	43.08685
P29606.0W	04/04/1975	Incomplete	DM 4	IND; MIS; STK	036N	073W	14	NW1/4SE1/4	41	650	307.2	-105.58253	43.09047
P29607.0W	04/04/1975	Incomplete	DM 5	IND; MIS; STK	036N	073W	14	NE1/4NE1/4	90	640	303.1	-105.57756	43.09792

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P29608.0W	04/04/1975		DM 6	IND; MIS; STK	036N	073W	14	SE1/4NE1/4	42	640	309.8	-105.57749	43.09424
P29610.0W	04/04/1975	Incomplete	DM 8	IND; MIS; STK	036N	073W	23	SW1/4NW1/4	60	742	365.8	-105.59261	43.07953
P6023.0W	06/15/1970		SMX Water Well #1	IND; STK	035N	072W	03	NW1/4SW1/4	25	400	27	-105.49166	43.03149
P6022.0W	06/15/1970	Incomplete	MX #WW1 (deepened)	IND; STK	036N	073W	11	SE1/4SE1/4	25	680	30	-105.57757	43.10157
P196923.0W	10/05/2011	Complete	NW/SE 11-35-74(1-Well) Mine Unit 15A (I&P Wells)	IND; MIS	035N	074W	11	NW1/4SE1/4	10	520	104.3	-105.699867	43.018606
P196924.0W	10/05/2011	Complete	SE/NE 11-35-74(16 Wells) Mine Unit 15A (I&P Wells)	IND; MIS	035N	074W	11	SE1/4NE1/4	160	520	118.3	-105.695233	43.021953
P2414.0W	12/11/1968	Incomplete	Smith #1	IRR	035N	074W	12	NE1/4NW1/4	100	600	154	-105.68569	43.02478
P32561.0W	07/21/1975	Incomplete	Scholtz #1	IRR	035N	075W	34	NW1/4NW1/4	80	50	15	-105.84675	42.96635
P193308.0W	02/05/2010	Incomplete	Spillman Draw Unit 35-73 15 - 1H Water Well	MIS	035N	073W	15	NE1/4SW1/4	150			-105.606708	43.002633
P189481.0W	01/07/2009	Complete	Spillman Draw Unit 16-1 Water Well	MIS	035N	073W	16	SE1/4SW1/4	25	600	12.25	-105.626183	42.998922
P193341.0W	07/07/2010	Incomplete	Spillman Draw Unit 35-73 17-1HWW	MIS	035N	073W	17	SW1/4NE1/4	150			-105.641353	43.006189
P178998.0W	12/12/2006	Complete	WW-7-1 (Mine Unit 9 Water Well)	MIS	035N	074W	07	SE1/4SE1/4	40			-105.774094	43.014083
P184297.0W	11/23/2007		WW-7-2 (Mine Unit 9 Water Well)	MIS	035N	074W	07	SE1/4SE1/4	40			-105.77416	43.01524
P187976.0W	07/30/2008	Incomplete	WW-7-3 (Mine Unit 9 Water Well)	MIS	035N	074W	07	SE1/4SE1/4	40			-105.774228	43.014475
P193392.0W	07/15/2010	Incomplete	WW7-4 (MU 9 Water Well)	MIS	035N	074W	07	SE1/4SE1/4	40			-105.774119	43.014756
P126426.0W	06/23/2000	Incomplete	WW-10-1	MIS	035N	074W	10	SW1/4SE1/4	35	297	85	-105.71992	43.01438
P179160.0W	01/10/2007		WW-17-2	MIS	035N	074W	17	NW1/4NE1/4	40			-105.75872	43.01148
P189030.0W	10/13/2008	Incomplete	WW-17-3	MIS	035N	074W	17	NW1/4NE1/4	40			-105.758742	43.011033
P191333.0W	08/12/2009	Incomplete	WW-17-4, Mine Unit 10	MIS	035N	074W	17	SE1/4NE1/4	80			-105.754439	43.006072
P15611.0W	10/18/1972	Fully Adjudicated	D J Mine #2	MIS	035N	075W	03	SE1/4NW1/4	95	1150	375	-105.84262	43.0353
P47942.0W	03/29/1979		South Mine Pit Well #1	MIS	035N	075W	11	SE1/4NE1/4	50	-1	100	-105.81279	43.0211
P49151.0W	07/16/1979		Enl. South Mine Pit Well #1	MIS	035N	075W	11	SE1/4NE1/4	950	100	100	-105.81279	43.0211
P113380.0W	12/22/1998	Incomplete	Sundowner Station #1	MIS	035N	075W	33	NE1/4NE1/4	22	370	250	-105.85166	42.96635
P150529.0W	04/23/2003	Complete	23-1A 3673	MIS	036N	073W	23	NE1/4NE1/4	40	565	375	-105.57754	43.08324
P108648.0W	01/20/1998		WW-36-2	MIS	036N	074W	36	NW1/4NW1/4	100			-105.69091	43.05369
P195234.0W	11/18/2010	Complete	Baker No. 9 Well	MIS	037N	073W	09	SE1/4NE1/4	50	330	45	-105.621133	43.1942
P195231.0W	11/18/2010	Complete	Enl. DCR # 27 (37-73)	MIS	037N	073W	27	NW1/4NE1/4	125			-105.607919	43.155989
P80502.0W	06/16/1989		WS 28 1	MIS	037N	073W	28	SW1/4SW1/4	25	240	110	-105.63768	43.14488
P191661.0W	10/08/2009	Incomplete	WW-35-2	MIS	037N	074W	35	NE1/4SE1/4	400			-105.701864	43.133278
P71290.0W	10/10/1985		DJ82 SW 4	MIS; MON; STK	036N	075W	34	SW1/4NE1/4	25	57	37.9	-105.83786	43.04977
P73878.0W	07/21/1983	Fully Adjudicated	Highland Reservoir	MIS; STK	036N	072W	29	SE1/4NW1/4	430	330	112	-105.52737	43.06431
P51619.0W	02/18/1980	Complete	MW-30	MON	035N	072W	01	NW1/4NW1/4	0	240	197	-105.45358	43.04042
P51617.0W	02/18/1980	Complete	MW-28C	MON	035N	072W	02	SE1/4SW1/4	0	130	110.75	-105.46811	43.02757
P51620.0W	02/18/1980	Complete	MW-31	MON	035N	072W	02	SW1/4SW1/4	0	230	136.74	-105.4756	43.02936
P51621.0W	02/18/1980	Complete	MW-32	MON	035N	072W	03	SE1/4SE1/4	0	250	136.4	-105.47842	43.02937
P51622.0W	02/18/1980	Complete	MW-33	MON	035N	072W	03	SW1/4NE1/4	0	190	62.63	-105.48337	43.03652
P51623.0W	02/18/1980	Complete	MW-34C	MON	035N	072W	03	NW1/4NE1/4	0	179	79.88	-105.48335	43.04114
P51625.0W	02/18/1980	Complete	MW-36	MON	035N	072W	10	SE1/4NW1/4	0	280	146.99	-105.48586	43.02186
P51626.0W	04/02/1980	Complete	MW-37	MON	035N	072W	10	SE1/4NE1/4	0	225	81.67	-105.47831	43.02185
P51627.0W	02/18/1980	Complete	MW-39	MON	035N	073W	01	SW1/4SW1/4	0	210	132.58	-105.57261	43.02876
P52153.0W	05/14/1980	Complete	OWD 7	MON	035N	074W	01	NE1/4NW1/4	0	720	91	-105.68597	43.03925

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P117941.0W	07/30/1999	Complete	MD-416	MON	035N	074W	02	NW1/4NE1/4	0	902	203	-105.70065	43.03917
P117942.0W	07/30/1999	Complete	MD-417	MON	035N	074W	02	NW1/4NE1/4	0	901	186	-105.70065	43.03917
P117947.0W	07/30/1999	Complete	MS-416	MON	035N	074W	02	NW1/4NE1/4	0	675	169	-105.70065	43.03917
P117948.0W	07/30/1999	Complete	MS-417	MON	035N	074W	02	NW1/4NE1/4	0	660	158	-105.70065	43.03917
P55545.0W	01/02/1981	Complete	DJ81-UB-4	MON	035N	074W	02	NE1/4SE1/4	0	459	458.33	-105.69552	43.03205
P55546.0W	01/02/1981	Complete	DJ81-SC-4	MON	035N	074W	02	NE1/4SE1/4	0	385	322.14	-105.69552	43.03205
P55547.0W	01/02/1981	Complete	DJ81-IB-4	MON	035N	074W	02	NE1/4SE1/4	0	353	311.54	-105.69552	43.03205
P70199.0W	05/21/1985	Complete	MM 2 295	MON	035N	074W	02	NW1/4NE1/4	0	757	230.5	-105.70065	43.03917
P179131.0W	01/11/2007	Complete	SE/SE 7-35-74 (2 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	07	SE1/4SE1/4	0			-104.4387	41.425186
P97462.0W	10/19/1994		DJ-1	MON	035N	074W	07	SW1/4SE1/4	0	16	12.37	-105.77912	43.01521
P97463.0W	10/19/1994		DJ-2	MON	035N	074W	07	SW1/4SE1/4	0	16	12.43	-105.77912	43.01521
P97464.0W	10/19/1994		DJ-3	MON	035N	074W	07	SW1/4SE1/4	0	16	10.92	-105.77912	43.01521
P97465.0W	10/19/1994		DJ-4	MON	035N	074W	07	SW1/4SE1/4	0	15	9.21	-105.77912	43.01521
P179128.0W	01/11/2007	Complete	SW/SE 8-35-74 (2 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	08	SW1/4SE1/4	0			-104.439408	41.434572
P179130.0W	01/11/2007	Complete	SW/SW 8-35-74 (9 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	08	SW1/4SW1/4	0			-104.439706	41.429125
P70186.0W	05/21/1985	Complete	KM 8 136	MON	035N	074W	08	SW1/4SW1/4	0	870	336	-105.76921	43.01527
P77029.0W	06/13/1988	Complete	KM 137	MON	035N	074W	08	SW1/4SW1/4	0	880	320	-105.76921	43.01527
P77030.0W	06/13/1988	Complete	KM 138	MON	035N	074W	08	SW1/4SW1/4	0	885	320	-105.76921	43.01527
P77031.0W	06/13/1988	Complete	K 140	MON	035N	074W	08	SW1/4SW1/4	0	881	320	-105.76921	43.01527
P156864.0W	03/02/2004	Complete	NE/SE 9-35-74 (1 Well)	MON	035N	074W	09	NE1/4SE1/4	0	580	195	-105.73243	43.01737
P156865.0W	03/02/2004	Complete	SE/NE 9-35-74 (2 Wells)	MON	035N	074W	09	SE1/4NE1/4	0	640	262	-105.73243	43.02033
P153477.0W	08/11/2003	Complete	771CORE	MON	035N	074W	10	SE1/4NE1/4	0	389	156.5	-105.71502	43.02212
P153478.0W	08/11/2003	Complete	773CORE	MON	035N	074W	10	SW1/4SE1/4	0	429	224.3	-105.71992	43.01438
P156849.0W	03/02/2004	Complete	SE/SE 10-35-74 (8 Wells)	MON	035N	074W	10	SE1/4SE1/4	0	800	224	-105.715	43.01437
P156850.0W	03/02/2004	Complete	NE/SE 10-35-74 (12 Wells)	MON	035N	074W	10	NE1/4SE1/4	0	820	171	-105.71501	43.01731
P156851.0W	03/02/2004	Complete	SE/NE 10-35-74 (8 Wells)	MON	035N	074W	10	SE1/4NE1/4	0	860	168	-105.71502	43.02212
P156853.0W	03/02/2004	Complete	SW/SE 10-35-74 (9 Wells)	MON	035N	074W	10	SW1/4SE1/4	0	820	216	-105.71992	43.01438
P156854.0W	03/02/2004	Complete	NW/SE 10-35-74 (7 Wells)	MON	035N	074W	10	NW1/4SE1/4	0	820	195	-105.71993	43.01733
P156855.0W	03/02/2004	Complete	SW/NE 10-35-74 (1 Well)	MON	035N	074W	10	SW1/4NE1/4	0	560	177	-105.71995	43.02213
P156857.0W	03/02/2004	Complete	SE/SW 10-35-74 (10 Wells)	MON	035N	074W	10	SE1/4SW1/4	0	820	246	-105.72484	43.01371
P156858.0W	03/02/2004	Complete	NE/SW 10-35-74 (12 Wells)	MON	035N	074W	10	NE1/4SW1/4	0	840	200	-105.72485	43.01735
P156859.0W	03/02/2004	Complete	SE/NW 10-35-74 (2 Wells)	MON	035N	074W	10	SE1/4NW1/4	0	560	176	-105.72488	43.02213
P156861.0W	03/02/2004	Complete	SW/SW 10-35-74 (3 Wells)	MON	035N	074W	10	SW1/4SW1/4	0	640	256	-105.7298	43.01372
P156862.0W	03/02/2004	Complete	NW/SW 10-35-74 (6 Wells)	MON	035N	074W	10	NW1/4SW1/4	0	840	204	-105.72979	43.01736
P156863.0W	03/02/2004	Complete	SW/NW 10-35-74 (10 Wells)	MON	035N	074W	10	SW1/4NW1/4	0	860	202	-105.72982	43.02214
P156846.0W	03/02/2004	Complete	NW/SW 11-35-74 (2 Wells)	MON	035N	074W	11	NW1/4SW1/4	0	620	193	-105.7125	43.0173
P156847.0W	03/02/2004	Complete	SW/NW 11-35-74 (3 Wells)	MON	035N	074W	11	SW1/4NW1/4	0	600	173	-105.7125	43.0203
P175279.0W	06/14/2006		NE/NW 11-35-74 (6 Wells) Mine Unit 15A	MON	035N	074W	11	NE1/4NW1/4	0			-105.70523	43.02462
P175280.0W	06/14/2006		NW/NE 11-35-74 (4 Wells) Mine Unit 15A	MON	035N	074W	11	NW1/4NE1/4	0			-105.70035	43.02469
P175281.0W	06/14/2006		NE/NE 11-35-74 (1 Well) Mine Unit 15A	MON	035N	074W	11	NE1/4NE1/4	0			-105.69546	43.02478

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P175282.0W	06/14/2006		SW/NW 11-35-74 (4 Wells) Mine Unit 15A	MON	035N	074W	11	SW1/4NW1/4	0			-105.7125	43.0203
P175283.0W	06/14/2006		SE/NW 11-35-74 (8 Wells) Mine Unit 15A	MON	035N	074W	11	SE1/4NW1/4	0			-105.70519	43.02102
P175284.0W	06/14/2006		SE/NE 11-35-74 (3 Wells) Mine Unit 15A	MON	035N	074W	11	SE1/4NE1/4	0			-105.69541	43.02116
P175285.0W	06/14/2006		NE/SW 11-35-74 (7 Wells) Mine Unit 15A	MON	035N	074W	11	NE1/4SW1/4	0			-105.70515	43.01738
P175286.0W	06/14/2006		NW/SE 11-35-74 (4 Wells) Mine Unit 15A	MON	035N	074W	11	NW1/4SE1/4	0			-105.70025	43.01745
P175287.0W	06/14/2006		SW/SW 11-35-74 (7 Wells) Mine Unit 15A	MON	035N	074W	11	SW1/4SW1/4	0			-105.7125	43.01437
P175288.0W	06/14/2006		SE/SW 11-35-74 (4 Wells) Mine Unit 15A	MON	035N	074W	11	SE1/4SW1/4	0			-105.70511	43.01371
P175552.0W	06/14/2006		SW/NE 11-35-74 (8 Wells) Mine Unit 15A	MON	035N	074W	11	SW1/4NE1/4	0			-105.7003	43.02109
P55817.0W	03/02/1981	Complete	DJ81-SC-13	MON	035N	074W	12	SW1/4NE1/4	0	282.5	251.14	-105.68076	43.02113
P55818.0W	03/02/1981	Complete	DJ81-IB-13	MON	035N	074W	12	SW1/4NE1/4	0	251	247.87	-105.68076	43.02113
P175290.0W	06/14/2006		NW/NW 14-35-74 (2 Wells) Mine Unit 15A	MON	035N	074W	14	NW1/4NW1/4	0			-105.71005	43.01004
P156848.0W	03/02/2004	Complete	NE/NE 15-35-74 (2 Wells)	MON	035N	074W	15	NE1/4NE1/4	0	640	230	-105.71499	43.01004
P156852.0W	03/02/2004	Complete	NW/NE 15-35-74 (2 Wells)	MON	035N	074W	15	NW1/4NE1/4	0	580	209	-105.7199	43.01007
P156856.0W	03/02/2004	Complete	NE/NW 15-35-74 (3 Wells)	MON	035N	074W	15	NE1/4NW1/4	0	620	217	-105.72483	43.00871
P156860.0W	03/02/2004	Complete	NW/NW 15-35-74 (2 Wells)	MON	035N	074W	15	NW1/4NW1/4	0	620	232	-105.72977	43.00872
P175289.0W	06/14/2006		NE/NE 15-35-74 (1 Well) Mine Unit 15A	MON	035N	074W	15	NE1/4NE1/4	0			-105.71499	43.01004
P176084.0W	07/20/2006	Complete	SWMO-002	MON	035N	074W	16	NE1/4SW1/4	0	900	420.99	-105.744389	43.002969
P176085.0W	07/20/2006	Complete	SWMU-002	MON	035N	074W	16	NE1/4SW1/4	0	1100	456.36	-105.744389	43.002969
P176086.0W	07/20/2006	Complete	SWPW-002	MON	035N	074W	16	NE1/4SW1/4	0	1070	431.31	-105.744389	43.002969
P192473.0W	03/05/2010	Incomplete	SE/NW 16-35-74 (2 Wells) Mine Unit 10 Monitor	MON	035N	074W	16	SE1/4NW1/4	0			-105.744364	43.006092
P192474.0W	03/05/2010	Incomplete	NE/SW 16-35-74 (6 Wells) Mine Unit 10 Monitor	MON	035N	074W	16	NE1/4SW1/4	0			-105.744364	43.002503
P192475.0W	03/05/2010	Incomplete	NW/SW 16-35-74 (7 Wells) Mine Unit 10 Monitor	MON	035N	074W	16	NW1/4SW1/4	0			-105.749183	43.002878
P192477.0W	03/05/2010	Incomplete	NW/NW 16-35-74 (1 Well) Mine Unit 10 Monitor	MON	035N	074W	16	NW1/4NW1/4	0			-105.751803	43.009206
P192478.0W	03/05/2010	Incomplete	SW/NW 16-35-74 (9 Wells) Mine Unit 10 Monitor	MON	035N	074W	16	SW1/4NW1/4	0			-105.751778	43.006128
P176082.0W	07/20/2006	Complete	SWMP-002	MON	035N	074W	17	SE1/4NW1/4	0	960	395.97	-105.761828	43.0071
P176083.0W	07/20/2006	Complete	SWMP-003	MON	035N	074W	17	SE1/4NE1/4	0	950	388.39	-105.754269	43.0066
P179132.0W	01/11/2007	Complete	NW/NE 17-35-74 (2 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	17	NW1/4NE1/4	0			-104.442836	41.433639
P179133.0W	01/11/2007	Complete	NE/NW 17-35-74 (8 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	17	NE1/4NW1/4	0			-104.442869	41.430614
P179134.0W	01/11/2007	Complete	NW/NW 17-35-74 (6 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	17	NW1/4NW1/4	0			-104.444139	41.428839

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	*Facility Name*	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	*Longitude*	*Latitude*
P179136.0W	01/11/2007	Complete	SW/NW 17-35-74 (6 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	17	SW1/4NW1/4	0			-104.446244	41.427444
P192467.0W	03/05/2010	Incomplete	NE/SW 17-35-74 (2 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	NE1/4SW1/4	0			-105.763906	43.002406
P192468.0W	03/05/2010	Incomplete	NW/SW 17-35-74 (3 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	NW1/4SW1/4	0			-105.768986	43.002178
P192469.0W	03/05/2010	Incomplete	NE/SE 17-35-74 (2 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	NE1/4SE1/4	0			-105.754175	43.002908
P192470.0W	03/05/2010	Incomplete	SE/NE 17-35-74 (14 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	SE1/4NE1/4	0			-105.754356	43.006072
P192471.0W	03/05/2010	Incomplete	SW/SE 17-35-74 (5 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	SW1/4SE1/4	0			-105.759103	42.998739
P192472.0W	03/05/2010	Incomplete	SE/NW 17-35-74 (11 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	SE1/4NW1/4	0			-105.7641	43.005894
P192476.0W	03/05/2010	Incomplete	SW/NW 17-35-74 (3 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	SW1/4NW1/4	0			-105.769147	43.005839
P192479.0W	03/05/2010	Incomplete	NW/NE 17-35-74 (2 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	NW1/4NE1/4	0			-105.758756	43.011033
P192480.0W	03/05/2010	Incomplete	NE/NE 17-35-74 (3 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	NE1/4NE1/4	0			-105.754333	43.011022
P192481.0W	03/05/2010	Incomplete	NE/NW 17-35-74 (2 Wells) Mine Unit 10 Monitor	MON	035N	074W	17	NE1/4NW1/4	0			-105.764253	43.009578
P58597.0W	04/27/1981	Complete	DJ81-UB-14A	MON	035N	074W	17	NE1/4SW1/4	0	135	123.38	-105.7641	43.00281
P58598.0W	04/27/1981	Complete	DJ81-UB-14B	MON	035N	074W	17	NE1/4SW1/4	0	176	138.9	-105.7641	43.00281
P70184.0W	05/21/1985	Complete	OM 17 422	MON	035N	074W	17	SW1/4NE1/4	0	670	452	-105.75922	43.00653
P70185.0W	05/21/1985	Complete	KM 17 421	MON	035N	074W	17	NE1/4NW1/4	0	930	424	-105.76423	43.01009
P176078.0W	07/20/2006	Complete	SWMP-001	MON	035N	074W	18	NW1/4SW1/4	0	1060	620.68	-105.788661	43.002561
P176079.0W	07/20/2006	Complete	SWMO-001	MON	035N	074W	18	NW1/4SE1/4	0	810	473.22	-105.778631	43.002639
P176080.0W	07/20/2006	Complete	SWMU-001	MON	035N	074W	18	NW1/4SE1/4	0	1060	418.91	-105.778631	43.002639
P176081.0W	07/20/2006	Complete	SWPW-001	MON	035N	074W	18	NW1/4SE1/4	0	860	462.82	-105.778631	43.002639
P179135.0W	01/11/2007	Complete	NE/NE 18-35-74 (4 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	NE1/4NE1/4	0			-104.444781	41.424839
P179137.0W	01/11/2007	Complete	SE/NE 18-35-74 (8 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	SE1/4NE1/4	0			-104.449183	41.424242
P179138.0W	01/11/2007	Complete	SW/NE 18-35-74 (3 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	SW1/4NE1/4	0			-104.449592	41.420814
P179139.0W	01/11/2007	Complete	NE/SE 18-35-74 (2 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	NE1/4SE1/4	0			-104.452297	41.423906
P179140.0W	01/11/2007	Complete	NW/SE 18-35-74 (6 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	NW1/4SE1/4	0			-104.452297	41.423906
P180360.0W	03/14/2007	Complete	SW/SW 18-35-74 (4 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	SW1/4SW1/4	0			-106.368889	42.826522
P180361.0W	03/14/2007	Complete	SE/SW 18-35-74 (7 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	SE1/4SW1/4	0			-104.456292	41.416269
P180362.0W	03/14/2007	Complete	NW/SW 18-35-74 (2 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	NW1/4SW1/4	0			-106.368483	42.830428

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P180363.0W	03/14/2007	Complete	NE/SW 18-35-74 (6 Wells) Mine Unit 9 Monitor Wells	MON	035N	074W	18	NE1/4SW1/4	0			-106.361122	42.831642
P192458.0W	03/05/2010	Incomplete	NW/SE 18-35-74 (3 Wells) Mine Unit 10 Monitor	MON	035N	074W	18	NE1/4SE1/4	0			-105.774025	43.002225
P192459.0W	03/05/2010	Incomplete	NE/SW 18-35-74 (3 Wells) Mine Unit 10 Monitor	MON	035N	074W	18	NE1/4SW1/4	0			-105.784028	43.002108
P192460.0W	03/05/2010	Incomplete	NE/SE 18-35-74-(9 Wells) Mine Unit 10 Monitor	MON	035N	074W	18	NE1/4SE1/4	0			-105.774003	43.002247
P192461.0W	03/05/2010	Incomplete	SW/SE 18-35-74 (3 Wells) Mine Unit 10 Monitor	MON	035N	074W	18	SW1/4SE1/4	0			-105.778631	42.998525
P192462.0W	03/05/2010	Incomplete	SE/SW 18-35-74- (6 Wells) Mine Unit 10 Monitor	MON	035N	074W	18	SE1/4SW1/4	0			-105.783886	42.998431
P192463.0W	03/05/2010	Incomplete	SW/SW 18-35-74 (4 Wells) Mine Unit 10 Monitor	MON	035N	074W	18	SW1/4SW1/4	0			-105.788547	42.998439
P55550.0W	01/02/1981	Complete	DJ81-UB-5	MON	035N	074W	18	SW1/4SW1/4	0	235.1	231.61	-105.78862	42.99893
P55551.0W	01/02/1981	Complete	DJ81-SC-5	MON	035N	074W	18	SW1/4SW1/4	0	164.5	162.34	-105.78862	42.99893
P55552.0W	01/02/1981	Complete	DJ81-IB-5	MON	035N	074W	18	SW1/4SW1/4	0	131	130.48	-105.78862	42.99893
P192464.0W	03/05/2010	Incomplete	NW/NW 19-35-74- (6 Wells) Mine Unit 10 Monitor	MON	035N	074W	19	NW1/4NW1/4	0			-105.788556	42.994753
P176087.0W	07/20/2006	Complete	SWMP-004	MON	035N	074W	21	SW1/4NE1/4	0	840	276.66	-105.739369	42.992039
P55549.0W	01/02/1981	Complete	DJ81-OB-1	MON	035N	075W	02	NE1/4SE1/4	0	154	-7.00	-105.81295	43.03196
P68500.0W	09/21/1984		DJ84-SC-21	MON	035N	075W	02	SE1/4SE1/4	0	230	163.6	-105.81289	43.02834
P77838.0W	08/18/1988	Complete	DJ88 HC 1	MON	035N	075W	03	SE1/4NW1/4	0	50	-7.00	-105.84262	43.0353
P60362.0W	04/16/1982	Complete	DJ82-SW-2	MON	035N	075W	11	NW1/4SE1/4	0	60	38.65	-105.81766	43.01751
P60363.0W	04/16/1982	Complete	DJ82-SW-3	MON	035N	075W	11	NW1/4NE1/4	0	40	38.1	-105.81777	43.02472
P81685.0W	01/24/1990	Complete	DJ SW 3B 90	MON	035N	075W	11	SW1/4NE1/4	0	92	83.92	-105.81771	43.02112
P68501.0W	09/21/1984		DJ84-SC-22	MON	035N	075W	12	NE1/4SW1/4	0	164	99.87	-105.80304	43.01731
P110558.0W	06/16/1998	Complete	DJ98-SW-14	MON	035N	075W	13	SW1/4NE1/4	0	109.1	106.31	-105.7981	43.0063
P192466.0W	03/05/2010	Incomplete	SE/SE 13-35-75 (1Well) Mine Unit 10 Monitor	MON	035N	075W	13	SE1/4SE1/4	0			-105.793772	42.998517
P110559.0W	06/16/1998	Complete	DJ98-SW-15	MON	035N	075W	24	NW1/4SE1/4	0	42	42	-105.79786	42.98817
P192465.0W	03/05/2010	Incomplete	NE/NE 24-35-75 (2 Wells) Mine Unit 10 Monitor	MON	035N	075W	24	NE1/4NE1/4	0			-105.793183	42.994875
P77432.0W	07/20/1988	Complete	CMO 2	MON	036N	072W	14	NE1/4NE1/4	0	510	312	-105.45862	43.09897
P77441.0W	07/20/1988	Complete	CMO 11	MON	036N	072W	14	SW1/4SW1/4	0	475	290	-105.47322	43.08793
P77442.0W	07/20/1988	Complete	CMO 14	MON	036N	072W	14	SW1/4NE1/4	0	465	345	-105.46347	43.09529
P77443.0W	07/20/1988	Complete	CMO 15	MON	036N	072W	14	SW1/4NE1/4	0	500	346	-105.46347	43.09529
P77444.0W	07/20/1988	Complete	CMO 16	MON	036N	072W	14	NE1/4NE1/4	0	480	345	-105.45862	43.09897
P77446.0W	07/20/1988	Complete	CMO 18	MON	036N	072W	14	NE1/4NE1/4	0	500	345	-105.45862	43.09897
P77453.0W	07/20/1988	Complete	CMU 7	MON	036N	072W	14	NW1/4SE1/4	0			-105.46346	43.09165
P77455.0W	07/20/1988	Complete	CMU 9	MON	036N	072W	14	SE1/4SW1/4	0	650	345	-105.46833	43.08796
P77456.0W	07/20/1988	Complete	CMU 10	MON	036N	072W	14	SW1/4SW1/4	0	640	343	-105.47322	43.08793
P77457.0W	07/20/1988	Complete	CMU 11	MON	036N	072W	14	SW1/4SW1/4	0	640	329	-105.47322	43.08793
P77460.0W	07/20/1988	Incomplete	CMU 16	MON	036N	072W	14	NE1/4NE1/4	0			-105.45862	43.09897
P77461.0W	07/20/1988	Complete	CMU 17	MON	036N	072W	14	NE1/4NE1/4	0	645	319	-105.45862	43.09897
P77462.0W	07/20/1988	Complete	CMU 18	MON	036N	072W	14	NE1/4NE1/4	0	740	312	-105.45862	43.09897

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P77472.0W	07/20/1988	Complete	CM 11	MON	036N	072W	14	NE1/4SE1/4	0	615	333	-105.45858	43.09168
P77476.0W	07/20/1988	Complete	CM 15	MON	036N	072W	14	SW1/4SE1/4	0	600	334	-105.46345	43.088
P77483.0W	07/20/1988	Complete	CM 23	MON	036N	072W	14	SW1/4SW1/4	0	615	382	-105.47322	43.08793
P77484.0W	07/20/1988	Complete	CM 24	MON	036N	072W	14	SW1/4SW1/4	0	620	366	-105.47322	43.08793
P77487.0W	07/20/1988	Complete	CM 27	MON	036N	072W	14	SW1/4SW1/4	0	600	317	-105.47322	43.08793
P77491.0W	07/20/1988	Complete	CM 33	MON	036N	072W	14	SE1/4NW1/4	0	600	319	-105.46835	43.09525
P77492.0W	07/20/1988	Complete	CM 34	MON	036N	072W	14	SE1/4NW1/4	0	600	331	-105.46835	43.09525
P77502.0W	07/20/1988	Complete	CM 31	MON	036N	072W	14	NE1/4SW1/4	0	615	368	-105.46834	43.09161
P77508.0W	07/20/1988	Complete	CMO 12	MON	036N	072W	14	NE1/4SW1/4	0	480	286	-105.46834	43.09161
P77509.0W	07/20/1988	Complete	CMO 13	MON	036N	072W	14	NE1/4SW1/4	0	505	317	-105.46834	43.09161
P76809.0W	04/29/1988	Complete	SW/SW SEC 17 Well M 1	MON	036N	072W	16	SW1/4SW1/4	0	570	379.3	-105.51201	43.08767
P76820.0W	04/29/1988	Complete	M 12	MON	036N	072W	16	SW1/4SW1/4	0	547	365.2	-105.51201	43.08767
P76821.0W	04/29/1988	Complete	M 13	MON	036N	072W	16	SW1/4SW1/4	0	550	351.8	-105.51201	43.08767
P76822.0W	04/29/1988	Complete	M 20	MON	036N	072W	16	SW1/4SW1/4	0	535	376.1	-105.51201	43.08767
P76856.0W	04/29/1988	Complete	M 56	MON	036N	072W	16	SW1/4SW1/4	0	515	351.4	-105.51201	43.08767
P76857.0W	04/29/1988	Complete	M 57	MON	036N	072W	16	SW1/4SW1/4	0	525	360.3	-105.51201	43.08767
P77203.0W	06/21/1988	Complete	M 14	MON	036N	072W	16	SW1/4SW1/4	0	580	363	-105.51201	43.08767
P77204.0W	06/21/1988	Complete	M 15	MON	036N	072W	16	SW1/4SW1/4	0	575	362	-105.51201	43.08767
P76855.0W	04/29/1988	Complete	M 55	MON	036N	072W	17	SE1/4SE1/4	0	530	364.1	-105.5168	43.08764
P77212.0W	06/21/1988	Complete	M 64	MON	036N	072W	17	SE1/4SE1/4	0	545	362.75	-105.5168	43.08764
P87634.0W	04/21/1992	Complete	M-99	MON	036N	072W	17	SW1/4SE1/4	0	546	365	-105.52173	43.08943
P108531.0W	01/12/1998	Complete	HM8	MON	036N	072W	18	NW1/4NW1/4	0	600	346.7	-105.55249	43.09808
P108532.0W	01/12/1998	Complete	HM9	MON	036N	072W	18	NW1/4NW1/4	0	600	338.42	-105.55249	43.09808
P108533.0W	01/12/1998	Complete	HM10	MON	036N	072W	18	SW1/4NW1/4	0	640	358.5	-105.55252	43.09444
P108534.0W	01/12/1998	Complete	HM11	MON	036N	072W	18	SW1/4NW1/4	0	600	357.76	-105.55252	43.09444
P108535.0W	01/12/1998	Complete	HM12	MON	036N	072W	18	SE1/4NW1/4	0	575	357.76	-105.54681	43.09458
P108536.0W	01/12/1998	Complete	HM13	MON	036N	072W	18	SE1/4NW1/4	0	570	358.7	-105.54681	43.09458
P108537.0W	01/12/1998	Complete	HM14	MON	036N	072W	18	NE1/4SW1/4	0	575	366.32	-105.54686	43.0914
P108538.0W	01/12/1998	Complete	HM15	MON	036N	072W	18	NW1/4SE1/4	0	580	385.6	-105.54166	43.09144
P108539.0W	01/12/1998	Complete	HM16	MON	036N	072W	18	NW1/4SE1/4	0	570	369	-105.54166	43.09144
P108540.0W	01/12/1998	Complete	HM17	MON	036N	072W	18	SW1/4SE1/4	0	545	359.28	-105.54181	43.08567
P108541.0W	01/12/1998	Complete	HM18	MON	036N	072W	18	SW1/4SE1/4	0	515	349.54	-105.54181	43.08567
P108553.0W	01/12/1998	Complete	HM30	MON	036N	072W	18	SW1/4SE1/4	0	500	333.51	-105.54181	43.08567
P108554.0W	01/12/1998	Complete	HM31	MON	036N	072W	18	SE1/4SW1/4	0	480	309.75	-105.54695	43.08644
P108555.0W	01/12/1998	Complete	HM32	MON	036N	072W	18	SE1/4SW1/4	0	480	304.36	-105.54695	43.08644
P108556.0W	01/12/1998	Complete	HM33	MON	036N	072W	18	NE1/4SW1/4	0	520	304.36	-105.54686	43.0914
P108557.0W	01/12/1998	Complete	HM34	MON	036N	072W	18	NW1/4SW1/4	0	520	331.53	-105.54948	43.09204
P108558.0W	01/12/1998	Complete	HM35	MON	036N	072W	18	NW1/4SW1/4	0	550	348.75	-105.54948	43.09204
P108559.0W	01/12/1998	Complete	HM36	MON	036N	072W	18	SW1/4NW1/4	0	560	346.7	-105.55252	43.09444
P108560.0W	01/12/1998	Complete	HM37	MON	036N	072W	18	SW1/4NW1/4	0	560	333.5	-105.55252	43.09444
P108574.0W	01/12/1998	Complete	HM06	MON	036N	072W	18	SW1/4NW1/4	0	480	313	-105.55252	43.09444
P108575.0W	01/12/1998	Complete	HM07	MON	036N	072W	18	SW1/4NW1/4	0	485	313	-105.55252	43.09444
P108576.0W	01/12/1998	Complete	HM08	MON	036N	072W	18	NE1/4SW1/4	0	460	313.71	-105.54686	43.0914
P108577.0W	01/12/1998	Complete	HM09	MON	036N	072W	18	NE1/4SW1/4	0	470	313.71	-105.54686	43.0914
P108578.0W	01/12/1998	Complete	HM010	MON	036N	072W	18	SW1/4SE1/4	0	465	313.71	-105.54181	43.08567
P108586.0W	01/12/1998	Complete	HMU6	MON	036N	072W	18	SW1/4NW1/4	0	610	369.7	-105.55252	43.09444

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P108587.0W	01/12/1998	Complete	HMU7	MON	036N	072W	18	SW1/4NW1/4	0	620	366.03	-105.55252	43.09444
P108588.0W	01/12/1998	Complete	HMU8	MON	036N	072W	18	NE1/4SW1/4	0	585	357.04	-105.54686	43.0914
P108589.0W	01/12/1998	Complete	HMU9	MON	036N	072W	18	NE1/4SW1/4	0	615	379.2	-105.54686	43.0914
P108590.0W	01/12/1998	Complete	HMU10	MON	036N	072W	18	SW1/4SE1/4	0	615	379.2	-105.54181	43.08567
P108598.0W	01/12/1998	Complete	HMP6	MON	036N	072W	18	SW1/4NW1/4	0	550	337.72	-105.55252	43.09444
P108599.0W	01/12/1998	Complete	HMP7	MON	036N	072W	18	SW1/4NW1/4	0	550	347.5	-105.55252	43.09444
P108600.0W	01/12/1998	Complete	HMP8	MON	036N	072W	18	NE1/4SW1/4	0	520	352.75	-105.54686	43.0914
P108601.0W	01/12/1998	Complete	HMP9	MON	036N	072W	18	NE1/4SW1/4	0	560	389.45	-105.54686	43.0914
P108602.0W	01/12/1998	Complete	HMP10	MON	036N	072W	18	SW1/4SE1/4	0	535	367.75	-105.54181	43.08567
P108542.0W	01/12/1998	Complete	HM19	MON	036N	072W	19	NE1/4NE1/4	0	510	353.71	-105.53675	43.08401
P108543.0W	01/12/1998	Complete	HM20	MON	036N	072W	19	NE1/4NE1/4	0	490	338.42	-105.53675	43.08401
P108544.0W	01/12/1998	Complete	HM21	MON	036N	072W	19	NE1/4NE1/4	0	500	332.59	-105.53675	43.08401
P108545.0W	01/12/1998	Complete	HM22	MON	036N	072W	19	SE1/4NE1/4	0	510	326.33	-105.53677	43.08022
P108546.0W	01/12/1998	Complete	HM23	MON	036N	072W	19	SE1/4NE1/4	0	515	351.6	-105.53677	43.08022
P108547.0W	01/12/1998	Complete	HM24	MON	036N	072W	19	SE1/4NE1/4	0	510	347.4	-105.53677	43.08022
P108548.0W	01/12/1998	Complete	HM25	MON	036N	072W	19	SE1/4NE1/4	0	505	241.21	-105.53677	43.08022
P108549.0W	01/12/1998	Complete	HM26	MON	036N	072W	19	SW1/4NE1/4	0	500	339.51	-105.54187	43.08012
P108550.0W	01/12/1998	Complete	HM27	MON	036N	072W	19	SW1/4NE1/4	0	500	324.27	-105.54187	43.08012
P108551.0W	01/12/1998	Complete	HM28	MON	036N	072W	19	NW1/4NE1/4	0	480	313.22	-105.54183	43.08402
P108552.0W	01/12/1998	Complete	HM29	MON	036N	072W	19	NW1/4NE1/4	0	480	314.05	-105.54183	43.08402
P108579.0W	01/12/1998	Complete	HM011	MON	036N	072W	19	NW1/4NE1/4	0	420	292.3	-105.54183	43.08402
P108580.0W	01/12/1998	Complete	HM012	MON	036N	072W	19	SE1/4NE1/4	0	410	316.76	-105.53677	43.08022
P108591.0W	01/12/1998	Complete	HMU11	MON	036N	072W	19	NW1/4NE1/4	0	550	339.8	-105.54183	43.08402
P108592.0W	01/12/1998	Complete	HMU12	MON	036N	072W	19	SE1/4NE1/4	0	550	359.73	-105.53677	43.08022
P108603.0W	01/12/1998	Complete	HMP11	MON	036N	072W	19	NW1/4NE1/4	0	490	330.4	-105.54183	43.08402
P108604.0W	01/12/1998	Complete	HMP12	MON	036N	072W	19	SE1/4NW1/4	0	500	361.74	-105.547	43.08002
P57472.0W	07/07/1981	Complete	RM 1	MON	036N	072W	19	NE1/4SE1/4	0	345	240	-105.53679	43.07659
P120487.0W	11/05/1999	Complete	LO-3	MON	036N	072W	20	NW1/4SW1/4	0	470	337.5	-105.53178	43.07665
P120488.0W	11/05/1999	Complete	LO-2	MON	036N	072W	20	NE1/4SW1/4	0	395	278.2	-105.5269	43.07667
P120489.0W	11/05/1999	Complete	LO-1	MON	036N	072W	20	SE1/4SW1/4	0	370	298.1	-105.52694	43.07303
P57473.0W	07/07/1981	Complete	RM 2	MON	036N	072W	20	SE1/4SE1/4	0	235	210	-105.51722	43.07305
P69002.0W	11/20/1984	Complete	Tailings Dam Monitor Well XXXIV	MON	036N	072W	20	SE1/4SE1/4	0	245	-7.00	-105.51722	43.07305
P76839.0W	04/29/1988	Complete	M 39	MON	036N	072W	20	NW1/4SE1/4	0	380	238.4	-105.52202	43.07668
P76840.0W	04/29/1988	Complete	M 40	MON	036N	072W	20	NE1/4SE1/4	0	410	250	-105.51714	43.0767
P76841.0W	04/29/1988	Complete	M 14	MON	036N	072W	20	SE1/4NE1/4	0	405	292	-105.51707	43.08034
P76844.0W	04/29/1988	Complete	M 44	MON	036N	072W	20	SE1/4NE1/4	0	425	255.4	-105.51707	43.08034
P76845.0W	04/29/1988	Complete	M 45	MON	036N	072W	20	SE1/4NE1/4	0	550	260.3	-105.51707	43.08034
P76846.0W	04/29/1988	Complete	M 46	MON	036N	072W	20	SE1/4NE1/4	0	425	262.4	-105.51707	43.08034
P76847.0W	04/29/1988	Complete	M 47	MON	036N	072W	20	SE1/4NE1/4	0	428	265.4	-105.51707	43.08034
P76848.0W	04/29/1988	Complete	M 48	MON	036N	072W	20	NE1/4NE1/4	0	480	304.2	-105.5165	43.08575
P76850.0W	04/29/1988	Complete	M 50	MON	036N	072W	20	NE1/4NE1/4	0	530	348.1	-105.5165	43.08575
P76851.0W	04/29/1988	Complete	M 51	MON	036N	072W	20	NE1/4NE1/4	0	530	352.1	-105.5165	43.08575
P76852.0W	04/29/1988	Complete	M 52	MON	036N	072W	20	NE1/4NE1/4	0	535	365.14	-105.5165	43.08575
P76853.0W	04/29/1988	Complete	M 53	MON	036N	072W	20	NE1/4NE1/4	0	545	366.2	-105.5165	43.08575
P76854.0W	04/29/1988	Complete	M 54	MON	036N	072W	20	NE1/4NE1/4	0	530	363.2	-105.5165	43.08575
P77191.0W	06/15/1988	Complete	TDM XL (174)	MON	036N	072W	20	NE1/4SW1/4	0	358	294	-105.5269	43.07667

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P77206.0W	06/21/1988	Complete	M 58	MON	036N	072W	20	NE1/4NE1/4	0	482	303	-105.5165	43.08575
P77207.0W	06/21/1988	Complete	M 59	MON	036N	072W	20	NE1/4NE1/4	0	520	337.05	-105.5165	43.08575
P77208.0W	06/21/1988	Complete	M 60	MON	036N	072W	20	NE1/4NE1/4	0	515	338.54	-105.5165	43.08575
P77209.0W	06/21/1988	Complete	M 61	MON	036N	072W	20	NE1/4NE1/4	0	502	331.68	-105.5165	43.08575
P77210.0W	06/21/1988	Complete	M 62	MON	036N	072W	20	NE1/4NE1/4	0	520	348.75	-105.5165	43.08575
P77211.0W	06/21/1988	Complete	M 63	MON	036N	072W	20	NE1/4NE1/4	0	540	365.89	-105.5165	43.08575
P78269.0W	10/24/1988	Complete	MU 16	MON	036N	072W	20	NE1/4SE1/4	0	440	354.75	-105.51714	43.0767
P78270.0W	10/24/1988	Complete	MU 15	MON	036N	072W	20	NE1/4NE1/4	0	620	375.67	-105.5165	43.08575
P78271.0W	10/24/1988	Complete	MO 17	MON	036N	072W	20	NE1/4NE1/4	0	360	245.42	-105.5165	43.08575
P78272.0W	10/24/1988	Complete	MO 16 (Previously M 53)	MON	036N	072W	20	NE1/4NE1/4	0	535	356.75	-105.5165	43.08575
P78929.0W	01/27/1989	Complete	MU 17	MON	036N	072W	20	NE1/4SE1/4	0	430	290	-105.51714	43.0767
P78930.0W	01/27/1989	Complete	MU 18	MON	036N	072W	20	NE1/4SE1/4	0	422	256	-105.51714	43.0767
P78931.0W	01/27/1989	Complete	MU 19	MON	036N	072W	20	NE1/4SE1/4	0	428	257	-105.51714	43.0767
P53856.0W	08/28/1980		TDM Well Cluster 7	MON	036N	072W	21	SE1/4SE1/4	0	221	162	-105.49772	43.07317
P57470.0W	07/07/1981	Complete	TDM Well Cluster 13	MON	036N	072W	21	SE1/4SE1/4	0	193	162	-105.49772	43.07317
P76798.0W	04/29/1988	Complete	MO 11	MON	036N	072W	21	SW1/4NW1/4	0	476	286.95	-105.51178	43.08066
P76799.0W	04/29/1988	Complete	MO 12A	MON	036N	072W	21	SW1/4NW1/4	0	353	287.6	-105.51178	43.08066
P76800.0W	04/29/1988	Complete	MO 13A	MON	036N	072W	21	SW1/4NW1/4	0	400	277	-105.51178	43.08066
P76801.0W	04/29/1988	Complete	MO 14	MON	036N	072W	21	SW1/4NW1/4	0	462	278.5	-105.51178	43.08066
P76802.0W	04/29/1988	Complete	MO 15	MON	036N	072W	21	NW1/4SW1/4	0	339	277.5	-105.51158	43.07497
P76804.0W	04/29/1988	Complete	MU 10	MON	036N	072W	21	SW1/4NW1/4	0	540	310.05	-105.51178	43.08066
P76805.0W	04/29/1988	Complete	MU 11	MON	036N	072W	21	SW1/4NW1/4	0	505	311.27	-105.51178	43.08066
P76806.0W	04/29/1988	Complete	MU 12	MON	036N	072W	21	SW1/4NW1/4	0	513.5	301.67	-105.51178	43.08066
P76807.0W	04/29/1988	Complete	MU 13	MON	036N	072W	21	SW1/4NW1/4	0	510	275.33	-105.51178	43.08066
P76808.0W	04/29/1988	Complete	MU 14	MON	036N	072W	21	NW1/4SW1/4	0	500	292.05	-105.51158	43.07497
P76810.0W	04/29/1988	Complete	M 2	MON	036N	072W	21	NW1/4NW1/4	0	575	374.4	-105.51208	43.08402
P76811.0W	04/29/1988	Complete	M 3	MON	036N	072W	21	NW1/4NW1/4	0	565	359.8	-105.51208	43.08402
P76812.0W	04/29/1988	Complete	M 4	MON	036N	072W	21	NW1/4NW1/4	0	540	357.2	-105.51208	43.08402
P76813.0W	04/29/1988	Complete	M 5	MON	036N	072W	21	NW1/4NW1/4	0	535	354	-105.51208	43.08402
P76814.0W	04/29/1988	Complete	M 6	MON	036N	072W	21	NW1/4NW1/4	0	540	359.2	-105.51208	43.08402
P76815.0W	04/29/1988	Complete	M 7	MON	036N	072W	21	NW1/4NW1/4	0	540	347.5	-105.51208	43.08402
P76816.0W	04/29/1988	Complete	M 8	MON	036N	072W	21	NW1/4NW1/4	0	515	331.9	-105.51208	43.08402
P76817.0W	04/29/1988	Complete	M 9	MON	036N	072W	21	NW1/4NW1/4	0	589	375.1	-105.51208	43.08402
P76818.0W	04/29/1988	Complete	M 10	MON	036N	072W	21	NW1/4NW1/4	0	575	367.2	-105.51208	43.08402
P76819.0W	04/29/1988	Complete	M 11	MON	036N	072W	21	NW1/4NW1/4	0	555	349.4	-105.51208	43.08402
P76823.0W	04/29/1988	Complete	M 21	MON	036N	072W	21	SE1/4SW1/4	0	535	366.3	-105.50748	43.0731
P76824.0W	04/29/1988	Complete	M 23	MON	036N	072W	21	NE1/4NW1/4	0	505	346.9	-105.50726	43.08405
P76825.0W	04/29/1988	Complete	M 24	MON	036N	072W	21	NE1/4NW1/4	0	485	335.1	-105.50726	43.08405
P76826.0W	04/29/1988	Complete	M 25	MON	036N	072W	21	NE1/4NW1/4	0	490	321.7	-105.50726	43.08405
P76827.0W	04/29/1988	Complete	M 26	MON	036N	072W	21	NE1/4NW1/4	0	470	321.4	-105.50726	43.08405
P76828.0W	04/29/1988	Complete	M 27	MON	036N	072W	21	NE1/4NW1/4	0	470	318.1	-105.50726	43.08405
P76829.0W	04/29/1988	Complete	M 28	MON	036N	072W	21	SE1/4NW1/4	0	480	323.8	-105.50733	43.0804
P76830.0W	04/29/1988	Complete	M 30	MON	036N	072W	21	SE1/4NW1/4	0	457	304.6	-105.50733	43.0804
P76831.0W	04/29/1988	Complete	M 31	MON	036N	072W	21	SE1/4NW1/4	0	435	281.9	-105.50733	43.0804
P76832.0W	04/29/1988	Complete	M 32	MON	036N	072W	21	SW1/4NW1/4	0	415	256.8	-105.51178	43.08066
P76833.0W	04/29/1988	Complete	M 33	MON	036N	072W	21	SW1/4NW1/4	0	420	249.9	-105.51178	43.08066

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P76834.0W	04/29/1988	Complete	M 34	MON	036N	072W	21	NW1/4SW1/4	0	380	283.6	-105.51158	43.07497
P76835.0W	04/29/1988	Complete	M 35	MON	036N	072W	21	NW1/4SW1/4	0	425	270.85	-105.51158	43.07497
P76836.0W	04/29/1988	Complete	M 36	MON	036N	072W	21	NW1/4SW1/4	0	450	281.5	-105.51158	43.07497
P76837.0W	04/29/1988	Complete	M 37	MON	036N	072W	21	NW1/4SW1/4	0	470	252	-105.51158	43.07497
P76838.0W	04/29/1988	Complete	M 38	MON	036N	072W	21	NE1/4SE1/4	0	405	245	-105.49766	43.07682
P76842.0W	04/29/1988	Complete	M 42	MON	036N	072W	21	SW1/4NW1/4	0	405	247.3	-105.51178	43.08066
P76843.0W	04/29/1988	Complete	M 43	MON	036N	072W	21	SW1/4NW1/4	0	435	263.2	-105.51178	43.08066
P76858.0W	04/29/1988	Complete	MO 1	MON	036N	072W	21	NW1/4NW1/4	0	465	344.9	-105.51208	43.08402
P76859.0W	04/29/1988	Complete	MO 2	MON	036N	072W	21	NW1/4NW1/4	0	460	337.04	-105.51208	43.08402
P76860.0W	04/29/1988	Complete	MO 5	MON	036N	072W	21	NW1/4NW1/4	0	455	328.7	-105.51208	43.08402
P76861.0W	04/29/1988	Complete	MO 6	MON	036N	072W	21	NW1/4NW1/4	0	480	346.63	-105.51208	43.08402
P76862.0W	04/29/1988	Complete	MO 7	MON	036N	072W	21	NW1/4NW1/4	0	455	335.56	-105.51208	43.08402
P76863.0W	04/29/1988	Complete	MO 8	MON	036N	072W	21	NW1/4NW1/4	0	440	318.35	-105.51208	43.08402
P76864.0W	04/29/1988	Complete	MO 9	MON	036N	072W	21	NW1/4NW1/4	0	395	287.3	-105.51208	43.08402
P76865.0W	04/29/1988	Complete	MU 1	MON	036N	072W	21	NW1/4NW1/4	0	590	358.95	-105.51208	43.08402
P76866.0W	04/29/1988	Complete	MU 2	MON	036N	072W	21	NW1/4NW1/4	0	600	358.24	-105.51208	43.08402
P76867.0W	04/29/1988	Complete	MU 5	MON	036N	072W	21	NW1/4NW1/4	0	590	344.45	-105.51208	43.08402
P76868.0W	04/29/1988	Complete	MU 6	MON	036N	072W	21	NW1/4NW1/4	0	600	362.98	-105.51208	43.08402
P76869.0W	04/29/1988	Complete	MU 7	MON	036N	072W	21	NW1/4NW1/4	0	580	342.65	-105.51208	43.08402
P76870.0W	04/29/1988	Complete	MU 8	MON	036N	072W	21	NW1/4NW1/4	0	540	302.65	-105.51208	43.08402
P76871.0W	04/29/1988	Complete	MSH 35	MON	036N	072W	21	NW1/4NW1/4	0	455	337.69	-105.51208	43.08402
P76872.0W	04/29/1988	Complete	MSH 15	MON	036N	072W	21	NW1/4NW1/4	0	553	349.25	-105.51208	43.08402
P77193.0W	06/15/1988	Complete	TDM XLII (176)	MON	036N	072W	21	SE1/4SE1/4	0	161	112	-105.49772	43.07317
P77196.0W	06/15/1988	Complete	TDM XLV (179)	MON	036N	072W	21	NE1/4SE1/4	0	216	156	-105.49766	43.07682
P77200.0W	06/15/1988	Complete	TDM XLIX (183)	MON	036N	072W	21	NW1/4SE1/4	0	217	174	-105.50253	43.07679
P77205.0W	06/21/1988	Complete	M 16	MON	036N	072W	21	NW1/4NW1/4	0	580	364	-105.51208	43.08402
P78267.0W	10/24/1988	Complete	M 22	MON	036N	072W	21	NE1/4NW1/4	0	515	362.08	-105.50726	43.08405
P78268.0W	10/24/1988	Complete	M 29	MON	036N	072W	21	SE1/4NW1/4	0	465	319.25	-105.50733	43.0804
P53862.0W	08/28/1980	Complete	TDM Well Cluster 2	MON	036N	072W	22	SE1/4SW1/4	0	75	33	-105.48795	43.07323
P77198.0W	06/15/1988	Complete	TDM XLVII (181)	MON	036N	072W	22	NW1/4SW1/4	0	137	97	-105.49279	43.07685
P77199.0W	06/15/1988	Complete	TDM XLVIII (182)	MON	036N	072W	22	SW1/4NW1/4	0	156	103	-105.49274	43.08051
P77459.0W	07/20/1988	Complete	CMU 15	MON	036N	072W	23	SW1/4NE1/4	0	670	358	-105.46344	43.0807
P162571.0W	09/24/2004	Complete	MFG-3	MON	036N	072W	27	SW1/4NE1/4	0	151.5	45.4	-105.48313	43.06594
P162572.0W	09/24/2004	Complete	MFG-1	MON	036N	072W	27	SW1/4NE1/4	0	51.5	41.6	-105.48313	43.06594
P162573.0W	09/24/2004	Complete	MFG-2	MON	036N	072W	27	SW1/4NE1/4	0	96	46.65	-105.48313	43.06594
P53861.0W	08/28/1980	Complete	TDM Well Cluster 3	MON	036N	072W	27	SW1/4NW1/4	0	120	108	-105.49295	43.06587
P57466.0W	07/07/1981		TDM Cluster 9	MON	036N	072W	27	NE1/4SW1/4	0	80	-7.00	-105.4881	43.06224
P57467.0W	07/07/1981		TDM Well Cluster 10	MON	036N	072W	27	NW1/4NE1/4	0	27	-7.00	-105.48309	43.0696
P57468.0W	07/07/1981	Complete	TDM Well Cluster 11	MON	036N	072W	27	NE1/4NW1/4	0	52	-7.00	-105.48799	43.06957
P57469.0W	07/07/1981		TDM Well Cluster 12	MON	036N	072W	27	SE1/4SW1/4	0	145	108	-105.48815	43.05857
P67987.0W	07/18/1984	Complete	Tailings Dam Monitor Well XXXI	MON	036N	072W	27	NW1/4NE1/4	0	43	33	-105.48309	43.0696
P67988.0W	07/18/1984	Complete	Tailings Dam Monitor Well XXXII	MON	036N	072W	27	SW1/4NE1/4	0	40	17	-105.48313	43.06594
P67989.0W	07/18/1984	Complete	Tailings Dam Monitor Well XXXIII	MON	036N	072W	27	NW1/4SE1/4	0	20	-7.00	-105.48317	43.06227
P69004.0W	11/20/1984	Complete	Tailings Dam Monitor Well XXXVI	MON	036N	072W	27	NW1/4SW1/4	0	240	169.6	-105.49189	43.06221
P58090.0W	08/26/1981	Complete	TDM Well Cluster 15	MON	036N	072W	28	NW1/4SE1/4	0	280	188	-105.50287	43.06214
P69003.0W	11/20/1984	Complete	Tailings Dam Monitor Well XXXV	MON	036N	072W	28	NW1/4NW1/4	0	225	-7.00	-105.50997	43.07107

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P71110.0W	09/11/1985	Complete	TDM XXXVIII	MON	036N	072W	28	SE1/4NW1/4	0	258	247	-105.50768	43.06578
P71111.0W	09/11/1985	Complete	TDM XXXVII	MON	036N	072W	28	SW1/4NW1/4	0	180	168	-105.51259	43.06574
P77190.0W	06/15/1988	Complete	TDM XXXIX (173)	MON	036N	072W	28	NW1/4SE1/4	0	200	165	-105.50287	43.06214
P77197.0W	06/15/1988	Complete	TDM XLVI (180)	MON	036N	072W	28	NE1/4NW1/4	0	240	213	-105.50753	43.07056
P80814.0W	09/13/1989	Complete	TDM XIR (116R)	MON	036N	072W	28	NW1/4NE1/4	0	219	175	-105.50265	43.06948
P57474.0W	07/07/1981	Complete	RM 3	MON	036N	072W	29	NW1/4NW1/4	0	193	178	-105.53194	43.06935
P57475.0W	07/07/1981	Complete	RM 4	MON	036N	072W	29	SE1/4SE1/4	0	55	32	-105.51781	43.05837
P79115.0W	02/27/1989	Complete	3750 5350 30 36 72	MON	036N	072W	30	SE1/4NE1/4	0	340	274	-105.53718	43.06511
P51605.0W	02/18/1980	Complete	MW-38	MON	036N	072W	32	SW1/4NW1/4	0	200	35.58	-105.53278	43.05098
P51624.0W	02/18/1980	Complete	MW-35	MON	036N	072W	34	SW1/4SW1/4	0	280	113.55	-105.49512	43.04322
P56681.0W	05/12/1981	Complete	MWR #9	MON	036N	073W	09	SE1/4SW1/4	0	640	400.7	-105.62714	43.10118
P108527.0W	01/12/1998	Complete	HM4	MON	036N	073W	12	SW1/4SE1/4	0	600	310.57	-105.56289	43.10162
P108528.0W	01/12/1998	Complete	HM5	MON	036N	073W	12	SW1/4SE1/4	0	600	324.5	-105.56289	43.10162
P108529.0W	01/12/1998	Complete	HM6	MON	036N	073W	12	SE1/4SE1/4	0	600	322.97	-105.558	43.10167
P108526.0W	01/12/1998	Complete	HM3	MON	036N	073W	13	NE1/4NW1/4	0	600	327.74	-105.56776	43.09796
P108530.0W	01/12/1998	Complete	HM7	MON	036N	073W	13	NE1/4NE1/4	0	600	331.88	-105.55802	43.09799
P108561.0W	01/12/1998	Complete	HM38	MON	036N	073W	13	SE1/4NE1/4	0	580	334.89	-105.55804	43.09433
P108562.0W	01/12/1998	Complete	HM39	MON	036N	073W	13	SE1/4NE1/4	0	590	354.73	-105.55804	43.09433
P108563.0W	01/12/1998	Complete	HM40	MON	036N	073W	13	SW1/4NE1/4	0	580	345.67	-105.5629	43.09433
P108564.0W	01/12/1998	Complete	HM41	MON	036N	073W	13	SW1/4NE1/4	0	585	338.04	-105.5629	43.09433
P108565.0W	01/12/1998	Complete	HM42	MON	036N	073W	13	SE1/4NW1/4	0	595	352.47	-105.56776	43.0943
P108566.0W	01/12/1998	Complete	HM43	MON	036N	073W	13	SE1/4NW1/4	0	585	329.95	-105.56776	43.0943
P108567.0W	01/12/1998	Complete	HM44	MON	036N	073W	13	NE1/4NW1/4	0	595	338.1	-105.56776	43.09796
P108568.0W	01/12/1998	Complete	HM45	MON	036N	073W	13	NW1/4NW1/4	0	600	331	-105.57264	43.09794
P108569.0W	01/12/1998	Complete	HM01	MON	036N	073W	13	NE1/4NW1/4	0	460	298.76	-105.56776	43.09796
P108570.0W	01/12/1998	Complete	HM02	MON	036N	073W	13	NE1/4NW1/4	0	480	324.7	-105.56776	43.09796
P108571.0W	01/12/1998	Complete	HM03	MON	036N	073W	13	NW1/4NE1/4	0	495	306.7	-105.56292	43.09797
P108572.0W	01/12/1998	Complete	HM04	MON	036N	073W	13	NE1/4NE1/4	0	468	315.2	-105.55802	43.09799
P108573.0W	01/12/1998	Complete	HM05	MON	036N	073W	13	NE1/4NE1/4	0	470	315.2	-105.55802	43.09799
P108581.0W	01/12/1998	Complete	HMU1	MON	036N	073W	13	NE1/4NW1/4	0	650	339.8	-105.56776	43.09796
P108582.0W	01/12/1998	Complete	HMU2	MON	036N	073W	13	NE1/4NW1/4	0	610	343.24	-105.56776	43.09796
P108583.0W	01/12/1998	Complete	HMU3	MON	036N	073W	13	NW1/4NE1/4	0	630	345.8	-105.56292	43.09797
P108584.0W	01/12/1998	Complete	HMU4	MON	036N	073W	13	NE1/4NE1/4	0	620	344.6	-105.55802	43.09799
P108585.0W	01/12/1998	Complete	HMU5	MON	036N	073W	13	NE1/4NE1/4	0	620	347.49	-105.55802	43.09799
P108593.0W	01/12/1998	Complete	HMP1	MON	036N	073W	13	NE1/4NW1/4	0	585	331.93	-105.56776	43.09796
P108594.0W	01/12/1998	Complete	HMP2	MON	036N	073W	13	NE1/4NW1/4	0	585	338.1	-105.56776	43.09796
P108595.0W	01/12/1998	Complete	HMP3	MON	036N	073W	13	NW1/4NE1/4	0	540	327.92	-105.56292	43.09797
P108596.0W	01/12/1998	Complete	HMP4	MON	036N	073W	13	NE1/4NE1/4	0	565	327.55	-105.55802	43.09799
P108597.0W	01/12/1998	Complete	HMP5	MON	036N	073W	13	NE1/4NE1/4	0	550	338.8	-105.55802	43.09799
P112657.0W	11/03/1998	Complete	HMO13	MON	036N	073W	13	NE1/4NW1/4	0	490	315.58	-105.56776	43.09796
P112658.0W	11/03/1998	Complete	HMO14	MON	036N	073W	13	NW1/4NE1/4	0	500	326.71	-105.56292	43.09797
P112659.0W	11/03/1998	Complete	HMO15	MON	036N	073W	13	NE1/4NE1/4	0	490	313.3	-105.55802	43.09799
P77464.0W	07/20/1988	Complete	CM 2	MON	036N	073W	13	NW1/4NW1/4	0	607	308.36	-105.57264	43.09794
P77465.0W	07/20/1988	Complete	CM 3	MON	036N	073W	13	NW1/4NW1/4	0	620	315.28	-105.57264	43.09794
P77466.0W	07/20/1988	Complete	CM 4	MON	036N	073W	13	NW1/4NW1/4	0	615	315.05	-105.57264	43.09794
P77467.0W	07/20/1988	Complete	CM 5	MON	036N	073W	13	NW1/4NW1/4	0	625	316.72	-105.57264	43.09794

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P77431.0W	07/20/1988	Complete	C MO 1	MON	036N	073W	14	NE1/4NE1/4	0	523	290.58	-105.57756	43.09792
P77433.0W	07/20/1988	Complete	CMO 3	MON	036N	073W	14	NE1/4NE1/4	0	520	297.4	-105.57756	43.09792
P77434.0W	07/20/1988	Complete	CMO 4	MON	036N	073W	14	NE1/4NE1/4	0	530	303.58	-105.57756	43.09792
P77435.0W	07/20/1988	Complete	CMO 5	MON	036N	073W	14	SE1/4NE1/4	0	525	311.96	-105.57749	43.09424
P77436.0W	07/20/1988	Complete	CMO 6	MON	036N	073W	14	NW1/4SE1/4	0	530	324.7	-105.58253	43.09047
P77437.0W	07/20/1988	Complete	CMO 7	MON	036N	073W	14	NW1/4SE1/4	0	530	300.65	-105.58253	43.09047
P77438.0W	07/20/1988	Complete	CMO 8	MON	036N	073W	14	SW1/4SE1/4	0	530	299.13	-105.58251	43.08687
P77439.0W	07/20/1988	Complete	CMO 9	MON	036N	073W	14	SE1/4SW1/4	0	520	295.76	-105.58753	43.08685
P77440.0W	07/20/1988	Complete	CMO 10	MON	036N	073W	14	SW1/4SW1/4	0	520	300.6	-105.59288	43.08851
P77447.0W	07/20/1988	Complete	CMU 1	MON	036N	073W	14	NE1/4NE1/4	0	620	314	-105.57756	43.09792
P77448.0W	07/20/1988	Complete	CMU 2	MON	036N	073W	14	NE1/4NE1/4	0	620	294.12	-105.57756	43.09792
P77449.0W	07/20/1988	Complete	CMU 3	MON	036N	073W	14	NE1/4NE1/4	0	627	308.92	-105.57756	43.09792
P77463.0W	07/20/1988	Complete	CM 1	MON	036N	073W	14	NE1/4NE1/4	0	620	306.63	-105.57756	43.09792
P77468.0W	07/20/1988	Complete	CM 7	MON	036N	073W	14	SE1/4NE1/4	0	620	320.5	-105.57749	43.09424
P77470.0W	07/20/1988	Complete	CM 9	MON	036N	073W	14	SE1/4NE1/4	0	620	320.72	-105.57749	43.09424
P77471.0W	07/20/1988	Complete	CM 10	MON	036N	073W	14	NE1/4SE1/4	0	615	323.55	-105.57753	43.09056
P77473.0W	07/20/1988	Complete	CM 12	MON	036N	073W	14	NW1/4SE1/4	0	600	332	-105.58253	43.09047
P77474.0W	07/20/1988	Complete	CM 13	MON	036N	073W	14	NW1/4SE1/4	0	600	334	-105.58253	43.09047
P77475.0W	07/20/1988	Complete	CM 14	MON	036N	073W	14	SW1/4SE1/4	0	600	331	-105.58251	43.08687
P77477.0W	07/20/1988	Complete	CM 16	MON	036N	073W	14	SW1/4SE1/4	0	600	342	-105.58251	43.08687
P77485.0W	07/20/1988	Complete	CM 25	MON	036N	073W	14	SW1/4SW1/4	0	610	363	-105.59288	43.08851
P77486.0W	07/20/1988	Complete	CM 26	MON	036N	073W	14	SW1/4SE1/4	0	600	344	-105.58251	43.08687
P77488.0W	07/20/1988	Complete	CM 28	MON	036N	073W	14	SW1/4SW1/4	0	600	317	-105.59288	43.08851
P77489.0W	07/20/1988	Complete	CM 29	MON	036N	073W	14	NW1/4SW1/4	0	600	335	-105.59252	43.09049
P77490.0W	07/20/1988	Complete	CM 30	MON	036N	073W	14	NW1/4SW1/4	0	610	345	-105.59252	43.09049
P77493.0W	07/20/1988	Complete	CM 35	MON	036N	073W	14	SE1/4NW1/4	0	605	343	-105.58777	43.09418
P77494.0W	07/20/1988	Complete	CM 36	MON	036N	073W	14	SW1/4NE1/4	0	660	349.65	-105.58253	43.09421
P77495.0W	07/20/1988	Complete	CM 37	MON	036N	073W	14	SW1/4NE1/4	0	660	349.61	-105.58253	43.09421
P77496.0W	07/20/1988	Complete	CM 38	MON	036N	073W	14	NW1/4NE1/4	0	636	333.75	-105.58253	43.09866
P77497.0W	07/20/1988	Complete	CM 39	MON	036N	073W	14	NW1/4NE1/4	0	620	328.55	-105.58253	43.09866
P77498.0W	07/20/1988	Complete	CM 40	MON	036N	073W	14	NW1/4NE1/4	0	660	336.96	-105.58253	43.09866
P77499.0W	07/20/1988	Complete	CM 41	MON	036N	073W	14	NE1/4NE1/4	0	630	315.56	-105.57756	43.09792
P77500.0W	07/20/1988	Complete	CM 42	MON	036N	073W	14	NE1/4NE1/4	0	620	312.14	-105.57756	43.09792
P77501.0W	07/20/1988	Complete	CM 43	MON	036N	073W	14	NE1/4NE1/4	0	620	306.85	-105.57756	43.09792
P77503.0W	07/20/1988	Complete	CM 32	MON	036N	073W	14	NE1/4SW1/4	0	600	331	-105.58753	43.09065
P77504.0W	07/20/1988	Complete	CM 17	MON	036N	073W	14	SE1/4SW1/4	0	600	346	-105.58753	43.08685
P77505.0W	07/20/1988	Complete	CM 6	MON	036N	073W	14	SE1/4NE1/4	0	620	321.24	-105.57749	43.09424
P77506.0W	07/20/1988	Complete	CMU 12	MON	036N	073W	14	NE1/4SW1/4	0	580	312	-105.58753	43.09065
P77507.0W	07/20/1988	Complete	CMU 13	MON	036N	073W	14	NE1/4SW1/4	0	575	318	-105.58753	43.09065
P78263.0W	10/24/1988	Complete	CM 47	MON	036N	073W	14	SW1/4NE1/4	0	590	327.34	-105.58253	43.09421
P78264.0W	10/24/1988	Complete	CM 46	MON	036N	073W	14	SW1/4NE1/4	0	590	318.42	-105.58253	43.09421
P78265.0W	10/24/1988	Complete	CM 45	MON	036N	073W	14	SW1/4NE1/4	0	590	330.89	-105.58253	43.09421
P78266.0W	10/24/1988	Complete	CM 44	MON	036N	073W	14	NE1/4NE1/4	0	615	304.86	-105.57756	43.09792
P78273.0W	10/24/1988	Complete	CMSH 1	MON	036N	073W	14	SE1/4NE1/4	0	620	314.76	-105.57749	43.09424
P80478.0W	08/10/1989	Complete	CRMW 1	MON	036N	073W	14	SE1/4SW1/4	0			-105.58753	43.08685
P80709.0W	09/18/1989	Complete	CIMW 1	MON	036N	073W	14	SE1/4SW1/4	0			-105.58753	43.08685

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P80711.0W	09/18/1989	Complete	CRMW 3	MON	036N	073W	14	SE1/4SW1/4	0			-105.58753	43.08685
P80712.0W	09/18/1989	Complete	CRMW 4	MON	036N	073W	14	SE1/4SW1/4	0			-105.58753	43.08685
P80713.0W	09/18/1989	Complete	CRMW 5	MON	036N	073W	14	SE1/4SW1/4	0			-105.58753	43.08685
P80714.0W	09/18/1989	Complete	CRMW 6	MON	036N	073W	14	SE1/4SW1/4	0			-105.58753	43.08685
P80715.0W	09/18/1989	Complete	14 2 3673 WW	MON	036N	073W	14	NE1/4SE1/4	0			-105.57753	43.09056
P80960.0W	10/12/1989	Complete	COW 1	MON	036N	073W	14	NE1/4SW1/4	0	557	322	-105.58753	43.09065
P47398.0W	04/10/1979	Complete	W H 50 11	MON	036N	073W	15	SE1/4SE1/4	0	598	359	-105.59749	43.0877
P56682.0W	05/12/1981	Complete	MWN #15	MON	036N	073W	15	SE1/4NE1/4	0	584	472.4	-105.59746	43.09412
P82651.0W	06/05/1990	Complete	15-M1	MON	036N	073W	15	SW1/4SE1/4	0	586	328.21	-105.60242	43.08688
P84412.0W	02/07/1991	Complete	EM-23	MON	036N	073W	15	SW1/4SE1/4	0	620	323.72	-105.60242	43.08688
P84413.0W	02/07/1991	Complete	EM-24	MON	036N	073W	15	SW1/4SE1/4	0	600	321.83	-105.60242	43.08688
P84414.0W	02/07/1991	Complete	EM-25	MON	036N	073W	15	SE1/4SE1/4	0	610	324.85	-105.59749	43.0877
P84415.0W	02/07/1991	Complete	EM-26	MON	036N	073W	15	SE1/4SE1/4	0	600	333.32	-105.59749	43.0877
P84416.0W	02/07/1991	Complete	EM-27	MON	036N	073W	15	SE1/4SE1/4	0	600	314.71	-105.59749	43.0877
P84417.0W	02/07/1991	Complete	EM-28	MON	036N	073W	15	SE1/4SE1/4	0	580	292.95	-105.59749	43.0877
P84425.0W	02/07/1991	Complete	EMU-8	MON	036N	073W	15	SE1/4SE1/4	0	680	347.99	-105.59749	43.0877
P84847.0W	04/08/1991	Complete	EMO-8	MON	036N	073W	15	SE1/4SE1/4	0	440	195.78	-105.59749	43.0877
P167755.0W	05/19/2005	Complete	SW/SW 17-36-73 (2 Wells) Mine Unit J	MON	036N	073W	17	SW1/4SW1/4	0	540	290.89	-105.6519	43.08754
P167756.0W	05/19/2005	Complete	SE/SW 17-36-73 (5 Wells) Mine Unit J	MON	036N	073W	17	SE1/4SW1/4	0	540	283.21	-105.64693	43.08657
P167757.0W	05/19/2005	Complete	SW/SE 17-36-73 (1 Wells) Mine Unit J	MON	036N	073W	17	SW1/4SE1/4	0	540	280.23	-105.64195	43.08659
P167745.0W	05/19/2005	Complete	NE/SE 19-36-73 (1 Wells) Mine Unit J	MON	036N	073W	19	NE1/4SE1/4	0	600	319	-105.65671	43.07565
P167748.0W	05/19/2005	Complete	SE/NE 19-36-73 (3 Wells) Mine Unit J	MON	036N	073W	19	SE1/4NE1/4	0	580	308	-105.65674	43.07928
P167751.0W	05/19/2005	Complete	NE/NE 19-36-73 (1 Wells) Mine Unit J	MON	036N	073W	19	NE1/4NE1/4	0	560	297.6	-105.65646	43.08111
P172934.0W	01/31/2006		SW/SW 19-36-73 (2 Wells) Mine Unit K Monitor Wells	MON	036N	073W	19	SW1/4SW1/4	0			-105.6716	43.07188
P52155.0W	05/14/1980	Complete	OWD 9	MON	036N	073W	19	SW1/4SW1/4	0	936	613	-105.6716	43.07188
P95215.0W	04/26/1994	Complete	SNOW-1	MON	036N	073W	19	NE1/4NW1/4	0	80	54.9	-105.66692	43.08283
P95216.0W	04/26/1994	Complete	SNOW-2	MON	036N	073W	19	NE1/4NW1/4	0	80	51.9	-105.66692	43.08283
P95217.0W	04/26/1994	Complete	SNOW-3	MON	036N	073W	19	NE1/4NW1/4	0	80	52.8	-105.66692	43.08283
P95218.0W	04/26/1994	Complete	SNOW-4	MON	036N	073W	19	NE1/4NW1/4	0	500	300	-105.66692	43.08283
P167743.0W	05/19/2005	Complete	SW/SW 20-36-73 (5Wells) Mine Unit J	MON	036N	073W	20	SW1/4SW1/4	0	580	319	-105.65164	43.07204
P167744.0W	05/19/2005	Complete	SE/SE 20-36-73 (2Wells) Mine Unit J	MON	036N	073W	20	SE1/4SW1/4	0	580	331	-105.6467	43.07203
P167746.0W	05/19/2005	Complete	NW/SW 20-36-73 (4 Wells) Mine Unit J	MON	036N	073W	20	NW1/4SW1/4	0	580	295	-105.65171	43.07567
P167747.0W	05/19/2005	Complete	NE/SW 20-36-73 (4 Wells) Mine Unit J	MON	036N	073W	20	NE1/4SW1/4	0	580	321	-105.64676	43.07566
P167749.0W	05/19/2005	Complete	SW/NW 20-36-73 (4 Wells) Mine Unit J	MON	036N	073W	20	SW1/4NW1/4	0	560	299.5	-105.65175	43.07801

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P167750.0W	05/19/2005	Complete	SE/NW 20-36-73 (8 Wells) Mine Unit J	MON	036N	073W	20	SE1/4NW1/4	0	560	290.5	-105.64682	43.0793
P167752.0W	05/19/2005	Complete	NW/NW 20-36-73 (7 Wells) Mine Unit J	MON	036N	073W	20	NW1/4NW1/4	0	560	301.2	-105.64959	43.08294
P167753.0W	05/19/2005	Complete	NE/NW 20-36-73 (2 Wells) Mine Unit J	MON	036N	073W	20	NE1/4NW1/4	0	520	285.2	-105.64688	43.08294
P167754.0W	05/19/2005	Complete	NW/NE 20-36-73 (3 Wells) Mine Unit J	MON	036N	073W	20	NW1/4NE1/4	0	540	289.83	-105.64191	43.08296
P168580.0W	06/22/2005	Complete	JMT-001	MON	036N	073W	20	NE1/4SW1/4	0	560	314.98	-105.64676	43.07566
P168581.0W	06/22/2005	Complete	JMT-002	MON	036N	073W	20	SE1/4SW1/4	0	560	324.05	-105.6467	43.07203
P47383.0W	04/10/1979	Complete	W H 70 1	MON	036N	073W	20	SW1/4SE1/4	0	565	360	-105.64176	43.07201
P47384.0W	04/10/1979	Complete	W H 70 2	MON	036N	073W	20	NE1/4SE1/4	0	503	338	-105.63692	43.07565
P47389.0W	04/10/1979	Complete	W H 50 2	MON	036N	073W	20	NW1/4SE1/4	0	745	392	-105.64181	43.07565
P47390.0W	04/10/1979	Complete	W H 50 3	MON	036N	073W	20	SW1/4SE1/4	0	779	412	-105.64176	43.07201
P47391.0W	04/10/1979	Complete	W H 50 4	MON	036N	073W	20	SE1/4SE1/4	0	760	404	-105.63691	43.072
P90384.0W	12/14/1992	Complete	FM-34(M)	MON	036N	073W	20	SE1/4SW1/4	0	788	383.9	-105.6467	43.07203
P90385.0W	12/14/1992	Complete	FM-35(M)	MON	036N	073W	20	SW1/4SE1/4	0	780	370.52	-105.64176	43.07201
P90386.0W	12/14/1992	Complete	FM-36(M)	MON	036N	073W	20	NW1/4SE1/4	0	780	367.02	-105.64181	43.07565
P90387.0W	12/14/1992	Complete	FM-37(M)	MON	036N	073W	20	NW1/4SE1/4	0	780	349.85	-105.64181	43.07565
P90388.0W	12/14/1992	Complete	FM-38(M)	MON	036N	073W	20	NE1/4SE1/4	0	760	367.4	-105.63692	43.07565
P90389.0W	12/14/1992	Complete	FM-34(M)	MON	036N	073W	20	NE1/4SE1/4	0	760	369.8	-105.63692	43.07565
P90403.0W	12/14/1992	Complete	FMO-2	MON	036N	073W	20	SW1/4SE1/4	0	650	291.15	-105.64176	43.07201
P90404.0W	12/14/1992	Complete	FMO-3	MON	036N	073W	20	SW1/4SE1/4	0	610	334.3	-105.64176	43.07201
P90405.0W	12/14/1992	Complete	FMO-4	MON	036N	073W	20	SW1/4SE1/4	0	610	339.39	-105.64176	43.07201
P90406.0W	12/14/1992	Complete	FMO-5	MON	036N	073W	20	SE1/4SE1/4	0	600	363.65	-105.63691	43.072
P90407.0W	12/14/1992	Complete	FMO-6	MON	036N	073W	20	SE1/4SE1/4	0	600	320.6	-105.63691	43.072
P90424.0W	12/14/1992	Complete	FMP-2	MON	036N	073W	20	SW1/4SE1/4	0	820	373.13	-105.64176	43.07201
P90425.0W	12/14/1992	Complete	FMP-3	MON	036N	073W	20	SW1/4SE1/4	0	780	376.72	-105.64176	43.07201
P90426.0W	12/14/1992	Complete	FMP-4	MON	036N	073W	20	SW1/4SE1/4	0	785	379.14	-105.64176	43.07201
P90427.0W	12/14/1992	Complete	FMP-5	MON	036N	073W	20	SE1/4SE1/4	0	900	376.3	-105.63691	43.072
P90428.0W	12/14/1992	Complete	FMP-6	MON	036N	073W	20	SE1/4SE1/4	0	770	367.61	-105.63691	43.072
P90445.0W	12/14/1992	Complete	FMU-2	MON	036N	073W	20	SW1/4SE1/4	0	960	398.7	-105.64176	43.07201
P90446.0W	12/14/1992	Complete	FMU-3	MON	036N	073W	20	SW1/4SE1/4	0	960	421.35	-105.64176	43.07201
P90447.0W	12/14/1992	Complete	FMU-4	MON	036N	073W	20	SW1/4SE1/4	0	960	401.31	-105.64176	43.07201
P90448.0W	12/14/1992	Complete	FMU-5	MON	036N	073W	20	SE1/4SE1/4	0	900	418.88	-105.63691	43.072
P90449.0W	12/14/1992	Complete	FMU-6	MON	036N	073W	20	SE1/4SE1/4	0	880	384.01	-105.63691	43.072
P47385.0W	04/10/1979	Complete	W H 60 1	MON	036N	073W	21	SW1/4SW1/4	0	672	393	-105.63191	43.07203
P47386.0W	04/10/1979	Complete	W H 60 2	MON	036N	073W	21	SE1/4SW1/4	0	658	397	-105.62703	43.0721
P47387.0W	04/10/1979	Complete	W H 60 3	MON	036N	073W	21	SE1/4SE1/4	0	615	389	-105.61726	43.07226
P47392.0W	04/10/1979	Complete	W H 50 5	MON	036N	073W	21	NW1/4SW1/4	0	745	440	-105.63194	43.07568
P47393.0W	04/10/1979	Complete	W H 50 6	MON	036N	073W	21	NE1/4SW1/4	0	720	400	-105.62704	43.07575
P47394.0W	04/10/1979	Complete	W H 50 7	MON	036N	073W	21	SW1/4NE1/4	0	708	390	-105.62214	43.07946
P47400.0W	04/10/1979	Complete	W H 40 2	MON	036N	073W	21	SW1/4NE1/4	0	770	392	-105.62214	43.07946
P47401.0W	04/10/1979	Complete	W H 40 3	MON	036N	073W	21	NE1/4SE1/4	0	714	347	-105.61723	43.07766
P90364.0W	12/14/1992	Complete	FM-14(U)	MON	036N	073W	21	SE1/4SE1/4	0	650	363.33	-105.61726	43.07226
P90365.0W	12/14/1992	Complete	FM-15(U)	MON	036N	073W	21	SE1/4SE1/4	0	660	370.94	-105.61726	43.07226

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P90366.0W	12/14/1992	Complete	FM-16(U)	MON	036N	073W	21	SE1/4SE1/4	0	650	367.54	-105.61726	43.07226
P90367.0W	12/14/1992	Complete	FM-17(L)	MON	036N	073W	21	SW1/4SE1/4	0	740	322.48	-105.62214	43.07218
P90368.0W	12/14/1992	Complete	FM-18(L)	MON	036N	073W	21	SW1/4SE1/4	0	750	339.55	-105.62214	43.07218
P90390.0W	12/14/1992	Complete	FM-40(M)	MON	036N	073W	21	NW1/4SW1/4	0	760	371.9	-105.63194	43.07568
P90391.0W	12/14/1992	Complete	FM-41(M)	MON	036N	073W	21	NW1/4SW1/4	0	725	363.21	-105.63194	43.07568
P90392.0W	12/14/1992	Complete	FM-42(M)	MON	036N	073W	21	NW1/4SW1/4	0	730	354.52	-105.63194	43.07568
P90393.0W	12/14/1992	Complete	FM-43(M)	MON	036N	073W	21	SW1/4NW1/4	0	730	364.39	-105.63197	43.07944
P90394.0W	12/14/1992	Complete	FM-44(M)	MON	036N	073W	21	SE1/4NW1/4	0	720	355.5	-105.62705	43.07945
P90395.0W	12/14/1992	Complete	FM-45(M)	MON	036N	073W	21	SE1/4NW1/4	0	720	355.65	-105.62705	43.07945
P90396.0W	12/14/1992	Complete	FM-46(M)	MON	036N	073W	21	SW1/4NE1/4	0	720	355.18	-105.62214	43.07946
P90397.0W	12/14/1992	Complete	FM-47(M)	MON	036N	073W	21	SW1/4NE1/4	0	700	382	-105.62214	43.07946
P90398.0W	12/14/1992	Complete	FM-48(M)	MON	036N	073W	21	SE1/4NE1/4	0	699.7	380	-105.61722	43.07951
P90399.0W	12/14/1992	Complete	FM-49(M)	MON	036N	073W	21	SE1/4NE1/4	0	680	384	-105.61722	43.07951
P90400.0W	12/14/1992	Complete	FM-50(M)	MON	036N	073W	21	SE1/4NE1/4	0	680	386	-105.61722	43.07951
P90408.0W	12/14/1992	Complete	FMO-7	MON	036N	073W	21	SW1/4SW1/4	0	600	318.54	-105.63191	43.07203
P90409.0W	12/14/1992	Complete	FMO-8	MON	036N	073W	21	NW1/4SW1/4	0	570	272.75	-105.63194	43.07568
P90410.0W	12/14/1992	Complete	FMO-9	MON	036N	073W	21	SW1/4SW1/4	0	570	320.7	-105.63191	43.07203
P90411.0W	12/14/1992	Complete	FMO-10	MON	036N	073W	21	SW1/4SW1/4	0	550	294.3	-105.63191	43.07203
P90413.0W	12/14/1992	Complete	FMO-12	MON	036N	073W	21	SE1/4SW1/4	0	570	298.74	-105.62703	43.0721
P90414.0W	12/14/1992	Complete	FMO-13	MON	036N	073W	21	SW1/4SE1/4	0	570	295.32	-105.62214	43.07218
P90415.0W	12/14/1992	Complete	FMO-14	MON	036N	073W	21	SW1/4NE1/4	0	550	273.26	-105.62214	43.07946
P90416.0W	12/14/1992	Complete	FMO-15	MON	036N	073W	21	NW1/4SE1/4	0	500	234.32	-105.62047	43.07765
P90417.0W	12/14/1992	Complete	FMO-16	MON	036N	073W	21	SE1/4NE1/4	0	470	250.43	-105.61722	43.07951
P90418.0W	12/14/1992	Complete	FMO-17	MON	036N	073W	21	SE1/4NE1/4	0	460	329.85	-105.61722	43.07951
P90420.0W	12/14/1992	Complete	FMO-19	MON	036N	073W	21	NE1/4SE1/4	0	500	228.2	-105.61723	43.07766
P90421.0W	12/14/1992	Complete	FMO-20	MON	036N	073W	21	NE1/4SE1/4	0	530	278.25	-105.61723	43.07766
P90429.0W	12/14/1992	Complete	FMP-7	MON	036N	073W	21	SW1/4SW1/4	0	770	374.5	-105.63191	43.07203
P90430.0W	12/14/1992	Complete	FMP-8	MON	036N	073W	21	NW1/4SW1/4	0	730	359.3	-105.63194	43.07568
P90431.0W	12/14/1992	Complete	FMP-9	MON	036N	073W	21	SW1/4SW1/4	0	770	366	-105.63191	43.07203
P90432.0W	12/14/1992	Complete	FMP-10	MON	036N	073W	21	SW1/4SW1/4	0	675	411.68	-105.63191	43.07203
P90434.0W	12/14/1992	Complete	FMP-12	MON	036N	073W	21	SE1/4SW1/4	0	670	356.2	-105.62703	43.0721
P90435.0W	12/14/1992	Complete	FMP-13	MON	036N	073W	21	SW1/4SE1/4	0	780	356.6	-105.62214	43.07218
P90436.0W	12/14/1992	Complete	FMP-14	MON	036N	073W	21	SW1/4NE1/4	0	700	316.38	-105.62214	43.07946
P90437.0W	12/14/1992	Complete	FMP-15	MON	036N	073W	21	NW1/4SE1/4	0	720	300.42	-105.62047	43.07765
P90438.0W	12/14/1992	Complete	FMP-16	MON	036N	073W	21	SE1/4NE1/4	0	670	327.21	-105.61722	43.07951
P90439.0W	12/14/1992	Complete	FMP-17	MON	036N	073W	21	SE1/4NE1/4	0	640	306.35	-105.61722	43.07951
P90441.0W	12/14/1992	Complete	FMP-19	MON	036N	073W	21	NE1/4SE1/4	0	698	312.72	-105.61723	43.07766
P90442.0W	12/14/1992	Complete	FMP-20	MON	036N	073W	21	NE1/4SE1/4	0	635	337.4	-105.61723	43.07766
P90450.0W	12/14/1992	Complete	FMU-7	MON	036N	073W	21	SW1/4SW1/4	0	880	423.6	-105.63191	43.07203
P90451.0W	12/14/1992	Complete	FMU-8	MON	036N	073W	21	NW1/4SW1/4	0	860	405.5	-105.63194	43.07568
P90452.0W	12/14/1992	Complete	FMU-9	MON	036N	073W	21	SW1/4SW1/4	0	880	413.35	-105.63191	43.07203
P90453.0W	12/14/1992	Complete	FMU-10	MON	036N	073W	21	SW1/4SW1/4	0	900	365.84	-105.63191	43.07203
P90455.0W	12/14/1992	Complete	FMU-12	MON	036N	073W	21	SE1/4SW1/4	0	880	398.16	-105.62703	43.0721
P90456.0W	12/14/1992	Complete	FMU-13	MON	036N	073W	21	SW1/4SE1/4	0	860	349.48	-105.62214	43.07218
P90457.0W	12/14/1992	Complete	FMU-14	MON	036N	073W	21	SW1/4NE1/4	0	820	352.35	-105.62214	43.07946
P90458.0W	12/14/1992	Complete	FMU-15	MON	036N	073W	21	NW1/4SE1/4	0	770	334.7	-105.62047	43.07765

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P90459.0W	12/14/1992	Complete	FMU-16	MON	036N	073W	21	SE1/4NE1/4	0	840	339.9	-105.61722	43.07951
P90460.0W	12/14/1992	Complete	FMU-17	MON	036N	073W	21	SE1/4NE1/4	0	860	339.27	-105.61722	43.07951
P90462.0W	12/14/1992	Complete	FMU-19	MON	036N	073W	21	NE1/4SE1/4	0	800	326.42	-105.61723	43.07766
P90463.0W	12/14/1992	Complete	FMU-20	MON	036N	073W	21	NE1/4SE1/4	0	800	368.57	-105.61723	43.07766
P90704.0W	01/27/1993	Complete	FT-6(L)	MON	036N	073W	21	SW1/4SW1/4	0	820	360.52	-105.63191	43.07203
P90706.0W	01/27/1993	Complete	FT-8(M)	MON	036N	073W	21	SE1/4SW1/4	0	750	356.85	-105.62703	43.0721
P90707.0W	01/27/1993	Complete	FT-9(U)	MON	036N	073W	21	SW1/4SW1/4	0	680	369.15	-105.63191	43.07203
P90708.0W	01/27/1993	Complete	FT-10(U)	MON	036N	073W	21	SE1/4SW1/4	0	670	364.4	-105.62703	43.0721
P90709.0W	01/27/1993	Complete	FT-11(M)	MON	036N	073W	21	NE1/4SW1/4	0	720	354.4	-105.62704	43.07575
P90710.0W	01/27/1993	Complete	FT-12(L)	MON	036N	073W	21	NW1/4SE1/4	0	780	357.9	-105.62047	43.07765
P90711.0W	01/27/1993	Complete	FT-13(L)	MON	036N	073W	21	SE1/4SE1/4	0	760	371.8	-105.61726	43.07226
P90712.0W	01/27/1993	Complete	FT-14(M)	MON	036N	073W	21	NE1/4SE1/4	0	720	370.2	-105.61723	43.07766
P90713.0W	01/27/1993	Complete	FT-15(U)	MON	036N	073W	21	NE1/4SE1/4	0	550	293.85	-105.61723	43.07766
P90717.0W	01/27/1993	Complete	FT-19(L)	MON	036N	073W	21	SE1/4NE1/4	0	680	249.73	-105.61722	43.07951
P114913.0W	04/07/1999	Complete	DMP-11	MON	036N	073W	22	SW1/4NE1/4	0	700	356.04	-105.60248	43.07952
P114914.0W	04/07/1999	Complete	DMP-12	MON	036N	073W	22	NE1/4SW1/4	0	700	330.06	-105.60743	43.0759
P119557.0W	10/05/1999	Complete	DM-20	MON	036N	073W	22	NW1/4SE1/4	0	665	350.12	-105.60252	43.07589
P119558.0W	10/05/1999	Complete	DM-21	MON	036N	073W	22	NW1/4SE1/4	0	670	348.18	-105.60252	43.07589
P119559.0W	10/05/1999	Complete	DM-22	MON	036N	073W	22	NW1/4SE1/4	0	685	356.22	-105.60252	43.07589
P119560.0W	10/05/1999	Complete	DM-23	MON	036N	073W	22	NE1/4SW1/4	0	686	345.58	-105.60743	43.0759
P119561.0W	10/05/1999	Complete	DM-24	MON	036N	073W	22	NE1/4SW1/4	0	690	399.87	-105.60743	43.0759
P119562.0W	10/05/1999	Complete	DM-25	MON	036N	073W	22	SE1/4NW1/4	0	665	317.9	-105.6074	43.07953
P119563.0W	10/05/1999	Complete	DM-27	MON	036N	073W	22	SW1/4NE1/4	0	695	371.25	-105.60248	43.07952
P119564.0W	10/05/1999	Complete	DM-28	MON	036N	073W	22	SW1/4NE1/4	0	690	384.85	-105.60248	43.07952
P119565.0W	10/05/1999	Complete	DM-29	MON	036N	073W	22	NW1/4NE1/4	0	690	382.3	-105.60486	43.08316
P119566.0W	10/05/1999	Complete	DMO-6	MON	036N	073W	22	NE1/4SW1/4	0	610	313.3	-105.60743	43.0759
P119567.0W	10/05/1999	Complete	DMU-6	MON	036N	073W	22	NE1/4SW1/4	0	710	330.25	-105.60743	43.0759
P119568.0W	10/05/1999	Complete	DMU-7	MON	036N	073W	22	SW1/4NE1/4	0	770	402.92	-105.60248	43.07952
P119569.0W	10/05/1999	Complete	DMU-8	MON	036N	073W	22	SW1/4NE1/4	0	750	368.8	-105.60248	43.07952
P119570.0W	10/05/1999	Complete	DMU-9	MON	036N	073W	22	NW1/4SW1/4	0	750	372.95	-105.61233	43.07591
P119571.0W	10/05/1999	Complete	DMT-1	MON	036N	073W	22	NE1/4SW1/4	0	745	367.53	-105.60743	43.0759
P128970.0W	09/01/2000	Complete	DMU-10	MON	036N	073W	22	NW1/4SW1/4	0	840	394.7	-105.61233	43.07591
P47395.0W	04/10/1979	Complete	W H 50 8	MON	036N	073W	22	SW1/4NW1/4	0	620	325	-105.61231	43.07954
P47396.0W	04/10/1979	Complete	W H 50 9	MON	036N	073W	22	SE1/4NW1/4	0	585	309	-105.6074	43.07953
P47397.0W	04/10/1979	Complete	W H 50 10	MON	036N	073W	22	NW1/4NE1/4	0	640	376	-105.60486	43.08316
P82914.0W	07/13/1990	Complete	DMU-1	MON	036N	073W	22	SE1/4NE1/4	0	754.1	409.6	-105.59757	43.07951
P82915.0W	07/13/1990	Complete	DMU-2	MON	036N	073W	22	NE1/4NE1/4	0	730	402.5	-105.59753	43.08317
P82919.0W	07/13/1990	Complete	DMO-1	MON	036N	073W	22	SE1/4NE1/4	0	612.95	363	-105.59757	43.07951
P82920.0W	07/13/1990	Complete	DMO-2	MON	036N	073W	22	NE1/4NE1/4	0	587.4	370	-105.59753	43.08317
P82933.0W	07/13/1990	Complete	DM-10	MON	036N	073W	22	SE1/4NE1/4	0	688.1	392	-105.59757	43.07951
P82934.0W	07/13/1990	Complete	DM-11	MON	036N	073W	22	SE1/4NE1/4	0	688	383.1	-105.59757	43.07951
P82935.0W	07/13/1990	Complete	DM-12	MON	036N	073W	22	SE1/4NE1/4	0	675.4	373.7	-105.59757	43.07951
P82936.0W	07/13/1990	Complete	DM-13	MON	036N	073W	22	SE1/4NE1/4	0	661.4	355.1	-105.59757	43.07951
P82937.0W	07/13/1990	Complete	DM-14	MON	036N	073W	22	SW1/4NE1/4	0	684.6	366.9	-105.60248	43.07952
P82938.0W	07/13/1990	Complete	DM-15	MON	036N	073W	22	SW1/4NE1/4	0	690	372.8	-105.60248	43.07952
P82939.0W	07/13/1990	Complete	DM-16	MON	036N	073W	22	NE1/4NE1/4	0	682.4	362.6	-105.59753	43.08317

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P82940.0W	07/13/1990	Complete	DM-17	MON	036N	073W	22	NE1/4NE1/4	0	666.5	342.6	-105.59753	43.08317
P82941.0W	07/13/1990	Complete	DM-18	MON	036N	073W	22	NE1/4NE1/4	0	679.75	352.3	-105.59753	43.08317
P82942.0W	07/13/1990	Complete	DM-19	MON	036N	073W	22	NE1/4NE1/4	0	660.4	350	-105.59753	43.08317
P84398.0W	02/07/1991	Complete	EM-9	MON	036N	073W	22	NE1/4SE1/4	0	630	361.34	-105.59761	43.07588
P84399.0W	02/07/1991	Complete	EM-10	MON	036N	073W	22	NE1/4SE1/4	0	640	360.65	-105.59761	43.07588
P84400.0W	02/07/1991	Complete	EM-11	MON	036N	073W	22	NW1/4SE1/4	0	640	357.6	-105.60252	43.07589
P84401.0W	02/07/1991	Complete	EM-12	MON	036N	073W	22	NW1/4SE1/4	0	650	353.59	-105.60252	43.07589
P84402.0W	02/07/1991	Complete	EM-13	MON	036N	073W	22	NW1/4SE1/4	0	640	353.93	-105.60252	43.07589
P84403.0W	02/07/1991	Complete	EM-14	MON	036N	073W	22	NE1/4SW1/4	0	630	312.58	-105.60743	43.0759
P84404.0W	02/07/1991	Complete	EM-15	MON	036N	073W	22	NW1/4SW1/4	0	660	343.92	-105.61233	43.07591
P84405.0W	02/07/1991	Complete	EM-16	MON	036N	073W	22	NW1/4SW1/4	0	660	334.3	-105.61233	43.07591
P84406.0W	02/07/1991	Complete	EM-17	MON	036N	073W	22	SW1/4NW1/4	0	630	285.76	-105.61231	43.07954
P84407.0W	02/07/1991	Complete	EM-18	MON	036N	073W	22	SW1/4NW1/4	0	650	304.2	-105.61231	43.07954
P84408.0W	02/07/1991	Complete	EM-19	MON	036N	073W	22	NW1/4NW1/4	0	610	273.55	-105.61228	43.08316
P84409.0W	02/07/1991	Complete	EM-20	MON	036N	073W	22	NE1/4NW1/4	0	610	301.08	-105.60736	43.08316
P84410.0W	02/07/1991	Complete	EM-21	MON	036N	073W	22	NE1/4NW1/4	0	630	341.03	-105.60736	43.08316
P84411.0W	02/07/1991	Complete	EM-22	MON	036N	073W	22	NE1/4NW1/4	0	630	325.58	-105.60736	43.08316
P84418.0W	02/07/1991	Complete	EMU-1	MON	036N	073W	22	SE1/4NW1/4	0	690	279.2	-105.6074	43.07953
P84419.0W	02/07/1991	Complete	EMU-2	MON	036N	073W	22	SE1/4NW1/4	0	680	324.92	-105.6074	43.07953
P84420.0W	02/07/1991	Complete	EMU-3	MON	036N	073W	22	SE1/4NW1/4	0	700	338.35	-105.6074	43.07953
P84421.0W	02/07/1991	Complete	EMU-4	MON	036N	073W	22	NW1/4NE1/4	0	700	364.2	-105.60486	43.08316
P84422.0W	02/07/1991	Complete	EMU-5	MON	036N	073W	22	NW1/4NE1/4	0	700	368.3	-105.60486	43.08316
P84423.0W	02/07/1991	Complete	EMU-6	MON	036N	073W	22	NW1/4NE1/4	0	710	370.38	-105.60486	43.08316
P84424.0W	02/07/1991	Complete	EMU-7	MON	036N	073W	22	NW1/4NE1/4	0			-105.60486	43.08316
P84426.0W	02/07/1991	Complete	EMU-12	MON	036N	073W	22	SE1/4NE1/4	0	670	356.74	-105.59757	43.07951
P84427.0W	02/07/1991	Complete	EMU-13	MON	036N	073W	22	NE1/4SE1/4	0	690	357.19	-105.59761	43.07588
P84428.0W	02/07/1991	Complete	EMU-14	MON	036N	073W	22	NE1/4SE1/4	0	680	362.19	-105.59761	43.07588
P84429.0W	02/07/1991	Complete	EMSHO-1	MON	036N	073W	22	SE1/4NE1/4	0	560	362.5	-105.59757	43.07951
P84430.0W	02/07/1991	Complete	ET-1	MON	036N	073W	22	NE1/4NE1/4	0	610	339.84	-105.59753	43.08317
P84431.0W	02/07/1991	Complete	ET-2	MON	036N	073W	22	NE1/4NE1/4	0	630	355.67	-105.59753	43.08317
P84432.0W	02/07/1991	Complete	ET-3	MON	036N	073W	22	SE1/4NE1/4	0	640	369.28	-105.59757	43.07951
P84433.0W	02/07/1991	Complete	ET-4	MON	036N	073W	22	SW1/4NE1/4	0	640	357.7	-105.60248	43.07952
P84434.0W	02/07/1991	Complete	ET-5	MON	036N	073W	22	SW1/4NE1/4	0	630	322.14	-105.60248	43.07952
P84435.0W	02/07/1991	Complete	ET-6	MON	036N	073W	22	SW1/4NE1/4	0	630	289.62	-105.60248	43.07952
P84842.0W	04/08/1991	Complete	EMO-2	MON	036N	073W	22	SE1/4NW1/4	0	420	233.03	-105.6074	43.07953
P84843.0W	04/08/1991	Complete	EMO-3	MON	036N	073W	22	SE1/4NW1/4	0	520	317.85	-105.6074	43.07953
P84844.0W	04/08/1991	Complete	EMO-4	MON	036N	073W	22	NW1/4NE1/4	0	550	322.49	-105.60486	43.08316
P84845.0W	04/08/1991	Complete	EMO-5	MON	036N	073W	22	NW1/4NE1/4	0	450	264.54	-105.60486	43.08316
P84846.0W	04/08/1991	Complete	EMO-7	MON	036N	073W	22	NW1/4NE1/4	0	490	258.24	-105.60486	43.08316
P84849.0W	04/08/1991	Complete	EMO-10	MON	036N	073W	22	SE1/4NE1/4	0	565	382.8	-105.59757	43.07951
P84850.0W	04/08/1991	Complete	EMO-13	MON	036N	073W	22	NE1/4SE1/4	0	435	202.98	-105.59761	43.07588
P84851.0W	04/08/1991	Complete	EMO-15	MON	036N	073W	22	SE1/4NE1/4	0	560	350.47	-105.59757	43.07951
P90351.0W	12/14/1992	Complete	FM-1(M)	MON	036N	073W	22	SW1/4NW1/4	0	590	291.9	-105.61231	43.07954
P90352.0W	12/14/1992	Complete	FM-2(M)	MON	036N	073W	22	SW1/4NW1/4	0	620	301.86	-105.61231	43.07954
P90353.0W	12/14/1992	Complete	FM-3(L)	MON	036N	073W	22	SW1/4NW1/4	0	740	326.7	-105.61231	43.07954
P90354.0W	12/14/1992	Complete	FM-4(L)	MON	036N	073W	22	NW1/4SW1/4	0	740	348.03		

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P90355.0W	12/14/1992	Complete	FM-5(L)	MON	036N	073W	22	NW1/4SW1/4	0	740	343.78	-105.61233	43.07591
P90356.0W	12/14/1992	Complete	FM-6(U)	MON	036N	073W	22	NW1/4SW1/4	0	628.5	349.12	-105.61233	43.07591
P90357.0W	12/14/1992	Complete	FM-7(U)	MON	036N	073W	22	NE1/4SW1/4	0	610	343.38	-105.60743	43.0759
P90358.0W	12/14/1992	Complete	FM-8(U)	MON	036N	073W	22	SE1/4SW1/4	0	590	337.09	-105.60747	43.07227
P90359.0W	12/14/1992	Complete	FM-9(U)	MON	036N	073W	22	SE1/4SW1/4	0	605	340.12	-105.60747	43.07227
P90360.0W	12/14/1992	Complete	FM-10(U)	MON	036N	073W	22	SE1/4SW1/4	0	615	360.46	-105.60747	43.07227
P90361.0W	12/14/1992	Complete	FM-11(U)	MON	036N	073W	22	SE1/4SW1/4	0	610	352.16	-105.60747	43.07227
P90362.0W	12/14/1992	Complete	FM-12(U)	MON	036N	073W	22	SW1/4SW1/4	0	620	356.95	-105.6123	43.07229
P90363.0W	12/14/1992	Complete	FM-13(U)	MON	036N	073W	22	SW1/4SW1/4	0	620	354.27	-105.6123	43.07229
P90419.0W	12/14/1992	Complete	FMO-18	MON	036N	073W	22	SW1/4NW1/4	0	500	215.88	-105.61231	43.07954
P90422.0W	12/14/1992	Complete	FMO-21	MON	036N	073W	22	SW1/4SW1/4	0	520	271	-105.6123	43.07229
P90440.0W	12/14/1992	Complete	FMP-18	MON	036N	073W	22	SW1/4NW1/4	0	610	253.44	-105.61231	43.07954
P90443.0W	12/14/1992	Complete	FMP-21	MON	036N	073W	22	SW1/4SW1/4	0	610	312.91	-105.6123	43.07229
P90461.0W	12/14/1992	Complete	FMU-18	MON	036N	073W	22	SW1/4NW1/4	0	780	343.2	-105.61231	43.07954
P90464.0W	12/14/1992	Complete	FMU-21	MON	036N	073W	22	SW1/4SW1/4	0	760	373.8	-105.6123	43.07229
P90714.0W	01/27/1993	Complete	FT-16(L)	MON	036N	073W	22	NW1/4SW1/4	0	750	335.2	-105.61233	43.07591
P90715.0W	01/27/1993	Complete	FT-17(U)	MON	036N	073W	22	NW1/4SW1/4	0	600	327.31	-105.61233	43.07591
P90716.0W	01/27/1993	Complete	FT-18(M)	MON	036N	073W	22	NW1/4SW1/4	0	680	336.6	-105.61233	43.07591
P151872.0W	06/06/2003	Complete	IM-1	MON	036N	073W	23	NE1/4SE1/4	0	653	421.29	-105.57779	43.07599
P151890.0W	06/06/2003	Complete	IM-22	MON	036N	073W	23	NE1/4SE1/4	0	670	437.56	-105.57779	43.07599
P151891.0W	06/06/2003	Complete	IM-21	MON	036N	073W	23	NE1/4SE1/4	0	660	441.73	-105.57779	43.07599
P151892.0W	06/06/2003	Complete	IM-20	MON	036N	073W	23	SE1/4SE1/4	0	633	425.71	-105.57774	43.07236
P77478.0W	07/20/1988	Complete	CM 18	MON	036N	073W	23	NE1/4NW1/4	0	600	347	-105.58756	43.08311
P77479.0W	07/20/1988	Complete	CM 19	MON	036N	073W	23	NE1/4NW1/4	0	600	348	-105.58756	43.08311
P77480.0W	07/20/1988	Complete	CM 20	MON	036N	073W	23	NE1/4NW1/4	0	610	358	-105.58756	43.08311
P77481.0W	07/20/1988	Complete	CM 21	MON	036N	073W	23	NE1/4NW1/4	0	610	368	-105.58756	43.08311
P77482.0W	07/20/1988	Complete	CM 22	MON	036N	073W	23	NW1/4NW1/4	0	610	384	-105.59254	43.08309
P80710.0W	09/18/1989	Complete	CRMW 2	MON	036N	073W	23	NE1/4NW1/4	0			-105.58756	43.08311
P82913.0W	07/13/1990	Complete	DSH-1	MON	036N	073W	23	NW1/4NW1/4	0	628	353.4	-105.59254	43.08309
P82916.0W	07/13/1990	Complete	DMU-3	MON	036N	073W	23	NW1/4NW1/4	0	743	411.8	-105.59254	43.08309
P82917.0W	07/13/1990	Complete	DMU-4	MON	036N	073W	23	SW1/4NW1/4	0	739.5	426.3	-105.59261	43.07953
P82918.0W	07/13/1990	Complete	DMU-5	MON	036N	073W	23	SW1/4NW1/4	0	738	424.9	-105.59261	43.07953
P82921.0W	07/13/1990	Complete	DMO-3	MON	036N	073W	23	NW1/4NW1/4	0	592.5	383.1	-105.59254	43.08309
P82922.0W	07/13/1990	Complete	DMO-4	MON	036N	073W	23	SW1/4NW1/4	0	609.7	393.1	-105.59261	43.07953
P82923.0W	07/13/1990	Complete	DMO-5	MON	036N	073W	23	SW1/4NW1/4	0	600	387.5	-105.59261	43.07953
P82924.0W	07/13/1990	Complete	DM-1	MON	036N	073W	23	NW1/4NW1/4	0	653	359.5	-105.59254	43.08309
P82925.0W	07/13/1990	Complete	DM-2	MON	036N	073W	23	NW1/4NW1/4	0	677	380.1	-105.59254	43.08309
P82926.0W	07/13/1990	Complete	DM-3	MON	036N	073W	23	NW1/4NW1/4	0	690.4	388.3	-105.59254	43.08309
P82927.0W	07/13/1990	Complete	DM-4	MON	036N	073W	23	NE1/4NW1/4	0	680	383.8	-105.58756	43.08311
P82928.0W	07/13/1990	Complete	DM-5	MON	036N	073W	23	SE1/4NW1/4	0	684.4	392.4	-105.58761	43.07956
P82929.0W	07/13/1990	Complete	DM-6	MON	036N	073W	23	SE1/4NW1/4	0	691.4	398.8	-105.58761	43.07956
P82930.0W	07/13/1990	Complete	DM-7	MON	036N	073W	23	SW1/4NW1/4	0	686	399.3	-105.59261	43.07953
P82931.0W	07/13/1990	Complete	DM-8	MON	036N	073W	23	SW1/4NW1/4	0	683.4	394.4	-105.59261	43.07953
P82932.0W	07/13/1990	Complete	DM-9	MON	036N	073W	23	SW1/4NW1/4	0	686.6	392.5	-105.59261	43.07953
P83069.0W	07/27/1990	Complete	DSH-2	MON	036N	073W	23	NW1/4NW1/4	0	692	365	-105.59254	43.08309
P84388.0W	02/07/1991	Complete	DMD-1	MON	036N	073W	23	NW1/4NW1/4	0	658	404	-105.59254	43.08309

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P84389.0W	02/07/1991	Complete	DMD-2	MON	036N	073W	23	SW1/4NW1/4	0	676	389	-105.59261	43.07953
P84390.0W	02/07/1991	Incomplete	EM-1	MON	036N	073W	23	NE1/4NW1/4	0	620	378.34	-105.58756	43.08311
P84391.0W	02/07/1991	Incomplete	EM-2	MON	036N	073W	23	NE1/4NW1/4	0	630	389.6	-105.58756	43.08311
P84392.0W	02/07/1991	Complete	EM-3	MON	036N	073W	23	SE1/4NW1/4	0	630	391.75	-105.58761	43.07956
P84393.0W	02/07/1991	Complete	EM-4	MON	036N	073W	23	SE1/4NW1/4	0	630	389.12	-105.58761	43.07956
P84394.0W	02/07/1991	Complete	EM-5	MON	036N	073W	23	SE1/4NW1/4	0	630	383.75	-105.58761	43.07956
P84395.0W	02/07/1991	Complete	EM-6	MON	036N	073W	23	SW1/4NW1/4	0	630	374.7	-105.59261	43.07953
P84396.0W	02/07/1991	Complete	EM-7	MON	036N	073W	23	NW1/4SW1/4	0	630	371.93	-105.59266	43.07589
P84397.0W	02/07/1991	Complete	EM-8	MON	036N	073W	23	NW1/4SW1/4	0	630	370.01	-105.59266	43.07589
P84848.0W	04/08/1991	Complete	EMO-9	MON	036N	073W	23	NW1/4NW1/4	0	520	370.08	-105.59254	43.08309
P84852.0W	04/08/1991	Complete	EMO-16	MON	036N	073W	23	SW1/4NW1/4	0	530	307.83	-105.59261	43.07953
P151873.0W	06/06/2003	Complete	IMO-6	MON	036N	073W	24	NW1/4SW1/4	0	593	396.89	-105.57273	43.07603
P151874.0W	06/06/2003	Complete	IMO-5	MON	036N	073W	24	SW1/4SW1/4	0	594	393.93	-105.5728	43.07115
P151875.0W	06/06/2003	Complete	IMO-4	MON	036N	073W	24	NE1/4SW1/4	0	540	344.03	-105.56785	43.07608
P151876.0W	06/06/2003	Complete	IMO-3	MON	036N	073W	24	SE1/4SW1/4	0	533	340.83	-105.56789	43.07113
P151877.0W	06/06/2003	Complete	IMO-2	MON	036N	073W	24	NE1/4SW1/4	0	515	306.72	-105.56785	43.07608
P151878.0W	06/06/2003	Complete	IMU-7	MON	036N	073W	24	NW1/4SW1/4	0	787	435.07	-105.57273	43.07603
P151879.0W	06/06/2003	Complete	IMU-6	MON	036N	073W	24	SW1/4SW1/4	0	790	442.33	-105.5728	43.07115
P151880.0W	06/06/2003	Complete	IMU-5	MON	036N	073W	24	NE1/4SW1/4	0	723	390.11	-105.56785	43.07608
P151881.0W	06/06/2003	Complete	IMU-4	MON	036N	073W	24	SE1/4SW1/4	0	724	390.27	-105.56789	43.07113
P151882.0W	06/06/2003	Complete	IMU-3	MON	036N	073W	24	NW1/4SE1/4	0	703	362.81	-105.56297	43.07613
P151883.0W	06/06/2003	Complete	IMU-2	MON	036N	073W	24	NE1/4SW1/4	0	745	402	-105.56785	43.07608
P151884.0W	06/06/2003	Complete	IMP-7	MON	036N	073W	24	NW1/4SW1/4	0	662	436.38	-105.57273	43.07603
P151885.0W	06/06/2003	Complete	IMP-6	MON	036N	073W	24	SW1/4SW1/4	0	652	440.72	-105.5728	43.07115
P151886.0W	06/06/2003	Complete	IMP-5	MON	036N	073W	24	NE1/4SW1/4	0	645	395.31	-105.56785	43.07608
P151887.0W	06/06/2003	Complete	IMP-4	MON	036N	073W	24	SE1/4SW1/4	0	641	388.82	-105.56789	43.07113
P151888.0W	06/06/2003	Complete	IMP-3	MON	036N	073W	24	NW1/4SE1/4	0	553	345.29	-105.56297	43.07613
P151889.0W	06/06/2003	Complete	IMP-2	MON	036N	073W	24	NE1/4SW1/4	0	635	403.9	-105.56785	43.07608
P151893.0W	06/06/2003	Complete	IM-19	MON	036N	073W	24	SW1/4SW1/4	0	633	421.37	-105.5728	43.07115
P151894.0W	06/06/2003	Complete	IM-18	MON	036N	073W	24	SW1/4SW1/4	0	618	418.76	-105.5728	43.07115
P151895.0W	06/06/2003	Complete	IM-17	MON	036N	073W	24	SW1/4SW1/4	0	628	432.02	-105.5728	43.07115
P151896.0W	06/06/2003	Complete	IM-16	MON	036N	073W	24	SE1/4SW1/4	0	682	431.87	-105.56789	43.07113
P151897.0W	06/06/2003	Complete	IM-15	MON	036N	073W	24	SE1/4SW1/4	0	693	433.38	-105.56789	43.07113
P151898.0W	06/06/2003	Complete	IM-14	MON	036N	073W	24	SW1/4SE1/4	0	678	423.88	-105.56299	43.07112
P151899.0W	06/06/2003	Complete	IM-13	MON	036N	073W	24	SW1/4SE1/4	0	583	390.74	-105.56299	43.07112
P151900.0W	06/06/2003	Complete	IM-12	MON	036N	073W	24	SW1/4SE1/4	0	555	356.71	-105.56299	43.07112
P151901.0W	06/06/2003	Complete	IM-11	MON	036N	073W	24	SE1/4SE1/4	0	534	344.07	-105.55808	43.07255
P151902.0W	06/06/2003	Complete	IM-10	MON	036N	073W	24	NE1/4SE1/4	0	507	323.89	-105.55782	43.07618
P151903.0W	06/06/2003	Complete	IM-9	MON	036N	073W	24	NE1/4SE1/4	0	528	339.46	-105.55782	43.07618
P151904.0W	06/06/2003	Complete	IM-8	MON	036N	073W	24	NW1/4SE1/4	0	585	364.42	-105.56297	43.07613
P151905.0W	06/06/2003	Complete	IM-7	MON	036N	073W	24	NW1/4SE1/4	0	621	383.12	-105.56297	43.07613
P151906.0W	06/06/2003	Complete	IM-6	MON	036N	073W	24	SW1/4NE1/4	0	625	387.21	-105.56295	43.0798
P151907.0W	06/06/2003	Complete	IM-5	MON	036N	073W	24	SE1/4NW1/4	0	602	373.8	-105.56781	43.07981
P151908.0W	06/06/2003	Complete	IM-4	MON	036N	073W	24	SE1/4NW1/4	0	623	392.31	-105.56781	43.07981
P151909.0W	06/06/2003	Complete	IM-3	MON	036N	073W	24	SW1/4NW1/4	0	642	418.38	-105.57267	43.07982
P151910.0W	06/06/2003	Complete	IM-2	MON	036N	073W	24	SW1/4NW1/4	0	656	423.96	-105.57267	43.07982

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P47402.0W	04/10/1979	Complete	W H 40 4	MON	036N	073W	27	SW1/4NE1/4	0	735	416	-105.60254	43.06497
P47399.0W	04/10/1979	Complete	W H 40 1	MON	036N	073W	28	NW1/4NW1/4	0	795	383	-105.63192	43.06828
P90369.0W	12/14/1992	Complete	FM-19(U)	MON	036N	073W	28	NW1/4NE1/4	0	650	339.25	-105.62215	43.06834
P90370.0W	12/14/1992	Complete	FM-20(L)	MON	036N	073W	28	NE1/4NW1/4	0	820	350.9	-105.62704	43.06831
P90371.0W	12/14/1992	Complete	FM-21(L)	MON	036N	073W	28	NE1/4NW1/4	0	820	346.37	-105.62704	43.06831
P90372.0W	12/14/1992	Complete	FM-22(L)	MON	036N	073W	28	NE1/4NW1/4	0	820	353.61	-105.62704	43.06831
P90373.0W	12/14/1992	Complete	FM-23(L)	MON	036N	073W	28	SW1/4NW1/4	0	820	352.8	-105.63195	43.06476
P90374.0W	12/14/1992	Complete	FM-24(L)	MON	036N	073W	28	NW1/4NW1/4	0	830	351.76	-105.63192	43.06828
P90412.0W	12/14/1992	Complete	FMO-11	MON	036N	073W	28	NW1/4NW1/4	0	540	259.25	-105.63192	43.06828
P90433.0W	12/14/1992	Complete	FMP-11	MON	036N	073W	28	NW1/4NW1/4	0	820	355.25	-105.63192	43.06828
P90454.0W	12/14/1992	Complete	FMU-11	MON	036N	073W	28	NW1/4NW1/4	0	880	402.45	-105.63192	43.06828
P90703.0W	01/27/1993	Complete	FT-5(M)	MON	036N	073W	28	NW1/4NW1/4	0	770	372.8	-105.63192	43.06828
P90705.0W	01/27/1993	Complete	FT-7(U)	MON	036N	073W	28	NE1/4NW1/4	0	670	354.4	-105.62704	43.06831
P47388.0W	04/10/1979	Complete	W H 50 1	MON	036N	073W	29	SW1/4NE1/4	0	803	409	-105.64176	43.06473
P90375.0W	12/14/1992	Complete	FM-25(L)	MON	036N	073W	29	NE1/4NE1/4	0	860	360.59	-105.63681	43.06836
P90376.0W	12/14/1992	Complete	FM-26(L)	MON	036N	073W	29	SE1/4NE1/4	0	860	376.8	-105.63685	43.06473
P90377.0W	12/14/1992	Complete	FM-27(L)	MON	036N	073W	29	NE1/4NE1/4	0	870	388	-105.63681	43.06836
P90378.0W	12/14/1992	Complete	FM-28(M)	MON	036N	073W	29	NW1/4NE1/4	0	810	376.75	-105.64174	43.06837
P90379.0W	12/14/1992	Complete	FM-29(M)	MON	036N	073W	29	SW1/4NE1/4	0	820	380.9	-105.64176	43.06473
P90380.0W	12/14/1992	Complete	FM-30(M)	MON	036N	073W	29	SE1/4NW1/4	0	820	377.03	-105.64669	43.06474
P90381.0W	12/14/1992	Complete	FM-31(M)	MON	036N	073W	29	SE1/4NW1/4	0	820	380.1	-105.64669	43.06474
P90382.0W	12/14/1992	Complete	FM-32(M)	MON	036N	073W	29	NE1/4NW1/4	0	820	381.05	-105.64668	43.06838
P90383.0W	12/14/1992	Complete	FM-33(M)	MON	036N	073W	29	NE1/4NW1/4	0	840.5	410.95	-105.64668	43.06838
P90402.0W	12/14/1992	Complete	FMO-1	MON	036N	073W	29	NW1/4NE1/4	0	649	455	-105.64174	43.06837
P90423.0W	12/14/1992	Complete	FMP-1	MON	036N	073W	29	NW1/4NE1/4	0	800	375.7	-105.64174	43.06837
P90444.0W	12/14/1992	Complete	FMU-1	MON	036N	073W	29	NW1/4NE1/4	0	880	368.5	-105.64174	43.06837
P90700.0W	01/27/1993	Complete	FT-1(M)	MON	036N	073W	29	NW1/4NE1/4	0	810	332.32	-105.64174	43.06837
P90701.0W	01/27/1993	Complete	FT-2(L)	MON	036N	073W	29	NE1/4NE1/4	0	860	371.33	-105.63681	43.06836
P90702.0W	01/27/1993	Complete	FT-4(U)	MON	036N	073W	29	NE1/4NE1/4	0	700	321.8	-105.63681	43.06836
P172936.0W	01/31/2006		NW/NW30-36-73 (4 Wells) Mine Unit K Monitor Wells	MON	036N	073W	30	NW1/4NW1/4	0			-105.67157	43.06824
P172938.0W	01/31/2006		SW/NW 30-36-73 (6 Wells) Mine Unit K Monitor Wells	MON	036N	073W	30	SW1/4NW1/4	0			-105.67153	43.0646
P172940.0W	01/31/2006		NW/SW 30-36-73 (7Wells) Mine Unit K Monitor Wells	MON	036N	073W	30	NW1/4SW1/4	0			-105.6715	43.06096
P172942.0W	01/31/2006		SW/SW 30-36-73 (1 Wells) Mine Unit K Monitor Wells	MON	036N	073W	30	SW1/4SW1/4	0			-105.67147	43.05733
P183359.0W	09/14/2007	Complete	SW/SW 30-36-73 (1 Well) Mine Unit K Monitor Well Ext.	MON	036N	073W	30	SW1/4SW1/4	0			-105.671469	43.057331
P70183.0W	05/21/1985	Complete	OM 30 376	MON	036N	073W	30	NW1/4SW1/4	0	947	490.2	-105.6715	43.06096
P85942.0W	08/26/1991	Complete	M-8	MON	036N	073W	31	NW1/4NW1/4	0	505	296.57	-105.67145	43.0537
P85943.0W	08/26/1991	Complete	M-9	MON	036N	073W	31	SW1/4NW1/4	0	518	308.53	-105.67143	43.05007
P85944.0W	08/26/1991	Complete	M-10	MON	036N	073W	31	SW1/4NW1/4	0	533	342.58	-105.67143	43.05007
P85945.0W	08/26/1991	Complete	M-11	MON	036N	073W	31	SW1/4NW1/4	0	541	341.86	-105.67143	43.05007
P55553.0W	01/02/1981	Complete	DJ81-UB-7	MON	036N	074W	06	SW1/4SW1/4	0	228	65.1	-105.7893	43.11507
P55554.0W	01/02/1981	Complete	DJ81-SC-7	MON	036N	074W	06	SW1/4SW1/4	0	251.5	69.74	-105.7893	43.11507

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P55556.0W	01/02/1981	Complete	DJ81-BA-7	MON	036N	074W	06	SW1/4SW1/4	0	76	48.46	-105.7893	43.11507
P55557.0W	01/02/1981	Complete	DJ81-OB-7	MON	036N	074W	06	SW1/4SW1/4	0	55	46.88	-105.7893	43.11507
P56082.0W	03/09/1981	Complete	DJ-AW-4	MON	036N	074W	06	SE1/4NW1/4	0	75.9	18.72	-105.78466	43.12241
P59820.0W	02/01/1982	Complete	DJ81-AW-23	MON	036N	074W	07	NW1/4NW1/4	0	99.3	27.19	-105.78931	43.11143
P59821.0W	02/01/1982	Complete	DJ81-AW-22	MON	036N	074W	07	NW1/4NW1/4	0	84.5	25.63	-105.78931	43.11143
P172935.0W	01/31/2006		SE/SE24-36-74 (1 Well) Mine Unit K Monitor Wells	MON	036N	074W	24	SE1/4SE1/4	0			-105.67632	43.07187
P135275.0W	05/25/2001	Complete	M-212	MON	036N	074W	25	SE1/4SW1/4	0	901	333	-105.6851	43.05842
P135276.0W	05/25/2001	Complete	M-213	MON	036N	074W	25	SE1/4SW1/4	0	916	369	-105.6851	43.05842
P135277.0W	05/25/2001	Complete	M-214	MON	036N	074W	25	SE1/4SW1/4	0	940	366	-105.6851	43.05842
P135278.0W	05/25/2001	Complete	M-215	MON	036N	074W	25	NE1/4SW1/4	0	915	355	-105.68598	43.06098
P135279.0W	05/25/2001	Complete	M-216	MON	036N	074W	25	NE1/4SW1/4	0	890	352	-105.68598	43.06098
P135280.0W	05/25/2001	Complete	M-217	MON	036N	074W	25	NE1/4SW1/4	0	905	371	-105.68598	43.06098
P135281.0W	05/25/2001	Complete	M-218	MON	036N	074W	25	NW1/4SW1/4	0	955	404	-105.69089	43.06231
P135282.0W	05/25/2001	Complete	M-219	MON	036N	074W	25	NW1/4SW1/4	0	959	410	-105.69089	43.06231
P135283.0W	05/25/2001	Complete	M-220	MON	036N	074W	25	NW1/4SW1/4	0	926	404	-105.69089	43.06231
P135293.0W	05/25/2001	Complete	MS-206	MON	036N	074W	25	SW1/4SW1/4	0	501	301	-105.69092	43.05737
P135294.0W	05/25/2001	Complete	MS-207	MON	036N	074W	25	NW1/4SW1/4	0	541	331	-105.69089	43.06231
P135295.0W	05/25/2001	Complete	MS-208	MON	036N	074W	25	SW1/4SW1/4	0	480	298	-105.69092	43.05737
P135296.0W	05/25/2001	Complete	MS-209	MON	036N	074W	25	NW1/4SW1/4	0	521	298	-105.69089	43.06231
P135297.0W	05/25/2001	Complete	MS-210	MON	036N	074W	25	SW1/4SW1/4	0	494	291	-105.69092	43.05737
P135298.0W	05/25/2001	Complete	MS-211	MON	036N	074W	25	SW1/4SW1/4	0	520	318	-105.69092	43.05737
P135299.0W	05/25/2001	Complete	MS-212	MON	036N	074W	25	SW1/4SW1/4	0	518	328	-105.69092	43.05737
P135300.0W	05/25/2001	Complete	MS-213	MON	036N	074W	25	SE1/4SW1/4	0	518	321	-105.6851	43.05842
P135306.0W	05/25/2001	Complete	MD-206	MON	036N	074W	25	SW1/4SW1/4	0	958	375	-105.69092	43.05737
P135307.0W	05/25/2001	Complete	MD-207	MON	036N	074W	25	NW1/4SW1/4	0	1021	412	-105.69089	43.06231
P135308.0W	05/25/2001	Complete	MD-208	MON	036N	074W	25	SW1/4SW1/4	0	931	375	-105.69092	43.05737
P135309.0W	05/25/2001	Complete	MD-209	MON	036N	074W	25	SW1/4SW1/4	0	1002	374	-105.69092	43.05737
P135310.0W	05/25/2001	Complete	MD-210	MON	036N	074W	25	SW1/4SW1/4	0	915	368	-105.69092	43.05737
P135311.0W	05/25/2001	Complete	MD-211	MON	036N	074W	25	SW1/4SW1/4	0	977	400	-105.69092	43.05737
P135312.0W	05/25/2001	Complete	MD-212	MON	036N	074W	25	SW1/4SW1/4	0	897	333	-105.69092	43.05737
P135313.0W	05/25/2001	Complete	MD-213	MON	036N	074W	25	SE1/4SW1/4	0	901	324	-105.6851	43.05842
P135340.0W	05/25/2001	Complete	MP-228	MON	036N	074W	25	SW1/4SW1/4	0	861	329	-105.69092	43.05737
P172937.0W	01/31/2006		NE/NE25-36-74 (8 Wells) Mine Unit K Monitor Wells	MON	036N	074W	25	NE1/4NE1/4	0			-105.67627	43.06823
P172939.0W	01/31/2006		SE/NE 25-36-74 (12 Wells) Mine Unit K Monitor Wells	MON	036N	074W	25	SE1/4NE1/4	0			-105.67625	43.06459
P172941.0W	01/31/2006		NE/SE 25-36-74 (12Wells) Mine Unit K Monitor Wells	MON	036N	074W	25	NE1/4SE1/4	0			-105.67624	43.06095
P172943.0W	01/31/2006		SE/SE 25-36-74 (6 Wells) Mine Unit K Monitor Wells	MON	036N	074W	25	SE1/4SE1/4	0			-105.67622	43.05732
P172944.0W	01/31/2006		SW/SE 25-36-74 (2 Wells) Mine Unit K Monitor Wells	MON	036N	074W	25	SW1/4SE1/4	0			-105.68343	43.05661
P183360.0W	09/14/2007	Complete	SE/SE 25-36-74 (3 Wells) Mine Unit K Monitor Well Ext.	MON	036N	074W	25	SE1/4SE1/4	0			-105.676219	43.057319

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P183361.0W	09/14/2007	Complete	SW/SE 25-36-74 (1 Well) Mine Unit K Monitor Well Ext.	MON	036N	074W	25	SW1/4SE1/4	0			-105.683431	43.056611
P183362.0W	09/14/2007	Complete	NW/SE 25-36-74 (1 Well) Mine Unit K Monitor Well Ext.	MON	036N	074W	25	NW1/4SE1/4	0			-105.681111	43.060969
P28276.0W	09/23/1974	Complete	TW 1	MON	036N	074W	25	SE1/4SE1/4	0	1010	520	-105.67622	43.05732
P28277.0W	09/23/1974	Complete	TW 2	MON	036N	074W	25	SW1/4SW1/4	0	946	490	-105.69092	43.05737
P54909.0W	03/07/1980	Complete	OWS 1	MON	036N	074W	25	SW1/4SE1/4	0	575	233.23	-105.68343	43.05661
P54910.0W	03/07/1980	Complete	OWD 1	MON	036N	074W	25	SW1/4SE1/4	0	994	640.21	-105.68343	43.05661
P54911.0W	03/07/1980	Complete	OWS 2	MON	036N	074W	25	SE1/4SE1/4	0	584	115.7	-105.67622	43.05732
P54912.0W	03/07/1980	Complete	OWD 2	MON	036N	074W	25	SE1/4SE1/4	0	900	-1.00	-105.67622	43.05732
P54913.0W	03/07/1980	Complete	OWS 3	MON	036N	074W	25	SE1/4SW1/4	0	570	207.42	-105.6851	43.05842
P54914.0W	03/07/1980	Complete	OWD 3	MON	036N	074W	25	SE1/4SW1/4	0	882	615	-105.6851	43.05842
P54915.0W	03/07/1980	Complete	OWS 4	MON	036N	074W	25	SW1/4SW1/4	0	540	152.72	-105.69092	43.05737
P54916.0W	03/07/1980	Complete	OWD 4	MON	036N	074W	25	SW1/4SW1/4	0	-1	603.95	-105.69092	43.05737
P70188.0W	05/21/1985	Complete	OM 25 590	MON	036N	074W	25	NE1/4SE1/4	0	977	533	-105.67624	43.06095
P70189.0W	05/21/1985	Complete	OM 25 589	MON	036N	074W	25	SW1/4SW1/4	0	864	403	-105.69092	43.05737
P70190.0W	05/21/1985	Complete	NM 25 588	MON	036N	074W	25	SE1/4SE1/4	0	942	474.6	-105.67622	43.05732
P70191.0W	05/21/1985	Complete	PM 25 587	MON	036N	074W	25	SE1/4SE1/4	0	798	398	-105.67622	43.05732
P70192.0W	05/21/1985	Complete	MM 25 586	MON	036N	074W	25	NE1/4SE1/4	0	990	493.6	-105.67624	43.06095
P70193.0W	05/21/1985	Complete	QM 25 585	MON	036N	074W	25	NE1/4SE1/4	0	775	471	-105.67624	43.06095
P110974.0W	07/14/1998	Complete	O-301	MON	036N	074W	26	NW1/4SE1/4	0	529	294.97	-105.69921	43.0623
P110975.0W	07/14/1998	Complete	MS-307	MON	036N	074W	26	NE1/4SW1/4	0	510	315.38	-105.70572	43.06096
P110976.0W	07/14/1998	Complete	MS-308	MON	036N	074W	26	NE1/4SW1/4	0	494	208.1	-105.70572	43.06096
P110977.0W	07/14/1998	Complete	MS-312	MON	036N	074W	26	NW1/4SE1/4	0	467	270.67	-105.69921	43.0623
P110978.0W	07/14/1998	Complete	MS-313	MON	036N	074W	26	NW1/4SE1/4	0	458	262.39	-105.69921	43.0623
P135264.0W	05/25/2001	Complete	M-201	MON	036N	074W	26	SW1/4SE1/4	0	801	567	-105.70078	43.05735
P135265.0W	05/25/2001	Complete	M-202	MON	036N	074W	26	SW1/4SE1/4	0	820	285	-105.70078	43.05735
P135267.0W	05/25/2001	Complete	M-204	MON	036N	074W	26	SE1/4SE1/4	0	860	327	-105.69584	43.05737
P135268.0W	05/25/2001	Complete	M-205	MON	036N	074W	26	SE1/4SE1/4	0	861	319	-105.69584	43.05737
P135269.0W	05/25/2001	Complete	M-206	MON	036N	074W	26	SE1/4SE1/4	0	880	356	-105.69584	43.05737
P135284.0W	05/25/2001	Complete	M-221	MON	036N	074W	26	NE1/4SE1/4	0	937	392	-105.69582	43.0623
P135285.0W	05/25/2001	Complete	M-222	MON	036N	074W	26	NE1/4SE1/4	0	920	364	-105.69582	43.0623
P135286.0W	05/25/2001	Complete	M-223	MON	036N	074W	26	NE1/4SE1/4	0	882	323	-105.69582	43.0623
P135287.0W	05/25/2001	Complete	M-224	MON	036N	074W	26	NW1/4SE1/4	0	862	320	-105.69921	43.0623
P135288.0W	05/25/2001	Complete	MS-201	MON	036N	074W	26	SW1/4SE1/4	0	482	277	-105.70078	43.05735
P135289.0W	05/25/2001	Complete	MS-202	MON	036N	074W	26	SE1/4SE1/4	0	558	255	-105.69584	43.05737
P135290.0W	05/25/2001	Complete	MS-203	MON	036N	074W	26	SE1/4SE1/4	0	481	288	-105.69584	43.05737
P135291.0W	05/25/2001	Complete	MS-204	MON	036N	074W	26	NE1/4SE1/4	0	619	309	-105.69582	43.0623
P135292.0W	05/25/2001	Complete	MS-205	MON	036N	074W	26	NE1/4SE1/4	0	521	330	-105.69582	43.0623
P135301.0W	05/25/2001	Complete	MD-201	MON	036N	074W	26	SW1/4SE1/4	0	899	319	-105.70078	43.05735
P135302.0W	05/25/2001	Complete	MD-202	MON	036N	074W	26	SE1/4SE1/4	0	939	342	-105.69584	43.05737
P135303.0W	05/25/2001	Complete	MD-203	MON	036N	074W	26	SE1/4SE1/4	0	935	361	-105.69584	43.05737
P135304.0W	05/25/2001	Complete	MD-204	MON	036N	074W	26	NE1/4SE1/4	0	978	389	-105.69582	43.0623
P135305.0W	05/25/2001	Complete	MD-205	MON	036N	074W	26	NE1/4SE1/4	0	979	402	-105.69582	43.0623
P135314.0W	05/25/2001	Complete	MP-201	MON	036N	074W	26	SW1/4SE1/4	0	742	290	-105.70078	43.05735
P142001.0W	01/22/2002	Complete	M-314B	MON	036N	074W	26	SE1/4SW1/4	0	715	268	-105.7057	43.05733

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P52154.0W	05/14/1980	Complete	OWD 8	MON	036N	074W	26	SE1/4NW1/4	0	916	572	-105.70574	43.06393
P54917.0W	03/07/1980	Complete	OWS 5	MON	036N	074W	26	SE1/4SE1/4	0	510	147.02	-105.69584	43.05737
P54918.0W	03/07/1980	Complete	OWD 5	MON	036N	074W	26	SE1/4SE1/4	0	892	557.7	-105.69584	43.05737
P61829.0W	07/16/1982	Complete	OM1	MON	036N	074W	26	NW1/4SE1/4	0	812	413	-105.69921	43.0623
P61830.0W	07/16/1982	Complete	OM2	MON	036N	074W	26	NW1/4SE1/4	0	808	395	-105.69921	43.0623
P61832.0W	07/16/1982	Complete	OM4	MON	036N	074W	26	NE1/4SW1/4	0	825	416	-105.70572	43.06096
P61833.0W	07/16/1982	Complete	OM5	MON	036N	074W	26	NE1/4SW1/4	0	810	404	-105.70572	43.06096
P61834.0W	07/16/1982	Complete	OM6	MON	036N	074W	26	NE1/4SW1/4	0	805	395	-105.70572	43.06096
P61835.0W	07/16/1982	Complete	OM7	MON	036N	074W	26	NE1/4SW1/4	0	805	375	-105.70572	43.06096
P61836.0W	07/16/1982	Complete	OM8	MON	036N	074W	26	NE1/4SW1/4	0	815	397	-105.70572	43.06096
P61837.0W	07/16/1982	Complete	OM9	MON	036N	074W	26	NE1/4SW1/4	0	899	420	-105.70572	43.06096
P61838.0W	*07/16/1982*	*Complete*	*OM10*	*MON*	*036N*	*074W*	*26*	*NE1/4SW1/4*	*0*	320	207	*-105.70572*	*43.06096*
P61839.0W	07/16/1982	Complete	OM11	MON	036N	074W	26	NE1/4SW1/4	0	222	81	-105.70572	43.06096
P70195.0W	05/21/1985	Complete	OM 26 837	MON	036N	074W	26	SE1/4SE1/4	0	857	411	-105.69584	43.05737
P70196.0W	05/21/1985	Complete	OM 26 836	MON	036N	074W	26	SW1/4SE1/4	0	776	336	-105.70078	43.05735
P70197.0W	05/21/1985	Complete	OM 76 835	MON	036N	074W	26	NW1/4SE1/4	0	752	351	-105.69921	43.0623
P70198.0W	05/21/1985	Complete	OM 26 834	MON	036N	074W	26	NW1/4SW1/4	0	783	377	-105.71064	43.06095
P80503.0W	06/16/1989	Complete	OM 3	MON	036N	074W	26	NE1/4SW1/4	0	815	397	-105.70572	43.06096
P117949.0W	07/30/1999	Complete	MD-411	MON	036N	074W	33	SE1/4SE1/4	0	910	228.81	-105.73506	43.04273
P117950.0W	07/30/1999	Complete	MS-411	MON	036N	074W	33	SE1/4SE1/4	0	685	227.18	-105.73506	43.04273
P118645.0W	09/03/1999	Complete	M-418A	MON	036N	074W	33	NE1/4SE1/4	0	850	258.73	-105.73508	43.04638
P109119.0W	03/06/1998	Complete	M-424	MON	036N	074W	34	NE1/4SW1/4	0	903	285.76	-105.72528	43.04639
P109123.0W	03/06/1998	Complete	M-428	MON	036N	074W	34	NW1/4SE1/4	0	1020	401.01	-105.72029	43.0464
P118643.0W	09/03/1999	Complete	MS 405A	MON	036N	074W	34	SW1/4NE1/4	0	905	426.44	-105.7203	43.05004
P118644.0W	09/03/1999	Complete	M 429A	MON	036N	074W	34	NW1/4SE1/4	0	935	341.6	-105.72029	43.0464
P118646.0W	09/03/1999	Complete	MD-410	MON	036N	074W	34	NE1/4SW1/4	0	1020	316.99	-105.72528	43.04639
P70187.0W	05/21/1985	Complete	MM 34 528	MON	036N	074W	34	NW1/4SW1/4	0	800	274.7	-105.73017	43.04639
P116204.0W	06/01/1999	Complete	M-435	MON	036N	074W	35	NW1/4SW1/4	0	853	247	-105.71056	43.04641
P116205.0W	06/01/1999	Complete	M-436	MON	036N	074W	35	SW1/4SW1/4	0	823	207	-105.71055	43.04276
P117937.0W	07/30/1999	Complete	MD-412	MON	036N	074W	35	NW1/4SW1/4	0	941	233	-105.71056	43.04641
P117938.0W	07/30/1999	Complete	MD-413	MON	036N	074W	35	NW1/4SW1/4	0	896	225	-105.71056	43.04641
P117939.0W	07/30/1999	Complete	MD-414	MON	036N	074W	35	SE1/4SW1/4	0	904	181	-105.70563	43.04276
P117940.0W	07/30/1999	Complete	MD-415	MON	036N	074W	35	SE1/4SW1/4	0	915	151	-105.70563	43.04276
P117943.0W	07/30/1999	Complete	MS-412	MON	036N	074W	35	NW1/4SW1/4	0	721	212	-105.71056	43.04641
P117944.0W	07/30/1999	Complete	MS-413	MON	036N	074W	35	NW1/4SW1/4	0	704	200	-105.71056	43.04641
P117945.0W	07/30/1999	Complete	MS-414	MON	036N	074W	35	SE1/4SW1/4	0	704	180	-105.70563	43.04276
P117946.0W	07/30/1999	Complete	MS-415	MON	036N	074W	35	SE1/4SW1/4	0	716	209	-105.70563	43.04276
P118996.0W	09/16/1999	Complete	M-455A	MON	036N	074W	35	NE1/4SW1/4	0	797	194	-105.70564	43.04641
P135266.0W	05/25/2001	Complete	M-203	MON	036N	074W	35	NW1/4NE1/4	0	822	299	-105.70076	43.05371
P70200.0W	05/21/1985	Complete	MM 35 744	MON	036N	074W	35	NE1/4SW1/4	0	777	224	-105.70564	43.04641
P70201.0W	05/21/1985	Complete	LM 35 743	MON	036N	074W	35	SE1/4SW1/4	0	807	238.5	-105.70563	43.04276
P70202.0W	05/21/1985	Complete	MM 35 742	MON	036N	074W	35	SE1/4SW1/4	0	719	242.3	-105.70563	43.04276
P70203.0W	05/21/1985	Complete	KM 35 741	MON	036N	074W	35	SE1/4SW1/4	0	880	247	-105.70563	43.04276
P70204.0W	05/21/1985	Complete	OM 35 740	MON	036N	074W	35	SE1/4SW1/4	0	680	253	-105.70563	43.04276
P135270.0W	05/25/2001	Complete	M-207	MON	036N	074W	36	NW1/4NW1/4	0	858	319	-105.69091	43.05369
P135271.0W	05/25/2001	Complete	M-208	MON	036N	074W	36	NW1/4NW1/4	0	856	338	-105.69091	43.05369

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P135272.0W	05/25/2001	Complete	M-209	MON	036N	074W	36	NW1/4NW1/4	0	855	323	-105.69091	43.05369
P135273.0W	05/25/2001	Complete	M-210	MON	036N	074W	36	NE1/4NW1/4	0	838	313	-105.68603	43.05369
P135274.0W	05/25/2001	Complete	M-211	MON	036N	074W	36	NE1/4NW1/4	0	842	303	-105.68603	43.05369
P141280.0W	12/06/2001	Complete	WW-36-3	MON	036N	074W	36	NE1/4NW1/4	0	396	233	-105.68603	43.05369
P54919.0W	03/07/1980	Complete	OWD 6	MON	036N	074W	36	NE1/4NW1/4	0	865	613.08	-105.68603	43.05369
P54921.0W	07/21/1980	Complete	OWD 10	MON	036N	074W	36	NE1/4NW1/4	0	802	781	-105.68603	43.05369
P85921.0W	08/26/1991	Complete	B-1	MON	036N	074W	36	NE1/4NW1/4	0	497	310.23	-105.68603	43.05369
P85922.0W	08/26/1991	Complete	B-2	MON	036N	074W	36	SE1/4NW1/4	0	514	339.83	-105.68601	43.05006
P85923.0W	08/26/1991	Complete	B-3	MON	036N	074W	36	SE1/4NW1/4	0	484	328.13	-105.68601	43.05006
P85924.0W	08/26/1991	Complete	B-4	MON	036N	074W	36	SE1/4NW1/4	0	502	330.83	-105.68601	43.05006
P85925.0W	08/26/1991	Complete	B-5	MON	036N	074W	36	SE1/4NW1/4	0	534	359.12	-105.68601	43.05006
P85926.0W	08/26/1991	Complete	B-6	MON	036N	074W	36	SE1/4NW1/4	0	502	338.02	-105.68601	43.05006
P85927.0W	08/26/1991	Complete	B-7	MON	036N	074W	36	SE1/4NW1/4	0	510	319.02	-105.68601	43.05006
P85928.0W	08/26/1991	Complete	B-8	MON	036N	074W	36	SW1/4NE1/4	0	550	364.32	-105.68111	43.05006
P85929.0W	08/26/1991	Complete	B-9	MON	036N	074W	36	SW1/4NE1/4	0	470	293.61	-105.68111	43.05006
P85930.0W	08/26/1991	Complete	B-10	MON	036N	074W	36	SW1/4NE1/4	0	500	294.32	-105.68111	43.05006
P85931.0W	08/26/1991	Complete	B-11	MON	036N	074W	36	SE1/4NE1/4	0	460	266.89	-105.67619	43.05006
P85932.0W	08/26/1991	Complete	B-12	MON	036N	074W	36	SE1/4NE1/4	0	473	274.22	-105.67619	43.05006
P85933.0W	08/26/1991	Complete	B-13	MON	036N	074W	36	SE1/4NE1/4	0	467	275.81	-105.67619	43.05006
P85934.0W	08/26/1991	Complete	B-14	MON	036N	074W	36	SE1/4NE1/4	0	497	310.06	-105.67619	43.05006
P85935.0W	08/26/1991	Complete	M-1	MON	036N	074W	36	NE1/4NW1/4	0	490	295.76	-105.68603	43.05369
P85936.0W	08/26/1991	Complete	M-2	MON	036N	074W	36	NW1/4NE1/4	0	550	352.21	-105.68343	43.05551
P85937.0W	08/26/1991	Complete	M-3	MON	036N	074W	36	NW1/4NE1/4	0	550	356.93	-105.68343	43.05551
P85938.0W	08/26/1991	Complete	M-4	MON	036N	074W	36	NW1/4NE1/4	0	550	340.4	-105.68343	43.05551
P85939.0W	08/26/1991	Complete	M-5	MON	036N	074W	36	NE1/4NE1/4	0	520	306.03	-105.67621	43.05369
P85940.0W	08/26/1991	Complete	M-6	MON	036N	074W	36	NE1/4NE1/4	0	492	303	-105.67621	43.05369
P85941.0W	08/26/1991	Complete	M-7	MON	036N	074W	36	NE1/4NE1/4	0	470	280.84	-105.67621	43.05369
P85946.0W	08/26/1991	Complete	M-12	MON	036N	074W	36	NE1/4SE1/4	0	467	291.09	-105.67618	43.04645
P85947.0W	08/26/1991	Complete	M-13	MON	036N	074W	36	NE1/4SE1/4	0	460	273.16	-105.67618	43.04645
P85948.0W	08/26/1991	Complete	M-14	MON	036N	074W	36	NE1/4SE1/4	0	460	251.69	-105.67618	43.04645
P85949.0W	08/26/1991	Complete	M-15	MON	036N	074W	36	SW1/4NE1/4	0	430	239.23	-105.68111	43.05006
P85950.0W	08/26/1991	Complete	M-16	MON	036N	074W	36	NW1/4SE1/4	0	434	248.48	-105.6811	43.04645
P85951.0W	08/26/1991	Complete	M-17	MON	036N	074W	36	NW1/4SE1/4	0	460	282.81	-105.6811	43.04645
P85952.0W	08/26/1991	Complete	M-18	MON	036N	074W	36	NE1/4SW1/4	0	476	277.11	-105.686	43.04644
P85953.0W	08/26/1991	Complete	M-19	MON	036N	074W	36	NE1/4SW1/4	0	460	277.11	-105.686	43.04644
P85954.0W	08/26/1991	Complete	M-20	MON	036N	074W	36	NE1/4SW1/4	0	512	342.87	-105.686	43.04644
P85955.0W	08/26/1991	Complete	M-21	MON	036N	074W	36	SW1/4NW1/4	0	489	330.95	-105.69089	43.05006
P85956.0W	08/26/1991	Complete	M-22	MON	036N	074W	36	SW1/4NW1/4	0	493	328.74	-105.69089	43.05006
P85957.0W	08/26/1991	Complete	M-23	MON	036N	074W	36	SE1/4NW1/4	0	455	285.22	-105.68601	43.05006
P85958.0W	08/26/1991	Complete	M-24	MON	036N	074W	36	NE1/4NW1/4	0	477	288.67	-105.68603	43.05369
P85959.0W	08/26/1991	Complete	M-25	MON	036N	074W	36	NE1/4NW1/4	0	488	295.02	-105.68603	43.05369
P85960.0W	08/26/1991	Complete	MS-1	MON	036N	074W	36	NE1/4NW1/4	0	412	257.81	-105.68603	43.05369
P85961.0W	08/26/1991	Complete	MS-2	MON	036N	074W	36	SE1/4NW1/4	0	452	301.23	-105.68601	43.05006
P85962.0W	08/26/1991	Complete	MS-3	MON	036N	074W	36	SE1/4NW1/4	0	415	275.68	-105.68601	43.05006
P85963.0W	08/26/1991	Complete	MS-4	MON	036N	074W	36	SE1/4NW1/4	0	440	288.28	-105.68601	43.05006
P85964.0W	08/26/1991	Complete	MS-5	MON	036N	074W	36	SW1/4NE1/4	0	466	307.56	-105.68111	43.05006

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P85965.0W	08/26/1991	Complete	MS-6	MON	036N	074W	36	SW1/4NE1/4	0	385	307.56	-105.68111	43.05006
P85966.0W	08/26/1991	Complete	MS-7	MON	036N	074W	36	SE1/4NE1/4	0	367	213.47	-105.67619	43.05006
P85967.0W	08/26/1991	Complete	MS-8	MON	036N	074W	36	SE1/4NE1/4	0	376	221.46	-105.67619	43.05006
P85968.0W	08/26/1991	Complete	MS-9	MON	036N	074W	36	SE1/4NE1/4	0	374	221.05	-105.67619	43.05006
P85969.0W	08/26/1991	Complete	MS-10	MON	036N	074W	36	SE1/4NE1/4	0	418	262.47	-105.67619	43.05006
P85970.0W	08/26/1991	Complete	MD-1	MON	036N	074W	36	NE1/4NW1/4	0	596	325.86	-105.68603	43.05369
P85971.0W	08/26/1991	Complete	MD-2	MON	036N	074W	36	SE1/4NW1/4	0	641	368.16	-105.68601	43.05006
P85972.0W	08/26/1991	Complete	MD-3	MON	036N	074W	36	SE1/4NW1/4	0	595	343.86	-105.68601	43.05006
P85973.0W	08/26/1991	Complete	MD-4	MON	036N	074W	36	SE1/4NW1/4	0	607	355.12	-105.68601	43.05006
P85974.0W	08/26/1991	Complete	MD-5	MON	036N	074W	36	SW1/4NE1/4	0	647	375.05	-105.68111	43.05006
P85975.0W	08/26/1991	Complete	MD-6	MON	036N	074W	36	SW1/4NE1/4	0	577	303.69	-105.68111	43.05006
P85976.0W	08/26/1991	Complete	MD-7	MON	036N	074W	36	SE1/4NE1/4	0	600	280.79	-105.67619	43.05006
P85977.0W	08/26/1991	Complete	MD-8	MON	036N	074W	36	SE1/4NE1/4	0	567	293.07	-105.67619	43.05006
P85978.0W	08/26/1991	Complete	MD-9	MON	036N	074W	36	SE1/4NE1/4	0	582	295.39	-105.67619	43.05006
P85979.0W	08/26/1991	Complete	MD-10	MON	036N	074W	36	SE1/4NE1/4	0	612	328.51	-105.67619	43.05006
P55809.0W	03/02/1981	Complete	DJ81-IB-9	MON	036N	075W	24	SE1/4NW1/4	0	531	424.1	-105.80378	43.07865
P55814.0W	03/02/1981	Complete	DJ81-SC-9	MON	036N	075W	24	SE1/4NW1/4	0	593	423.02	-105.80378	43.07865
P55815.0W	03/02/1981	Complete	DJ81-BA-9	MON	036N	075W	24	SE1/4NW1/4	0	410	362.34	-105.80378	43.07865
P56087.0W	03/09/1981	Complete	DJ-AW-7	MON	036N	075W	24	SW1/4SE1/4	0	60.93	22.6	-105.79891	43.07137
P56048.0W	03/13/1981	Complete	DJ81-SP1	MON	036N	075W	34	SE1/4NW1/4	0	138.1	120.6	-105.84278	43.04978
P69354.0W	02/08/1985	Complete	DJ84 SW 31	MON	036N	075W	34	SE1/4NW1/4	0	138	118.7	-105.84278	43.04978
P69355.0W	02/08/1985		DJ84 SC 40	MON	036N	075W	34	SE1/4NW1/4	0	130	117.71	-105.84278	43.04978
P69356.0W	02/08/1985	Complete	DJ84 SC 39	MON	036N	075W	34	SE1/4NW1/4	0	148	130.35	-105.84278	43.04978
P69357.0W	02/08/1985	Complete	DJ84 SC 38	MON	036N	075W	34	SE1/4NW1/4	0	152	134.23	-105.84278	43.04978
P69358.0W	02/08/1985	Complete	DJ84 SC 36	MON	036N	075W	34	SE1/4NW1/4	0	140	123.22	-105.84278	43.04978
P69359.0W	02/08/1985	Complete	DJ84 SC 35	MON	036N	075W	34	SE1/4NW1/4	0	163	132.69	-105.84278	43.04978
P69360.0W	02/08/1985	Complete	DJ84 SC 34	MON	036N	075W	34	SE1/4NW1/4	0	150	122.83	-105.84278	43.04978
P69361.0W	02/08/1985	Complete	DJ84 SC 33	MON	036N	075W	34	SE1/4NW1/4	0	150	126.03	-105.84278	43.04978
P69362.0W	02/08/1985		DJ84 SC 32	MON	036N	075W	34	SE1/4NW1/4	0	155	132.84	-105.84278	43.04978
P69363.0W	02/08/1985	Complete	DJ84 SC 31	MON	036N	075W	34	SE1/4NW1/4	0	190	145.57	-105.84278	43.04978
P69364.0W	02/08/1985	Complete	DJ 84 SC 30	MON	036N	075W	34	SE1/4NW1/4	0	174	147.12	-105.84278	43.04978
P69365.0W	02/08/1985	Complete	DJ84 BA 37	MON	036N	075W	34	NW1/4NE1/4	0	160	124.03	-105.83787	43.05339
P69366.0W	02/08/1985	Complete	DJ84 SC 37	MON	036N	075W	34	SW1/4NE1/4	0	345	280.27	-105.83786	43.04977
P55578.0W	01/02/1981	Complete	DJ81-BA-12	MON	036N	075W	35	NW1/4NW1/4	0	239	255.27	-105.82806	43.05337
P55580.0W	01/02/1981	Complete	DJ81-SC-12	MON	036N	075W	35	NW1/4NW1/4	0	442	361.01	-105.82806	43.05337
P137351.0W	08/13/2001	Complete	36-UB (W)-11	MON	036N	075W	36	NW1/4NE1/4	0	429	412	-105.79885	43.05336
P55574.0W	01/02/1981	Complete	DJ81-SC-11	MON	036N	075W	36	SW1/4NE1/4	0	357	237.91	-105.79876	43.04974
P55575.0W	01/02/1981	Complete	DJ81-IB-11	MON	036N	075W	36	SW1/4NE1/4	0	319	232.29	-105.79876	43.04974
P55576.0W	01/02/1981	Complete	DJ81-BA-11	MON	036N	075W	36	SW1/4NE1/4	0	180	163.91	-105.79876	43.04974
P52694.0W	03/07/1980	Complete	10 OW 1	MON	037N	073W	10	NW1/4NW1/4	0	100	38.45	-105.61814	43.19907
P52693.0W	03/07/1980	Complete	15 OW 1	MON	037N	073W	15	NE1/4NW1/4	0	180	136.24	-105.61304	43.18461
P52692.0W	03/07/1980	Complete	16 OW 1	MON	037N	073W	16	SE1/4NW1/4	0	180	94.71	-105.63279	43.18099
P52690.0W	03/07/1980	Complete	21 0W 1	MON	037N	073W	21	SE1/4SW1/4	0	60	16.75	-105.63276	43.15935
P52691.0W	03/07/1980	Complete	22-0W-1	MON	037N	073W	22	NW1/4NW1/4	0	80	37.36	-105.61794	43.17023
P52689.0W	03/07/1980	Complete	28 OWS 1	MON	037N	073W	28	NE1/4NE1/4	0	160	73.06	-105.62285	43.15575
P77026.0W	06/13/1988	Complete	UM 198	MON	037N	073W	30	SE1/4NW1/4	0	510	220	-105.6724	43.15191

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P77027.0W	06/13/1988	Complete	UM 199	MON	037N	073W	30	SE1/4NW1/4	0	492	220	-105.6724	43.15191
P77028.0W	06/13/1988	Complete	UM 200	MON	037N	073W	30	SE1/4NW1/4	0	505	220	-105.6724	43.15191
P77032.0W	06/13/1988	Complete	U 201	MON	037N	073W	30	SE1/4NW1/4	0	510	220	-105.6724	43.15191
P52686.0W	03/07/1980	Complete	33 OWD 1	MON	037N	073W	33	NW1/4NW1/4	0	360	147.62	-105.63754	43.14308
P52687.0W	03/07/1980	Complete	33 OWS 1	MON	037N	073W	33	NW1/4NW1/4	0	190	133.27	-105.63754	43.14308
P52688.0W	03/07/1980	Complete	33-OWD-2	MON	037N	073W	33	NE1/4SW1/4	0	300	218.3	-105.63269	43.13406
P184482.0W	01/04/2008	Incomplete	SW/SW 25-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	25	SW1/4SW1/4	0			-105.696919	43.144303
P158839.0W	05/13/2004	Complete	26-476 (Reynolds Ranch)	MON	037N	074W	26	SE1/4NW1/4	0	500	237.95	-105.71187	43.1516
P158840.0W	05/13/2004	Complete	26-477 (Reynolds Ranch)	MON	037N	074W	26	SE1/4SE1/4	0	860	289.79	-105.70195	43.14452
P184483.0W	01/04/2008	Incomplete	SE/SE 26-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	26	SE1/4SE1/4	0			-105.701956	43.144214
P184484.0W	01/04/2008	Incomplete	SW/SE 26-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	26	SW1/4SE1/4	0			-105.706803	43.144292
P184485.0W	01/04/2008	Incomplete	NE/SE (2Wells)26-37-74 Mine Unit 27 Monitor Wells	MON	037N	074W	26	NE1/4SE1/4	0			-105.702325	43.147781
P186180.0W	03/26/2008	Incomplete	SE/SE 26-37-74 (6Wells) Mine Unit Monitor	MON	037N	074W	26	SE1/4SE1/4	0			-105.701914	43.144067
P191408.0W	09/01/2009	Incomplete	SE/SE 26-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	26	SE1/4SE1/4	0			-105.702039	43.143878
P59819.0W	02/01/1982	Complete	DJ81-AW-24	MON	037N	074W	30	SE1/4SE1/4	0	50.3	14.85	-105.78123	43.14425
P59818.0W	02/01/1982	Complete	DJ81-AW-25	MON	037N	074W	31	NE1/4NE1/4	0	91.21	12.74	-105.78122	43.14064
P158841.0W	05/13/2004	Complete	35-882 (Reynolds Ranch)	MON	037N	074W	35	SE1/4NW1/4	0	640	337	-105.71184	43.13728
P158842.0W	05/13/2004	Complete	35-883 (Reynolds Ranch)	MON	037N	074W	35	SE1/4NE1/4	0	850	301.44	-105.7019	43.13736
P184478.0W	01/04/2008	Incomplete	SW/NE 35-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	35	SW1/4NE1/4	0			-105.706844	43.137342
P184481.0W	01/04/2008	Incomplete	NW/NE 35-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	35	NW1/4NE1/4	0			-105.707189	43.140569
P185399.0W	03/03/2008	Incomplete	SE/NE 35-37-74 (1 Well) Mine Unit 27 Monitor Well	MON	037N	074W	35	SE1/4NE1/4	0			-105.701869	43.136872
P185401.0W	03/03/2008	Incomplete	NE/SE 35-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	35	NE1/4SE1/4	0			-105.701936	43.133256
P186181.0W	03/26/2008	Incomplete	NE/NE 35-37-74 (6 Wells) Mine Unit 27 Monitor	MON	037N	074W	35	NE1/4NE1/4	0			-105.701878	43.140428
P186183.0W	03/26/2008	Incomplete	SE/NE 35-37-74 (3 Wells) Mine Unit 27 Monitor	MON	037N	074W	35	SE1/4NE1/4	0			-105.701839	43.136722
P191405.0W	09/01/2009	Incomplete	NE/NE 35-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	35	NE1/4NE1/4	0			-105.701686	43.140786
P191409.0W	09/01/2009	Incomplete	SE/NE 35-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	35	SE1/4NE1/4	0			-105.701944	43.136914
P145534.0W	06/26/2002	Complete	SMC1057	MON	037N	074W	36	NE1/4NW1/4	0	604	294	-105.69203	43.141
P145535.0W	06/26/2002	Complete	SMC1060	MON	037N	074W	36	SW1/4NW1/4	0	785	250	-105.69696	43.13739
P184475.0W	01/04/2008	Complete	SE/SW 36-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	SE1/4SW1/4	0			-105.6923	43.130594
P184476.0W	01/04/2008	Incomplete	NE/SW 36-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	NE1/4SW1/4	0			-105.692058	43.133681

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P184477.0W	01/04/2008	Incomplete	SE/NW 36-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	SE1/4NW1/4	0			-105.691908	43.137094
P184479.0W	01/04/2008	Incomplete	NE/NW 36-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	NE1/4NW1/4	0			-105.691906	43.140961
P184480.0W	01/04/2008	Incomplete	NW/NW 36-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	NW1/4NW1/4	0			-105.697311	43.140911
P185400.0W	03/03/2008	Incomplete	SW/NW 36-37-74 (1 Well) Mine Unit 27 Monitor Well	MON	037N	074W	36	SW1/4NW1/4	0			-105.697008	43.136903
P185402.0W	03/03/2008	Incomplete	NW/SW 36-37-74 (3 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	NW1/4SW1/4	0			-105.6969	43.133344
P185403.0W	03/03/2008	Incomplete	SW/SW 36-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	SW1/4SW1/4	0			-105.696892	43.129689
P186182.0W	03/26/2008	Incomplete	NW/NW 36-37-74 (6 Wells) Mine Unit 27 Monitor	MON	037N	074W	36	NW1/4NW1/4	0			-105.696969	43.140444
P186184.0W	03/26/2008	Incomplete	SW/NW 36-37-74 (6 Wells) Mine Unit 27 Monitor	MON	037N	074W	36	SW1/4NW1/4	0			-105.696872	43.136881
P186185.0W	03/26/2008	Incomplete	NW/SW 36-37-74 (6 Wells) Mine Unit 27 Monitor	MON	037N	074W	36	NW1/4SW1/4	0			-105.696972	43.133322
P186186.0W	03/26/2008	Incomplete	SE/SW 36-37-74 (3 Wells) Mine Unit 27 Monitor	MON	037N	074W	36	SE1/4SW1/4	0			-105.691922	43.12965
P191406.0W	09/01/2009	Incomplete	SW/SW 36-37-74 (1 Well) Mine Unit 27 Monitor Well	MON	037N	074W	36	SW1/4SW1/4	0			-105.6964	43.129269
P191407.0W	09/01/2009	Incomplete	SE/SW 36-37-74 (2 Wells) Mine Unit 27 Monitor Wells	MON	037N	074W	36	SE1/4SW1/4	0			-105.691964	43.130217
P191410.0W	09/01/2009	Incomplete	NW/SW 36-37-74 (1 Well) Mine Unit 27 Monitor Well	MON	037N	074W	36	NW1/4SW1/4	0			-105.697078	43.133197
P78282.0W	10/13/1988	Complete	SMC1071S	MON	037N	074W	36	SE1/4NE1/4	0	30	-7.00	-105.68213	43.13746
P78283.0W	10/13/1988	Complete	SMC1072S	MON	037N	074W	36	SE1/4NE1/4	0	32.4	-7.00	-105.68213	43.13746
P4565.0W	02/13/1970	Complete	Smith #37	STK	034N	074W	04	SE1/4NW1/4	10	143	100	-105.74393	42.94834
P59700.0W	03/19/1981	Complete	Keenan #36	STK	034N	074W	05	NW1/4NW1/4	25	80	45	-105.76865	42.95197
P14027.0W	05/30/1972	Complete	Budhall #1	STK	034N	074W	06	NE1/4NW1/4	3	380	120	-105.78334	42.9519
P22378.0P	09/07/1963	Complete	Monument #68	STK	035N	072W	03	NW1/4SE1/4	4	189	85	-105.48219	43.03331
P22360.0P	07/31/1950	Complete	Jenkins #20	STK	035N	072W	08	NE1/4SE1/4	3	204	-1.00	-105.51812	43.01826
P22071.0P	07/27/1966	Complete	Strock #2	STK	035N	072W	18	SW1/4NE1/4	10	255	80	-105.54249	43.0071
P4994.0P	11/10/1966	Complete	Smith #16	STK	035N	073W	02	NE1/4SW1/4	10	200	60	-105.58748	43.03228
P70099.0W	05/09/1985	Complete	Smith 16	STK	035N	073W	02	NE1/4SW1/4	4	140	60	-105.58748	43.03228
P151581.0W	06/03/2003	Complete	Taylor # 3	STK	035N	073W	03	NW1/4NW1/4	7	280	87	-105.61208	43.03943
P3699.0P	03/31/1969	Complete	Smith #17	STK	035N	073W	15	NW1/4SW1/4	7.5	176	75	-105.61142	43.00318
P11831.0W	12/29/1971	Complete	Smith #47	STK	035N	073W	16	NW1/4SE1/4	10	62	20	-105.62126	43.00314
P25039.0W	11/26/1973	Complete	Smith #48	STK	035N	073W	29	NE1/4NW1/4	5	65	35	-105.64613	42.98121
P67930.0W	07/02/1984	Complete	Smith #53	STK	035N	073W	29	SE1/4NE1/4	25	720	390	-105.63619	42.97758
P164093.0W	12/01/2004	Complete	Hay Meadow #1	STK	035N	074W	01	SE1/4NE1/4	6	85	21	-105.67606	43.03562
P5008.0P	11/13/1966	Complete	Smith #35	STK	035N	074W	01	SE1/4NE1/4	10	145	40	-105.67606	43.03562
P154804.0W	11/04/2003	Complete	Hay Meadow #1	STK	035N	074W	02	SW1/4NW1/4	8	85	21	-105.71042	43.03722
P5004.0P	09/25/1937	Complete	Smith #31	STK	035N	074W	03	NW1/4NE1/4	8	80	36	-105.72029	43.03913
P24679.0W	08/24/1973	Complete	KM #2 Smith #2	STK	035N	074W	07	NE1/4NE1/4	80	550	350	-105.77422	43.0245
P5000.0P	03/20/1938	Complete	Smith #27	STK	035N	074W	08	SW1/4SE1/4	8	80	36	-105.7593	43.0138

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P165194.0W	01/12/2005	Complete	Potts #1	STK	035N	074W	10	SW1/4NE1/4	4	180	58	-105.71995	43.02213
P165195.0W	01/12/2005		Potts #2	STK	035N	074W	10	SW1/4SW1/4	3	245	128.5	-105.7298	43.01372
P5001.0P	08/04/1952	Complete	Smith #28	STK	035N	074W	10	NW1/4SW1/4	10	151	35	-105.72979	43.01736
P129283.0W	09/25/2000	Complete	Solar Panel 2	STK	035N	074W	11	NW1/4NE1/4	10	80	12	-105.70035	43.02469
P70101.0W	05/09/1985	Complete	Smith 62	STK	035N	074W	11	NE1/4NE1/4	10	400	125	-105.69546	43.02478
P62481.0W	10/26/1982	Complete	Smith #51	STK	035N	074W	12	NW1/4SE1/4	12	140	24	-105.68071	43.01749
P5002.0P	10/08/1954	Complete	Smith #29	STK	035N	074W	13	SE1/4SW1/4	10	105	55	-105.68559	42.99937
P184775.0W	01/16/2008	Incomplete	East Lola	STK	035N	074W	16	SE1/4NE1/4	7			-105.734653	43.006006
P21501.0P	09/27/1951	Complete	Bowman #1	STK	035N	074W	20	NE1/4NW1/4	10	180	175	-105.76401	42.99716
P3703.0P	04/13/1969	Complete	Smith #26	STK	035N	074W	21	SE1/4SW1/4	7.5	56	38	-105.74416	42.98473
P4564.0W	02/13/1970	Complete	Smith #36	STK	035N	074W	21	SW1/4NE1/4	10	237	140	-105.73937	42.99204
P4998.0P	04/16/1952	Complete	Smith #24	STK	035N	074W	22	NE1/4SW1/4	12	207	140	-105.72463	42.98834
P4999.0P	10/01/1950	Complete	Smith #25	STK	035N	074W	23	NW1/4SW1/4	12	75	35	-105.71013	42.98824
P3702.0P	03/27/1969	Complete	Smith #22	STK	035N	074W	27	SW1/4SW1/4	7.5	126	75	-105.72948	42.97018
P163067.0W	10/04/2004	Complete	West Downs #1	STK	035N	074W	28	SW1/4SW1/4	8	260	135	-105.74904	42.97017
P8611.0W	04/09/1971	Complete	Smith #42	STK	035N	074W	28	SW1/4SW1/4	7	103	60	-105.74904	42.97017
P14028.0W	05/30/1972	Complete	Four Corners #1	STK	035N	074W	30	SE1/4SE1/4	25			-105.77376	42.97003
P38331.0W	06/13/1977	Complete	Coates #1	STK	035N	074W	30	NW1/4SE1/4	13	365	55	-105.77868	42.97362
P163066.0W	10/04/2004		Campbell #1	STK	035N	074W	32	NE1/4NE1/4	6	300	172	-105.75395	42.96652
P8174.0P	03/31/1941	Complete	Henry Keenan #4	STK	035N	074W	33	SW1/4SW1/4	5	141	85	-105.74903	42.95566
P4996.0P	09/23/1950	Complete	Smith #21	STK	035N	074W	35	SE1/4NW1/4	10	135	85	-105.70491	42.96294
P3701.0P	03/18/1952	Complete	Smith #20	STK	035N	074W	36	NW1/4SE1/4	7.5	170	60	-105.68022	42.95938
P46868.0W	03/13/1979	Complete	Adams #1	STK	035N	075W	04	NE1/4NE1/4	5	460	300	-105.85257	43.0389
P131347.0W	12/06/2000	Complete	Herma # 3	STK	035N	075W	15	SE1/4SW1/4	0	180	75	-105.84208	42.99902
P75727.0W	10/08/1987	Complete	Tillard 55 #3	STK	035N	075W	21	SW1/4SE1/4	20	60	20	-105.85678	42.98457
P76256.0W	02/01/1988	Complete	Tillard 55 #3	STK	035N	075W	23	SW1/4NW1/4	4	350	150	-105.82728	42.99217
P32314.0W	03/08/1976	Complete	Seidel #1	STK	035N	075W	28	NW1/4NE1/4	5	180	45	-105.85673	42.98094
P12215.0P	07/31/1920	Complete	Spencer #15	STK	035N	075W	34	SW1/4NE1/4	6	125	100	-105.8369	42.9629
P12216.0P	08/31/1927	Complete	Spencer Pasture #16	STK	035N	075W	34	SW1/4SW1/4	10	130	90	-105.84667	42.95552
P22374.0P	08/16/1960	Complete	Irwin Dike	STK	036N	072W	01	NE1/4NE1/4	3	75	-1.00	-105.4394	43.12852
P14372.0P	03/21/1938	Complete	Numrich #4	STK	036N	072W	05	SE1/4NE1/4	5	190	-1.00	-105.51742	43.12388
P14370.0P	03/21/1938	Complete	Numrich #2	STK	036N	072W	07	NW1/4SE1/4	5	180	-1.00	-105.54137	43.10564
P61086.0W	06/07/1982	Complete	Numrich #3	STK	036N	072W	07	SE1/4SW1/4	5	300	70	-105.54671	43.10187
P14371.0P	03/21/1938	Complete	Numrich #3	STK	036N	072W	08	NE1/4SW1/4	5	185	-1.00	-105.52618	43.10585
P16285.0P	12/31/1936	Complete	Fowler Spring #3	STK	036N	072W	10	NE1/4NE1/4	4	8	0	-105.47828	43.11334
P22372.0P	08/28/1959	Complete	Antone #40	STK	036N	072W	12	SW1/4SE1/4	5	150	-1.00	-105.44397	43.10276
P99382.0W	06/13/1995	Complete	Antone #3	STK	036N	072W	12	NE1/4NE1/4	5	402	210	-105.43918	43.11374
P74925.0W	06/05/1987	Complete	North Box #130	STK	036N	072W	14	NE1/4SW1/4	25	1170	82	-105.46834	43.09161
P31652.0W	10/10/1975	Complete	Enl. Highland #24	STK	036N	072W	17	SW1/4SW1/4	0	740	340	-105.52994	43.08574
P41462.0W	12/22/1977		Enl. Highland #13	STK	036N	072W	17	SE1/4SE1/4	25	691	330	-105.5168	43.08764
P69141.0W	11/26/1984	Complete	Fowler #5	STK	036N	072W	17	NW1/4SE1/4	20	742	420	-105.52165	43.09127
P14369.0P	03/21/1938	Complete	Numrich #1	STK	036N	072W	18	NE1/4NW1/4	5	185	-1.00	-105.54676	43.09822
P16288.0P	09/21/1954	Complete	Lee Fowler #4	STK	036N	072W	20	SE1/4NE1/4	8	-1	-1.00	-105.51707	43.08034
P31649.0W	10/10/1975	Complete	Enl. Highland #21	STK	036N	072W	20	NW1/4SW1/4	0	601	-1.00	-105.53178	43.07665
P31650.0W	10/10/1975	Complete	Enl. Highland #22	STK	036N	072W	20	SW1/4NW1/4	0	681	260	-105.53176	43.08028
P31651.0W	10/10/1975	Complete	Enl. Highland #23	STK	036N	072W	20	NE1/4NW1/4	0	741	260	-105.52682	43.08394

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P16287.0P	09/21/1930	Complete	Fowler Spring #2	STK	036N	072W	22	NW1/4NW1/4	1	3	0	-105.49269	43.08416
P99385.0W	06/13/1995	Complete	North Box #2	STK	036N	072W	22	SW1/4SW1/4	4	405	206	-105.49283	43.0732
P9155.0P	10/21/1968	Complete	Reynolds No. 3	STK	036N	073W	03	NW1/4SW1/4	10	140	21	-105.613183	43.12035
P163616.0W	11/04/2004	Complete	Mangy Coyote S5-1	STK	036N	073W	05	SE1/4SW1/4	1	6	6	-105.64931	43.11688
P99386.0W	06/13/1995	Complete	Willow Creek #1	STK	036N	073W	11	SE1/4SE1/4	8	695	348	-105.57757	43.10157
P14373.0P	12/31/1938	Complete	Numrich #5	STK	036N	073W	13	SE1/4SW1/4	5	185	-1.00	-105.56776	43.08697
P144333.0W	05/06/2002	Complete	Terrell No. 1	STK	036N	073W	15	SW1/4SW1/4	7	146	85	-105.61226	43.08679
P153488.0W	08/13/2003	Complete	Duck Creek #17-2	STK	036N	073W	17	SW1/4NW1/4	5.8	183	106	-105.65199	43.09379
P163615.0W	11/04/2004	Complete	Duck Creek #17-1	STK	036N	073W	17	SW1/4NW1/4	2	7	7	-105.65199	43.09379
P77858.0W	08/23/1988	Complete	Duck Creek #17	STK	036N	073W	17	SW1/4NE1/4	2	255	102	-105.64204	43.09381
P27911.0W	09/05/1974	Complete	Adams #1	STK	036N	073W	19	NW1/4NE1/4	25	300	100	-105.66188	43.08286
P9161.0P	08/31/1938	Complete	Reynolds #20	STK	036N	073W	20	NW1/4NW1/4	4	47	26	-105.64959	43.08294
P160753.0W	07/12/2004	Complete	Reynolds #21-3	STK	036N	073W	21	NE1/4NW1/4	5	317	148	-105.62707	43.08305
P6986.0P	10/28/1960	Complete	Vollman #4	STK	036N	073W	21	SW1/4SE1/4	4	200	127	-105.62214	43.07218
P14377.0P	03/21/1938	Complete	Numrich #9	STK	036N	073W	22	NW1/4NE1/4	5	180	-1.00	-105.60486	43.08316
P14374.0P	03/21/1938	Complete	Numrich #6	STK	036N	073W	23	SW1/4NE1/4	5	170	-1.00	-105.58261	43.07959
P14375.0P	03/21/1938	Complete	Numrich #7	STK	036N	073W	23	SE1/4NW1/4	5	180	-1.00	-105.58761	43.07956
P14376.0P	03/21/1938	Complete	Numrich #8	STK	036N	073W	23	NW1/4NW1/4	5	180	-1.00	-105.59254	43.08309
P6987.0P	09/20/1952	Complete	Vollman #5	STK	036N	073W	26	SW1/4NE1/4	5	198	94	-105.582739	43.065061
P6983.0P	08/21/1955	Complete	Vollman #1	STK	036N	073W	27	SW1/4SE1/4	5	180	142.3	-105.60249	43.05768
P75937.0W	08/12/1987	Complete	Stock Water Overfiling SWEPI #1 Water	STK	036N	073W	27	NW1/4SE1/4	25	710	450	-105.60251	43.06133
P6984.0P	11/30/1932	Complete	Vollman #2	STK	036N	073W	30	SE1/4NE1/4	5	100	85	-105.65661	43.06473
P6989.0P	12/31/1932	Complete	Vollman #7	STK	036N	073W	30	NE1/4NE1/4	5	32	-1.00	-105.65661	43.06838
P6985.0P	09/25/1940	Complete	Vollman #3	STK	036N	073W	35	NE1/4SE1/4	5	20	15	-105.57774	43.04691
P9154.0P	07/31/1940	Complete	Reynolds #1	STK	036N	074W	01	SW1/4NE1/4	3	11	4	-105.68173	43.12276
P47627.0W	04/09/1979	Complete	Granpa #1	STK	036N	074W	03	NW1/4NE1/4	25			-105.72102	43.12646
P139440.0W	10/02/2001	Complete	Judson Spring	STK	036N	074W	06	SE1/4NW1/4	12	10	1	-105.78466	43.12241
P30728.0W	08/15/1975		Hornbuckle #17	STK	036N	074W	08	SW1/4SW1/4	8	92	54	-105.76985	43.10079
P126089.0W	06/12/2000	Complete	Upper Brown Spring #1	STK	036N	074W	09	NW1/4SW1/4	25	160	29	-105.75011	43.10458
P163613.0W	11/04/2004	Complete	Silver Spoon Spring S12-1	STK	036N	074W	12	NW1/4NW1/4	1	4	1	-105.69136	43.1119
P9158.0P	11/30/1951	Complete	Reynolds #13	STK	036N	074W	13	NW1/4NW1/4	3	195	150	-105.69125	43.09743
P30999.0W	09/19/1975	Complete	Smith #51	STK	036N	074W	17	NE1/4NE1/4	5	100	78	-105.75502	43.09729
P19184.0P	09/30/1956	Complete	Lenzen #1	STK	036N	074W	19	SW1/4SE1/4	7.5	225	102	-105.77957	43.07147
P55599.0W	02/18/1981	Complete	Lenzen Ranch Co. #3	STK	036N	074W	19	NE1/4NW1/4	6	260	60	-105.78459	43.08236
P8625.0W	03/26/1971	Complete	Smith #41	STK	036N	074W	20	NE1/4SE1/4	7	85	60	-105.75492	43.0754
P5006.0P	11/12/1966	Complete	Smith #33	STK	036N	074W	23	SE1/4SW1/4	8	175	60	-105.70581	43.07186
P5007.0P	09/16/1938	Complete	Smith #34	STK	036N	074W	24	NE1/4SW1/4	8	145	110	-105.68609	43.07553
P111655.0W	09/03/1998	Complete	WW109 A	STK	036N	074W	26	NW1/4NE1/4	4	200	90	-105.70082	43.07004
P5005.0P	10/22/1954	Complete	Smith #32	STK	036N	074W	27	NE1/4SW1/4	8	287	115	-105.72535	43.06093
P70100.0W	05/09/1985	Complete	Smith 61	STK	036N	075W	23	SE1/4SE1/4	4	200	125	-105.81354	43.07144
P30898.0W	09/02/1975	Complete	Smith #50	STK	036N	075W	26	SE1/4SE1/4	4	65	50	-105.81348	43.05697
P14636.0P	09/21/1952	Complete	#1 G Manning Southwest Windmill	STK	037N	072W	30	SE1/4SE1/4	5	180	126	-105.54235	43.14532
P196886.0W	10/10/2011	Incomplete	Manning No. 11	STK	037N	072W	30	SW1/4SE1/4	25			-105.547133	43.144739
P70352.0W	06/06/1985	Complete	Manning #9	STK	037N	072W	31	SE1/4SW1/4	3	120	20	-105.55124	43.13082

Table 3.4-4 Groundwater Rights within 5 kilometers of Smith Ranch

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P19964.0P	05/11/1955	Complete	Hornbuckle Well #3	STK	037N	073W	08	SW1/4NE1/4	8	530	-1.00	-105.6479	43.19545
P19968.0P	12/31/1942	Complete	Hornbuckle Well #7	STK	037N	073W	17	SE1/4SW1/4	8	210	100	-105.65268	43.17366
P19965.0P	12/31/1940	Complete	Hornbuckle Well #4	STK	037N	073W	19	SW1/4SE1/4	8	130	90	-105.66751	43.15914
P195606.0W	05/02/2011	Incomplete	Smuck No. 2	STK	037N	073W	20	NW1/4NW1/4	25			-105.657622	43.169578
P69509.0W	02/06/1985	Complete	DCR # 27 (37-73)	STK	037N	073W	27	NW1/4NE1/4	25	1000	140	-105.607939	43.155781
P75999.0W	11/13/1987	Complete	Duck Creek #28	STK	037N	073W	28	SW1/4SW1/4	3	240	110	-105.63768	43.14488
P94859.0W	03/28/1994		Duck Creek #30	STK	037N	073W	30	SW1/4SW1/4	20			-105.67725	43.1447
P28416.0W	11/15/1974	Complete	Duck Creek #1	STK	037N	073W	31	SW1/4SW1/4	13.5	440	40	-105.67717	43.13027
P96420.0W	08/02/1994	Complete	Duck Creek #31	STK	037N	073W	31	NW1/4NW1/4	2	170	125	-105.67723	43.14109
P9167.0P	09/30/1951	Complete	Reynolds #32	STK	037N	073W	32	SW1/4SW1/4	3	175	130	-105.65773	43.12857
P94860.0W	03/28/1994	Complete	Duck Creek #32	STK	037N	073W	32	NE1/4SW1/4	5	320	240	-105.65249	43.13398
P129266.0W	09/22/2000	Complete	Wes Dipping Vat	STK	037N	074W	08	SE1/4NW1/4	25	115	36	-105.77153	43.1945
P24118.0P	12/31/1968	Complete	ART #55 1	STK	037N	074W	08	NE1/4SE1/4	3	200	-1.00	-105.76158	43.19092
P3319.0W	09/30/1969	Complete	Section 8 37 74 Well #1	STK	037N	074W	08	NW1/4SE1/4	2	215	-4.00	-105.76654	43.19091
P36169.0P	02/09/1977	Complete	Henry #5	STK	037N	074W	08	SE1/4SW1/4	25	300	-6.00	-105.77146	43.1873
P158737.0W	04/30/2004		Phillips Creek Windmill	STK	037N	074W	09	SW1/4SW1/4	25			-105.75661	43.18736
P158736.0W	04/30/2004	Complete	South Past. Solar	STK	037N	074W	10	NE1/4SW1/4	2.5	150	39	-105.73176	43.19127
P19962.0P	12/31/1918	Complete	Hornbuckle Well #1	STK	037N	074W	12	NW1/4NW1/4	25	-1	-1.00	-105.69722	43.19859
P19967.0P	12/31/1941	Complete	Hornbuckle Well #6	STK	037N	074W	12	SE1/4SW1/4	10	510	25	-105.69224	43.18786
P7720.0P	11/24/1957	Complete	Henry #4	STK	037N	074W	14	NE1/4NE1/4	4	255	-6.00	-105.7021	43.18411
P140786.0W	11/13/2001	Complete	Shearing Pens # 2	STK	037N	074W	20	SW1/4SW1/4	6	118	1	-105.77631	43.15867
P113277.0W	12/07/1998		Hooper House Spring	STK	037N	074W	21	NE1/4NW1/4	0	0	0	-105.7516	43.1695
P158732.0W	04/30/2004		Waters Fee 31-21	STK	037N	074W	21	NW1/4NE1/4	25			-105.74666	43.16961
P158735.0W	04/30/2004	Complete	Hooper House Well	STK	037N	074W	21	NW1/4SW1/4	5	245	54	-105.75652	43.1622
P193958.0W	09/15/2010	Incomplete	Upper Pasture #2	STK	037N	074W	22	SE1/4SW1/4	5			-105.731811	43.158706
P7719.0P	10/30/1945	Complete	Henry #3	STK	037N	074W	23	NW1/4NE1/4	5	235	23	-105.70696	43.16966
P19971.0P	11/03/1959	Complete	Hornbuckle Well #10	STK	037N	074W	24	NW1/4NW1/4	8	140	90	-105.69708	43.16976
P126088.0W	06/12/2000	Complete	Lower Brown Springs #1	STK	037N	074W	32	SE1/4NW1/4	25	200	86	-105.77128	43.13705
P17314.0P	08/13/1955	Complete	Mason #2	STK	037N	074W	34	SW1/4SE1/4	4	255	120	-105.72668	43.13004
P9169.0P	06/30/1942	Complete	Reynolds #36 (deepened)	STK	037N	074W	36	SE1/4NE1/4	3	180	58	-105.68213	43.13746

Table 3.4-5 Peak Discharges for Design Recurrence Interval Storm Events

Basin	Area (ac)	Channel Length (ft)	Channel Slope (ft/ft)	Basin Relief (ft)	Tc (min)	Qpk 50-yr, 6-hr (cfs)	Qpk 100-yr, 6-hr (cfs)
A1	106.0	2544	0.033	90	11.5	71.00	82.82
A2	62.5	1779	0.037	70	9.6	37.15	51.28
A3	3.1	619	0.045	35	7.5	1.95	2.68
A4	56.8	2093	0.055	115	8.7	34.60	47.50
A	**228.4**	-	-	-	-	**106.48***	**155.50***
B1	143.0	6359	0.088	560	10.0	128.87	166.76
B2	38.9	1996	0.055	110	7.9	24.19	33.18
B3	26.1	1202	0.025	30	9.9	15.35	21.21
B4	22.8	370	0.069	45	26.6	13.80	18.45
B	**230.8**	-	-	-	-	**131.76***	**183.2***
C1	173.4	4964	0.098	485	9.4	120.91	162.58
C2	52.4	2169	0.058	125	8.5	34.70	47.09
C3	51.5	3718	0.027	100	14.7	26.84	37.54
C	**277.3**	-	-	-	-	**120.27***	**177.75***
D1	60.5	2509	0.052	150	8.7	36.87	50.71
D	**60.5**	-	-	-	-	**29.77***	**43.18***
E1	102	2931	0.044	130	10.7	68.87	92.94
E2	103.3	4166	0.031	130	14.6	54.29	75.89
E	**205.3**	-	-	-	-	**80.11***	**119.57***
F1	69.2	2476	0.044	110	10.6	50.42	67.26
F2	97.5	3364	0.051	170	11.2	85.58	111.02
F3	45.7	2017	0.072	55	12.1	32.16	43.02
F4	81.3	4633	0.019	90	20.3	39.69	52.26
F	**332.4**	-	-	-	-	**154.10***	**222.42***
G1	555.3	10157	0.039	395	18.7	338.66	458.60
G2	23.6	812	0.037	30	7.9	14.68	20.13
G3	49.5	2942	0.025	75	13.9	26.48	36.94
G	**628.4**	-	-	-	-	**238.39***	**342.49***
H1	323.2	5531	0.033	185	16.4	161.21	226.35
H2	24.5	2004	0.030	60	10.7	14.11	19.55
H3	29.6	2315	0.013	30	16.2	14.84	20.83
H	**377.3**	-	-	-	-	**126.64***	**189.48***
I1	127.1	2556	0.037	95	11.0	72.49	100.49
I2	235.6	3290	0.015	50	18.2	112.91	158.97
I3	83.0	1642	0.010	25	16.2	41.61	58.40
I4	31.1	1208	0.058	70	7.0	19.75	26.99
I5	12.6	625	0.016	10	10.5	7.30	10.10
I	**489.4**	-	-	-	-	**157.74***	**231.56***

Basin totals are not the arithmetic sum of the sub-basins. Totals are modeled flows at the outlet and account for friction losses, routing lag times, etc.

Table 3.4-6 North Butte Surface Water Quality Data Within 2 Kilometers

		Major Ions (mg/l)											
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Ammonia as N	Nitrite + Nitrate as N	Fluoride	Silica
Smple Name	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NH4	NO2+ NO3	F	SiO2
NBI-3	6/1/2011	12	2	ND	11	ND	62	ND	ND	0.07	ND	ND	28.3
NBI-5	8/13/2010	52	7	256	16	130	491	27	23	1.44	ND	0.60	10.3
NBI-5	6/1/2011	31	4	9	5	12.0	62	42	ND	ND	ND	ND	5.4
NBI-6	6/1/2011	7	2	1	6	ND	40	2	ND	ND	ND	ND	16.3
NBI-8	6/1/2011	12	2	ND	7	ND	58	ND	ND	ND	ND	ND	15.8
NBI-10	6/1/2011	19	3	ND	6	ND	83	ND	ND	ND	ND	ND	10.7
NBI-11	6/1/2011	21	3	ND	7	ND	90	1	17	ND	ND	ND	19.5
NBI-12	8/12/2010	60	13	96	27	ND	471	29	23	2.26	ND	0.40	4.0
NBI-12	6/1/2011	26	3	4	7	ND	99	12	2	0.10	ND	ND	11.9
NBI-14	6/1/2011	68	14	13	13	ND	161	131	5	ND	ND	ND	22.4
NBI-15	6/1/2011	128	30	11	16	ND	409	153	3	ND	ND	ND	26.0
NBI-15	9/20/2011	62	61	22	5	7	288	190	5	ND	ND	0.20	1.0
NBI-16	8/13/2010	54	9	7	20	ND	235	3	9	1.88	ND	0.20	10.1
NBI-16	6/1/2011	23	3	ND	7	ND	96	4	1	ND	ND	ND	10.8
NBI-16	9/20/2011	32	6	2	14	16	97	ND	ND	ND	ND	0.10	24.3
NBI-17	6/1/2011	9	2	ND	7	ND	46	ND	ND	ND	ND	ND	13.6
NBSD-1/ NBXS-13	6/2/2011	173	36	47	14	ND	386	345	12	0.09	3.00	0.10	19.3
n=		17	17	11	17	4	17	12	10	6	1	6	17
Average		46	12	43	11	41	187	78	10	0.97	3.0	0.3	14.7
Standard Deviation		45	16	76	6	59	160	107	8	1.01	-	0.2	7.8
Minimum		7	2	1	5	7	40	1	1	0.07	3.0	0.1	1.0
Maximum		173	61	256	27	130	491	345	23	2.26	3.0	0.6	28.3

		Non-Metals (mg/L)					Trace Metals (mg/l) DISSOLVED																
		Conductivity (umho/cm)	pH (std units)	Total Dissolved Solids @ 180°C	Total Susp. Solids @ 105°C	Turbidity (NTU)	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc
Smple Name	Sample Date	Cond.	pH	TDS	TSS	Turb.	Al	As	Ba	Be	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn
NBI-3	6/1/2011	98	7.6	106	ND	3.2	ND	0.001	ND	ND	ND	ND	ND	ND	0.07	ND	ND	ND	ND	ND	ND	ND	ND
NBI-5	8/13/2010	1140	9.7	1390	-	-	0.6	0.040	0.20	-	0.10	ND	ND	0.08	1.19	0.001	0.69	ND	ND	ND	0.002	ND	0.04
NBI-5	6/1/2011	222	9.6	165	ND	17.3	0.2	0.005	ND	ND	ND	ND	ND	ND	0.20	ND	ND	ND	0.02	ND	ND	ND	ND
NBI-6	6/1/2011	62	7.6	103	7.0	47.7	1.5	0.002	ND	ND	ND	ND	ND	ND	0.46	ND	ND	ND	ND	ND	ND	ND	ND
NBI-8	6/1/2011	90	7.7	87	29.0	20.9	0.1	0.002	ND	ND	ND	ND	ND	ND	0.18	ND	ND	ND	ND	ND	ND	ND	ND
NBI-10	6/1/2011	124	7.7	117	ND	21.3	0.2	0.003	ND	ND	ND	ND	ND	ND	0.20	ND	ND	ND	ND	ND	ND	ND	ND
NBI-11	6/1/2011	138	7.7	127	23.0	42.7	0.1	0.002	ND	ND	ND	ND	ND	ND	0.14	ND	ND	ND	ND	ND	ND	ND	ND
NBI-12	8/12/2010	770	7.6	609	-	-	ND	0.017	0.3	-	0.2	ND	ND	0.02	0.79	ND	0.72	ND	ND	ND	0.002	ND	0.01
NBI-12	6/1/2011	180	7.9	173	130.0	144.0	0.50	0.003	ND	ND	ND	ND	ND	ND	0.30	ND	ND	ND	ND	ND	ND	ND	ND
NBI-14	6/1/2011	512	7.6	378	ND	7.0	ND	0.003	ND	ND	ND	ND	ND	ND	0.09	ND	0.10	ND	ND	ND	0.003	ND	ND
NBI-15	6/1/2011	836	8.3	601	6.0	4.2	ND	0.004	0.2	ND	ND	ND	ND	ND	0.04	ND	0.10	ND	ND	ND	0.004	ND	ND
NBI-15	9/20/2011	788	8.4	513	-	-	ND	0.004	ND	-	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	0.001	ND	ND
NBI-16	8/13/2010	361	7.7	286	-	-	0.90	0.006	0.2	-	0.1	ND	ND	0.25	0.41	0.042	0.04	ND	ND	ND	0.001	ND	0.59
NBI-16	6/1/2011	156	8.0	120	ND	4.9	ND	0.003	ND	ND	ND	ND	ND	ND	0.11	ND	ND	ND	ND	ND	0.001	ND	ND
NBI-16	9/20/2011	212	9.4	195	-	-	0.10	0.016	ND	-	ND	ND	ND	ND	0.16	ND	0.01	ND	ND	ND	0.002	ND	ND
NBI-17	6/1/2011	71	7.4	66	ND	5.9	ND	0.001	ND	ND	ND	ND	ND	ND	0.09	ND	ND	ND	ND	ND	ND	ND	ND
NBSD-1/ NBXS-13	6/2/2011	1190	7.9	875	183.0	129.0	ND	0.004	0.2	ND	ND	ND	ND	ND	ND	ND	0.13	ND	ND	ND	0.006	ND	ND
n=		17	17	17	6	12	9	17	5	0	3	0	0	3	15	2	8	0	1	0	9	0	3
Average		409	8.1	348	63	37.3	0.5	0.007	0.2	-	0.1	-	-	0.12	0.30	0.022	0.23	-	0.020	-	0.002	-	0.213
Standard Deviation		387	0.7	357	75	48.7	0.5	0.010	0.0	-	0.1	-	-	0.12	0.32	0.029	0.30	-	-	-	0.002	-	0.327
Minimum		62	7.4	66	6	3.2	0.1	0.001	0.2	ND	0.1	ND	ND	0.02	0.04	0.001	0.01	ND	0.020	ND	0.001	ND	0.010
Maximum		1190	9.7	1390	183	144.0	1.5	0.040	0.3	ND	0.2	ND	ND	0.25	1.19	0.042	0.72	ND	0.020	ND	0.006	ND	0.590

		Trace Metals (mg/l) TOTALS			Radiometrics (pCi/L) DISSOLVED								Radiometrics (pCi/L) SUSPENDED				
		Iron	Manganese	Mercury	Lead 210	Uranium (mg/L)	Radium 226	Radium 228	Thorium 230	Polonium 210	Gross Alpha	Gross Beta	Lead 210	Uranium (mg/L)	Radium 226	Thorium 230	Polonium 210
Smple Name	Sample Date	Fe	Mn	Hg	210Pb	NatU	226Ra	228Ra	230Th	210Po	-	-	210Pb	NatU	226Ra	230Th	210Po
NBI-3	6/1/2011	0.12	ND	ND	-0.50	ND	0.04	0.10	0.006	0.40	-2.0	8.3	1.40	0.0006	0.13	0.30	0.40
NBI-5	8/13/2010	64.60	1.30	-	-	0.016	5.30	3.90	-	-	36.8	28.2	-	-	-	-	-
NBI-5	6/1/2011	0.90	0.02	ND	-0.60	0.013	0.01	-0.50	0.080	-0.05	0.5	3.8	0.06	ND	-0.07	0.10	0.20
NBI-6	6/1/2011	2.49	0.02	ND	0.00	0.004	-0.10	0.50	0.060	0.40	0.4	6.9	0.20	0.0003	0.04	0.07	0.10
NBI-8	6/1/2011	1.04	0.01	ND	-0.70	ND	-0.01	0.20	0.010	0.40	-0.6	6.7	0.30	0.0004	0.05	0.20	0.10
NBI-10	6/1/2011	1.04	0.02	ND	-0.10	ND	0.09	0.60	0.002	0.30	-0.5	3.8	0.10	ND	0.08	0.05	0.08
NBI-11	6/1/2011	1.88	0.03	ND	-0.50	ND	0.05	0.90	0.020	0.30	-1.0	6.2	0.50	ND	0.15	0.09	0.30
NBI-12	8/12/2010	44.90	1.82	-	-	0.009	2.70	1.20	-	-	11.6	30.9	-	-	-	-	-
NBI-12	6/1/2011	6.52	0.07	ND	-0.60	0.0004	0.09	1.20	0.090	0.30	0.7	9.2	0.50	0.0004	0.33	0.10	0.90
NBI-14	6/1/2011	0.37	0.11	ND	-0.80	0.002	0.13	0.40	0.040	-0.03	-0.9	14.9	0.20	ND	-0.10	0.10	0.10
NBI-15	6/1/2011	0.05	0.22	ND	-1.00	0.074	0.03	-0.60	0.080	0.10	124.0	45.6	0.20	0.0004	0.11	0.08	0.10
NBI-15	9/20/2011	0.12	0.03	-	0.30	0.084	0.20	-0.30	0.090	0.07	108.0	36.2	0.30	0.0004	0.18	0.60	0.20
NBI-16	8/13/2010	29.40	0.96	-	-	0.009	3.90	2.00	-	-	13.0	29.4	-	-	-	-	-
NBI-16	6/1/2011	0.39	0.02	ND	-0.60	0.0005	-0.02	0.40	0.100	2.80	-0.7	5.6	0.70	0.0005	0.26	0.10	0.10
NBI-16	9/20/2011	1.25	0.08	-	0.30	0.0160	0.08	0.30	0.0009	0.80	-0.5	12.7	-0.20	ND	0.32	0.40	-0.30
NBI-17	6/1/2011	0.24	ND	ND	-0.40	ND	-0.08	0.50	-0.020	0.40	-2.0	5.0	-0.10	0.0005	0.13	0.20	0.40
NBSD-1/ NBXS-13	6/2/2011	7.55	0.38	ND	-0.05	0.0359	0.31	0.40	0.004	0.30	32.5	22.3	1.80	0.0020	1.30	0.50	1.80
n=		17	15	0	14	12	17	17	14	14	17	17	14	9	14	14	14
Average		9.58	0.34	-	-0.38	0.022	0.75	0.66	0.04	0.46	18.78	16.22	0.43	0.0006	0.21	0.21	0.32
Standard Deviation		18.72	0.56	-	0.40	0.028	1.61	1.05	0.04	0.71	38.54	13.19	0.56	0.0005	0.34	0.18	0.50
Minimum		0.05	0.01	ND	-1.00	0.0004	-0.10	-0.60	-0.02	-0.05	-2.00	3.80	-0.20	0.0003	-0.10	0.05	-0.30
Maximum		64.60	1.82	ND	0.30	0.084	5.30	3.90	0.10	2.8	124.0	45.6	1.80	0.0020	1.30	0.60	1.80

Table 3.4-7 North Butte Remote Satellite Sediment Quality Data

Sample Name	Sample Date	Radiometrics Totals (pCi/g-dry)			
		Uranium (NatU)	Lead-210 (210Pb)	Radium-226 (226Ra)	Thorium-230 (230Th)
NBI-1	8/12/2010	6.83	1.3	2.4	1.6
NBI-2	8/12/2010	3.46	1.3	1.8	1.3
NBI-3	8/12/2010	2.11	2.7	1.9	0.9
NBI-4	8/12/2010	3.44	1.3	2.0	1.6
NBI-5	8/12/2010	2.24	1.9	1.5	0.6
NBI-6	8/12/2010	1.98	2.2	1.8	0.9
NBI-7	8/12/2010	1.97	0.9	1.6	1.0
NBI-8	8/12/2010	2.17	3.3	2.1	1.3
NBI-9	8/12/2010	2.73	1.8	2.2	1.3
NBI-10	8/12/2010	3.08	6.4	10.4	8.6
NBI-11	8/12/2010	1.64	2.7	1.9	1.2
NBI-12	8/12/2010	1.96	2.9	1.7	1.2
NBI-13	8/13/2010	1.70	2.7	1.6	1.3
NBI-14	8/13/2010	1.84	1.9	1.6	1.1
NBI-14	9/20/2011	2.56	2.1	1.7	1.3
NBI-15	8/13/2010	3.84	1.6	1.1	0.9
NBI-16	8/13/2010	2.81	1.8	1.4	1.0
NBI-17	8/13/2010	2.47	1.9	1.3	0.8
NBI-18	8/13/2010	2.26	1.4	1.0	0.6
NBSWS-1	8/12/2010	2.87	1.7	1.7	0.7
NBSWS-1	6/1/2011	2.36	1.1	1.4	0.9
NBSWS-2	8/12/2010	2.88	2.3	1.8	1.5
NBSWS-2	6/1/2011	2.09	0.6	1.1	0.6
NBSWS-3	8/12/2010	1.53	1.1	1.0	0.8
NBSWS-3	6/1/2011	1.26	0.6	0.9	0.5
NBSU-1	8/13/2010	1.45	1.9	0.9	0.5
NBSU-1	6/2/2011	1.38	0.6	1.0	0.6
NBSU-2	8/13/2010	1.90	1.3	1.2	1.0
NBSU-2	9/20/2011	1.43	1.1	1.0	0.7
NBSU-3	8/13/2010	2.13	1.7	1.2	0.7
NBSU-3	6/2/2011	1.78	1.2	0.9	0.3
NBSU-4	8/13/2010	2.25	1.3	1.1	0.7
NBSU-4	5/31/2011	1.11	0.6	0.8	0.3
NBSU-5	8/13/2010	2.16	1.7	1.1	0.8
NBSU-5	6/2/2011	1.92	0.6	1.2	0.7
NBSU-6	8/14/2010	2.67	1.6	1.1	1.0
NBSU-6	5/31/2011	1.93	0.5	0.9	1.0
NBSD-1	8/13/2010	1.84	0.8	0.8	0.5
NBSD-1*	6/2/2011	1.58	0.5	0.9	0.5
NBSD-2	8/13/2010	1.57	1.9	1.2	0.8
NBSD-2	6/2/2011	1.62	0.7	1.0	0.7
NBSD-3	8/13/2010	1.91	2.2	1.2	0.9
NBSD-3	6/2/2011	1.27	1.4	0.9	0.5
NBXS-1	6/2/2011	1.29	1.1	0.7	0.3
NBXS-2	8/14/2010	1.15	1.2	0.8	0.8
NBXS-2	6/2/2011	1.17	0.8	0.7	0.3
NBXS-3	6/2/2011	1.24	1.0	0.8	0.4
NBXS-4	6/2/2011	3.97	1.3	1.9	1.5
NBXS-5	6/2/2011	2.19	0.8	1.2	0.9
NBXS-6	6/2/2011	1.98	1.4	1.2	0.9
NBXS-7	8/14/2010	2.93	1.3	1.2	1.3

Table 3.4-7 North Butte Remote Satellite Sediment Quality Data

Sample Name	Sample Date	Radiometrics Totals (pCi/g-dry)			
		Uranium (NatU)	Lead-210 (210Pb)	Radium-226 (226Ra)	Thorium-230 (230Th)
NBXS-7	6/2/2011	2.47	0.8	1.0	0.9
NBXS-8	8/14/2010	1.54	0.5	0.7	0.5
NBXS-8	6/1/2011	1.96	0.8	1.0	0.7
NBXS-9	6/1/2011	2.01	0.6	1.0	0.6
NBXS-10	6/1/2011	2.09	0.4	1.0	1.0
NBXS-10	9/21/2011	2.06	0.6	0.8	0.7
NBXS-11	6/1/2011	3.37	1.3	1.3	1.2
NBXS-12	6/1/2011	2.82	0.6	1.1	1.0
NBXS-13*	6/2/2011	1.58	0.5	0.9	0.5
	n =	60	60	60	60
	Average	2.2	1.4	1.4	1.0
	Standard Deviation	0.9	0.9	1.3	1.1
	Minimum	1.1	0.4	0.7	0.3
	Maximum	6.8	6.4	10.4	8.6

* Sampled at same location.

Table 3.4-8 Wells within 2 kilometers of the North Butte Remote Satellite

Permit Number	Permit Priority	Uses	Permit Facility Name	Permit Applicant	T	R	SEC	QQ	Static Water Level	Well Depth	Flow Amount	Comments
P13299P	8/15/68	STO	1-8-44-75 Jordan	Naomi A. Jordan	44	75	8	SENW	0	-1	5	Not found in field.
P58966W	11/13/81	STO	Sheepstick Well #1	Brown Land Co.	44		17	NENE			25	No longer in use.
P89253W	8/11/92	STO	CCI #2	T-Chair Land Co.	44	75	17	NWSE	214.6	440	8	Contains submersible pump, discharges to stock tank.
P11893P	12/11/62	STO	North Pfister #2	Brown Land Co.	44	75	18	SWNE	80	250	1.5	No longer in use.
P40889W	11/25/77	STO,MIS	Brown #6 [?=Beck well?]	American Nuclear Corp.** Brown Land Co.	44	75	19	SESW	400	780	40	Used for lawn watering and stock use.
P114048W	2/18/99	STO	Dobie Hill Well #1	T-Chair Land Co.	44	75	29	SWSE	295	640	25	Contains submersible pump, discharges to stock tank.
P36013W	1/17/77	STO	Brown #5	Franklin Brown	44	75	30	SWNE	90	540	45	Contains submersible pump, discharges to stock pond.
P48652W	6/21/79	STO	Cities Service Brown (WS)	Brown Land Co.	44	75	31	NWNW	280	702	25	Contains submersible pump, discharges to stock tank.
P15069P	12/31/60	STO	Brown #2 (Flowing Spring)	Brown Land Co.	44	76	14	SESE	spring	no well	8	No longer flowing.
P63604W	4/6/83	STO	Red Barrel #1	T-Chair Livestock Co.	44	76	25	SWNW	125	525	10	Contains submersible pump, discharges to stock tank and pond.
P24095P	12/21/53	STO	Calving Shed #18	John Christensen	44	76	27	NWNW	40	140	4	No longer in use.
P15068P [? = P23206W]	6/8/73	STO	Brown #1 (Flowing Spring)	Brown Land Co.	44	76	11	NESE	spring	no well	5	Flows to stock tank.

		Major Ions (mg/l)											Non-Metals (mg/L)			Trace Metals (mg/l) DISSOLVED																	Trace Metals (mg/l) TOTALS			Radiometrics (pCi/L) DISSOLVED								Radiometrics (pCi/L) SUSPENDED				
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	pH (std units)	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Mercury	Lead 210	Uranium (mg/L)	Radium 226	Radium 228	Thorium 230	Polonium 210	Gross Alpha	Gross Beta	Lead 210	Uranium (mg/L)	Radium 226	Thorium 230	Polonium 210
Well Name	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+ NO3	F	SiO2	TDS	Cond.	pH	Al	As	Ba	Be	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	Hg	210Pb	NatU	226Ra	228Ra	230Th	210Po	-	-	210Pb	NatU	226Ra	230Th	210Po
Red Barrel #1	6/1/2011	73	16	174	5	ND	181	487	5	ND	0.2	9.7	857	1230	8.0	ND	ND	ND	ND	0.30	ND	ND	ND	0.07	ND	0.17	ND	ND	ND	ND	ND	0.01	0.49	0.16	ND	0.60	0.019	0.25	0.50	0.030	1.80	40.1	12.9	0.20	ND	-0.08	0.02	0.09
Red Barrel #1	9/20/2011	78	17	183	5	ND	169	488	5	ND	0.2	9.9	851	1210	8.0	ND	ND	ND	-	ND	ND	ND	ND	0.07	ND	0.16	ND	ND	ND	ND	ND	0.02	0.60	0.15	-	0.60	0.019	1.20	0.60	-0.008	0.20	39.5	13.8	-0.30	ND	-0.005	0.10	0.10
Red Barrel #1 (Dup)	9/21/2011	75	17	181	5	ND	168	481	5	ND	0.2	9.1	849	1220	7.9	ND	ND	ND	-	0.10	ND	ND	ND	0.05	ND	0.15	ND	ND	ND	ND	ND	0.02	0.51	0.16	-	0.04	0.019	0.34	0.30	0.060	5.10	30.5	11.2	-0.20	ND	0.03	0.30	0.20
CCI #2	6/1/2011	76	18	114	6	ND	255	302	3	0.5	ND	11.7	654	960	8.0	ND	ND	ND	ND	0.20	ND	ND	ND	ND	ND	0.01	ND	ND	ND	0.09	ND	ND	ND	0.02	ND	-0.09	0.130	0.40	1.30	0.040	-0.02	299.0	56.4	1.30	0.0006	0.36	0.03	1.10
CCI #2	9/20/2011	79	19	112	6	ND	238	302	3	0.6	ND	12.3	639	948	7.9	ND	ND	ND	-	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	0.09	ND	0.48	0.69	0.03	-	0.50	0.123	0.80	1.00	0.030	0.50	294.0	41.3	0.70	0.0023	0.34	0.30	1.40
Dobie Hill #1	6/1/2011	11	2	105	2	ND	179	106	12	ND	0.6	9.5	342	546	8.5	ND	ND	ND	ND	0.20	ND	ND	ND	0.08	ND	0.02	ND	ND	ND	ND	ND	ND	0.23	0.02	ND	0.80	ND	0.08	-0.01	0.050	-0.02	1.1	2.3	-0.08	ND	-0.08	0.04	0.02
Dobie Hill #1	9/21/2011	12	2	106	2	ND	158	115	12	ND	0.7	10.0	353	556	8.5	ND	ND	ND	-	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	0.04	0.01	-	0.20	ND	0.21	0.30	0.005	-0.04	-2.0	2.8	-0.30	ND	0.09	0.20	0.09
Brown #5	6/1/2011	110	22	166	7	ND	154	598	6	0.1	0.1	11.7	990	1370	8.0	ND	ND	ND	ND	0.20	ND	ND	ND	ND	ND	0.02	ND	ND	ND	0.001	ND	0.05	0.12	0.02	ND	0.50	0.012	0.11	0.80	-0.004	-0.01	40.3	9.4	0.20	ND	-0.05	0.04	0.20
Brown #5	9/20/2011	115	23	167	7	ND	137	607	6	0.2	0.1	11.1	1000	1360	7.9	ND	ND	ND	-	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	0.002	ND	0.03	0.06	0.02	-	0.50	0.012	0.26	0.90	0.050	0.30	24.8	12.0	-0.80	ND	0.07	0.60	0.04
City Service Brown	6/2/2011	47	12	186	5	ND	98	479	5	ND	0.2	9.8	785	1150	8.2	ND	ND	ND	ND	0.20	ND	ND	ND	ND	ND	0.02	ND	ND	ND	ND	ND	0.03	0.26	0.02	ND	0.50	0.007	0.32	0.60	0.010	0.20	28.2	7.6	0.40	ND	-0.06	0.04	0.20
City Service Brown	9/21/2011	48	13	189	5	ND	95	477	6	ND	0.2	9.5	786	1140	8.3	ND	ND	ND	-	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	ND	ND	0.13	0.26	0.02	-	0.40	0.079	0.50	1.10	0.070	0.80	19.7	8.1	-0.40	ND	-0.08	0.20	0.10
Beck Well	6/2/2011	84	16	191	7	ND	105	584	4	ND	ND	10.1	955	1330	8.0	ND	ND	ND	ND	0.10	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	ND	0.03	0.09	0.05	ND	1.00	0.014	2.20	0.50	0.100	0.10	43.8	14.7	1.90	ND	0.07	0.04	1.30
Beck Well	9/21/2011	87	17	189	7	ND	97	587	4	ND	ND	10.0	946	1320	8.0	ND	ND	ND	-	ND	ND	ND	ND	ND	ND	0.04	ND	ND	ND	ND	ND	0.02	ND	0.04	-	0.30	0.130	1.30	0.10	0.040	0.50	25.5	9.4	0.04	ND	-0.05	0.20	0.20
Brown #1	6/2/2011	12	5	13	2	ND	83	11	2	1.4	0.2	30.4	116	161	7.6	ND	0.003	ND	ND	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.70	ND	-0.08	0.50	0.070	-0.04	-1.0	0.8	0.40	ND	0.03	0.03	0.02
Brown #1	9/21/2011	12	6	14	2	ND	79	11	2	1.6	0.4	29.9	121	165	7.6	ND	0.003	ND	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND	ND	ND	-	0.40	0.003	-0.07	0.09	-0.020	0.10	-1.0	0.09	-0.30	ND	-0.05	0.30	0.09
n=		15	15	15	15	0	15	15	15	6	11	15	15	15	15	0	2	0	0	8	0	0	0	4	0	13	0	0	0	5	0	10	11	13	0	15	12	15	15	15	15	15	15	15	2	15	15	15
Average		61	14	139	5	0	146	376	5	1	0	13	683	978	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	59	14	0	0	0	0	0
Standard Deviation		36	7	61	2	0	54	218	3	1	0	7	306	420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	98	15	1	0	0	0	0
Minimum		11	2	13	2	0	79	11	2	0	0	9	116	161	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum		115	23	191	7	0	255	607	12	2	1	30	1000	1370	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	1	0	5	299	56	2	0	0	1	1

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P140506.0W	11/02/2001		T-C Ranch 2S-5	CBM	043N	076W	02	SW1/4NW1/4	25			-105.96581	43.73204
P140507.0W	11/02/2001	Complete	T-C Ranch 2S-9	CBM	043N	076W	02	NE1/4SE1/4	1	1610	1505	-105.951131	43.728439
P140508.0W	11/02/2001	Complete	T-C Ranch 2S-13	CBM	043N	076W	02	SW1/4SW1/4	1	1600	1475	-105.966308	43.72425
P140509.0W	11/02/2001	Complete	T-C Ranch 2S-15	CBM	043N	076W	02	SW1/4SE1/4	1	1700	1350	-105.95564	43.72436
P144906.0W	05/14/2002	Complete	Pumpking Buttes Ranch 34-33-4475	CBM	044N	075W	33	SW1/4SE1/4	2	1705	610	-105.87378	43.73868
P144907.0W	05/14/2002	Complete	Pumpking Buttes Ranch 23-27-4475	CBM	044N	075W	27	NE1/4SW1/4	8	1530	615	-105.85854	43.75748
P158575.0W	05/04/2004		Pumpking Buttes Ranch 21-4-4375	CBM	043N	075W	04	NE1/4NW1/4	60			-105.87894	43.73501
P159067.0W	05/14/2004	Complete	Hartzog State 43-16-4475BG	CBM	044N	075W	16	NE1/4SE1/4	10	1435	1321	-105.86807	43.78716
P159068.0W	05/14/2004	Complete	Hartzog State 41-16-4475BG	CBM	044N	075W	16	NE1/4NE1/4	5	1593	1450		
P159069.0W	05/14/2004	Complete	Hartzog State 34-16-4475BG	CBM	044N	075W	16	SW1/4SE1/4	12	1412	1312		
P159070.0W	05/14/2004	Complete	Hartzog State 32-16-4475BG	CBM	044N	075W	16	SW1/4NE1/4	13	1635	1506		
P159071.0W	05/14/2004	Complete	Hartzog State 21-16-4475BG	CBM	044N	075W	16	NE1/4NW1/4	13	1748	1605		
P159072.0W	05/14/2004	Complete	Hartzog State 12-16-4475BG	CBM	044N	075W	16	SW1/4NW1/4	15	1618	1499		
P159076.0W	05/14/2004	Complete	Hartzog 23-8-4475BG	CBM	044N	075W	08	NE1/4SW1/4	20	1572	1430		
P159077.0W	05/14/2004	Complete	Hartzog 21-8-4475BG	CBM	044N	075W	08	NE1/4NW1/4	16	1541	1403		
P159115.0W	05/17/2004	Complete	T-Chair 12-10-4376	CBM	043N	076W	10	SW1/4NW1/4	60			-105.98595	43.717239
P159286.0W	02/17/2004	Complete	Pumpkin Buttes Ranch 21-34-4475	CBM	044N	075W	34	NE1/4NW1/4	9	1575	1464		
P159290.0W	02/17/2004		State 14-16-4475	CBM	044N	075W	16	SW1/4SW1/4	35			-105.88437	43.78357
P159355.0W	02/17/2004	Complete	Gilbertz 23-34-4475	CBM	044N	075W	34	NE1/4SW1/4	17	1556	1428.45	-105.85854	43.74223
P159410.0W	02/19/2004	Incomplete	Pumpkin ButtesFed 43-33-4475	CBM	044N	075W	33	NE1/4SE1/4	65			-105.86868	43.74243
P162022.0W	08/09/2004	Complete	Jordan 21-27-4475	CBM	044N	075W	27	NE1/4NW1/4	12	1507	1376	-105.858519	43.764433
P162032.0W	08/16/2004		Pumpkin Buttes14-27-4475	CBM	044N	075W	27	SW1/4SW1/4	85			-105.86371	43.75385
P162427.0W	09/15/2004	Incomplete	State 14-16-4475	CBM	044N	075W	16	SW1/4SW1/4	85			-105.88437	43.78357
P163412.0W	10/20/2004	Complete	T Chair 14-7-4475BG	CBM	044N	075W	07	SW1/4SW1/4	15	1803	550.98		
P165262.0W	01/25/2005		Hartzog Federal 14-3-4475BG	CBM	044N	075W	03	SW1/4SW1/4	30			-105.860978	43.812
P165263.0W	01/25/2005	Complete	Hartzog 21-3-4475BG	CBM	044N	075W	03	NE1/4NW1/4	30			-105.856119	43.821128
P165264.0W	01/25/2005	Complete	Hartzog 23-3-4475BG	CBM	044N	075W	03	NE1/4SW1/4	30			-105.855328	43.816119
P165267.0W	01/25/2005	Complete	Hartzog Federal 12-10-4475BG	CBM	044N	075W	10	SW1/4NW1/4	30			-105.8609	43.805231
P165268.0W	01/25/2005	Complete	Hartzog 21-10-4475BG	CBM	044N	075W	10	NE1/4NW1/4	30			-105.856033	43.808928
P165277.0W	01/25/2005		Hartzog 23-34-4575BG	CBM	045N	075W	34	NE1/4SW1/4	30			-105.861558	43.827678
P165279.0W	01/25/2005	Complete	Hartzog 34-34-4575BG	CBM	045N	075W	34	SW1/4SE1/4	30			-105.856639	43.823939
P165739.0W	02/08/2005	Complete	Hartzog Federal 21-4-4475BG	CBM	044N	075W	04	NE1/4NW1/4	30			-105.87831	43.82129
P165740.0W	02/08/2005	Complete	Hartzog Federal 14-4-4475BG	CBM	044N	075W	04	SW1/4SW1/4	30			-105.88395	43.81228
P165741.0W	02/08/2005	Complete	Hartzog Federal 23-4-4475BG	CBM	044N	075W	04	NE1/4SW1/4	30			-105.87849	43.81543
P165742.0W	02/08/2005	Complete	Hartzog Federal 12-4-4475BG	CBM	044N	075W	04	SW1/4NW1/4	30			-105.88356	43.81856
P165792.0W	02/18/2005	Complete	Hartzog Federal 41-21-4475BG	CBM	044N	075W	21	NE1/4NE1/4	10.62	1561	762		
P165793.0W	02/18/2005		Hartzog Federal 23-22-4475BG	CBM	044N	075W	22	NE1/4SW1/4	25			-105.85789	43.77237
P165992.0W	02/28/2005	Complete	Hartzog Federal 12-3-4475BG	CBM	044N	075W	03	SW1/4NW1/4	30			-105.860589	43.819039
P166856.0W	04/01/2005	Complete	Jordan 14-22-4475	CBM	044N	075W	22	SW1/4SW1/4	12	1490	1376	-105.863192	43.768883
P166872.0W	04/12/2005		Savageton Fed 21-17-4475BG	CBM	044N	075W	17	NE1/4NW1/4	85			-105.89962	43.79453
P166874.0W	04/12/2005		Savageton Fed 21-4-4475BG	CBM	044N	075W	04	NE1/4NW1/4	85			-105.87831	43.82129
P166875.0W	04/12/2005		Savageton Fed 23-4-4475BG	CBM	044N	075W	04	NE1/4SW1/4	85			-105.87849	43.81543
P166876.0W	04/12/2005		Savageton Fed 32-17-4475BG	CBM	044N	075W	17	SW1/4NE1/4	85			-105.89463	43.79088
P166877.0W	04/12/2005		Savageton Fed 32-33-4575BG	CBM	045N	075W	33	SW1/4NE1/4	85			-105.87644	43.83154
P166878.0W	04/12/2005		Savageton Fed 34-33-4575BG	CBM	045N	075W	33	SW1/4SE1/4	85			-105.87644	43.82428
P166880.0W	04/12/2005		Savageton Fed 41-17-4475BG	CBM	044N	075W	17	NE1/4NE1/4	85			-105.88961	43.79453

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P166924.0W	04/12/2005		Savageton Fed 12-21-4475BG	CBM	044N	075W	21	SW1/4NW1/4	85			-105.88435	43.77628
P166925.0W	04/12/2005		Savageton Fed 21-21-4475BG	CBM	044N	075W	21	NE1/4NW1/4	85			-105.87898	43.7799
P166928.0W	04/12/2005		Savageton Fed 32-18-4475BG	CBM	044N	075W	18	SW1/4NE1/4	85			-105.91488	43.79068
P166929.0W	04/12/2005		Savageton Fed 41-18-4475BG	CBM	044N	075W	18	NE1/4NE1/4	85			-105.90968	43.79445
P166930.0W	04/12/2005		Savageton Fed 43-17-4475BG	CBM	044N	075W	17	NE1/4SE1/4	85			-105.8896	43.78723
P167066.0W	04/12/2005		Savageton Fed 12-22-4475BG	CBM	044N	075W	22	SW1/4NW1/4	85			-105.862439	43.775808
P167067.0W	04/12/2005	Complete	Savageton Fed 21-22-4475BG	CBM	044N	075W	22	NE1/4NW1/4	8	1501	1304	-105.856219	43.778528
P167070.0W	04/12/2005		Savageton Fed 14-32-4574	CBM	044N	075W	32	SW1/4SW1/4	85			-105.90483	43.73923
P167148.0W	04/13/2005		Pumpkin ButtesFED 23-33-4475	CBM	044N	075W	33	NE1/4SW1/4	85			-105.87907	43.74265
P167149.0W	04/13/2005		Pumpkin ButtesFED 34-28-4475	CBM	044N	075W	28	SW1/4SE1/4	85			-105.87408	43.75408
P167151.0W	04/13/2005		Pumpkin ButtesFED 43-28-4475	CBM	044N	075W	28	NE1/4SE1/4	85			-105.86879	43.75775
P167155.0W	04/13/2005		T Chair Fed 34-18-4475BG	CBM	044N	075W	18	SW1/4SE1/4	85			-105.91505	43.78345
P167193.0W	04/13/2005		Pumpkin Buttes Fed 12-34-4475	CBM	044N	075W	34	SW1/4NW1/4	85			-105.86365	43.74618
P167194.0W	04/13/2005		Pumpkin Buttes Fed 14-28-4475	CBM	044N	075W	28	SW1/4SW1/4	85			-105.88452	43.75431
P167195.0W	04/13/2005		Pumpkin Buttes Fed 23-28-4475	CBM	044N	075W	28	NE1/4SW1/4	85			-105.87924	43.75791
P167711.0W	05/10/2005		Hartzog Federal 12-5-4475BG	CBM	044N	075W	05	SW1/4NW1/4	30			-105.90371	43.81835
P167712.0W	05/10/2005	Complete	Hartzog Federal 21-5-4475BG	CBM	044N	075W	05	NE1/4NW1/4	30			-105.898481	43.8212
P167713.0W	05/10/2005		Hartzog Federal 32-5-4475BG	CBM	044N	075W	05	SW1/4NE1/4	30			-105.89364	43.81846
P167714.0W	05/10/2005		Hartzog Federal 34-5-4475BG	CBM	044N	075W	05	SW1/4SE1/4	30			-105.8941	43.81207
P167715.0W	05/10/2005	Complete	Hartzog Federal 41-5-4475BG	CBM	044N	075W	05	NE1/4NE1/4	30			-105.888411	43.821261
P167716.0W	05/10/2005	Complete	Hartzog Federal 43-5-4475BG	CBM	044N	075W	05	NE1/4SE1/4	30			-105.888861	43.815381
P167717.0W	05/10/2005		Hartzog Federal 12-6-4475BG	CBM	044N	075W	06	SW1/4NW1/4	30			-105.92391	43.81819
P167719.0W	05/10/2005	Complete	Hartzog Federal 21-6-4475BG	CBM	044N	075W	06	NE1/4NW1/4	30			-105.918589	43.821089
P167720.0W	05/10/2005	Complete	Hartzog Federal 32-6-4475BG	CBM	044N	075W	06	SW1/4NE1/4	30			-105.91375	43.818261
P167721.0W	05/10/2005	Complete	Hartzog Federal 41-6-4475BG	CBM	044N	075W	06	NE1/4NE1/4	30			-105.90855	43.82115
P167722.0W	05/10/2005		Hartzog Federal 12-31-4575BG	CBM	045N	075W	31	SW1/4NW1/4	30			-105.9267	43.83142
P167723.0W	05/10/2005		Hartzog Federal 14-31-4575BG	CBM	045N	075W	31	SW1/4SW1/4	30			-105.92661	43.8241
P167724.0W	05/10/2005	Complete	Hartzog Federal 21-31-4575BG	CBM	045N	075W	31	NE1/4NW1/4	30			-105.922039	43.835211
P167725.0W	05/10/2005		Hartzog Federal 23-31-4575BG	CBM	045N	075W	31	NE1/4SW1/4	30			-105.92178	43.82783
P167726.0W	05/10/2005	Complete	Hartzog Federal 32-31-4575BG	CBM	045N	075W	31	SW1/4NE1/4	30			-105.916028	43.832989
P167727.0W	05/10/2005	Complete	Hartzog Federal 34-31-4575BG	CBM	045N	075W	31	SW1/4SE1/4	30			-105.914958	43.824378
P167729.0W	05/10/2005	Complete	Hartzog Federal 43-31-4575BG	CBM	045N	075W	31	NE1/4SE1/4	30			-105.91115	43.828939
P167730.0W	05/10/2005	Complete	Hartzog Federal 14-32-4575BG	CBM	045N	075W	32	SW1/4SW1/4	30			-105.906711	43.824239
P167731.0W	05/10/2005	Complete	Hartzog Federal 34-32-4575BG	CBM	045N	075W	32	SW1/4SE1/4	30			-105.89755	43.824339
P167732.0W	05/10/2005		Hartzog Federal 41-32-4575BG	CBM	045N	075W	32	NE1/4NE1/4	30			-105.89203	43.83549
P167733.0W	05/10/2005		Hartzog Federal 14-33-4575BG	CBM	045N	075W	33	SW1/4SW1/4	30			-105.88654	43.82428
P167734.0W	05/10/2005		Hartzog State 12-36-4576BG	CBM	045N	076W	36	SW1/4NW1/4	30			-105.94545	43.8316
P167735.0W	05/10/2005	Complete	Hartzog State 32-36-4576BG	CBM	045N	076W	36	SW1/4NE1/4	30			-105.936328	43.831589
P167736.0W	05/10/2005	Complete	Hartzog State 41-36-4576BG	CBM	045N	076W	36	NE1/4NE1/4	30			-105.93045	43.835089
P167737.0W	05/10/2005	Complete	Hartzog State 43-36-4576BG	CBM	045N	076W	36	NE1/4SE1/4	30			-105.931819	43.827208
P168204.0W	04/19/2005		Savageton Fed 12-18-4475BG	CBM	044N	075W	18	SW1/4NW1/4	85			-105.92528	43.7904
P168205.0W	04/19/2005		Savageton Fed 21-18-4475BG	CBM	044N	075W	18	NE1/4NW1/4	85			-105.91991	43.79413
P168206.0W	04/19/2005		Savageton Fed 23-18-4475BG	CBM	044N	075W	18	NE1/4SW1/4	85			-105.92013	43.78696
P168207.0W	04/19/2005		Savageton Fed 12-4-4475BG	CBM	044N	075W	04	SW1/4NW1/4	85			-105.88356	43.81856
P168208.0W	04/19/2005		Savageton Fed 14-4-4475BG	CBM	044N	075W	04	SW1/4SW1/4	85			-105.88395	43.81228
P168991.0W	07/18/2005		Savageton Fed 34-17-4475BG	CBM	044N	075W	17	SW1/4SE1/4	85			-105.89464	43.78358

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P168992.0W	07/18/2005		Savageton Fed 23-17-4475BG	CBM	044N	075W	17	NE1/4SW1/4	85			-105.89966	43.78723
P168993.0W	07/18/2005		Savageton Fed 14-17-4475BG	CBM	044N	075W	17	SW1/4SW1/4	85			-105.90473	43.78358
P168994.0W	07/18/2005		Savageton Fed 12-17-4475BG	CBM	044N	075W	17	SW1/4NW1/4	85			-105.90466	43.79088
P169870.0W	08/15/2005		Savageton Fed 14-18-4475BG	CBM	044N	075W	18	SW1/4SW1/4	85			-105.92549	43.78488
P171232.0W	10/20/2005	Complete	Hartzog Federal 34-4-4475BG	CBM	044N	075W	04	SW1/4SE1/4	30			-105.872869	43.8129
P171233.0W	10/20/2005	Complete	Hartzog Federal 43-4-4475BG	CBM	044N	075W	04	NE1/4SE1/4	30			-105.8658	43.815353
P171234.0W	10/20/2005		Hartzog Federal 32-8-4475BG	CBM	044N	075W	08	SW1/4NE1/4	30			-105.894189	43.805908
P171235.0W	10/20/2005	Complete	Hartzog Federal 34-8-4475BG	CBM	044N	075W	08	SW1/4SE1/4	30			-105.8941	43.798208
P171236.0W	10/20/2005	Complete	Hartzog Federal 41-8-4475BG	CBM	044N	075W	08	NE1/4NE1/4	30			-105.888969	43.808758
P171237.0W	10/20/2005	Complete	Hartzog Federal 43-8-4475BG	CBM	044N	075W	08	NE1/4SE1/4	30			-105.889619	43.801689
P171238.0W	10/20/2005	Complete	Hartzog Federal 12-9-4475BG	CBM	044N	075W	09	SW1/4NW1/4	30			-105.883689	43.804969
P171239.0W	10/20/2005	Complete	Hartzog Federal 14-9-4475BG	CBM	044N	075W	09	SW1/4SW1/4	30			-105.884178	43.798289
P171240.0W	10/20/2005	Complete	Hartzog Federal 21-9-4475BG	CBM	044N	075W	09	NE1/4NW1/4	30			-105.878986	43.809244
P171241.0W	10/20/2005	Complete	Hartzog Federal 23-9-4475BG	CBM	044N	075W	09	NE1/4SW1/4	30			-105.877569	43.801319
P171242.0W	10/20/2005		Hartzog Federal 32-9-4475BG	CBM	044N	075W	09	SW1/4NE1/4	30			-105.872389	43.8047
P171243.0W	10/20/2005	Complete	Hartzog Federal 34-9-4475BG	CBM	044N	075W	09	SW1/4SE1/4	30			-105.87245	43.797839
P171244.0W	10/20/2005	Complete	Hartzog Federal 41-9-4475BG	CBM	044N	075W	09	NE1/4NE1/4	30			-105.867139	43.80835
P171245.0W	10/20/2005	Complete	Hartzog Federal 43-9-4475BG	CBM	044N	075W	09	NE1/4SE1/4	30			-105.867478	43.80065
P171246.0W	10/20/2005	Complete	Hartzog Federal 14-10-4475BG	CBM	044N	075W	10	SW1/4SW1/4	30			-105.861789	43.797228
P171247.0W	10/20/2005	Complete	Hartzog Federal 23-10-4475BG	CBM	044N	075W	10	NE1/4SW1/4	30			-105.855031	43.801331
P171263.0W	10/20/2005	Complete	Hartzog Federal 12-15-4475BG	CBM	044N	075W	15	SW1/4NW1/4	30			-105.861608	43.789639
P171264.0W	10/20/2005	Complete	Hartzog Federal 14-15-4475BG	CBM	044N	075W	15	SW1/4SW1/4	30			-105.865178	43.782819
P171265.0W	10/20/2005	Complete	Hartzog Federal 21-15-4475BG	CBM	044N	075W	15	NE1/4NW1/4	30			-105.855658	43.79425
P171266.0W	10/20/2005		Hartzog Federal 23-15-4475BG	CBM	044N	075W	15	NE1/4SW1/4	30			-105.856358	43.786408
P171801.0W	08/18/2005	Complete	North Butte CS State #4	CBM	044N	076W	16	SW1/4NW1/4	200	1478	375	-106.005281	43.789719
P172347.0W	11/14/2005	Expired	Christensen 21-32-4575	CBM	045N	075W	32	NE1/4NW1/4	45			-105.9024	43.83552
P172348.0W	11/14/2005		Christensen 23-32-4575	CBM	045N	075W	32	NE1/4SW1/4	45			-105.90191	43.82801
P172349.0W	11/14/2005		Christensen 43-32-4575	CBM	045N	075W	32	NE1/4SE1/4	45			-105.89173	43.82802
P172404.0W	11/14/2005		Christensen 14-5-4475	CBM	044N	075W	05	SW1/4SW1/4	45			-105.9041	43.81175
P172405.0W	11/14/2005		Christensen 23-6-4475	CBM	044N	075W	06	NE1/4SW1/4	45			-105.91898	43.81489
P172406.0W	11/14/2005		Christensen 34-6-4475	CBM	044N	075W	06	SW1/4SE1/4	45			-105.91415	43.81159
P172407.0W	11/14/2005		Christensen 43-6-4475	CBM	044N	075W	06	NE1/4SE1/4	45			-105.90894	43.81498
P172408.0W	11/14/2005		Christensen 32-7-4475	CBM	044N	075W	07	SW1/4NE1/4	45			-105.91444	43.80474
P172409.0W	11/14/2005		Christensen 41-7-4475	CBM	044N	075W	07	NE1/4NE1/4	45			-105.90927	43.80827
P172410.0W	11/14/2005		Christensen 12-8-4475	CBM	044N	075W	08	SW1/4NW1/4	45			-105.90435	43.80495
P176457.0W	07/26/2006	Incomplete	State 23-16-4475	CBM	044N	075W	16	NE1/4SW1/4	85			-105.87893	43.7872
P177903.0W	10/19/2006	Incomplete	TM-CBM Federal 4476-5-43	CBM	044N	076W	05	NE1/4SE1/4	20			-106.00955	43.8144
P177920.0W	10/19/2006	Incomplete	TM-CBM Federal 4476-8-41	CBM	044N	076W	08	NE1/4NE1/4	20			-106.00985	43.8077
P177921.0W	10/19/2006	Incomplete	TM-CBM Federal 4476-8-43	CBM	044N	076W	08	NE1/4SE1/4	20			-106.01041	43.80057
P178931.0W	12/26/2006		Savageton Fed 14-8-5475BG	CBM	044N	075W	08	SW1/4SW1/4	85			-105.90455	43.79807
P178932.0W	12/26/2006		Savageton Fed 34-7-4475BG	CBM	044N	075W	07	SW1/4SE1/4	85			-105.91469	43.79783
P180383.0W	03/12/2007		Pumpkin Buttes Fed 43-33-4475BG	CBM	044N	075W	33	NE1/4SE1/4	85			-105.86868	43.74243
P180384.0W	03/12/2007		Pumpkin Buttes Fed 23-33-4475BG	CBM	044N	075W	33	NE1/4SW1/4	85			-105.87907	43.74265
P180385.0W	03/12/2007		Pumpkin Buttes Fed 12-34-4475BG	CBM	044N	075W	34	SW1/4NW1/4	85			-105.86365	43.74618
P180451.0W	03/14/2007		Christensen Fed 41-17-4476	CBM	044N	076W	17	NE1/4NE1/4	45			-106.01079	43.79342
P180965.0W	04/02/2007		23-32-4575 Christensen	CBM	045N	075W	32	NE1/4SW1/4	30			-105.901381	43.8288

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P180966.0W	04/02/2007		43-32-4575 Christensen	CBM	045N	075W	32	NE1/4SE1/4	30			-105.892456	43.827831
P180968.0W	04/02/2007		12-8-4475 Christensen	CBM	044N	075W	08	SW1/4NW1/4	30			-105.904819	43.805314
P180969.0W	04/02/2007	Complete	41-7-4475 Christensen	CBM	044N	075W	07	NE1/4NE1/4	30			-105.909269	43.808269
P180970.0W	04/02/2007	Complete	32-7-4475 Christensen	CBM	044N	075W	07	SW1/4NE1/4	30			-105.914439	43.804739
P180971.0W	04/02/2007		43-6-4475 Christensen	CBM	044N	075W	06	NE1/4SE1/4	30			-105.909103	43.815206
P180972.0W	04/02/2007		34-6-4475 Christensen	CBM	044N	075W	06	SW1/4SE1/4	30			-105.91415	43.81159
P180973.0W	04/02/2007		23-6-4475 Christensen	CBM	044N	075W	06	NE1/4SW1/4	30			-105.918703	43.814875
P180974.0W	04/02/2007		14-5-4475 Christensen	CBM	044N	075W	05	SW1/4SW1/4	30			-105.904811	43.812006
P181720.0W	04/30/2007	Complete	Dry Willow Fee 4475 30-32	CBM	044N	075W	30	SW1/4NE1/4	85			-105.915069	43.761589
P181721.0W	04/30/2007	Complete	Dry Willow Fee 4475 30-34	CBM	044N	075W	30	SW1/4SE1/4	85			-105.915019	43.754311
P181722.0W	04/30/2007		Dry Willow Fee 4475 31-12	CBM	044N	075W	31	SW1/4NW1/4	85			-105.92561	43.74689
P181723.0W	04/30/2007	Complete	Dry Willow Fee 4475 31-14	CBM	044N	075W	31	SW1/4SW1/4	85			-105.925661	43.739539
P181724.0W	04/30/2007	Complete	Dry Willow Fee 4475 31-41	CBM	044N	075W	31	NE1/4NE1/4	85			-105.909819	43.750639
P181725.0W	04/30/2007	Incomplete	Dry Willow Fee 4476 26-12	CBM	044N	076W	26	SW1/4NW1/4	85			-105.965692	43.761886
P181726.0W	04/30/2007	Complete	Dry Willow Fee 4476 26-23	CBM	044N	076W	26	NE1/4SW1/4	85			-105.960761	43.758119
P181727.0W	04/30/2007	Incomplete	Dry Willow Fee 4476 26-43	CBM	044N	076W	26	NE1/4SE1/4	85			-105.950811	43.758192
P181728.0W	04/30/2007	Complete	Dry Willow Fee 4476 35-12	CBM	044N	076W	35	SW1/4NW1/4	85			-105.965839	43.746969
P182188.0W	05/10/2007	Complete	Dry Willow Fee 4476 35-14	CBM	044N	076W	35	SW1/4SW1/4	85			-105.965861	43.739531
P182189.0W	05/10/2007	Complete	Dry Willow Fee 4475 30-23	CBM	044N	075W	30	NE1/4SW1/4	85			-105.92025	43.7579
P182190.0W	05/10/2007	Complete	Dry Willow Fee 4475 30-21	CBM	044N	075W	30	NE1/4NW1/4	85			-105.920281	43.765189
P182191.0W	05/10/2007	Complete	Dry Willow Fee 4475 30-14	CBM	044N	075W	30	SW1/4SW1/4	85			-105.925569	43.754219
P182192.0W	05/10/2007	Complete	Dry Willow Fee 4475 29-14	CBM	044N	075W	29	SW1/4SW1/4	85			-105.9047	43.754369
P182193.0W	05/10/2007	Incomplete	Dry Willow Fee 4475 20-34	CBM	044N	075W	20	SW1/4SE1/4	85			-105.894603	43.769033
P182194.0W	05/10/2007	Incomplete	Dry Willow Fee 4475 20-23	CBM	044N	075W	20	NE1/4SW1/4	85			-105.899706	43.772608
P182195.0W	05/10/2007	Incomplete	Dry Willow Fee 4475 20-14	CBM	044N	075W	20	SW1/4SW1/4	85			-105.904764	43.768992
P182196.0W	05/10/2007	Complete	Dry Willow Fee 4475 20-12	CBM	044N	075W	20	SW1/4NW1/4	85			-105.904761	43.776269
P182197.0W	05/10/2007	Complete	Dry Willow Fee 4475 19-43	CBM	044N	075W	19	NE1/4SE1/4	85			-105.909911	43.772581
P182456.0W	05/16/2007	Incomplete	Dry Willow Fed 4476 24-43	CBM	044N	076W	24	NE1/4SE1/4	85			-105.930792	43.772517
P182466.0W	06/11/2007	Incomplete	Dry Willow Fed 4376 3-34	CBM	043N	076W	03	SW1/4SE1/4	85			-105.975672	43.724708
P182467.0W	06/11/2007	Complete	Dry Willow Fed 4376 3-22	CBM	043N	076W	03	SE1/4NW1/4	85			-105.980889	43.732061
P182468.0W	06/11/2007	Complete	Dry Willow Fed 4376 3-14	CBM	043N	076W	03	SW1/4SW1/4	85			-105.985869	43.72465
P182627.0W	06/14/2007		Dry Willow Fee 4476 24-43	CBM	044N	076W	24	NE1/4SE1/4	85			-105.93083	43.77242
P182630.0W	06/14/2007	Incomplete	TM-CBM Fed 4576 34-12	CBM	045N	076W	34	SW1/4NW1/4	85			-105.986819	43.831031
P182631.0W	06/14/2007	Incomplete	TM-CBM Fed 4576 34-14	CBM	045N	076W	34	SW1/4SW1/4	85			-105.986667	43.823656
P182632.0W	06/14/2007	Incomplete	TM-CBM Fed 4576 34-21	CBM	045N	076W	34	NE1/4NW1/4	85			-105.981947	43.834761
P182633.0W	06/14/2007	Incomplete	TM-CBM Fed 4576 34-23	CBM	045N	076W	34	NE1/4SW1/4	85			-105.9817	43.827308
P182634.0W	06/14/2007	Incomplete	TM-CBM Fed 4576 34-32	CBM	045N	076W	34	SW1/4NE1/4	85			-105.976803	43.831208
P182738.0W	05/24/2007	Complete	Dry Willow Fee 4476 26-21	CBM	044N	076W	26	NE1/4NW1/4	85			-105.960669	43.765481
P183893.0W	07/16/2007	Complete	Dry Willow Fed 4376 4-43	CBM	043N	076W	04	NE1/4SE1/4	85			-105.990936	43.727889
P183903.0W	07/16/2007	Incomplete	TM-CBM 4376 2-23	CBM	043N	076W	02	NE1/4SW1/4	85			-105.960797	43.727828
P184094.0W	08/15/2007	Incomplete	Dry Willow Fed 4476 24-12	CBM	044N	076W	24	SW1/4NW1/4	85			-105.946106	43.776031
P184095.0W	08/15/2007	Complete	Dry Willow Fed 4476 24-14	CBM	044N	076W	25	NW1/4NW1/4	85			-105.946942	43.767075
P184096.0W	08/15/2007	Incomplete	Dry Willow Fed 4476 24-21	CBM	044N	076W	24	NE1/4NW1/4	85			-105.941169	43.779911
P184097.0W	08/15/2007	Incomplete	Dry Willow Fed 4476 24-23	CBM	044N	076W	24	NE1/4SW1/4	85			-105.941033	43.772819
P184098.0W	08/15/2007	Incomplete	Dry Willow Fed 4476 24-32	CBM	044N	076W	24	SW1/4NE1/4	85			-105.935886	43.775664
P184099.0W	08/15/2007	Incomplete	Dry Willow Fed 4476 24-41	CBM	044N	076W	24	NE1/4NE1/4	85			-105.930828	43.779539

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P184100.0W	08/15/2007	Incomplete	Dry Willow Fed 4476 25-12	CBM	044N	076W	25	SW1/4NE1/4	85			-105.936406	43.761872
P184101.0W	08/15/2007	Complete	Dry Willow Fed 4476 25-21	CBM	044N	076W	25	NE1/4NW1/4	85			-105.940483	43.765689
P184102.0W	08/15/2007	Complete	Dry Willow Fee 4475 19-32	CBM	044N	075W	19	SW1/4NE1/4	85			-105.915247	43.776167
P184103.0W	08/15/2007	Complete	Dry Willow Fee 4475 19-41	CBM	044N	075W	19	NE1/4NE1/4	85			-105.909828	43.780244
P184104.0W	08/15/2007	Complete	Dry Willow Fee 4476 25-23	CBM	044N	076W	25	NE1/4SW1/4	85			-105.94075	43.757733
P184144.0W	09/20/2007	Complete	Dry Willow Fed 4376 4-34	CBM	043N	076W	04	SW1/4SE1/4	85			-105.995922	43.724128
P184162.0W	10/01/2007	Incomplete	Savageton Fed 12-7-4475	CBM	044N	075W	07	SW1/4NW1/4	85			-105.924689	43.804061
P184163.0W	10/01/2007	Incomplete	Savageton Fed 23-7-4475	CBM	044N	075W	07	NE1/4SW1/4	85			-105.919597	43.800667
P184164.0W	10/01/2007	Incomplete	Savageton Fed 43-7-4475	CBM	044N	075W	07	NE1/4SE1/4	85			-105.909467	43.800917
P184215.0W	09/04/2007	Complete	Dry Willow Fed 4376 3-41	CBM	043N	076W	03	NE1/4NE1/4	85			-105.970861	43.735308
P184546.0W	10/19/2007	Incomplete	Christensen-Fed 21-4-4476	CBM	044N	076W	04	NE1/4NW1/4	45			-105.999231	43.820553
P184547.0W	10/19/2007	Incomplete	Christensen-Fed 41-4-4476	CBM	044N	076W	04	NE1/4NE1/4	45			-105.987719	43.820678
P184549.0W	10/19/2007	Incomplete	Christensen-Fed 41-5-4476	CBM	044N	076W	05	NE1/4NE1/4	45			-106.008783	43.820447
P185278.0W	12/20/2007	Incomplete	Savageton Fed 12-32-45-75	CBM	045N	075W	32	SW1/4NW1/4	85			-105.907322	43.832114
P185431.0W	06/19/2007	Incomplete	TM-CBM Federal 4576 34-34	CBM	045N	076W	34	SW1/4SE1/4	85			-105.976692	43.823272
P185432.0W	06/19/2007	Incomplete	TM-CBM Federal 4576 34-41	CBM	045N	076W	34	NE1/4NE1/4	85			-105.971869	43.834411
P185433.0W	06/19/2007	Incomplete	TM-CBM Federal 4576 34-43	CBM	045N	076W	34	NE1/4SE1/4	85			-105.971714	43.827017
P185785.0W	02/13/2008	Complete	Dry Willow Fed 4475 19-12	CBM	044N	075W	19	SW1/4NW1/4	1	1869	1601.61	-105.924989	43.776331
P185786.0W	02/13/2008	Complete	Dry Willow Fed 4475 20-21	CBM	044N	075W	20	NE1/4NW1/4	5	1747	1495.13	-105.89955	43.779781
P185787.0W	02/13/2008	Complete	Dry Willow Fed 4475 20-32	CBM	044N	075W	20	SW1/4NE1/4	1	1720	1553	-105.895239	43.776311
P185788.0W	02/13/2008	Complete	Dry Willow Fed 4475 20-41	CBM	044N	075W	20	NE1/4NE1/4	10	1800	1589.02	-105.889739	43.780031
P185789.0W	02/13/2008	Complete	Dry Willow Fed 4475 20-43	CBM	044N	075W	20	NE1/4SE1/4	15	1812	1537.86	-105.889631	43.773211
P185797.0W	02/13/2008	Complete	Dry Willow Fed 4476 26-14	CBM	044N	076W	26	SW1/4SW1/4	12	1651	1410.51	-105.965181	43.754839
P185801.0W	02/13/2008	Complete	Dry Willow Fed 4475 29-23	CBM	044N	075W	29	NE1/4SW1/4	1	1806	1516.5	-105.899011	43.757769
P185802.0W	02/13/2008	Complete	Dry Willow Fed 4475 29-32	CBM	044N	075W	29	SW1/4NE1/4	1	1817	1564.67	-105.893889	43.7623
P185803.0W	02/13/2008	Complete	Dry Willow Fed 4475 29-34	CBM	044N	075W	29	SW1/4SE1/4	26	1779	1500.74	-105.8941	43.754269
P185804.0W	02/13/2008	Complete	Dry Willow Fed 4475 31-23	CBM	044N	075W	31	NE1/4SW1/4	1	1778	1591.78	-105.920311	43.743019
P185805.0W	02/13/2008	Complete	Dry Willow Fed 4475 31-32	CBM	044N	075W	31	SW1/4NE1/4	1	1891	1687.9	-105.915169	43.746989
P185806.0W	02/13/2008	Incomplete	Dry Willow Fed 4475 31-34	CBM	044N	075W	31	SW1/4SE1/4	85			-105.915031	43.739044
P185807.0W	02/13/2008	Complete	Dry Willow Fed 4476 35-21	CBM	044N	076W	35	NE1/4NW1/4	1	1690	1496.42	-105.961511	43.750989
P185808.0W	02/13/2008	Complete	Dry Willow Fed 4476 35-23	CBM	044N	076W	35	NE1/4SW1/4	1	1750	1475.19	-105.960439	43.7433
P185809.0W	02/13/2008	Complete	Dry Willow Fed 4476 35-32	CBM	044N	076W	35	SW1/4NE1/4	1	1683	1507.44	-105.955411	43.747019
P185810.0W	02/13/2008	Complete	Dry Willow Fed 4476 35-43	CBM	044N	076W	35	NE1/4SE1/4	1	1596	1381.69	-105.950869	43.7433
P185813.0W	02/13/2008	Complete	Dry Willow Fed 4376 10-41	CBM	043N	076W	10	NE1/4NE1/4	1	1690	1371	-105.971239	43.721181
P185815.0W	02/13/2008	Complete	Dry Willow Fed 4376 3-12	CBM	043N	076W	03	SW1/4NW1/4	1	1965	1732.7	-105.98665	43.731539
P185816.0W	02/13/2008	Complete	Dry Willow Fed 4376 2-41	CBM	043N	076W	02	NE1/4NE1/4	1	1561	1218.2	-105.95025	43.736319
P185817.0W	02/13/2008	Complete	Dry Willow Fed 4376 2-32	CBM	043N	076W	02	SW1/4NE1/4	1	1743	1539.39	-105.954331	43.732031
P185818.0W	02/13/2008	Complete	Dry Willow Fed 4376 2-21	CBM	043N	076W	02	NE1/4NW1/4	1	1717	1480.5	-105.961581	43.735369
P185819.0W	02/13/2008	Complete	Dry Willow Fed 4475 31-21	CBM	044N	075W	31	NE1/4NW1/4	1	1847	1621.76	-105.92085	43.7502
P185820.0W	02/13/2008	Complete	Dry Willow Fed 4376 11-41	CBM	043N	076W	11	NE1/4NE1/4	1	1800	1639.47	-105.950831	43.720589
P185822.0W	02/13/2008	Complete	Dry Willow Fed 4376 11-21	CBM	043N	076W	11	NE1/4NW1/4	1	1700	1473.71	-105.960181	43.7211
P187373.0W	04/25/2008	Incomplete	Dry Willow Fed 4476 24-41	CBM	044N	076W	24	NE1/4NE1/4	85			-105.930861	43.77975
P187374.0W	04/25/2008	Incomplete	Dry Willow Fed 4476 24-43	CBM	044N	076W	24	NE1/4SE1/4	85			-105.930867	43.772369
P187375.0W	04/25/2008	Complete	Dry Willow Fed 4476 35-34	CBM	044N	076W	35	SW1/4SE1/4	1	1532	1475.19	-105.9548	43.740261
P187376.0W	04/25/2008	Complete	Dry Willow Fee 4476 26-12	CBM	044N	076W	26	SW1/4NW1/4	19	1698	1498.8	-105.96645	43.76175
P187377.0W	04/25/2008	Complete	Dry Willow Fed 4476 35-41	CBM	044N	076W	35	NE1/4NE1/4	1	1665	1541.97	-105.952019	43.751111

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P187378.0W	04/25/2008	Complete	Dry Willow Fed 4376 4-32	CBM	043N	076W	04	SW1/4NE1/4	1	1880	1674.16	-105.996069	43.732289
P187379.0W	04/25/2008	Complete	Dry Willow Fed 4376 4-41	CBM	043N	076W	04	NE1/4NE1/4	1	1930	1637.83	-105.990489	43.736069
P187380.0W	04/25/2008	Incomplete	Dry Willow Fed 4475 19-21	CBM	044N	075W	19	NE1/4NW1/4	85			-105.917731	43.780919
P187381.0W	04/25/2008	Complete	Dry Willow Fed 4475 29-43	CBM	044N	075W	29	NE1/4SE1/4	1	1770	1571.73	-105.888031	43.75915
P187382.0W	04/25/2008	Complete	Dry Willow Fed 4475 31-43	CBM	044N	075W	31	NE1/4SE1/4	1	1820	1618.85	-105.910819	43.744369
P187383.0W	04/25/2008	Complete	Dry Willow Fee 4475 19-14	CBM	044N	075W	19	SW1/4SW1/4	9	1687	1357.87	-105.926819	43.7705
P187384.0W	04/25/2008	Complete	Dry Willow Fed 4376 3-32	CBM	043N	076W	03	SW1/4NE1/4	1	1991	1725.83	-105.975661	43.732531
P187385.0W	04/25/2008	Complete	Dry Willow Fed 4376 4-12	CBM	043N	076W	04	SW1/4NW1/4	1	1940	1673.46	-106.006631	43.731981
P187386.0W	04/25/2008	Complete	Dry Willow Fed 4376 4-14	CBM	043N	076W	04	SW1/4SW1/4	1	1820	1541.8	-106.006031	43.72455
P187387.0W	04/25/2008	Complete	Dry Willow Fed 4376 4-21	CBM	043N	076W	04	NE1/4NW1/4	11	1980	1704	-106.001989	43.736039
P187388.0W	04/25/2008	Complete	Dry Willow Fed 4376 4-23	CBM	043N	076W	04	NE1/4SW1/4	1	1880	1631.9	-106.000761	43.728331
P187393.0W	04/25/2008	Complete	Dry Willow Fed 4376 3-23	CBM	043N	076W	03	NE1/4SW1/4	1	2002	1768.29	-105.98075	43.728019
P187883.0W	06/24/2008	Complete	Dry Willow Fed 4376 3-43	CBM	043N	076W	03	NE1/4SE1/4	1	1800	1619.73	-105.9708	43.727808
P189222.0W	10/20/2008	Complete	T Chair Land 29S-3	CBM	044N	075W	29	NE1/4NW1/4	3	1633	1539.63	-105.8997	43.765389
P189223.0W	10/20/2008	Complete	T Chair Land 30S-1	CBM	044N	075W	30	NE1/4NE1/4	1	1607	1476.55	-105.910419	43.765131
P190546.0W	03/31/2009	Incomplete	Dry Willow Fed 4376 12-21	CBM	043N	076W	12	NE1/4NW1/4	85			-105.940831	43.720628
P190547.0W	03/31/2009	Incomplete	Dry Willow Fed 4376 1-34	CBM	043N	076W	01	SW1/4SE1/4	85			-105.935906	43.724261
P190548.0W	03/31/2009	Incomplete	Dry Willow Fed 4376 1-41	CBM	043N	076W	01	NE1/4NE1/4	85			-105.930894	43.735475
P190549.0W	03/31/2009	Incomplete	Dry Willow Fed 4376 1-43	CBM	043N	076W	01	NE1/4SE1/4	85			-105.930994	43.727947
P190550.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 23-21	CBM	044N	076W	23	NE1/4NW1/4	85			-105.960533	43.77945
P190551.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 23-12	CBM	044N	076W	23	SW1/4NW1/4	85			-105.965522	43.775892
P190553.0W	03/31/2009	Complete	Christensen Fed 4476 33-14	CBM	044N	076W	33	SW1/4SW1/4	85			-106.006147	43.738881
P190554.0W	03/31/2009	Complete	Christensen Fed 4476 33-12	CBM	044N	076W	33	SW1/4NW1/4	85			-106.005942	43.746169
P190555.0W	03/31/2009	Complete	Christensen Fed 4476 28-23	CBM	044N	076W	28	NE1/4SW1/4	85			-106.000853	43.757331
P190556.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 34-34	CBM	044N	076W	34	SW1/4SE1/4	85			-105.975897	43.739022
P190558.0W	03/31/2009	Incomplete	Dry Willow Fee 4376 1-12	CBM	043N	076W	01	SW1/4NW1/4	85			-105.945967	43.731703
P190559.0W	03/31/2009	Incomplete	Dry Willow Fee 4376 1-32	CBM	043N	076W	01	SW1/4NE1/4	85			-105.935908	43.731589
P190560.0W	03/31/2009	Incomplete	Dry Willow Fee 4376 1-21	CBM	043N	076W	01	NE1/4NW1/4	85			-105.940878	43.735364
P190561.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 22-34	CBM	044N	076W	22	SW1/4SE1/4	85			-105.975578	43.768753
P190562.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 22-43	CBM	044N	076W	22	NE1/4SE1/4	85			-105.970492	43.772344
P190563.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 23-14	CBM	044N	076W	23	SW1/4SW1/4	85			-105.965617	43.768678
P190564.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 26-43	CBM	044N	076W	26	NE1/4SE1/4	85			-105.950758	43.757597
P190566.0W	03/31/2009	Incomplete	Dry Willow Fee 4376 1-23	CBM	043N	076W	01	NE1/4SW1/4	85			-105.940819	43.728031
P190569.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 34-32	CBM	044N	076W	34	SW1/4NE1/4	85			-105.975931	43.746581
P190570.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 34-14	CBM	044N	076W	34	SW1/4SW1/4	85			-105.985981	43.738953
P190571.0W	03/31/2009	Complete	Dry Willow Fed 4476 27-43	CBM	044N	076W	27	NE1/4SE1/4	23	1634	1418.2	-105.97155	43.759628
P190572.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 27-41	CBM	044N	076W	27	NE1/4NE1/4	85			-105.970606	43.765047
P190573.0W	03/31/2009	Incomplete	Dry Willow Fee 4476 27-34	CBM	044N	076W	27	SW1/4SE1/4	85			-105.975886	43.754047
P190574.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 27-23	CBM	044N	076W	27	NE1/4SW1/4	85			-105.980828	43.757811
P190575.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 23-43	CBM	044N	076W	23	NE1/4SE1/4	85			-105.95085	43.772175
P190576.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 23-32	CBM	044N	076W	23	SW1/4NE1/4	85			-105.955619	43.775822
P190577.0W	03/31/2009	Incomplete	Dry Willow Fed 4476 23-23	CBM	044N	076W	23	NE1/4SW1/4	85			-105.960628	43.7722
P190578.0W	03/31/2009	Incomplete	Dry Willow Fee 4376 1-14	CBM	043N	076W	01	SW1/4SW1/4	85			-105.945903	43.724206
P190589.0W	03/31/2009	Complete	Christensen FED 4476 28-21	CBM	044N	076W	28	NE1/4NW1/4	85			-106.000658	43.764603
P190590.0W	03/31/2009	Complete	Christensen FED 4476 28-14	CBM	044N	076W	28	SW1/4SW1/4	85			-106.005917	43.753392
P190591.0W	03/31/2009	Complete	Christensen FED 4476 28-12	CBM	044N	076W	28	SW1/4NW1/4	85			-106.005806	43.7607

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P190628.0W	03/31/2009	Incomplete	Savageton Fed 21-7-4475	CBM	044N	075W	07	NE1/4NW1/4	85			-105.919467	43.807656
P190631.0W	03/31/2009	Incomplete	Savageton Fed 41-32-4575	CBM	045N	075W	32	NE1/4NE1/4	85			-105.892017	43.835097
P190632.0W	03/31/2009	Incomplete	Savageton Fed 12-32-4575	CBM	045N	075W	32	SW1/4NW1/4	85			-105.907278	43.831306
P190633.0W	03/31/2009	Incomplete	Savageton Fed 12-33-4575	CBM	045N	075W	33	SW1/4NW1/4	85			-105.886811	43.831964
P190706.0W	03/31/2009	Complete	Christensen Fed 4476 33-23	CBM	044N	076W	33	NE1/4SW1/4	85			-106.001061	43.742586
P190707.0W	03/31/2009	Complete	Christensen Fed 4476 33-34	CBM	044N	076W	33	SW1/4SE1/4	85			-105.996033	43.739017
P190708.0W	03/31/2009	Complete	Christensen Fed 4476 33-43	CBM	044N	076W	33	NE1/4SE1/4	85			-105.990983	43.742775
P190709.0W	03/31/2009	Complete	Christensen Fed 4476 33-21	CBM	044N	076W	33	NE1/4NW1/4	85			-106.000997	43.749925
P190761.0W	04/16/2009	Incomplete	Christensen Fed 4476 27-21	CBM	044N	076W	27	NE1/4NW1/4	85			-105.980636	43.765336
P190762.0W	04/16/2009	Incomplete	Christensen Fed 4476 27-32	CBM	044N	076W	27	SW1/4NE1/4	85			-105.975781	43.761556
P190770.0W	04/16/2009	Incomplete	TM-CBM Fed 4476 5-43	CBM	044N	076W	05	NE1/4SE1/4	85			-106.009464	43.813975
P190772.0W	04/16/2009	Incomplete	TM-CBM Fed 4476 8-41	CBM	044N	076W	08	NE1/4NE1/4	85			-106.009872	43.807317
P190773.0W	04/16/2009	Incomplete	TM-CBM Fed 4476 8-43	CBM	044N	076W	08	NE1/4SE1/4	85			-106.010319	43.800042
P192396.0W	02/10/2010	Incomplete	Dry Willow Fee 4476 34-41	CBM	044N	076W	34	NE1/4NE1/4	85			-105.970811	43.750103
P192397.0W	02/10/2010	Incomplete	Dry Willow Fee 4476 34-43	CBM	044N	076W	34	NE1/4SE1/4	85			-105.970883	43.742997
P193575.0W	07/22/2010	Incomplete	Christensen 4476 28-41	CBM	044N	076W	28	NE1/4NE1/4	85			-105.990631	43.765342
P193576.0W	07/22/2010	Incomplete	Christensen 4476 28-34	CBM	044N	076W	28	SW1/4SE1/4	85			-105.995833	43.753908
P193577.0W	07/22/2010	Incomplete	Christensen 4476 21-34	CBM	044N	076W	21	SW1/4SE1/4	85			-105.995647	43.768494
P193578.0W	07/22/2010	Incomplete	Christensen 4476 33-41	CBM	044N	076W	33	NE1/4NE1/4	85			-105.990906	43.750453
P193579.0W	07/22/2010	Incomplete	Christensen 4476 28-43	CBM	044N	076W	28	NE1/4SE1/4	85			-105.990892	43.757681
P193580.0W	07/22/2010	Incomplete	Christensen 4476 33-32	CBM	044N	076W	33	SW1/4NE1/4	85			-105.996064	43.746303
P193746.0W	08/11/2010	Incomplete	Christensen 4476 21-32	CBM	044N	076W	21	SE1/4NE1/4	85			-105.991831	43.776108
P193747.0W	08/11/2010	Incomplete	Christensen 4476 21-41	CBM	044N	076W	21	NE1/4NE1/4	85			-105.989483	43.7797
P193748.0W	08/11/2010	Incomplete	Christensen 4476 28-32	CBM	044N	076W	28	SW1/4NE1/4	85			-105.994019	43.761942
P193773.0W	08/23/2010	Incomplete	Christensen 4476 34-12	CBM	044N	076W	34	SW1/4NW1/4	85			-105.986619	43.7472
P193774.0W	08/23/2010	Incomplete	Christensen 4476 34-21	CBM	044N	076W	34	NE1/4NW1/4	85			-105.981639	43.750969
P193776.0W	08/23/2010	Incomplete	T-Chair Fed 4376 3-33	CBM	043N	076W	03	NW1/4SE1/4	85			-105.976789	43.72725
P194364.0W	10/06/2010	Incomplete	Christensen Fed 4476 27-12	CBM	044N	076W	27	SW1/4NW1/4	85			-105.984789	43.761981
P194367.0W	10/15/2010	Incomplete	TRAIN CS Federal #04	CBM	044N	076W	22	SW1/4SW1/4	200			-105.985553	43.769128
P194608.0W	12/01/2010	Incomplete	Dry Willow Fee 4475 19-23	CBM	044N	075W	19	NE1/4SW1/4	85			-105.920111	43.772681
P194628.0W	12/23/2010	Incomplete	Miracle Maker CS Federal #02	CBM	044N	076W	22	SW1/4NE1/4	200			-105.975611	43.776447
P194666.0W	01/03/2011	Incomplete	Train CS Federal #02	CBM	044N	076W	22	SW1/4NW1/4	200			-105.9854	43.776033
P196183.0W	06/28/2011	Incomplete	Dry Willow Fed 4475 19-21	CBM	044N	075W	19	NE1/4NW1/4	85			-105.919172	43.780664
P196184.0W	06/28/2011	Incomplete	Dry Willow Fed 4476 34-36	CBM	044N	076W	36	SW1/4SE1/4	85			-105.935869	43.739639
P196213.0W	06/28/2011	Incomplete	TM-CBM Fee 4576 33-32	CBM	045N	076W	33	SW1/4NE1/4	85			-105.9967	43.829878
P196214.0W	06/28/2011	Incomplete	TM-CBM Fee 4576 33-41	CBM	045N	076W	33	NE1/4NE1/4	85			-105.990881	43.833644
P196670.0W	08/15/2011	Incomplete	TM-CBM Fee 4476 8-44	CBM	044N	076W	08	SE1/4SE1/4	85			-106.009417	43.797633
P196951.0W	10/06/2011	Incomplete	J Christensen Fed 32-4-4476	CBM	044N	076W	04	SW1/4NE1/4	60			-105.994275	43.817297
P196952.0W	10/06/2011	Incomplete	J Christensen Fed 32-3-4476	CBM	044N	076W	03	SW1/4NE1/4	60			-105.974114	43.817422
P196953.0W	10/06/2011	Incomplete	J Christensen Fed 12-4-4476	CBM	044N	076W	04	SW1/4NW1/4	60			-106.004369	43.817225
P196954.0W	10/06/2011	Incomplete	J Christensen Fed 12-3-4476	CBM	044N	076W	03	SW1/4NW1/4	60			-105.984194	43.817461
P196955.0W	10/06/2011	Incomplete	J Christensen Fed 23-4-4476	CBM	044N	076W	04	NE1/4SW1/4	60			-105.999428	43.813892
P196956.0W	10/06/2011	Incomplete	J Christensen Fed 14-4-4476	CBM	044N	076W	04	SW1/4SW1/4	60			-106.00465	43.810653
P196957.0W	10/06/2011	Incomplete	J Christensen Fed 21-3-4476	CBM	044N	076W	03	NE1/4NW1/4	60			-105.979153	43.820203
P188301.0W	07/08/2008	Complete	T-Chair Fed 21-9-4376	CBM; MIS	043N	076W	09	NE1/4NW1/4	60			-106.000992	43.720353
P188304.0W	07/08/2008	Complete	T-Chair Fed 41-9-189	CBM; MIS	043N	076W	09	NE1/4NE1/4	60			-105.990944	43.720447

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P115897.0W	05/17/1999	Complete	PB-CBM A36-8	CBM; STK	044N	076W	36	SE1/4SE1/4	60	1601	200	-105.93089	43.73958
P115898.0W	05/17/1999	Complete	PB-CBM A36-7	CBM; STK	044N	076W	36	NW1/4SE1/4	60	1340	200	-105.93584	43.74327
P115899.0W	05/17/1999	Complete	PB-CBM A36-6	CBM; STK	044N	076W	36	SE1/4SW1/4	60	1417	200	-105.94087	43.73958
P115900.0W	05/17/1999	Complete	PB-CBM A36-5	CBM; STK	044N	076W	36	NW1/4SW1/4	60	1476	200	-105.94585	43.74332
P115901.0W	05/17/1999	Complete	PB-CBM A36-4	CBM; STK	044N	076W	36	SE1/4NE1/4	60	1586	200	-105.93083	43.74691
P115902.0W	05/17/1999	Complete	PB-CBM A36-3	CBM; STK	044N	076W	36	NW1/4NE1/4	60	1683	200	-105.93575	43.75062
P115903.0W	05/17/1999	Complete	PB-CBM A36-2	CBM; STK	044N	076W	36	SE1/4NW1/4	60	1620	200	-105.94079	43.747
P115904.0W	05/17/1999	Complete	PB-CBM A36-1	CBM; STK	044N	076W	36	NW1/4NW1/4	60	1690	200	-105.9458	43.75078
P132838.0W	02/26/2001	Incomplete	North Butte CS State #7	CBM; STK	044N	076W	16	NE1/4SW1/4	200			-106.000542	43.786278
P132839.0W	02/26/2001	Incomplete	North Butte CS State #5	CBM; STK	044N	076W	16	SW1/4NE1/4	200			-105.99556	43.79009
P135683.0W	06/14/2001		T Chair Land 30S-5	CBM; STK	044N	075W	30	SW1/4NW1/4	30			-105.9256	43.76149
P145914.0W	07/16/2002	Incomplete	Train CS Federal # 1	CBM; STK	044N	076W	22	NE1/4NW1/4	200			-105.98038	43.77997
P149751.0W	02/19/2003		T-Chair Ranch 43-18-4475	CBM; STK	044N	075W	18	NE1/4SE1/4	75			-105.9098	43.78717
P152653.0W	06/20/2003	Complete	Pumpkin Buttes Ranch 14-34-4475	CBM; STK	044N	075W	34	SW1/4SW1/4	12	1621	1495.8	-105.863461	43.7384
P185784.0W	02/13/2008	Incomplete	Dry Willow Fed 4476 26-41	CBM; STK	044N	076W	26	NE1/4NE1/4	85			-105.950664	43.764844
P191599.0W	08/03/2009	Incomplete	Christensen CS State #01	CBM; STK	044N	076W	16	SW1/4SE1/4	200			-105.995383	43.782544
P191600.0W	08/03/2009	Complete	North Butte CS State #03	CBM; STK	044N	076W	16	NE1/4NW1/4	200	1405	482	-106.000011	43.793558
P191601.0W	08/03/2009	Complete	North Butte CS State #06	CBM; STK	044N	076W	16	NE1/4SE1/4	200	1540	469	-105.990078	43.786619
P191602.0W	08/03/2009	Complete	North Butte CS State #08	CBM; STK	044N	076W	16	SW1/4SW1/4	200	1442	273	-106.006239	43.783208
P195117.0W	02/22/2011	Incomplete	North Butte CS State NO 1	CBM;STK	044N	076W	16	SE1/4NE1/4	200			-105.990497	43.789758
P24084.0P	09/21/1958	Complete	House Well #3	DOM	044N	076W	21	NW1/4SE1/4	4	450	90	-105.99552	43.77258
P14909.0P	12/31/1940	Complete	Schlautmann #11	DOM; STK	045N	075W	34	SW1/4SE1/4	5	150	80	-105.8564	43.82433
P188784.0W	09/18/2008	Incomplete	Pumpkin Butte Ranch House	DOM; STK	043N	075W	04	NE1/4NW1/4	25			-105.87895	43.734989
P24085.0P	12/31/1940	Complete	Ellendale #4	DOM; STK	044N	076W	17	NE1/4SE1/4	3	406	22	-106.01063	43.78622
P28847.0W	07/22/1974	Complete	Heldt #4	DOM; STK	044N	076W	09	SE1/4SW1/4	12	600	80	-106.00058	43.79703
P101170.0W	12/21/1995	Complete	CR Wellfield #6A	IND	044N	076W	04	SW1/4NE1/4	1700	520	193	-105.9943	43.81776
P101171.0W	12/21/1995	Complete	CR Wellfield #6B	IND	044N	076W	04	NE1/4NW1/4	300	520	223	-105.99925	43.82053
P101172.0W	12/21/1995	Complete	CR Wellfield #6C	IND	044N	076W	04	SE1/4NW1/4	1100	540	213	-105.99934	43.81774
P101173.0W	12/21/1995	Complete	CR Wellfield #6D	IND	044N	076W	04	SW1/4NW1/4	150	600	284	-106.00439	43.81771
P101174.0W	12/21/1995	Complete	CR Wellfield #6E	IND	044N	076W	04	NW1/4SE1/4	1700	420	190	-105.9944	43.81442
P101175.0W	12/21/1995	Complete	CR Wellfield #6F	IND	044N	076W	04	SE1/4NE1/4	200	500	204.8	-105.98925	43.81779
P101177.0W	12/21/1995	Complete	CR Wellfield #6H	IND	044N	076W	04	SE1/4NE1/4	400	540	170	-105.98925	43.81779
P104862.0W	01/08/1997	Complete	ENL CR Wellfield #5C	IND	044N	076W	17	SE1/4SE1/4	195	460	133	-106.01054	43.78261
P104863.0W	01/08/1997	Complete	ENL CR Wellfield #5D	IND	044N	076W	20	NE1/4NE1/4	405	480	135	-106.01053	43.77901
P104864.0W	01/08/1997	Complete	ENL CR Wellfield #5E	IND	044N	076W	16	SW1/4SW1/4	750	360	81.9	-106.00551	43.78265
P104865.0W	01/08/1997	Complete	ENL CR Wellfield #5C	IND	044N	076W	21	NW1/4NW1/4	855	561	222.2	-106.00549	43.77907
P104866.0W	01/08/1997	Complete	ENL CR Wellfield #5G	IND	044N	076W	16	NE1/4NW1/4	100	480	152	-106.00069	43.79349
P104867.0W	01/08/1997	Complete	ENL CR Wellfield #5H	IND	044N	076W	16	NW1/4SW1/4	175	440	107	-106.00559	43.78622
P104868.0W	01/08/1997	Complete	ENL CR Wellfield #5I	IND	044N	076W	16	NE1/4SW1/4	240	460	128.8	-106.00054	43.78641
P104869.0W	01/08/1997	Complete	ENL CR Wellfield #5J	IND	044N	076W	16	SE1/4NW1/4	175	480	144.1	-106.00061	43.78995
P104870.0W	01/08/1997	Complete	ENL CR Wellfield #5K	IND	044N	076W	16	NW1/4NW1/4	125	460	150.3	-106.00575	43.79338
P107850.0W	09/26/1997	Incomplete	CR Wellfield #7A	IND	044N	076W	03	NW1/4SW1/4	400			-105.98432	43.81446
P107851.0W	09/26/1997	Incomplete	CR Wellfield #7B	IND	044N	076W	03	SW1/4SW1/4	840			-105.98443	43.81104
P107852.0W	09/26/1997	Incomplete	CR Wellfield #7C	IND	044N	076W	04	NE1/4SE1/4	1200			-105.98936	43.81442
P107853.0W	09/26/1997	Incomplete	CR Wellfield #7D	IND	044N	076W	04	SE1/4SE1/4	2680			-105.98947	43.811
P107854.0W	09/26/1997	Incomplete	CR Wellfield #7E	IND	044N	076W	04	SW1/4SE1/4	280			-105.99451	43.81104

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P107855.0W	09/26/1997	Incomplete	CR Wellfield #7F	IND	044N	076W	09	NE1/4NE1/4	1200			-105.98965	43.80755
P107856.0W	09/26/1997	Incomplete	CR Wellfield #7G	IND	044N	076W	09	SE1/4NE1/4	840			-105.98992	43.80409
P107857.0W	09/26/1997	Incomplete	CR Wellfield #7H	IND	044N	076W	09	NE1/4SE1/4	480			-105.99018	43.80063
P107858.0W	09/26/1997	Incomplete	CR Wellfield #7I	IND	044N	076W	10	SW1/4NW1/4	360			-105.98365	43.80309
P107859.0W	09/26/1997	Incomplete	CR Wellfield #7J	IND	044N	076W	10	NW1/4NW1/4	1200			-105.98462	43.8076
P131197.0W	12/01/2000	Complete	Pumpkin Buttes Shannon Unit Water Source Well	IND	044N	076W	36	SW1/4SW1/4	0	5155	557	-105.94587	43.73958
P52981.0W	07/09/1980	Complete	Hartzog Draw Unit Water Supply Well #1	IND	044N	075W	04	NW1/4SE1/4	146	7252	800	-105.87301	43.81544
P59134.0W	10/21/1981	Complete	Enl. of Hartzog Draw Unit Water Supply Well #1	IND	044N	075W	04	NW1/4SE1/4	146	7252	800	-105.87301	43.81544
P81754.0W	02/02/1990	Incomplete	Hartzog Draw Separation Facility	IND	044N	075W	04	SW1/4SE1/4	85	-1	-1.00	-105.87319	43.81165
P99005.0W	04/24/1995	Complete	CR Wellfield #5C	IND	044N	076W	17	SE1/4SE1/4	675	465	128	-106.01054	43.78261
P99006.0W	04/24/1995	Complete	CR Wellfield #5D	IND	044N	076W	20	NE1/4NE1/4	570	480	135	-106.01053	43.77901
P99007.0W	04/24/1995	Complete	CR Wellfield #5E	IND	044N	076W	16	SW1/4SW1/4	300	360	81.9	-106.00551	43.78265
P99008.0W	04/24/1995	Complete	CR Wellfield #5F	IND	044N	076W	21	NW1/4NW1/4	675	561	222.2	-106.00549	43.77907
P99009.0W	04/24/1995	Complete	CR Wellfield #5G	IND	044N	076W	16	NE1/4NW1/4	75	480	152	-106.00069	43.79349
P99010.0W	04/24/1995	Complete	CR Wellfield #5H	IND	044N	076W	16	NW1/4SW1/4	105	440	107.7	-106.00559	43.78622
P99011.0W	04/24/1995	Complete	CR Wellfield #5I	IND	044N	076W	16	NE1/4SW1/4	75	460	128.8	-106.00054	43.78641
P99012.0W	04/24/1995	Complete	CR Wellfield #5J	IND	044N	076W	16	SE1/4NW1/4	105	480	144.1	-106.00061	43.78995
P99013.0W	04/24/1995	Incomplete	CR Wellfield #5K	IND	044N	076W	16	NW1/4NW1/4	75	460	150.3	-106.00575	43.79338
P194854.0W	01/12/2011	Incomplete	CR MU7 SEC 3 NW-SW	IND; MIS	044N	076W	03	NW1/4SW1/4	60			-105.984564	43.814614
P194855.0W	01/12/2011	Incomplete	CR MU7 SEC 4 SE-SE	IND; MIS	044N	076W	04	SE1/4SE1/4	560			-105.989422	43.811178
P194856.0W	01/12/2011	Incomplete	CR MU7 SEC 4 NE-SE	IND; MIS	044N	076W	04	NE1/4SE1/4	500			-105.989511	43.814658
P194857.0W	01/12/2011	Incomplete	CR MU7 SEC 3 SW-SW	IND; MIS	044N	076W	03	SW1/4SW1/4	240			-105.984431	43.81095
P194858.0W	01/12/2011	Incomplete	CR MU7 SEC 9 NE-NE	IND; MIS	044N	076W	09	NE1/4NE1/4	200			-105.989497	43.808133
P194859.0W	01/12/2011	Incomplete	CR MU7 SEC 9 SE-NE	IND; MIS	044N	076W	09	SE1/4NE1/4	440			-105.990008	43.804058
P194860.0W	01/12/2011	Incomplete	CR MU7 SEC 9 NE-SE	IND; MIS	044N	076W	09	NE1/4SE1/4	220			-105.990161	43.801147
P194861.0W	01/12/2011	Incomplete	CR MU7 SEC 10 SW-NW	IND; MIS	044N	076W	10	SW1/4NW1/4	140			-105.983706	43.802903
P194862.0W	01/12/2011	Incomplete	CR MU7 SEC 10 NW-NW	IND; MIS	044N	076W	10	NW1/4NW1/4	460			-105.984572	43.807808
P195797.0W	05/16/2011	Incomplete	URZHTWF-1 through URZHTWF-14	IND; MIS	044N	075W	31	SW1/4NE1/4	210			-105.915131	43.7464
P192394.0W	01/21/2010	Incomplete	PW1	MIS	044N	076W	24	NW1/4SW1/4	25			-105.945647	43.772925
P192753.0W	04/05/2010	Incomplete	7WW-1	MIS	044N	076W	04	SE1/4SE1/4	15			-105.989444	43.810564
P30147.0W	04/03/1975		BARN #30	MIS	044N	076W	21	NE1/4SE1/4	12	660	35	-105.99049	43.77292
P33463.0W	09/30/1975		HANK 1	MIS	044N	075W	31	NW1/4SE1/4	14	440	370	-105.91512	43.74313
P60219.0W	02/23/1982	Complete	Hartzog Draw Unit Potable Water Well #1	MIS	044N	075W	04	NW1/4SE1/4	20	921	450	-105.87301	43.81544
P67281.0W	05/14/1984	Incomplete	RM 04	MIS	044N	076W	04	SW1/4NE1/4	0	562	120	-105.9943	43.81776
P72816.0W	06/25/1986	Incomplete	WCOW 5	MIS	044N	076W	17	SE1/4SE1/4	20	645	155	-106.01054	43.78261
P100644.0W	10/16/1995	Complete	7MW1	MON	044N	076W	10	NW1/4NW1/4	0	700	304.2	-105.98462	43.8076
P100645.0W	10/16/1995	Complete	7MW2	MON	044N	076W	10	SW1/4NW1/4	0	710	310.3	-105.98365	43.80309
P100646.0W	10/16/1995	Complete	7MW3	MON	044N	076W	10	NW1/4NW1/4	0	665	263.8	-105.98462	43.8076
P100647.0W	10/16/1995	Complete	7MW4	MON	044N	076W	10	SW1/4NW1/4	0	660	266.1	-105.98365	43.80309
P100648.0W	10/16/1995	Complete	7MW5	MON	044N	076W	10	NW1/4NW1/4	0	650	244.5	-105.98462	43.8076
P100649.0W	10/16/1995	Complete	7MW6	MON	044N	076W	09	SW1/4NW1/4	0	675	274	-106.00508	43.80412
P100650.0W	10/16/1995	Complete	7MW7	MON	044N	076W	03	SW1/4SW1/4	0	660	286.8	-105.98443	43.81104

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P100651.0W	10/16/1995	Complete	7MW8	MON	044N	076W	09	SE1/4NE1/4	0	650	241.5	-105.98992	43.80409
P100652.0W	10/16/1995	Complete	7MW9	MON	044N	076W	03	SW1/4SW1/4	0	670	272.4	-105.98443	43.81104
P100653.0W	10/16/1995	Complete	7MW10	MON	044N	076W	09	SE1/4NE1/4	0	640	224.5	-105.98992	43.80409
P100654.0W	10/16/1995	Complete	7MW11	MON	044N	076W	03	NW1/4SW1/4	0	650	234	-105.98432	43.81446
P100655.0W	10/16/1995	Complete	7MW12	MON	044N	076W	09	NE1/4NE1/4	0	650	248.8	-105.98965	43.80755
P100656.0W	10/16/1995	Complete	7MW13	MON	044N	076W	03	NW1/4SW1/4	0	600	202.8	-105.98432	43.81446
P100657.0W	10/16/1995	Complete	7MW14	MON	044N	076W	09	NE1/4NE1/4	0	640	236.4	-105.98965	43.80755
P100658.0W	10/16/1995	Complete	7MW15	MON	044N	076W	03	NW1/4SW1/4	0	640	182.8	-105.98432	43.81446
P100659.0W	10/16/1995	Complete	7MW16	MON	044N	076W	09	SE1/4NE1/4	0	720	308.4	-105.98992	43.80409
P100660.0W	10/16/1995	Complete	6MW17	MON	044N	076W	04	SE1/4SE1/4	0	540	196.5	-105.98947	43.811
P100661.0W	10/16/1995	Complete	7MW18	MON	044N	076W	09	SE1/4NE1/4	0	720	231.6	-105.98992	43.80409
P100662.0W	10/16/1995	Complete	6MW38	MON	044N	076W	04	NE1/4SE1/4	0	600	211.6	-105.98936	43.81442
P100663.0W	10/16/1995	Complete	6MW19	MON	044N	076W	04	SW1/4SE1/4	0	520	190	-105.99451	43.81104
P100664.0W	10/16/1995	Complete	7MW20	MON	044N	076W	09	NE1/4SE1/4	0	650	295	-105.99018	43.80063
P100665.0W	10/16/1995	Complete	6MW21	MON	044N	076W	04	SW1/4SE1/4	0	520	183.7	-105.99451	43.81104
P100666.0W	10/16/1995	Complete	7MW22	MON	044N	076W	09	NE1/4SE1/4	0	640	265.7	-105.99018	43.80063
P100667.0W	10/16/1995	Complete	6MW23	MON	044N	076W	04	SW1/4SE1/4	0	430	173.6	-105.99451	43.81104
P100668.0W	10/16/1995	Complete	7MW24	MON	044N	076W	09	NE1/4SE1/4	0	670	265.2	-105.99018	43.80063
P100669.0W	10/16/1995	Complete	6MW25	MON	044N	076W	04	SE1/4SW1/4	0	390	121.2	-105.99956	43.81109
P100670.0W	10/16/1995	Complete	7MW26	MON	044N	076W	09	SE1/4NE1/4	0	660	248.9	-105.98992	43.80409
P100671.0W	10/16/1995	Complete	6MW27	MON	044N	076W	04	NE1/4SW1/4	0	410	164.5	-105.99945	43.81443
P100672.0W	10/16/1995	Complete	7MW28	MON	044N	076W	09	SE1/4NE1/4	0	650	236	-105.98992	43.80409
P100673.0W	10/16/1995	Complete	6MW29	MON	044N	076W	04	NE1/4SW1/4	0	380	132.2	-105.99945	43.81443
P100674.0W	10/16/1995	Complete	7MW30	MON	044N	076W	09	NE1/4NE1/4	0	590	208	-105.98965	43.80755
P100675.0W	10/16/1995	Complete	6MW31	MON	044N	076W	04	NE1/4SW1/4	0	510	180.6	-105.99945	43.81443
P100676.0W	10/16/1995	Complete	7MW32	MON	044N	076W	09	NE1/4NE1/4	0	620	227.2	-105.98965	43.80755
P100677.0W	10/16/1995	Complete	6MW34	MON	044N	076W	04	NE1/4SE1/4	0	540	201.3	-105.98936	43.81442
P100678.0W	10/16/1995	Complete	6MW35	MON	044N	076W	04	SE1/4NW1/4	0	530	221	-105.99934	43.81774
P100679.0W	10/16/1995	Complete	6MW36	MON	044N	076W	04	NW1/4SE1/4	0	510	159	-105.9944	43.81442
P100680.0W	10/16/1995	Complete	6MW37	MON	044N	076W	04	SW1/4NW1/4	0	580	250	-106.00439	43.81771
P100681.0W	10/16/1995	Complete	6MW39	MON	044N	076W	04	SW1/4NW1/4	0	590	262	-106.00439	43.81771
P100682.0W	10/16/1995	Complete	6MW40	MON	044N	076W	04	SE1/4NE1/4	0	560	206	-105.98925	43.81779
P100683.0W	10/16/1995	Complete	6MW41	MON	044N	076W	04	SW1/4NW1/4	0	590	262.5	-106.00439	43.81771
P100684.0W	10/16/1995	Complete	6MW42	MON	044N	076W	04	SE1/4NE1/4	0	560	203	-105.98925	43.81779
P100685.0W	10/16/1995	Complete	6MW43	MON	044N	076W	04	SW1/4NW1/4	0	610	283	-106.00439	43.81771
P100686.0W	10/16/1995	Complete	6MW44	MON	044N	076W	04	NW1/4NE1/4	0	570	223.9	-105.9942	43.82058
P100687.0W	10/16/1995	Complete	6MW45	MON	044N	076W	04	NW1/4NW1/4	0	680	242.3	-106.0043	43.82051
P100688.0W	10/16/1995	Complete	6MW46	MON	044N	076W	04	SW1/4NE1/4	0	560	203	-105.9943	43.81776
P100689.0W	10/16/1995	Complete	6MW47	MON	044N	076W	04	NW1/4NW1/4	0	680	345.4	-106.0043	43.82051
P100690.0W	10/16/1995	Complete	6MW48	MON	044N	076W	04	NW1/4NE1/4	0	540	202	-105.9942	43.82058
P100691.0W	10/16/1995	Complete	6MW49	MON	044N	076W	04	NW1/4NW1/4	0	610	272.3	-106.0043	43.82051
P100692.0W	10/16/1995	Complete	6MW50	MON	044N	076W	04	NW1/4NE1/4	0	630	236	-105.9942	43.82058
P100693.0W	10/16/1995	Complete	6MW52	MON	044N	076W	04	NE1/4NW1/4	0	650	257	-105.99925	43.82053
P100694.0W	10/16/1995	Complete	6MW53	MON	044N	076W	04	NE1/4NW1/4	0	640	243.2	-105.99925	43.82053
P100695.0W	10/16/1995	Complete	6MW54	MON	044N	076W	04	NW1/4NE1/4	0	640	243.3	-105.9942	43.82058
P100701.0W	10/16/1995	Complete	6DM1	MON	044N	076W	09	SW1/4NW1/4	0	645	278	-106.00508	43.80412

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P100702.0W	10/16/1995	Complete	6DM2	MON	044N	076W	09	SE1/4NW1/4	0	660	268	-106.00003	43.80411
P100703.0W	10/16/1995	Complete	6DM3	MON	044N	076W	09	NE1/4NW1/4	0	610	235	-105.99975	43.80765
P100704.0W	10/16/1995	Complete	6DM4	MON	044N	076W	04	SE1/4NW1/4	0	620	237	-105.99934	43.81774
P100705.0W	10/16/1995	Complete	6DM5	MON	044N	076W	04	SE1/4SW1/4	0	600	210	-105.99956	43.81109
P100710.0W	10/16/1995	Complete	6DM10	MON	044N	076W	04	NW1/4SE1/4	0	550	175.5	-105.9944	43.81442
P100711.0W	10/16/1995	Complete	6SM1	MON	044N	076W	09	SW1/4NW1/4	0	340	170.4	-106.00508	43.80412
P100712.0W	10/16/1995	Complete	6SM2	MON	044N	076W	09	SW1/4NW1/4	0	300	147	-106.00508	43.80412
P100713.0W	10/16/1995	Complete	6SM3	MON	044N	076W	09	NE1/4NW1/4	0	245	132.3	-105.99975	43.80765
P100714.0W	10/16/1995	Complete	6SM4	MON	044N	076W	04	SE1/4NW1/4	0	220	131	-105.99934	43.81774
P100715.0W	10/16/1995	Complete	6SM5	MON	044N	076W	04	SE1/4NW1/4	0	280	101.3	-105.99934	43.81774
P100716.0W	10/16/1995	Complete	6SM6	MON	044N	076W	04	SE1/4NW1/4	0	300	88	-105.99934	43.81774
P100717.0W	10/16/1995	Complete	6SM7	MON	044N	076W	04	NW1/4SE1/4	0	335	127	-105.9944	43.81442
P100718.0W	10/16/1995	Complete	6SM8	MON	044N	076W	04	SW1/4NE1/4	0	250	81	-105.9943	43.81776
P100719.0W	10/16/1995	Complete	6SM9	MON	044N	076W	04	SW1/4NE1/4	0	230	84	-105.9943	43.81776
P100720.0W	10/16/1995	Complete	6SM10	MON	044N	076W	04	NW1/4SE1/4	0	300	78.2	-105.9944	43.81442
P100722.0W	10/16/1995	Complete	6MW51	MON	044N	076W	04	NE1/4NW1/4	0	600	253.5	-105.99925	43.82053
P100723.0W	10/16/1995	Complete	6MW33	MON	044N	076W	04	NW1/4SW1/4	0	520	198	-106.0045	43.81443
P104126.0W	10/15/1996	Complete	NBHW-1	MON	044N	076W	13	SE1/4SE1/4	0	720	378.5	-105.92829	43.78489
P104127.0W	10/15/1996	Complete	NBHW-2	MON	044N	076W	13	NW1/4SE1/4	0	760	422.8	-105.93351	43.78835
P104129.0W	10/15/1996	Complete	NBHW-4	MON	044N	076W	13	SW1/4SE1/4	0	760	526.6	-105.9357	43.78335
P104130.0W	10/15/1996	Complete	NBHW-5	MON	044N	076W	13	SW1/4SE1/4	0	635	417.9	-105.9357	43.78335
P104131.0W	10/15/1996	Complete	NBHW-6	MON	044N	076W	24	NE1/4NW1/4	0	600	373.4	-105.94077	43.77921
P104132.0W	10/15/1996	Complete	NBHW-7	MON	044N	076W	24	SE1/4NW1/4	0	610	357.3	-105.94077	43.77618
P104133.0W	10/15/1996	Complete	NBHW-8	MON	044N	076W	24	NE1/4SW1/4	0	640	343.6	-105.94078	43.77328
P104134.0W	10/15/1996	Complete	NBHW-9	MON	044N	076W	24	NE1/4SW1/4	0	560	218.1	-105.94078	43.77328
P104135.0W	10/15/1996	Complete	NBHW-10	MON	044N	076W	24	SE1/4SW1/4	0	490	171.3	-105.94079	43.76892
P104136.0W	10/15/1996	Complete	NBHW-11	MON	044N	076W	24	NE1/4NW1/4	0	665	225.8	-105.94077	43.77921
P104137.0W	10/15/1996	Complete	NBHW-12	MON	044N	076W	24	SE1/4NW1/4	0	646	195.7	-105.94077	43.77618
P104138.0W	10/15/1996	Complete	NBHW-13	MON	044N	076W	24	SE1/4NW1/4	0	470	125.4	-105.94077	43.77618
P104139.0W	10/15/1996	Complete	NBHW-14	MON	044N	076W	24	SE1/4NW1/4	0	520	107.7	-105.94077	43.77618
P104140.0W	10/15/1996	Complete	NBHW-15	MON	044N	076W	24	NE1/4NW1/4	0	350	126.2	-105.94077	43.77921
P104141.0W	10/15/1996	Complete	NBHW-16	MON	044N	076W	24	SW1/4SW1/4	0	670	221.3	-105.94725	43.76765
P104142.0W	10/15/1996	Complete	NBHW-17	MON	044N	076W	24	NE1/4SW1/4	0	555	207.4	-105.94078	43.77328
P104143.0W	10/15/1996	Complete	NBHW-18	MON	044N	076W	24	NE1/4SW1/4	0	630	290.4	-105.94078	43.77328
P104144.0W	10/15/1996	Complete	NBHW-19	MON	044N	076W	24	SW1/4NW1/4	0	660	326.3	-105.94575	43.77624
P104145.0W	10/15/1996	Complete	NBHW-20	MON	044N	076W	24	NW1/4NW1/4	0	630	372	-105.94726	43.78106
P105120.0W	02/25/1997	Complete	6TW4	MON	044N	076W	04	NW1/4SE1/4	0	560	181.3	-105.9944	43.81442
P105121.0W	02/25/1997	Complete	6TW5	MON	044N	076W	04	SW1/4NE1/4	0	460	195.2	-105.9943	43.81776
P105122.0W	02/25/1997	Complete	6DT1	MON	044N	076W	04	SE1/4NW1/4	0	580	193.1	-105.99934	43.81774
P106349.0W	06/13/1997	Complete	7MW19	MON	044N	076W	04	NE1/4SE1/4	0	580	166.4	-105.98936	43.81442
P106350.0W	06/13/1997	Complete	7MW21	MON	044N	076W	09	NE1/4SE1/4	0	620	224.5	-105.99018	43.80063
P106351.0W	06/13/1997	Complete	7MW23	MON	044N	076W	09	NE1/4SE1/4	0	670	264.4	-105.99018	43.80063
P106352.0W	06/13/1997	Complete	7MW25	MON	044N	076W	09	NE1/4SE1/4	0	670	258	-105.99018	43.80063
P106353.0W	06/13/1997	Complete	7MW27	MON	044N	076W	09	SW1/4NE1/4	0	660	254	-105.99497	43.8041
P106354.0W	06/13/1997	Complete	7MW29	MON	044N	076W	09	SW1/4NE1/4	0	630	231.7	-105.99497	43.8041
P106355.0W	06/13/1997	Complete	7MW31	MON	044N	076W	09	NW1/4NE1/4	0	590	207.8	-105.9947	43.8076

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P106356.0W	06/13/1997	Complete	7MW33	MON	044N	076W	09	NW1/4NE1/4	0	620	218.8	-105.9947	43.8076
P106357.0W	06/13/1997	Complete	7MW34	MON	044N	076W	09	NW1/4NE1/4	0	600	212.2	-105.9947	43.8076
P106358.0W	06/13/1997	Complete	7MW35	MON	044N	076W	09	NW1/4NE1/4	0	620	213.4	-105.9947	43.8076
P106359.0W	06/13/1997	Complete	7MW36	MON	044N	076W	04	SW1/4SE1/4	0	520	205.3	-105.99451	43.81104
P106360.0W	06/13/1997	Complete	7MW37	MON	044N	076W	04	SW1/4SE1/4	0	500	203.3	-105.99451	43.81104
P106361.0W	06/13/1997	Complete	7MW38	MON	044N	076W	04	SW1/4SE1/4	0	500	143.4	-105.99451	43.81104
P106362.0W	06/13/1997	Complete	7MW39	MON	044N	076W	04	SW1/4SE1/4	0	560	151.1	-105.99451	43.81104
P106363.0W	06/13/1997	Complete	7MW40	MON	044N	076W	04	NW1/4SE1/4	0	580	189.4	-105.9944	43.81442
P106364.0W	06/13/1997	Complete	7MW41	MON	044N	076W	04	NW1/4SE1/4	0	600	218.2	-105.9944	43.81442
P106369.0W	06/13/1997	Complete	7SM1	MON	044N	076W	04	NE1/4SE1/4	0	335	160	-105.98936	43.81442
P106370.0W	06/13/1997	Complete	7SM2	MON	044N	076W	03	SW1/4SW1/4	0	350	127.6	-105.98443	43.81104
P106371.0W	06/13/1997	Complete	7SM3	MON	044N	076W	10	NW1/4NW1/4	0	395	236.8	-105.98462	43.8076
P106372.0W	06/13/1997	Complete	7SM4	MON	044N	076W	04	NE1/4SE1/4	0	345	162.5	-105.98936	43.81442
P106373.0W	06/13/1997	Complete	7SM5	MON	044N	076W	10	NW1/4NW1/4	0	390	168.3	-105.98462	43.8076
P106374.0W	06/13/1997	Complete	7SM6	MON	044N	076W	04	SE1/4SE1/4	0	355	173.4	-105.98947	43.811
P106375.0W	06/13/1997	Complete	7SM7	MON	044N	076W	04	SE1/4SE1/4	0	335	176.8	-105.98947	43.811
P106376.0W	06/13/1997	Complete	7SM8	MON	044N	076W	09	SE1/4SE1/4	0	250	137.8	-105.99045	43.79716
P106377.0W	06/13/1997	Complete	7SM9	MON	044N	076W	04	SE1/4SE1/4	0	355	165.5	-105.98947	43.811
P106378.0W	06/13/1997	Complete	7SM10	MON	044N	076W	09	NE1/4SE1/4	0	360	208.6	-105.99018	43.80063
P106379.0W	06/13/1997	Complete	7SM11	MON	044N	076W	09	SE1/4NE1/4	0	250	137.1	-105.98992	43.80409
P106380.0W	06/13/1997	Complete	7SM12	MON	044N	076W	09	SE1/4NE1/4	0	395	224	-105.98992	43.80409
P106381.0W	06/13/1997	Complete	7SM13	MON	044N	076W	09	NE1/4SE1/4	0	370	168.3	-105.99018	43.80063
P106382.0W	06/13/1997	Complete	7DM1	MON	044N	076W	03	NW1/4SW1/4	0	780	225	-105.98432	43.81446
P106383.0W	06/13/1997	Complete	7DM2	MON	044N	076W	03	SW1/4SW1/4	0	750	230	-105.98443	43.81104
P106384.0W	06/13/1997	Complete	7DM3A	MON	044N	076W	10	NW1/4NW1/4	0	780	204.2	-105.98462	43.8076
P106385.0W	06/13/1997	Complete	7DM4A	MON	044N	076W	04	NE1/4SE1/4	0	760	215.1	-105.98936	43.81442
P106391.0W	06/13/1997	Complete	7TW1	MON	044N	076W	04	SE1/4SE1/4	0	535	225.3	-105.98947	43.811
P106392.0W	06/13/1997	Complete	7TW2	MON	044N	076W	04	SE1/4SE1/4	0	530	223.6	-105.98947	43.811
P106393.0W	06/13/1997	Complete	7TW3	MON	044N	076W	04	SE1/4SE1/4	0	525	213	-105.98947	43.811
P106394.0W	06/13/1997	Complete	7TW4	MON	044N	076W	03	SW1/4SW1/4	0	525	231.8	-105.98443	43.81104
P106395.0W	06/13/1997	Complete	7TW5	MON	044N	076W	09	NE1/4NE1/4	0	460	233.4	-105.98965	43.80755
P106396.0W	06/13/1997	Complete	7TW6	MON	044N	076W	09	NE1/4NE1/4	0	520	224.3	-105.98965	43.80755
P108341.0W	12/19/1997	Complete	7MW42	MON	044N	076W	04	NE1/4SE1/4	0	620	219.5	-105.98936	43.81442
P108342.0W	12/19/1997	Complete	7MW43	MON	044N	076W	04	NE1/4SE1/4	0	600	211.2	-105.98936	43.81442
P108947.0W	02/18/1998	Complete	Shogrin Federal #2 (Pistol Point)	MON	045N	075W	31	NE1/4SW1/4	0	1730	453	-105.92178	43.82783
P164527.0W	01/04/2005	Complete	North MW-A	MON	044N	075W	15	NW1/4SW1/4	0	125	80	-105.86436	43.78714
P164529.0W	01/04/2005		Van Vorhes MW-A	MON	044N	075W	03	SW1/4SW1/4	0	109	85	-105.86235	43.81219
P183847.0W	11/21/2007	Incomplete	URZHF-8	MON	044N	075W	31	SW1/4NE1/4	0			-105.915081	43.746869
P190034.0W	03/09/2009	Complete	URZHF-1	MON	043N	075W	06	SW1/4NE1/4	0	400	328.5	-105.91415	43.733731
P190035.0W	03/09/2009	Complete	URZHC-2	MON	043N	075W	06	SW1/4NE1/4	0	450	337.85	-105.914	43.733667
P190036.0W	03/09/2009	Complete	URZHG-3	MON	043N	075W	06	SW1/4NE1/4	0	300	281	-105.91425	43.733633
P191314.0W	08/10/2009	Complete	URZHH-7	MON	043N	075W	06	NE1/4NW1/4	0	145	91.54	-105.920375	43.735289
P191315.0W	08/10/2009	Complete	URZHH-10	MON	044N	075W	31	SW1/4NE1/4	0	135	128.9	-105.916347	43.745464
P191316.0W	08/10/2009	Complete	URZHH-9	MON	043N	075W	06	SE1/4SE1/4	0	155	123.81	-105.912146	43.72381
P191327.0W	08/10/2009	Complete	URZHF-11	MON	044N	075W	31	NW1/4SE1/4	6	420	341	-105.916078	43.743181
P191328.0W	08/10/2009	Complete	URZHF-12	MON	044N	075W	31	NE1/4SE1/4	0	482	379.5	-105.912053	43.742294

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P191329.0W	08/10/2009	Complete	URZHF-13	MON	044N	075W	31	NE1/4NW1/4	0	330	288.83	-105.917939	43.748775
P191330.0W	08/10/2009	Complete	URZHF-14	MON	044N	075W	31	NE1/4NW1/4	0	385	290.13	-105.918239	43.748828
P191331.0W	08/10/2009	Complete	URZHG-15	MON	044N	075W	31	NW1/4SE1/4	0	314	271.6	-105.914136	43.742844
P191332.0W	08/10/2009	Complete	URZHC-16	MON	044N	075W	31	NW1/4SE1/4	0	523	361.86	-105.914158	43.7427
P196630.0W	09/02/2011	Incomplete	NE/NE 24-44-76 (8 Wells) North Butte MINE UNIT 1	MON	044N	076W	24	NE1/4NE1/4	0			-105.930786	43.77935
P196631.0W	09/02/2011	Incomplete	SE/SE 13-44-76 (8 Wells) North Butte MINE UNIT 1	MON	044N	076W	13	SE1/4SE1/4	0			-105.928281	43.784392
P196632.0W	09/02/2011	Incomplete	SW/SW 18-44-75 (21-Wells) North Butte MINE UNIT 1	MON	044N	075W	18	SW1/4SW1/4	0			-105.925486	43.784408
P196633.0W	09/02/2011	Incomplete	SE/SW 18-44-75 (7-Wells) North Butte MINE UNIT 1	MON	044N	075W	18	SE1/4SW1/4	0			-105.920147	43.784308
P196634.0W	09/02/2011	Incomplete	NW/NE 18-44-75 (4-Wells) North Butte MINE UNIT 1	MON	044N	075W	19	NW1/4NE1/4	0			-105.915017	43.780881
P196635.0W	09/02/2011	Incomplete	NW/NE 19-44-75 (13 Wells) North Butte MINE UNIT 1	MON	044N	075W	19	NE1/4NW1/4	0			-105.917708	43.780919
P196636.0W	09/02/2011	Incomplete	NW/NW 19-44-75 (15 Wells) North Butte MINE UNIT 1	MON	044N	075W	19	NW1/4NW1/4	0			-105.925597	43.778344
P48981.0W	07/03/1979	Complete	WCPW 1	MON	044N	076W	17	SE1/4SE1/4	0	450	130	-106.01054	43.78261
P48982.0W	07/03/1979		WCOW 1	MON	044N	076W	17	SE1/4SE1/4	0	350	130	-106.01054	43.78261
P48983.0W	07/03/1979		WCOW 2	MON	044N	076W	17	SE1/4SE1/4	0	502	130	-106.01054	43.78261
P48984.0W	07/03/1979		WCOW 3	MON	044N	076W	17	SE1/4SE1/4	0	450	130	-106.01054	43.78261
P48985.0W	07/03/1979		WCOW-4	MON	044N	076W	17	SE1/4SE1/4	0	290	125	-106.01054	43.78261
P48987.0W	07/03/1979		WCOW 6	MON	044N	076W	17	SE1/4SE1/4	0	450	130	-106.01054	43.78261
P48988.0W	07/03/1979	Complete	WCOW 7	MON	044N	076W	17	SE1/4SE1/4	0	450	130	-106.01054	43.78261
P48989.0W	07/03/1979		WCOW 8	MON	044N	076W	17	SE1/4SE1/4	0	450	130	-106.01054	43.78261
P50567.0W	10/29/1979	Complete	Brown Piezometer A	MON	044N	075W	20	NE1/4SW1/4	0	320	229	-105.89968	43.77262
P50568.0W	10/29/1979	Complete	Brown Piezometer B	MON	044N	075W	30	NW1/4NW1/4	0	300	143	-105.92561	43.76513
P50569.0W	10/29/1979	Complete	Brown Piezometer C	MON	044N	075W	30	NW1/4NE1/4	0	340	170	-105.91509	43.76523
P50570.0W	10/29/1979	Complete	Brown Piezometer D	MON	044N	075W	30	SE1/4NW1/4	0	305	164	-105.92027	43.76154
P50571.0W	10/29/1979	Complete	Brown Piezometer E	MON	044N	075W	30	SE1/4NW1/4	0	300	166	-105.92027	43.76154
P50572.0W	10/29/1979	Complete	Brown Piezometer F	MON	044N	075W	30	SW1/4NE1/4	0	160	69	-105.91507	43.76159
P50573.0W	10/29/1979	Complete	Brown Piezometer G	MON	044N	075W	29	SW1/4SW1/4	0	320	169	-105.9047	43.75437
P50574.0W	10/29/1979	Complete	Brown Piezometer H	MON	044N	076W	25	NW1/4SW1/4	0	200	90	-105.94578	43.7581
P50575.0W	10/29/1979	Complete	Brown Piezometer I (EYE)	MON	044N	075W	30	SW1/4NW1/4	0	80	49	-105.9256	43.76149
P50576.0W	10/29/1979	Complete	Brown Piezometer J	MON	044N	075W	29	NW1/4NW1/4	0	110	95	-105.90478	43.76531
P50577.0W	10/29/1980	Complete	Brown Piezometer K	MON	044N	075W	29	NE1/4NW1/4	0	124	120	-105.89968	43.76532
P50578.0W	10/29/1979	Complete	Brown Piezometer 1	MON	044N	075W	19	NE1/4SE1/4	0	640	290	-105.90991	43.77258
P50579.0W	10/29/1979	Complete	Brown Piezometer M	MON	044N	075W	19	NE1/4SE1/4	0	528	261	-105.90991	43.77258
P50580.0W	10/29/1979	Complete	Brown Piezometer N	MON	044N	075W	19	NE1/4SE1/4	0	405	183	-105.90991	43.77258
P50581.0W	10/29/1979	Complete	Brown Piezometer O (OH)	MON	044N	075W	20	SW1/4NW1/4	0	580	282	-105.90476	43.77627
P50582.0W	10/29/1979	Complete	Brown Piezometer P	MON	044N	075W	29	SE1/4NE1/4	0	595	361	-105.88954	43.76168
P50583.0W	10/29/1979	Complete	Brown Piezometer Q	MON	044N	075W	29	SW1/4SW1/4	0	600	305	-105.9047	43.75437
P50584.0W	10/29/1979	Complete	Brown Piezometer R	MON	044N	075W	19	NE1/4SE1/4	0	520	265	-105.90991	43.77258
P53741.0W	08/06/1980	Complete	North Butte MN 1	MON	044N	075W	18	SE1/4SW1/4	0	966	385	-105.92019	43.78487
P53748.0W	08/06/1980	Complete	North Butte P 2 M	MON	044N	076W	24	NE1/4NE1/4	0	800	145	-105.93083	43.77983

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P53749.0W	08/06/1980	Complete	North Butte P 2 L	MON	044N	076W	24	NE1/4NE1/4	0	1000	378	-105.93083	43.77983
P53750.0W	08/06/1980	Complete	North Butte P 3	MON	044N	076W	13	SE1/4SE1/4	0	780	251	-105.92829	43.78489
P53752.0W	08/06/1980	Complete	North Butte R 5	MON	044N	076W	13	SE1/4SE1/4	0	760	133	-105.92829	43.78489
P53753.0W	08/06/1980	Complete	North Butte P 6	MON	044N	075W	18	SW1/4SW1/4	0	660	145	-105.92549	43.78488
P53754.0W	08/06/1980	Complete	North Butte P 7	MON	044N	076W	24	NE1/4NE1/4	0	660	539	-105.93083	43.77983
P53755.0W	08/06/1980	Complete	North Butte P 8	MON	044N	075W	19	NW1/4NW1/4	0	760	378	-105.92562	43.77881
P53756.0W	08/06/1980	Complete	North Butte P 9	MON	044N	075W	19	NE1/4NW1/4	0	640	197	-105.91772	43.78142
P53757.0W	08/06/1980	Complete	North Butte P 10	MON	044N	076W	13	NE1/4SE1/4	0	720	379	-105.93049	43.78833
P53758.0W	08/06/1980	Complete	North Butte P 11	MON	044N	076W	24	NW1/4NE1/4	0	820	384	-105.9358	43.77975
P53759.0W	08/06/1980	Complete	North Butte P 12	MON	044N	076W	13	SE1/4SE1/4	0	660	341	-105.92829	43.78489
P53760.0W	08/06/1980	Complete	North Butte P SS1 U	MON	044N	076W	25	NE1/4NW1/4	0	372	136	-105.94078	43.76529
P53761.0W	08/06/1980	Complete	North Butte SS1 P U	MON	044N	076W	25	NE1/4NW1/4	0	354	145	-105.94078	43.76529
P53762.0W	08/06/1980	Complete	North Butte SS1 M	MON	044N	076W	25	NE1/4NW1/4	0	454	139	-105.94078	43.76529
P53763.0W	08/06/1980	Complete	North Butte SS1 P M	MON	044N	076W	25	NE1/4NW1/4	0	446	146	-105.94078	43.76529
P53764.0W	08/06/1980	Complete	North Butte SS1 L	MON	044N	076W	25	NE1/4NW1/4	0	654	139	-105.94078	43.76529
P53766.0W	08/06/1980	Complete	North Butte SSW U	MON	044N	076W	26	SE1/4NE1/4	0	216	107	-105.95077	43.76177
P53767.0W	08/06/1980	Complete	North Butte SSW UM	MON	044N	076W	26	SW1/4NE1/4	0	346	104	-105.95574	43.76179
P53768.0W	08/06/1980	Complete	North Butte SSW LM	MON	044N	076W	26	SW1/4NE1/4	0	483	104	-105.95574	43.76179
P53769.0W	08/06/1980	Complete	North Butte SSW L	MON	044N	076W	26	SW1/4NE1/4	0	605	216	-105.95574	43.76179
P53770.0W	08/06/1980	Complete	North Butte SSE U	MON	044N	075W	19	NW1/4NE1/4	0	291	184	-105.91508	43.7814
P53771.0W	08/06/1980	Complete	North Butte SSE M	MON	044N	075W	19	NW1/4NE1/4	0	556	272	-105.91508	43.7814
P53772.0W	08/06/1980	Complete	North Butte SSE L	MON	044N	075W	19	NW1/4NE1/4	0	680	343	-105.91508	43.7814
P53779.0W	08/25/1980	Complete	N Butte SS1 (F) U	MON	044N	076W	25	NE1/4NW1/4	0	185	114	-105.94078	43.76529
P53780.0W	08/25/1980	Complete	N Butte SS1 (F) P U	MON	044N	076W	25	NE1/4NW1/4	0	191	115	-105.94078	43.76529
P53781.0W	08/25/1980	Complete	N Butte SS2 U	MON	044N	076W	24	SW1/4NE1/4	0	377	227	-105.93611	43.77612
P53782.0W	08/25/1980	Complete	N Butte SS2 P U	MON	044N	076W	24	SW1/4NE1/4	0	378	221	-105.93611	43.77612
P53783.0W	08/25/1980	Complete	N Butte SS2 M	MON	044N	076W	24	SW1/4NE1/4	0	645	306	-105.93611	43.77612
P53785.0W	08/25/1980	Complete	N Butte SS2 L	MON	044N	076W	24	SW1/4NE1/4	0	780	366	-105.93611	43.77612
P53786.0W	08/25/1980	Complete	N Butte SS2 P L	MON	044N	076W	24	SW1/4NE1/4	0	800	379	-105.93611	43.77612
P53791.0W	08/25/1980	Complete	WC - MN 1	MON	044N	076W	35	SW1/4SE1/4	0	210	100	-105.95587	43.73956
P60386.0W	04/21/1982		WCOW 21	MON	044N	076W	20	NE1/4NE1/4	0	505	138	-106.01053	43.77901
P60387.0W	04/21/1982		WCOW 22	MON	044N	076W	20	NE1/4NE1/4	0	455	150.9	-106.01053	43.77901
P60388.0W	04/21/1982	Complete	WCOW 23	MON	044N	076W	20	NE1/4NE1/4	0	462	148.5	-106.01053	43.77901
P60389.0W	04/21/1982		WCOW 24	MON	044N	076W	20	NE1/4NE1/4	0	360	144.8	-106.01053	43.77901
P60390.0W	04/21/1982		WCOW 25	MON	044N	076W	20	NE1/4NE1/4	0	455	145.2	-106.01053	43.77901
P60391.0W	04/21/1982		WCOW 26	MON	044N	076W	20	NE1/4NE1/4	0	460	146.5	-106.01053	43.77901
P60392.0W	04/21/1982	Complete	WCOW 27S	MON	044N	076W	20	NE1/4NE1/4	0	275	110.4	-106.01053	43.77901
P60393.0W	04/21/1982	Complete	WCOW 28D	MON	044N	076W	20	NE1/4NE1/4	0	660	159.4	-106.01053	43.77901
P66878.0W	03/19/1984	Complete	TW 01	MON	044N	076W	20	NE1/4NE1/4	0	470	120	-106.01053	43.77901
P66879.0W	03/19/1984	Complete	TW 02	MON	044N	076W	20	NE1/4NE1/4	0	470	120	-106.01053	43.77901
P67277.0W	05/14/1984	Complete	RM 03S	MON	044N	076W	10	NW1/4NW1/4	0	260	120	-105.98462	43.8076
P67278.0W	05/14/1984	Complete	RM 03	MON	044N	076W	10	NW1/4NW1/4	0	550	120	-105.98462	43.8076
P67279.0W	05/14/1984	Complete	RM 04D	MON	044N	076W	04	SW1/4NE1/4	0	763	150	-105.9943	43.81776
P67280.0W	05/14/1984	Complete	RM 04S	MON	044N	076W	04	SW1/4NE1/4	0	445	120	-105.9943	43.81776
P67282.0W	05/14/1984	Complete	RM 03D	MON	044N	076W	10	NW1/4NW1/4	0	700	150	-105.98462	43.8076
P74578.0W	05/11/1987	Complete	N Butte SS2 P M 1285P	MON	044N	076W	24	SW1/4NE1/4	0	640	143	-105.93611	43.77612

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P76612.0W	04/15/1988	Complete	SS2BC 1	MON	044N	076W	24	SW1/4NE1/4	0	640	298	-105.93611	43.77612
P76613.0W	04/15/1988	Complete	SS2BC 2	MON	044N	076W	24	SW1/4NE1/4	0	650	298	-105.93611	43.77612
P76614.0W	04/15/1988	Complete	SS2FBC AQ	MON	044N	076W	24	SW1/4NE1/4	0	459	225	-105.93611	43.77612
P76615.0W	04/15/1988	Complete	SSEA 1	MON	044N	075W	19	NW1/4NE1/4	0	668	330	-105.91508	43.7814
P76616.0W	04/15/1988	Complete	SSEA 2	MON	044N	075W	19	NW1/4NE1/4	0	670	330	-105.91508	43.7814
P76617.0W	04/15/1988	Complete	SSEA 3	MON	044N	075W	19	NW1/4NE1/4	0	666	330	-105.91508	43.7814
P76618.0W	04/15/1988	Complete	SSE1 1	MON	044N	075W	19	NW1/4NE1/4	0	740	322	-105.91508	43.7814
P76619.0W	04/15/1988	Complete	SSEA1 AQ	MON	044N	075W	19	NW1/4NE1/4	0	677.5	330	-105.91508	43.7814
P87751.0W	04/24/1992	Complete	M1	MON	044N	075W	19	NW1/4NE1/4	0	560	230	-105.91508	43.7814
P87752.0W	04/24/1992	Complete	M2	MON	044N	075W	19	NW1/4NE1/4	0	560	260	-105.91508	43.7814
P87753.0W	04/24/1992	Complete	M3	MON	044N	075W	19	SE1/4SW1/4	0	580	275	-105.92029	43.76883
P87754.0W	04/24/1992	Complete	M4	MON	044N	075W	18	SE1/4SW1/4	0	580	273	-105.92019	43.78487
P87755.0W	04/24/1992	Complete	M5	MON	044N	075W	18	SE1/4SW1/4	0	640	292	-105.92019	43.78487
P87756.0W	04/24/1992	Complete	M6	MON	044N	075W	18	SE1/4SW1/4	0	640	300	-105.92019	43.78487
P87757.0W	04/24/1992	Complete	M7	MON	044N	075W	18	SW1/4SW1/4	0	640	314	-105.92549	43.78488
P87758.0W	04/24/1992	Complete	M8	MON	044N	075W	18	SW1/4SW1/4	0	640	325	-105.92549	43.78488
P87759.0W	04/24/1992	Complete	M9	MON	044N	075W	18	SW1/4SW1/4	0	640	323	-105.92549	43.78488
P87760.0W	04/24/1992	Complete	M10	MON	044N	075W	18	SW1/4SW1/4	0	640	323	-105.92549	43.78488
P87765.0W	04/24/1992	Complete	M15	MON	044N	075W	19	NW1/4NW1/4	0	640	279	-105.92562	43.77881
P87766.0W	04/24/1992	Complete	M16	MON	044N	075W	19	NE1/4NW1/4	0	640	261	-105.91772	43.78142
P87768.0W	04/24/1992	Complete	M18	MON	044N	075W	19	NE1/4NW1/4	0	560	249	-105.91772	43.78142
P87769.0W	04/24/1992	Complete	M19	MON	044N	075W	19	SW1/4NE1/4	0	560	239	-105.91509	43.77611
P87770.0W	04/24/1992	Complete	M20	MON	044N	075W	19	NW1/4NE1/4	0	560	262	-105.91508	43.7814
P87774.0W	04/24/1992	Complete	UM1	MON	044N	075W	19	NW1/4NE1/4	0	320	150	-105.91508	43.7814
P87775.0W	04/24/1992	Complete	UM2	MON	044N	075W	19	NE1/4NW1/4	0	420	197	-105.91772	43.78142
P87776.0W	04/24/1992	Complete	UM3	MON	044N	075W	18	SE1/4SW1/4	0	340	193	-105.92019	43.78487
P87777.0W	04/24/1992	Complete	UM4	MON	044N	075W	18	SW1/4SW1/4	0	360	139	-105.92549	43.78488
P87778.0W	04/24/1992	Complete	UM5	MON	044N	075W	18	SW1/4SW1/4	0	360	190	-105.92549	43.78488
P87779.0W	04/24/1992	Complete	UM6	MON	044N	075W	18	SW1/4SW1/4	0	350	190	-105.92549	43.78488
P87780.0W	04/24/1992	Complete	UM7	MON	044N	075W	19	NW1/4NW1/4	0	320	192	-105.92562	43.77881
P87781.0W	04/24/1992	Complete	UM8	MON	044N	075W	19	NW1/4NW1/4	0	340	132	-105.92562	43.77881
P87782.0W	04/24/1992	Complete	UM9	MON	044N	075W	19	NE1/4NW1/4	0	340	161	-105.91772	43.78142
P87784.0W	04/24/1992	Complete	UUM1	MON	044N	075W	19	NW1/4NE1/4	0	180	92	-105.91508	43.7814
P87785.0W	04/24/1992	Complete	UUM2	MON	044N	075W	18	SW1/4SW1/4	0	220	119	-105.92549	43.78488
P95863.0W	06/23/1994	Complete	5 MW40	MON	044N	076W	17	SE1/4SE1/4	0	520	97.6	-106.01054	43.78261
P95864.0W	06/23/1994	Complete	5 MW42	MON	044N	076W	17	SE1/4SE1/4	0	500	76.2	-106.01054	43.78261
P95865.0W	06/23/1994	Complete	5 MW44	MON	044N	076W	17	SE1/4SE1/4	0	540	97.6	-106.01054	43.78261
P95866.0W	06/23/1994	Complete	5 MW46	MON	044N	076W	17	SE1/4SE1/4	0	520	117.4	-106.01054	43.78261
P96159.0W	07/14/1994	Complete	5 MW1	MON	044N	076W	16	SE1/4NW1/4	0	599	159	-106.00061	43.78995
P96160.0W	07/14/1994	Complete	5 MW2	MON	044N	076W	16	NW1/4SW1/4	0	462	111.4	-106.00559	43.78622
P96161.0W	07/14/1994	Complete	5 MW3	MON	044N	076W	16	SE1/4NW1/4	0	643	183	-106.00061	43.78995
P96162.0W	07/14/1994	Complete	5 MW4	MON	044N	076W	16	SW1/4NW1/4	0	500	119.4	-106.00567	43.7898
P96163.0W	07/14/1994	Complete	5 MW5	MON	044N	076W	16	NE1/4NW1/4	0	678	202	-106.00069	43.79349
P96164.0W	07/14/1994	Complete	5 MW6	MON	044N	076W	16	SE1/4NW1/4	0	580	126.3	-106.00061	43.78995
P96165.0W	07/14/1994	Complete	5 MW7	MON	044N	076W	16	NE1/4NW1/4	0	625	155	-106.00069	43.79349
P96166.0W	07/14/1994	Complete	5 MW8	MON	044N	076W	16	SE1/4NW1/4	0	560	128.6	-106.00061	43.78995

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P96168.0W	07/14/1994	Complete	5 MW10	MON	044N	076W	16	SE1/4NW1/4	0	574	134	-106.00061	43.78995
P96170.0W	07/14/1994	Complete	5 MW12	MON	044N	076W	16	SW1/4NW1/4	0	540	118	-106.00567	43.7898
P96172.0W	07/14/1994	Complete	5 MW14	MON	044N	076W	16	NW1/4NW1/4	0	574	125	-106.00575	43.79338
P96174.0W	07/14/1994	Complete	5 MW16	MON	044N	076W	16	NW1/4NW1/4	0	593	144	-106.00575	43.79338
P96176.0W	07/14/1994	Complete	5 MW18	MON	044N	076W	16	NW1/4NW1/4	0	575	137	-106.00575	43.79338
P96178.0W	07/14/1994	Complete	5 MW20	MON	044N	076W	16	NE1/4NW1/4	0	588	132	-106.00069	43.79349
P96193.0W	07/14/1994	Complete	5 MW41A	MON	044N	076W	20	NE1/4NE1/4	0	600	198.8	-106.01053	43.77901
P96194.0W	07/14/1994	Complete	5 MW43	MON	044N	076W	20	NE1/4NE1/4	0	620	227.9	-106.01053	43.77901
P96195.0W	07/14/1994	Complete	5 MW45	MON	044N	076W	20	NE1/4NE1/4	0	630	192.4	-106.01053	43.77901
P96196.0W	07/14/1994	Complete	5 MW47B	MON	044N	076W	21	NW1/4NW1/4	0	600	207.8	-106.00549	43.77907
P96197.0W	07/14/1994	Complete	5 MW49	MON	044N	076W	21	NW1/4NW1/4	0	560	171	-106.00549	43.77907
P96198.0W	07/14/1994	Complete	5 MW50	MON	044N	076W	16	SW1/4SW1/4	0	480	81.9	-106.00551	43.78265
P96199.0W	07/14/1994	Complete	5 MW51	MON	044N	076W	21	NW1/4NW1/4	0	560	173.4	-106.00549	43.77907
P96200.0W	07/14/1994	Complete	5 MW52	MON	044N	076W	16	SW1/4SW1/4	0	433	59.4	-106.00551	43.78265
P96201.0W	07/14/1994	Complete	5 MW53	MON	044N	076W	21	NE1/4NW1/4	0	560	164.5	-106.00046	43.77933
P96202.0W	07/14/1994	Complete	5 MW54	MON	044N	076W	16	SW1/4SW1/4	0	435	57.8	-106.00551	43.78265
P96203.0W	07/14/1994	Complete	5 MW55	MON	044N	076W	21	NE1/4NW1/4	0	500	139.4	-106.00046	43.77933
P96204.0W	07/14/1994	Complete	5 MW56	MON	044N	076W	16	SW1/4SW1/4	0	460	77.6	-106.00551	43.78265
P96205.0W	07/14/1994	Complete	5 MW57	MON	044N	076W	21	NE1/4NW1/4	0	470	104.6	-106.00046	43.77933
P96206.0W	07/14/1994	Complete	5 MW58	MON	044N	076W	16	NW1/4SW1/4	0	480	110.1	-106.00559	43.78622
P96207.0W	07/14/1994	Complete	5 MW59	MON	044N	076W	16	SE1/4SW1/4	0	460	93.2	-106.00047	43.78287
P96208.0W	07/14/1994	Complete	5 MW60	MON	044N	076W	16	NW1/4SW1/4	0	500	108.9	-106.00559	43.78622
P96209.0W	07/14/1994	Complete	5 MW61	MON	044N	076W	16	SE1/4SW1/4	0	440	69.7	-106.00047	43.78287
P96210.0W	07/14/1994	Complete	5 MW62	MON	044N	076W	16	NW1/4SW1/4	0	480	106.8	-106.00559	43.78622
P96211.0W	07/14/1994	Complete	5 MW63	MON	044N	076W	16	NE1/4SW1/4	0	500	113.8	-106.00054	43.78641
P96212.0W	07/14/1994	Complete	5 MW64	MON	044N	076W	16	NW1/4SW1/4	0	480	111.7	-106.00559	43.78622
P96213.0W	07/14/1994	Complete	5 MW65	MON	044N	076W	16	NE1/4SW1/4	0	500	110	-106.00054	43.78641
P96214.0W	07/14/1994	Complete	5 MW66	MON	044N	076W	16	NW1/4SW1/4	0	480	113.9	-106.00559	43.78622
P96215.0W	07/14/1994	Complete	5 MW67	MON	044N	076W	16	NE1/4SW1/4	0	520	121.1	-106.00054	43.78641
P96216.0W	07/14/1994	Complete	5 MW68	MON	044N	076W	16	NW1/4SW1/4	0	480	103.3	-106.00559	43.78622
P96217.0W	07/14/1994	Complete	5 MW69	MON	044N	076W	16	NE1/4SW1/4	0	560	140.6	-106.00054	43.78641
P96220.0W	07/14/1994	Complete	5 SM2	MON	044N	076W	21	NW1/4NW1/4	0	340	166.9	-106.00549	43.77907
P96221.0W	07/14/1994	Complete	5 SM3	MON	044N	076W	16	SW1/4SW1/4	0	270	106.7	-106.00551	43.78265
P96223.0W	07/14/1994	Complete	5 SM5	MON	044N	076W	16	NW1/4SW1/4	0	210	61.6	-106.00559	43.78622
P96224.0W	07/14/1994	Complete	5 SM6	MON	044N	076W	16	NE1/4SW1/4	0	230	83.3	-106.00054	43.78641
P96225.0W	07/14/1994	Complete	5 SM7	MON	044N	076W	16	NW1/4NW1/4	0	245	99	-106.00575	43.79338
P96230.0W	07/14/1994	Complete	5 DM2	MON	044N	076W	21	NW1/4NW1/4	0	760	209.9	-106.00549	43.77907
P96231.0W	07/14/1994	Complete	5 DM3	MON	044N	076W	16	SW1/4SW1/4	0	670	171.5	-106.00551	43.78265
P96232.0W	07/14/1994	Complete	5 DM4	MON	044N	076W	17	SE1/4SE1/4	0	720	147.9	-106.01054	43.78261
P96233.0W	07/14/1994	Complete	5 DM5	MON	044N	076W	16	NW1/4SW1/4	0	640	127.5	-106.00559	43.78622
P96235.0W	07/14/1994	Complete	5 DM7	MON	044N	076W	16	NE1/4NW1/4	0	680	159	-106.00069	43.79349
P96236.0W	07/14/1994	Complete	5 DM8T	MON	044N	076W	16	NW1/4SW1/4	0	525	105	-106.00559	43.78622
P98521.0W	03/21/1995	Complete	NPPW-1	MON	044N	076W	04	NW1/4SE1/4	0	510	182.82	-105.9944	43.81442
P98522.0W	03/21/1995	Complete	NPOW-1	MON	044N	076W	04	NW1/4SE1/4	0	510	208.58	-105.9944	43.81442
P98523.0W	03/21/1995	Complete	NPOW-2	MON	044N	076W	04	NW1/4SE1/4	0	510	177.99	-105.9944	43.81442
P98524.0W	03/21/1995	Complete	NPOW-3	MON	044N	076W	04	NW1/4SE1/4	0	540	184.25	-105.9944	43.81442

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P99267.0W	05/24/1995	Complete	5DM9T	MON	044N	076W	16	NE1/4SW1/4	0	560	119	-106.00054	43.78641
P99268.0W	05/24/1995	Complete	5TW1	MON	044N	076W	16	NE1/4NW1/4	0	620	153	-106.00069	43.79349
P99325.0W	06/01/1995	Complete	NPHW-1	MON	044N	076W	04	SW1/4NE1/4	0	520	194	-105.9943	43.81776
P99326.0W	06/01/1995	Complete	NPHW-2	MON	044N	076W	04	SE1/4NW1/4	0	540	205	-105.99934	43.81774
P99327.0W	06/01/1995	Complete	NPHW-3	MON	044N	076W	04	SW1/4NE1/4	0	540	181.7	-105.9943	43.81776
P99328.0W	06/01/1995	Complete	NPHW-4	MON	044N	076W	04	SW1/4SW1/4	0	540	195	-106.0046	43.81113
P99329.0W	06/01/1995	Complete	NPHW-5	MON	044N	076W	04	SE1/4NW1/4	0	560	226.5	-105.99934	43.81774
P99330.0W	06/01/1995	Complete	NPHW-6	MON	044N	076W	04	SE1/4SW1/4	0	440	129	-105.99956	43.81109
P99331.0W	06/01/1995	Complete	NPHW-7	MON	044N	076W	04	NW1/4SW1/4	0	420	132.5	-106.0045	43.81443
P99332.0W	06/01/1995	Complete	NPHW-8	MON	044N	076W	09	NE1/4NE1/4	0	660	206.5	-105.98965	43.80755
P99333.0W	06/01/1995	Complete	NPHW-9	MON	044N	076W	04	SE1/4SE1/4	0	620	188.9	-105.98947	43.811
P99334.0W	06/01/1995	Complete	NPHW-10	MON	044N	076W	04	SE1/4NE1/4	0	460	219.9	-105.98925	43.81779
P99335.0W	06/01/1995	Complete	NPHW-11	MON	044N	076W	04	NE1/4SE1/4	0	560	196	-105.98936	43.81442
P99336.0W	06/01/1995	Complete	NPHW-12	MON	044N	076W	09	NE1/4SE1/4	0	640	200	-105.99018	43.80063
P99337.0W	06/01/1995	Complete	NPHW-13	MON	044N	076W	10	NW1/4NW1/4	0	580	248	-105.98462	43.8076
P99338.0W	06/01/1995	Complete	NPHW-14	MON	044N	076W	03	SW1/4SW1/4	0	620	223.8	-105.98443	43.81104
P99339.0W	06/01/1995	Complete	NPHW-15	MON	044N	076W	04	NW1/4SE1/4	0	420	157	-105.9944	43.81442
P99340.0W	06/01/1995	Complete	NPHW-16	MON	044N	076W	04	SE1/4SE1/4	0	620	197	-105.98947	43.811
P103967.0W	09/19/1996	Complete	Paden #1	STK	043N	075W	05	SW1/4SW1/4	10	650	290	-105.90531	43.72448
P114048.0W	02/18/1999	Complete	Dobie Hill Well #1	STK	044N	075W	29	SW1/4SE1/4	25	640	295	-105.89465	43.75437
P116152.0W	05/28/1999	Complete	North Dry Willow #1	STK	043N	075W	06	NE1/4SE1/4	25	1132	200	-105.91027	43.72824
P11892.0P	12/15/1962	Complete	East Pfister #1	STK	044N	075W	21	NE1/4SE1/4	2	335	110	-105.86844	43.77264
P11893.0P	12/11/1962	Complete	North Pfister #2	STK	044N	075W	08	SW1/4NE1/4	1.5	250	80	-105.89436	43.80517
P119027.0W	09/20/1999	Complete	Old Maid #1	STK	043N	076W	02	SE1/4SE1/4	25	300	202	-105.95083	43.72468
P12283.0P	12/31/1960	Complete	Connie #2	STK	043N	075W	05	NW1/4SE1/4	5	350	-1.00	-105.89486	43.72803
P13299.0P	08/15/1968	Complete	1-8-44-75 Jordan	STK	044N	075W	08	SE1/4NW1/4	5	-1	0	-105.89936	43.80506
P14910.0P	12/31/1946	Complete	Schlautmann #12	STK	044N	075W	10	NE1/4NW1/4	5	165	140	-105.85782	43.8075
P14912.0P	12/31/1940	Complete	Schlautmann #14	STK	044N	075W	04	SE1/4SW1/4	10	170	120	-105.87859	43.81224
P15068.0P	12/31/1955	Complete	Brown #1	STK	044N	076W	13	NW1/4NW1/4	5	5	-4.00	-105.94476	43.79441
P15069.0P	12/31/1960	Complete	Brown #2	STK	044N	076W	14	NE1/4SE1/4	8	3	-4.00	-105.94728	43.78897
P15106.0W	08/29/1972	Complete	West Old Maid #1	STK	043N	076W	03	SW1/4NE1/4	4	275	125	-105.97585	43.73205
P24083.0P	09/21/1936	Complete	Dry Pasture #2	STK	044N	076W	34	NE1/4NE1/4	4	160	60	-105.97085	43.75069
P24095.0P	12/21/1953	Complete	Calving Shed #18	STK	044N	076W	27	NW1/4NW1/4	4	140	40	-105.98561	43.76596
P24098.0P	03/31/1961	Complete	Rector Well #22	STK	044N	075W	05	SW1/4SW1/4	4	40	31	-105.9041	43.81175
P24101.0P	12/31/1966	Complete	Beecher NW Well #25	STK	044N	076W	28	SW1/4SW1/4	4	340	240	-106.00593	43.75387
P24868.0P	12/21/1954	Complete	Butte Pasture Well #9 (deepened)	STK	044N	076W	21	NW1/4SE1/4	4	160	30	-105.99552	43.77258
P24869.0P	12/31/1940	Complete	School Section #10	STK	045N	076W	36	NE1/4NE1/4	4	22	8	-105.93159	43.83503
P29162.0W	02/10/1975	Complete	Well West of Widow Women #1	STK	043N	076W	03	NE1/4SW1/4	5	720	310	-105.98086	43.72834
P35814.0W	12/23/1976	Complete	Savageton Equity State #1	STK	044N	075W	16	NE1/4SE1/4	25	760	70	-105.86807	43.78716
P36013.0W	01/17/1977	Complete	Brown #5	STK	044N	075W	30	SW1/4NE1/4	45	540	90	-105.91507	43.76159
P37540.0W	02/16/1977	Complete	Pumpkin Pump #33	STK	045N	075W	32	SE1/4NW1/4	25	1170	280	-105.90215	43.83176
P39112.0W	07/21/1977	Complete	#39 Heldt Draw Unit	STK	044N	076W	03	SW1/4NE1/4	6	1010	290	-105.97418	43.81791
P43598.0W	05/04/1978	Complete	Del Gulch #35	STK	044N	076W	28	NW1/4NW1/4	15	464	180	-106.0057	43.76473
P48652.0W	06/21/1979	Complete	Cities Service Brown (WS)	STK	044N	075W	31	NW1/4NW1/4	25	702	280	-105.92558	43.75056
P63592.0W	04/06/1983	Complete	DW2L	STK	045N	075W	33	SE1/4SE1/4	15	740	442	-105.87141	43.82428
P63593.0W	04/06/1983	Complete	DW2M	STK	045N	075W	33	SE1/4SE1/4	10	494	399	-105.87141	43.82428

Table 3.4-10 North Butte Groundwater Rights

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P63594.0W	04/06/1983	Complete	DW2U	STK	045N	075W	33	SE1/4SE1/4	6	384	335	-105.87141	43.82428
P63604.0W	04/06/1983	Complete	Red Barrell #1	STK	044N	076W	25	SW1/4NW1/4	10	525	125	-105.94578	43.76173
P67378.0W	05/23/1984	Complete	Rector #1	STK	044N	075W	06	NE1/4SE1/4	12	363	160	-105.90894	43.81498
P89253.0W	08/11/1992	Complete	CCI #2	STK	044N	075W	17	NW1/4SE1/4	8	440	214.6	-105.89463	43.78723
P181234.0W	04/25/2007		URZHG-4	TST	044N	075W	31	NW1/4NE1/4	0			-105.914217	43.749483
P181235.0W	04/25/2007		URZHF-5	TST	044N	075W	31	NW1/4NE1/4	0			-105.914283	43.749483
P181236.0W	04/25/2007		URZHB-6	TST	044N	075W	31	NW1/4NE1/4	0			-105.9143	43.749617
Water rights information collected from Wyoming State Engineer e-permit database													

Table 3.4-10.1 Surface Water Rights within 5 kilometers of North Butte

WR Number	Facility Name	Uses	Twn	Rng	Sec	Qtr-Qtr	Total Capacity (ac-ft)	Stream Source	Latitude	Longitude
CR CR15/311	Shering Pen Reservoir	Stock	044N	075W	19	SE1/4NE1/4		Reservoir	43.77656	-105.90824
CR CR15/312	Brown Reservoir	Stock	044N	076W	35	SE1/4SE1/4	45.41	Reservoir	43.74046	-105.94898
P11893.0P	North Pfister #2	Stock	044N	075W	08	SW1/4NE1/4			43.80517	-105.89436
P12007.0R	Jordan No. 7 Reservoir	Stock	044N	075W	16	NE1/4SE1/4	17.29	Reservoir	43.78716	-105.86807
P13299.0P	1-8-44-75 Jordan	Stock	044N	075W	08	SE1/4NW1/4			43.80506	-105.89936
P1553.0S	Van Vorhes Stock Reservoir	Stock	044N	075W	09	NE1/4NE1/4	18.9	Reservoir	43.80973	-105.86871
P1612.0S	North Stock Reservoir	Stock	044N	075W	15	SW1/4NW1/4	14.85	Reservoir	43.78985	-105.86316
P16675.0S	Pumpkin Buttes Number 4 Stock Reservoir	Stock	044N	075W	27		12.96	Reservoir	43.78097	-105.86217
P17958.0S	24-18 Stock Reservoir	Stock	044N	075W	18	SE1/4SW1/4	5.89	Reservoir	43.78487	-105.92019
P17970.0S	24-28 Stock Reservoir	Stock	044N	075W	28	SE1/4SW1/4	3.47	Reservoir	43.75419	-105.8793
P17971.0S	21-21 Stock Reservoir	Stock	044N	075W	21	NW1/4NE1/4	12.69	Reservoir	43.78036	-105.87575
P17975.0S	43-18 Stock Reservoir	Stock	044N	075W	18	NE1/4SE1/4	2.1	Reservoir	43.78824	-105.90944
P18022.0S	24-8 Stock Reservoir	Stock	044N	075W	08	SE1/4SW1/4	14.6	Reservoir	43.79675	-105.89819
P18023.0S	23-85 Stock Reservoir	Stock	044N	075W	08	NE1/4SW1/4	1.6	Reservoir	43.80072	-105.89975
P18168.0S	North Enlargement Stock Reservoir	Stock	044N	075W	15	SW1/4NW1/4	16.86	Reservoir	43.79082	-105.86156
P2126.0S	North Middle Butte Stock Reservoir	Stock	044N	075W	30	SW1/4NE1/4	2.55	Reservoir	43.76083	-105.9175
P5485.0R	Shering Pen Reservoir	Stock	044N	075W	19	SE1/4NE1/4	39.9	Reservoir	43.77631	-105.90811
P5502.0R	Krohn Reservoir	Stock	044N	075W	20	NE1/4SE1/4	37.5	Reservoir	43.77264	-105.88951
P6347.0R	Brown Reservoir	Stock	044N	076W	35	SE1/4SE1/4	45.41	Reservoir	43.74017	-105.94928
P8158.0S	Pfister #2 Stock Reservoir	Stock	044N	075W	19	SE1/4NE1/4	0.01	Reservoir	43.77647	-105.90824
P8159.0S	Pfister #3 Stock Reservoir	Stock	044N	075W	19	SW1/4SW1/4	0.01	Reservoir	43.76886	-105.92768

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/l)							Trace Metals (mg/l) DISSOLVED																	Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED								Radiometrics (pCi/L) SUSPENDED				
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Ammonia	Nitrite + Nitrate as N	Fluoride	Silica	Conductivity (umho/cm)	pH (std units)	Total Dissolved Solids @ 180°C	Total Susp. Solids 105°C	Alkalinity as CACO3	Hardness	Turbidity (NTU)	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Lead 210	Uranium (mg/L)	Radium 226	Radium 228	Thorium 230	Polonium 210	Gross Alpha	Gross Beta	Lead 210	Uranium (mg/L)	Radium 226	Thorium 230	Polonium 210
Sample Name	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NH3	NO2+NO3	F	SiO2	Cond.	pH	TDS	TSS	ALK	HARD	Turb.	Al	As	Ba	Be	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	210Pb	NatU	226Ra	228Ra	230Th	210Po	-	-	210Pb	NatU	226Ra	230Th	210Po
BUSS PIT	11/13/1996	615	135	40	35	<0.10	37	2094	11.1	<0.05	<0.10	0.9	5.7	2630	7.61	2980		31			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	1.00	<0.05	1.42	<0.001	<0.10	<0.05	0.01	<0.10	0.01				0.113	1.80										
BUSS PIT	3/18/1997	160	20	9	10	<0.10	22	488	2.2	0.1	0.21	0.4	4.4	973	7.46	712		18			<0.10	<0.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.19	<0.001	<0.10	<0.05	0.00	<0.10	<0.01				0.041	0.20										
BUSS PIT	5/5/1997	497	101	37	32	<0.10	22	1678	<1	<0.05	<0.10	0.8	5.5	2260	7.28	2540		18			<0.10	<0.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	1.24	<0.001	<0.10	0.12	0.02	<0.10	0.03				0.107	3.20										
BUSS PIT	8/25/1997	572	110	41	36	<0.10	19	1870	10.9	0.1	<0.10	1.1	4.8	3000	7.19	3080		15			<0.10	<0.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	1.50	<0.001	<0.10	0.11	0.02	<0.10	0.02				0.087	3.70										
BUSS PIT	10/30/1997	618	112	41	36	<0.10	19	2010	10.2	0.0	<0.10	1.1	5.1	2920	7.14	3070		15			<0.10	<0.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	1.98	<0.001	<0.10	0.13	0.01	<0.10	0.03				0.092	5.70										
BUSS PIT	6/23/1998	553	130	44	34	<0.10	6	2100	14.8	0.1	<0.10	1.0	6.1	2700	6.20	2980		5			0	0	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	2.02	<0.001	<0.10	<0.05	0.02	<0.10	0.07				0.069	2.30										
BUSS PIT	7/11/1998	570	130	44	37	1.0	10	2060	11.2	0.1	<0.10	1.0	6.1	3000	5.54	3070		8			0	<0.001	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	2.32	<0.001	<0.10	0.17	0.01	<0.10	0.07				0.055	0.80										
BUSS PIT	8/4/1999	573	153	43	39	1.0	1	2040	14	<0.05	<0.10	1.1	6.9	3100	4.7	3080		1.0			1.85	<0.001	<0.10		<0.10		<0.05	<0.01	0.80	<0.05	2.64	<0.001	<0.10	0.19	0.012	<0.10	0.09				0.102	2.40										
BUSS PIT	9/5/2006	575	221	60	52	<1	<1	2470	15	0.40	<0.10	1.4	20.0	3970	3.8	3830		<1	2340		11.00	0.001	<0.10		<0.10	<0.01	<0.05	0.04	1.30	<0.05	7.76	<0.001	<0.10	0.55	0.017	<0.10	0.25				0.262	1.90										
BUSS PIT	8/30/2011	495	215	69	63	<5	<5	2360	15.0	<0.1	<0.1	1.8	23.0	3700	4.0	3930	<5			0.3	15.1	0.000	<0.1	0.05	<0.1	0.00	<0.01	0.04	0.42	<0.01	8.59	<0.001	<0.01	0.59	0.02	<0.1	0.27	0.47	8.04	1.30	0.22	1.60	1.30	0.200	<1	194	160	<1	<0.0003	<0.2	<0.2	<1
BUSS PIT	10/6/2011	558	232	69	59	<5	<5	2670	17	<0.05	<0.1	5.0	28.7	3730	4.1	3910					17.70	0.001	<0.1		0	<0.005	<0.05	<0.04	0.60	0.00	9.94	<0.001	<0.1	0.67	0.017	<0.1	0.82	0.72	10.20		0.225	1.60	1.50			339	182					
Cameron Spring	8/6/1988										0.24			386	8.0	296		180							<0.1	0.02	<0.05		<0.05	<0.05	<0.01		<0.1		<0.001						0.016	0.20										
Cameron Spring	4/27/1989													390	8.2	242		167							<0.1	<0.01	<0.05		<0.05	<0.05	<0.01		<0.1		<0.001						0.015	0.20										
Cameron Spring	9/23/1996	8	<1.0	78	7	<0.10	250	17	2.8	<0.05	0.20	0.4	57.0	391	7.64	266		205			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.028	<0.2										
Cameron Spring	11/13/1996	8	<1.0	79	7	2.9	212	19	3.7	<0.05	0.20	0.3	58.4	376	8.38	252		178			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.018	0.70										
Cameron Spring	3/18/1997	13	1	68	8	<0.10	209	11	3.1	0.1	<0.10	0.3	23.9	366	8.19	255		171			0	0	<0.10		<0.10	<0.01	<0.05	<0.01	0.26	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.007	0.20										
Cameron Spring	4/25/1997	16	1	83	9	4.1	243	15	2.2	0.2	<0.10	0.4	36.6	415	8.48	314		205			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	0.60	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.012	0.60										
Cameron Spring	8/26/1997	20	2	109	11	6.4	312	17	4.5	0.1	<0.10	0.5	27.9	467	8.56	412		265			<0.10	0	0		0.2	<0.01	<0.05	<0.01	1.24	<0.05	0.03	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.006	<0.2										
Cameron Spring	10/31/1997	18	2	131	12	8.9	369	21	5.0	0.2	<0.10	0.5	8.8	643	8.63	431		315			0	0	0		0.2	<0.01	<0.05	<0.01	0.32	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.009	<0.2										
Cameron Spring	6/22/1999	13	2	97	8	29.5	228	36	1.0	0.2	<0.10	0.5	23.2	449	9.36	354		228			0	0	<0.10		0.1	<0.01	<0.05	<0.01	0.17	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	0.02				0.016	<0.2										
Cameron Spring	7/11/1998	8	1	121	7	71.9	207	19	2.7	0.1	<0.10	0.6	33.3	586	9.79	412		271			1	0	<0.10		0.1	<0.01	<0.05	<0.01	0.62	<0.05	0.09	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.012	0.80										
Cameron Spring	730/1999	17	4	168	13	44.6	415	29	3.0	0.9	<0.10	1.0		854	9.28	648						0							0.48		0.04		<0.10		<0.001		<0.01				0.009	<0.2	<0.1									
Cameron Spring	10/18/2006	9	<0.5	80	7	<1	210	19	2	0.05	0.10	0.4	59.5	328	8.2	298		172.0			<0.10	0.023	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01	0.55	0.02		0.014	14.50	<1			43	18					
Cameron Spring	8/30/2011	8	<1	85	9	<5	216	15	4	<0.1	<0.1	0.2	61.0	403	8.4	310	<5			0.2	<0.1	0.022	<0.1	<0.001	<0.1	<0.001	<0.01	<0.01	<0.05	<0.01	<0.01	<0.001	<0.01	<0.05	0.001	<0.1	<0.01	<0.05	<0.01	3.20	0.017	<0.2	<1	<0.2	<1	14	10	<1	<0.0003	<0.2	<0.2	<1
Cameron Spring	10/6/2011	9	<1	80	7	<5	209	17	3	<0.05	0.20	0.5	66.3	379	8.3	258					<0.1	0.022	<0.1		0	<0.005	<0.05	<0.01	<0.03	<0.001	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.04	<0.01		0.017	0.32	0.00			21	12					
Cameron Spring (dup)	10/6/2011	9	2	79	8	<5	218	19	3.00	<0.1	0.20	0.5	67.2	382	8.29	257					<0.1	0.02	<0.1		<0.1	<0.005	<0.05	<0.01	<0.03	<0.001	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	<0.03	<0.01		0.019	0.30	0.40			25	13					
Cameron Pond-SD-2	8/30/2011	4	<1	16	16	178.0	114	12	2	<0.1	<0.1	0.4	55.0	849	10.2	560	<5			7.4	0.10	0.028	<0.1	<0.001	0.2	<0.001	<0.01	<0.01	0.10	<0.01	0.01	<0.001	<0.01	<0.05	0.00	<0.1	<0.01	0.28	0.02	1.30	0.0057	<0.2	<1	<0.2	<1	7	14	<1	<0.0003	<0.2	<0.2	<1
VECA PIT	9/20/1996	279	35	11	19	<0.10	56	793	2.6	<0.05	<0.10	0.5	3.0	1100	7.66	1190		46			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	0.00	<0.10	<0.01				0.219	2.10										
VECA PIT	11/12/1996	275	35	13	20	<0.10	56	808	2.4	<0.05	<0.10	0.5	3.3	1250	7.99	1150		46			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.193	1.80										
VECA PIT	3/18/1997	172	19	7	14	<0.10	56	466	1.6	0.1	0.12	0.4	5.6	989	7.84	745		46			0	0	<0.10		<0.10	<0.01	<0.05	<0.01	0.09	<0.05	0.05	<0.001	<0.10	<0.05	0.02	<0.10	<0.01				0.176	1.70										
VECA PIT	4/25/1997	242	28	10	18	<0.10	60	659	1.8	0.8	<0.10	0.4	4.0	1152	7.93	983		49			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	0.11	<0.05	0.04	<0.001	<0.10	<0.05	0.00	<0.10	<0.01				0.221	2.20										
VECA PIT	10/29/1997	243	29	11	21	<0.10	73	693	2.8	<0.05	<0.10	0.6	1.4	1320	7.86	1110		60			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.192	2.60										
VECA PIT	6/22/1998	135	14	6	12	<0.10	63	344	1.0	<0.05	<0.10	0.3	2.9	751	7.93	614		52			<0.10	0	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.10	<0.05	0.00	<0.10	0.01				0.100	1.00										
VECA PIT	7/11/1998	155	16	6	12	1.0	58	379	1.6	0.1	<0.10	0.3	1.7	846	7.90	673		48			<0.10	0	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.10	<0.05	0.00	<0.10	<0.01				0.117	2.00										
VECA PIT	8/5/1999	147	17	9	15	<0.50	54	387	4.0	0.1	<0.10	0.4		819	7.88	594						0							<0.05		<0.01		<0.10		0.01						0.126	3.00	1.00									
VECA PIT	10/17/2006	130	17	8	23	2.0	45	350	4.0	0.1	<0.1	0.5	1.6	697	8.83	506		39			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	0.08	<0.05	0.03	<0.001	<0.10	<0.05	0.01	<0.10	<0.01	0.14	0.03		0.137	0.70	3.70			56	146					
VECA PIT	10/6/2011	113	21	21	15	<5	62	371	9.0	<0.05	<0.1	0.5	2.0	828	8	578					<0.1	0	<0.1		<0.1	<0.005	<0.05	<0.01	<0.03	<0.001	<0.01	<0.001	<0.1	<0.05	0.00	<0.1	<0.01	0.11	0.01		0.132	2.80	0.50			201	74					
PC PIT	9/20/1996	534	101	91	33	<0.10	51	1980	30.0	<0.05	<0.10	0.5	<1.0	2710	7.65	2920		41			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	0	<0.05	0.01	<0.10	<0.01				0.493	0.90										
PC PIT	11/12/1996	530	97	95	34	<0.10	53	1910	26.7	<0.05	<0.10	0.5	<1.0	2530	7.82	2850		44			<0.10	0	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	0	<0.05	0.01	<0.10	<0.01				0.470	1.10										
PC PIT	3/18/1997	252	42	41	16	<0.10	32	919	14.0	<0.05	<0.10	0.3	1.5	1650	7.62	1280		26			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	0	<0.05	0.00	<0.10	<0.01				0.209	1.70										
PC PIT	4/29/1997	552	99	96	36	<0.10	65	1844	28.1	<0.05	<0.10	0.5	1.3	2784	7.86	2814		53			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	0	<0.05	0.00	<0.10	<0.01				0.522	1.30										
PC PIT	8/25/1997	510	92	95	35	<0.10	44	1800	31.7	0.1	<0.10	0.6	<1.0	3000	7.71	2950		36			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	0	<0.05	0.01	<0.10	<0.01				0.434	2.10										
PC PIT	11/5/1997	582	104	100	36	<0.10	50	1900	34.0	0.2	<0.10	0.6	<1.0	3060	7.64	2940		41			<0.10	<.001	<0.10		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	0	<0.05	0.00	<0.10	<0.01				0.500	1.20										
PC PIT	6/22/1998	459	93	94	33	<0.10	56	1750	27.2	0.1	0.12	0.6	2.0	2680	7.92	2850		46			<0.10	0	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	0	<0.05	0.01	<0.10	<0.01				0.475	1.10										
PC PIT	7/11/1998	465	115	97	34	1.0	59	1750	28.0	0.1	<0.10	0.6	1.0	2950	7.61	2880		49			0	0	0		0	<0.01	0.05	0.01	<0.05	0.05	<0.02	0	0.3	0.05	0.01	<0.10	0.01				0.561	1.20										
PC PIT	8/10/1999	529	118	99	38	<1.00	57	1770	38.0	0.1	<0.10	0.6		3030	7.82	2900						0							<0.05		<0.01				0.00						0.508	0.60	1.50									
PC PIT	10/5/2011	554	126	131	46	<5	72	2180	35.0	<0.05	<0.1	1.0	<0.2	3260	8.13	3180					<0.1	0	<0.1		<0.1	<0.005	<0.05	<0.01	0.28	<0.001	0.11	<0.001	0.30	<0.05	0.00	<0.1	0.43	0.38	0.12		0.346	2.50	0.40			439	190					
WCC-1	9/19/1996	50	3	26	7	2.5	201	24	2.6	<0.05	<0.10	0.3	53.3	367	8.34	261		168			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.017	<0.2										
WCC-1	11/19/1996	52	4	26	7	<0.10	203	22	4.4	<0.05	<0.10	0.3	51.0	354	8.28	270		166			0	0	0		<0.10	<0.01	<0.05	<0.01	0.07	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.011	17.10										
WCC-1	4/25/1997	52	4	24	8	2.3	200	20	2.1	0.1	<0.10	0.3	53.5	352	8.31	240		167			0	0	0		<0.10	<0.01	<0.05	<0.01	0.20	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.015	0.80										
WCC-1	10/29/2011	57	4	27	7	<0.10	244	19	3.7	<0.05	<0.10	0.4	51.4	419	8.21	292		200			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.015	<0.2										
WCC-1	6/19/1905	63	4	28	7	<0.10	254	22	3.4	<0.05	<0.10	0.3	52.5	346	8.25	304		208			<0.10	0	0		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	0.02				0.014	0.70										
WCC-1	6/22/1998	60	4	29	8	2.9	249	19	1.6	<0.05	<0.10	0.4	54.8	424	8.31	298		208			<0.10	0	0		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.017	<0.2										
WCC-1	7/11/1998	65	5	30	9	3.4	248	21	3.0	<0.05	<0.10	0.4		446	8.38	284						0							0.03		<0.01				<0.001						0.008	<0.2	<1.0									
WCC-1	10/17/2006	75	5	34	8	4.0	290	21	2.0	0.1	<0.1	0.3	49.8	455	8.37	294		243			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01	0.17	0.03		0.014	0.40	<1			9	41					
WCC-1	8/30/2011	60	3	29	9	6.0	240	15	4	<0.1	<0.1	0.2	59.0	439	8.5	270	12.0			5.3	<0.1	0.014	0.10	<0.001	<0.1	<0.001	<0.01	<0.01	<0.05	<0.01	0.01	<0.001	<0.01	<0.05	0.000	<0.1	<0.01	0.37	0.09	2.00	0.0151	<0.2	<1	<0.2	<1	10	9	<1	<0.0003	<0.2	<0.2	<1
WCC-1	10/6/2011	62	4	29	8	<5	245	19	3.0	<0.1	<0.1	0.4	59.7	435	8.36	279					<0.1	0	0		<0.1	<0.005	<0.05	<0.01	<0.03	<0.001	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	2.24	0.22		0.014	0.37	0.40			11	11					
WCC-2	9/19/1996	64	5	25	13	<0.10	240	33	8.1	0.3	<0.10	0.4	44.1	455	7.99	325		197			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.015	<0.2										
WCC-2	11/13/1996	81	7	30	10	<0.10	288	37	6.9	<0.05	<0.10	0.4	57.0	503	8.19	337		236			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.025	0.40										
WCC-2	3/18/1997	27	2	10	7	2.4	118	10	2.0	0.1	<0.10	0.2	23.9	203	8.55	158		100			0	0	<0.10		<0.10	<0.01	<0.05	<0.01	0.27	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.011	<0.2										
WCC-2	5/5/1997	53	4	20	9	3.7	191	23	<1	<0.05	<0.10	0.3	47.0	357	8.54	249		162			0	0	0		<0.10	<0.01	<0.05	<0.01	0.29	<0.05	<0.01	<0.001	<0.10	<0.05	0.00	<0.10	<0.01				0.021	0.90										
WCC-2	8/25/1997	62	5	25	13	2.9	227	30	4.7	<0.05	<0.10	0.4	45.7	434	8.36	308		191			0	0	0		<0.10	<0.01	<0.05	<0.01	0.19	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.020	0.80										
WCC-2	10/30/1997	59	5	25	9	2.7	237	24	3.5	<0.05	<0.10	0.3	46.8	442	8.31	285		198			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.021	1.80										
WCC-2	6/22/1998	38	8	28	10	4.0	112	102	3.9	<0.05	<0.10	0.4	11.7	236	8.80	267		97			<0.10	0	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.029	0.70										
WCC-2	7/11/1998	26	4	27	9	2.9	143	24	3.9	<0.05	<0.10	0.4	22.7	242	8.56	192		121			<0.10	0	<0.10		<0.10	0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01				0.017	<0.2										
WCC-2	8/4/1999	81	10	41	24	<1	334	27	16.0	0.2	<0.10	0.5		619	7.95	421						0							0.58		0.22				0.00						0.031	1.10	1.00									
WCC-2	10/17/2006	65	7	26	10	<1	242	29	5.0	0.1	<0.1	0.3	50.9	407	8.24	268		198			<0.10	0	0		<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01	0.03	<0.01		0.016	1.90	1.60			10	15					
WCC-2	8/30/2011	55	5	28	16	5.0	236	20	12	<0.1	<0.1	0.3	41.0	453	8.5	300	<5			12.0	<0.1	0.014	0.20	<0.001	<0.1	<0.001	<0.01	<0.01	<0.05	<0.01	<0.01	<0.001	<0.01	<0.05	0.001	<0.1	<0.01	0.37	0.01	1.40	0.014	0.30	1.10	<0.2	<1	11	15	1.30	<0.0003	<0.2	<0.2	<1
WCC-2	10/6/2011	58	5	28	10	7.0	228	24	4.0	<0.05	<0.1	0.5	60.0	433	8.50	280					<0.1	0	0		<0.1	<0.005	<0.05	<0.01	<0.03	<0.001	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	0.11	<0.01		0.017	0.78	0.70			15	15					
WCC-2 (dup)	10/6/2011	59	5	27	9	6.0	229	24	4.00	<0.05	<0.1	0.5	60.9	431	8.48	282					<0.1	0.02	0.10		<0.1	<0.005	<0.05	<0.01	<0.03	<0.001	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.07	<0.01		0.016	0.33	0.80			14	13					
SW1	10/1/1981	49	5	25	9	0.0	195	28	10.00	<0.05	<0.05	0.6		475	7.7	221		160	143		<0.05	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005				0.020	<0.39										

Table 3.4-11 Gas Hills Surface Water Quality

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)						
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Ammonia	Nitrite + Nitrate as N	Fluoride	Silica	Conductivity (umho/cm)	pH (std units)	Total Dissolved Solids @ 180°C	Total Susp. Solids 105°C	Alkalinity as CACO3	Hardness	Turbidity (NTU)
Sample Name	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NH3	NO2+NO3	F	SiO2	Cond.	pH	TDS	TSS	ALK	HARD	Turb.
SW1	1/1/1982	49	9	26	10	10.0	212	30	7.00	<0.05	<0.05	0.4		390	8.5	245		190	159	
SW1	4/1/1982	52	7	27	8	0.0	224	26	5.00	<0.05	<0.05	0.3		240	7.7	235		184	159	
SW1	7/1/1982	43	5	25	11	5.0	176	30	8.00	0.07	0.07	0.3		335	8.5	213		152	128	
SW1	10/1/1982	57	9	26	9	10.0	181	32	8.00	0.06	0.06	0.1		241	7.7	240		172	179	
SW1	4/1/1983	55	5	26	9	0.0	234	25	6.00	<0.05	<0.05			235	7.7	242		192	158	
SW1	7/1/1983													368	7.9					
SW1	10/1/1983	55	7	29	10	5.0	229	25	8.00	0.07	0.07			390	8.3			196	166	
SW1	5/1/1983	55	4	21	7	0.0	195	28	8.00	<0.05	<0.05			337	8.2			160	154	
SW1	10/1/1984	53	7	30	8	12.0	226	27	8.00	<0.05	<0.05			375	8.3			205	161	
SW1	4/1/1985													132	7.7					
SW1	7/1/1985													256	8.7					
SW1	10/1/1985	55	5	26	10	0.0	207	32	8.00	<0.05	<0.05			152	7.1			170	158	
SW2	10/1/1981	44	7	26	10	0.0	195	27	6.00	<0.05	0.71	0.5		460	7.8	216		160	139	
SW2	4/1/1982	48	6	29	11	0.0	210	26	6.00	0.06	0.52	0.4		343	8.3	229		172	145	
SW2	4/1/1983	45	5	5	3	0.0	49	99	5.00	0.30	1.42			295	7.7	186		40	133	
SW2	7/1/1983													400	8.3					
SW2	10/1/1983	58	6	27	10	0.0	205	46	7.00	<0.05	4.00			380	8.1	255		168	170	
SW2	5/1/1984	48	6	19	6	3.0	165	31	6.00	<0.05	1.00			389	8.3	200		140	145	
SW2	10/1/1984	54	10	30	8	12.0	207	29	7.00	<0.05	<0.05			380	8.6	252		190	176	
SW2	4/1/1985													229	8.7					
SW2	10/1/1985	37	4	21	8	0.0	140	32	12.00	0.14	<0.05			160	6.9	183		115	109	
SW3	10/1/1981	192	35	51	29	0.0	24	675	18.00	0.06	0.18	1.6		1650	7.0	1011		20	623	
SW3	1/1/1982	420	66	107	54	0.0	98	1370	30.00	<0.05	0.71	2.2		2500	8.2	2096		80	1321	
SW3	4/1/1982	145	24	35	19	0.0	34	415	10.00	<0.05	0.30	0.7		700	7.2	665		23	461	
SW3	7/1/1982	515	125	117	74	0.0	24	1960	36.00	<0.05	0.54	0.9		2750	7.7	2839		20	1800	
SW3	4/1/1983	34	5	4	5	0.0	24	92	3.00	0.06	0.50			770	6.7	155		20	105	
SW3	7/1/1983													650	7.4					
SW3	10/1/1983	129	21	24	15	0.0	93	329	11.00	<0.05	3.10			740	7.4	575		76	409	
SW3	5/1/1984	121	17	22	12	0.0	49	360	11.00	<0.05	0.69			701	8.0	568		40	372	
SW3	10/1/1984	135	21	28	12	0.0	61	436	12.00	<0.05	<0.05			780	7.8	674		50	424	
SW3	4/1/1985													420	7					
SW3	7/1/1985													600	7					
SW3	10/1/1985	121	17	30	13	0.0	79	352	13.00	<0.05	<0.05			405	7	583		65	372	
SM-5	5/25/1984	155	38	71	17	0.0	140	675	18.00	0.06	0.73	0.3		1180	7	1043				
SM-5	7/24/1984	28	4	7	3	0.0	39	62	6.00	<0.05	0.12	0.1		260	7	130				
SM-5	5/20/1987	37	6	<0.5	5	0.0	21	99	1.30	0.09	0.09	0.1		326	8	168				
SM-5	5/13/1989													85	7	72				
SM-6	9/10/1986	57	9	6	7	0.0	2	187	4.00	1.20	1.50	0.2		395	4	270				
SM-6	5/20/1987	8	1	3	7	0.0	17	27	0.30	<0.05	0.01	<0.1		109	7	360				
SM-6	6/17/1987	115	14	4	10	0.0	2	346	0.60	0.67	0.12	0.2		700	5	520				
SM-6	8/24/1987	498	97	8	18	0.0	0	1844	7.80	3.20	0.06	<0.1		2413	3	2694				
SM-6	5/13/1989													66	6	38				
SM-7	7/24/1984	22	3	38	3	0.0	122	37	8.00	0.10	<0.01	0.4		307	8	171				
SM-7	6/27/1985	145	17	73	10	0.0	93	490	5.00	<0.05	0.41	0.4		354	8	786				
SM-7	6/17/1987	13	3	37	6	0.0	110	38	0.40	0.51	0.42	0.6		250	8	174				
SM-7	5/13/1989													138	7	92				
SM-7	4/27/1990													184	8	155				
SM-7	5/17/1991													206	7	112				
SM-7	6/7/1991													218	7	349				
North Stock Pond	8/30/2011	18	2	282	15	53.0	540	95	10	1.60	<0.1	1.0	62.0	1240	9.0	1570	350.0			31.3

		Trace Metals (mg/l) DISSOLVED																
		Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc
Sample Name	Sample Date	Al	As	Ba	Be	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn
SW1	1/1/1982	<0.05	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005
SW1	4/1/1982	<0.05	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.01
SW1	7/1/1982	<0.05	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	0.1	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005
SW1	10/1/1982	<0.05	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	0.09	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005
SW1	4/1/1983		0.02							<0.05								<0.005
SW1	7/1/1983																	
SW1	10/1/1983		0.02							<0.05								<0.005
SW1	5/1/1983		0.01							<0.05								0.01
SW1	10/1/1984		0.02							<0.05								<0.005
SW1	4/1/1985																	
SW1	7/1/1985																	
SW1	10/1/1985		0.02							<0.05							<0.05	0.02
SW2	10/1/1981	0.21	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.01
SW2	4/1/1982	0.4	0.01	<0.02		<0.1	<0.005	<0.01	<0.01	0.23	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.01
SW2	4/1/1983		0.00							0.11								0.02
SW2	7/1/1983																	
SW2	10/1/1983		0.02							<0.05								<0.005
SW2	5/1/1984		0.02							<0.05								0.01
SW2	10/1/1984		0.02							<0.05								<0.005
SW2	4/1/1985																	
SW2	10/1/1985		0.02							<0.05							<0.05	0.02
SW3	10/1/1981	<0.05	<0.002	<0.02		<0.1	0.01	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.02
SW3	1/1/1982	<0.05	0.00	<0.02		<0.1	0.01	<0.01	0.02	<0.05	0.11	<0.01	<0.001	<0.05	0.04	<0.002	<0.05	0.01
SW3	4/1/1982	<0.05	<0.002	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005
SW3	7/1/1982	<0.05	<0.002	<0.02		<0.1	0.02	0.03	0.02	<0.05	0.11	<0.01	<0.001	<0.05	0.06	<0.002	<0.05	<0.005
SW3	4/1/1983		<0.002							<0.05								0.01
SW3	7/1/1983																	
SW3	10/1/1983		<0.002							<0.05								<0.005
SW3	5/1/1984		<0.002							<0.05								0.02
SW3	10/1/1984		<0.002							<0.05								<0.005
SW3	4/1/1985																	
SW3	7/1/1985																	
SW3	10/1/1985		<0.002							<0.05								0.02
SM-5	5/25/1984	<0.05	<0.002	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.06	<0.001	<0.05	0.20	0.01	<0.05	0.02
SM-5	7/24/1984	<0.05	<0.002	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.02
SM-5	5/20/1987	<0.1	0.00	<0.1		<0.1	<0.01	0.05	<0.01	<0.05	0.05	0.25	<0.001	<0.1	<0.05	0.01	<0.1	0.01
SM-5	5/13/1989																	
SM-6	9/10/1986	0.22	0.00	<0.1		<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.70	<0.001	<0.1	0.06	0.00	<0.1	0.05
SM-6	5/20/1987	<0.1	0.01	<0.1		<0.1	<0.01	<0.05	<0.01	0.28	<0.05	0.09	<0.001	<0.1	<0.05	0.00	<0.1	0.05
SM-6	6/17/1987	0.05	<0.001	0.20		<0.1	<0.01	<0.05	<0.01	0.08	<0.05	1.60	<0.001	<0.1	0.12	0.00	<0.1	0.13
SM-6	8/24/1987	37.00	<0.001	<0.1		<0.1	0.01	<0.05	0.10	3.50	<0.05	11.00	<0.001	<0.1	1.30	<0.001	<0.1	1.00
SM-6	5/13/1989																	
SM-7	7/24/1984	0.12	0.02	<0.02		<0.1	<0.005	<0.01	<0.01	0.18	<0.05	<0.01	<0.001	<0.05	<0.01	0.01	<0.05	0.01
SM-7	6/27/1985	0.08	0.01	<0.02		<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.05	<0.001	<0.05	0.02	0.00	<0.05	0.03
SM-7	6/17/1987	5.30	0.01	0.30		<0.1	<0.01	<0.05	<0.01	3.55	<0.05	0.06	<0.001	<0.1	<0.05	0.00	<0.1	0.04
SM-7	5/13/1989																	
SM-7	4/27/1990																	
SM-7	5/17/1991																	
SM-7	6/7/1991																	
North Stock Pond	8/30/2011	1.90	0.161	0.2	<0.001	0.1	0.00	<0.01	0.02	1.15	0.01	0.10	<0.001	0.02	<0.05	0.002	<0.1	<0.01

		Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED								Radiometrics (pCi/L) SUSPENDED				
		Iron	Manganese	Lead 210	Uranium (mg/L)	Radium 226	Radium 228	Thorium 230	Polonium 210	Gross Alpha	Gross Beta	Lead 210	Uranium (mg/L)	Radium 226	Thorium 230	Polonium 210
Sample Name	Sample Date	Fe	Mn	210Pb	NatU	226Ra	228Ra	230Th	210Po	-	-	210Pb	NatU	226Ra	230Th	210Po
SW1	1/1/1982				0.030	0.65										
SW1	4/1/1982				0.030	0.77										
SW1	7/1/1982				0.030	0.48										
SW1	10/1/1982				0.030	0.32										
SW1	4/1/1983				0.030											
SW1	7/1/1983															
SW1	10/1/1983				0.020	1.80										
SW1	5/1/1983				0.030	5.50										
SW1	10/1/1984				0.040	3.70										
SW1	4/1/1985															
SW1	7/1/1985															
SW1	10/1/1985					0.50										
SW2	10/1/1981				0.030	0.76										
SW2	4/1/1982				0.030	0.73										
SW2	4/1/1983				0.080											
SW2	7/1/1983															
SW2	10/1/1983				0.040	7.30										
SW2	5/1/1984				0.040	2.20										
SW2	10/1/1984				0.040	1.10										
SW2	4/1/1985															
SW2	10/1/1985					0.50										
SW3	10/1/1981				0.020	1.50										
SW3	1/1/1982				0.030	1.80										
SW3	4/1/1982				0.010	1.30										
SW3	7/1/1982				<0.005	1.60										
SW3	4/1/1983				<0.005											
SW3	7/1/1983															
SW3	10/1/1983				0.070	6.60										
SW3	5/1/1984				0.050	3.80										
SW3	10/1/1984				0.060	5.60										
SW3	4/1/1985															
SW3	7/1/1985															
SW3	10/1/1985					1.00										
SM-5	5/25/1984				0.550	1.20										
SM-5	7/24/1984				0.070	3.40										
SM-5	5/20/1987				0.040	5.10										
SM-5	5/13/1989				0.020	2.90										
SM-6	9/10/1986				0.020	7.60										
SM-6	5/20/1987				0.030	1.90										
SM-6	6/17/1987				0.060	18.00										
SM-6	8/24/1987				3.200	15.00										
SM-6	5/13/1989				0.006	4.30										
SM-7	7/24/1984				0.150	5.40										
SM-7	6/27/1985				0.220	1.30										
SM-7	6/17/1987				0.020	1.70										
SM-7	5/13/1989				0.000	0.30										
SM-7	4/27/1990				0.010	2.00										
SM-7	5/17/1991				0.010	0.60										
SM-7	6/7/1991				0.010	372.00										
North Stock Pond	8/30/2011	60.00	3.09	3.20	0.090	1.30	<1	<0.2	1.20	68	50	3.30	0.0031	1.80	1.50	<1

Table 3.4-12 Gas Hills Remote Satellite Sediment Quality Data

Sample Name	Sample Date	Radiometrics Totals (pCi/g-dry)			
		Uranium (NatU)	Lead-210 (210Pb)	Radium-226 (226Ra)	Thorium-230 (230Th)
AS-1	9/1/2011	2.40	4.8	3.0	3.8
AS-2	9/1/2011	2.30	3.7	1.8	1.5
AS-3	9/1/2011	6.50	9.6	11.6	6.9
AS-4	8/31/2011	15.40	10.4	8.6	9.7
SD-1	9/1/2011	2.50	1.4	1.1	0.7
SD-3	9/1/2011	1.90	1.5	1.3	0.7
SD-4	8/31/2011	1.20	3.7	2.3	1.1
SD-5	8/31/2011	0.90	1.9	1.4	1.2
SD-6	8/31/2011	0.70	<1.0	1.0	0.5
SD-7	8/31/2011	1.00	1.2	1.1	0.7
SD-8	8/31/2011	0.60	<1.0	1.0	0.5
SD-9	8/31/2011	0.90	1.4	1.5	0.7
SD-10	8/31/2011	1.20	2.0	1.1	0.5
SD-11	8/31/2011	4.90	4.3	4.0	3.2
SD-12	8/31/2011	1.30	1.2	1.8	1.1
SD-13	8/31/2011	1.10	1.8	1.1	0.6
WCC #1	8/30/2011	2.20	2.8	1.9	1.2
WCC #2	8/30/2011	1.70	2.2	1.3	0.7
WCC #3	8/31/2011	7.30	9.2	10.2	6.4
Buss Pit	8/30/2011	4.00	3.1	1.9	2.2
Cameron Pond – SD-2	8/30/2011	1.90	2.4	1.1	0.8
Cameron Spring	8/30/2011	1.70	1.2	0.9	0.5
North Stock Pond	8/30/2011	2.60	3.3	2.1	1.4
EFD	9/1/2011	1.80	3.5	2.5	1.2
WFC	9/1/2011	3.40	4.7	3.0	1.9
	N =	25	23	25	25
	Average	2.9	3.5	2.7	2.0
	Standard Deviation	3.1	2.7	2.9	2.3
	Minimum	0.6	1.2	0.9	0.5
	Maximum	15.4	10.4	11.6	9.7

Table 3.4-13 Surface Water Rights within 2 kilometers of Gas Hills

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Source Name	Longitude	Latitude
P10039.0R	03/31/1994	Unadjudicated	Buss I Reservoir	STO	033N	089W	27	SW1/4NW1/4	Buss Draw (A closed Basin)	-107.496324	42.80459
P10040.0R	03/31/1994	Unadjudicated	Buss III Reservoir	STO	033N	089W	27	NE1/4SW1/4	Buss Draw (A closed Basin)	-107.49386	42.80126
P10041.0R	03/31/1994	Unadjudicated	Cap Pit Reservoir	STO	033N	089W	27	NW1/4NE1/4	CH. 4 Draw	-107.492552	42.80933
P10075.0S	01/27/1987		Rim Stock Reservoir	STO	033N	089W	35	NE1/4SW1/4	Middle Sage Hen Creek	-107.474328	42.78687
P13001.0R	08/27/2007	Complete	B-SPOILS RESERVOIR	IND	033N	089W	15	NE1/4SE1/4	Canyon Creek	-107.48435	42.83004
P6542.0R	10/23/1959	Unadjudicated	Wencor Spoil Pile Reservoir	MIS; STO; WIL	033N	090W	27	SW1/4SE1/4	Lamac Draw	-107.606869	42.798
P9573.0R	01/23/1990	Unadjudicated	Veca Pond Reservoir	STO; WIL	033N	089W	22	NW1/4SW1/4	Veca Draw	-107.498363	42.81597
P9722.0R	12/24/1991	Fully Adjudicated	Area 4 Reclamation Reservoir	STO; WIL	033N	090W	36		Fraser Draw (Drainage of)	-107.569661	42.78895

Water rights information collected from Wyoming State Engineer e-permit database.

Table 3.4-14 Gas Hills Historical Groundwater Quality Data

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)			
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH
GW5A	10/1/1981	168	47	37	27	0.0	132	590	21	0.85	<0.05	1.9		945	1450	108	6.70
GW5A	1/1/1982	185	47	36	28	0.0	127	570	8	2.30	0.09	1.5		936	1450	104	8.00
GW5A	4/1/1982	195	49	42	27	0.0	117	620	9	0.73	0.16	1.4		1000	900	96	7.10
GW5A	7/1/1982	220	45	42	30	0.0	107	793	12	2.10	0.17	1.3		1196	1000	88	7.00
GW5A	10/1/1982	268	74	44	32	0.0	107	870	12	0.29	0.43	1.6		1352	1000	88	6.30
GW5A	1/1/1983														1010		6.30
GW5A	4/1/1983	225	58	45	34	0.0	112	845	13	1.40	1.90			1275	1050	92	6.80
GW5A	7/1/1983														1100		6.50
GW5A	10/1/1983	240	63	47	31	0.0	107	802	12	3.20	0.07			1248	1260	88	6.80
GW5A	5/1/1984	209	58	46	33	0.0	112	800	12	0.49	1.20			1214	1350	92	7.20
GW5A	10/1/1984	207	22	49	32	0.0	117	710	12	0.81	0.99			1090	1220	96	7.90
GW5A	4/1/1985														440		6.50
GW5A	10/6/1993	199	40	37	20	0.0	167	605	7	<0.01		2.6				137	6.56
GW5A	9/23/1996	190	47	32	21	<0.05	190	616	8	<0.10	<0.025	2.1	35.3	1040	1270	156	6.33
GW5A	3/7/1997	199	48	32	21	0.1	140	621	8	0.01	<0.025	2.0	34.4	1060	1310	115	7.79
GW5A	4/28/1997	187	45	34	22	0.1	139	592	8	<0.1	<0.025	1.9	34.4	1046	1305	114	7.70
GW5A	8/20/1997	194	46	32	21	0.1	140	591	7	<0.10	0.12	2.1	34.9	1040	1290	115	7.76
GW5A	10/29/1997	184	43	32	20	<0.05	142	590	7	<0.10	<0.025	2.1	35.4	1060	1290	116	7.80
GW5A	8/17/1998	192	46	35	21	1.0	146	599	8	<0.10	0.06	2.2		1060	1270		7.71
GW5A	7/29/1999	184	46	35	22	<0.05	140	574	8	<0.10	<0.025	2.1		970	1310		7.39
GW5A	9/5/2006	206	51	36	20	<1	146	688	8	<0.1	0.07	1.7	31.4	1180	1560	120	7.30
GW6	10/1/1981	54	13	38	13	0.0	249	81	9	0.36	<0.05	1.0		329	610	204	6.90
GW6	1/1/1982	54	15	34	13	10.0	234	52	12	3.00	0.06	0.8		305	490	208	8.40
GW6	4/1/1982	66	15	34	12	0.0	249	93	6	0.46	0.06	0.6		349	340	204	6.20
GW6	7/1/1982	57	12	34	13	0.0	249	63	8	2.50	<0.05	0.6		310	375	204	7.70
GW6	10/1/1982	54	15	35	13	0.0	200	60	8	0.36	0.08	0.8		283	338	164	6.80
GW6	1/1/1983														325		7.50
GW6	4/1/1983	58	10	34	14	0.0	259	52	7	1.30	0.16			303	350	212	7.80
GW6	7/1/1983														350		7.30
GW6	10/1/1983	61	12	34	14	0.0	259	55	7	5.00	0.10			310	450	212	8.00
GW6	5/1/1984	60	12	29	14	0.0	249	52	6	0.49	<0.05			295	459	204	7.70
GW6	10/1/1984	64	19	32	14	0.0	259	52	8	<0.05	0.19			316	450	212	8.20
GW6	4/1/1985														310		6.80
GW6	7/1/1985														195		6.50
GW6	10/1/1985	66	10	25	10	0.0	244	55	8	<0.05	0.18			292	305	200	6.00
GW7	1/1/1982	110	25	30	22	10.0	195	262	10	2.40	0.06	0.7		565	810	176	8.40
GW7	4/1/1982	116	21	44	21	0.0	166	310	12	0.42	<0.05	0.8		606	670	136	7.50
GW7	7/1/1983	70	12	23	18	0.0	224	77	10	3.80	0.14			321	353	184	7.40
GW7	10/1/1983	98	19	26	22	0.0	220	164	16	8.20	<0.05			453	640	180	7.60
GW7	5/1/1984	102	20	30	24	0.0	207	209	10	2.10	<0.05			506	699	170	7.60
GW7	10/1/1984	99	21	31	22	0.0	244	170	15	1.40	0.08			480	630	200	8.20
GW7	4/1/1985														480		6.80
GW7	7/1/1985																7.20
GW7	10/1/1985	114	21	32	17	0.0	330	282	19	<0.05	0.13			594	398	165	6.40
GW7	10/11/1993	420	80	28	28	0.0	260			0.16		0.7		2248	455	213	7.14
GW9	10/1/1981	79	21	26	21	0.0	229	152	10	3.04	<0.05	1.5		421	800	188	7.10
GW9	1/1/1982	98	21	26	23	0.0	232	200	6	2.50	0.06	1.5		488	685	190	8.20
GW9	4/1/1982	85	19	27	19	0.0	239	150	6	0.41	<0.05	1.3		424	439	196	7.30
GW9	7/1/1982	91	18	25	20	0.0	239	165	7	1.60	0.06	1.1		444	580	196	7.20
GW9	10/1/1982	108	22	26	21	0.0	239	184	7	0.17	<0.05	1.4		487	425	196	7.10
GW9	1/1/1983														380		6.80
GW9	4/1/1983	88	19	25	31	0.0	244	158	7	0.64	0.09			450	425	200	7.20
GW9	7/1/1983														440		7.20
GW9	10/1/1983	90	17	25	20	0.0	234	142	7	4.20	0.06			416	580	192	7.50
GW9	5/1/1984	88	16	27	20	0.0	244	137	8	0.52	<0.05			416	599	200	7.80
GW9	10/1/1984	87	18	27	20	0.0	254	142	6	<0.05	0.15			427	600	207	8.20
GW9	4/1/1985														391		7.30
GW9	7/1/1985														262		6.70
GW9	10/1/1985	75	15	25	15	0.0	256	106	11	0.43	0.14			379	360	210	6.40

		Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
GW5A	10/1/1981	<0.05	0.01	<0.02	0.15	0.01	<0.01	<0.01	0.14	<0.05	0.25	<0.001	<0.05	<0.01	<0.02	<0.05	0.34			0.009		3.9			
GW5A	1/1/1982	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	0.11	<0.05	0.27	<0.001	<0.05	0.03	<0.02	<0.05	0.01			0.008		8.1			
GW5A	4/1/1982	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.37	<0.001	<0.05	0.03	<0.02	<0.05	0.02			0.010		4.4			
GW5A	7/1/1982	<0.05	0.02	<0.02	<0.1	0.01	<0.01	<0.01	0.33	<0.05	0.37	<0.001	<0.05	0.03	<0.02	<0.05	0.01			0.010		4.2			
GW5A	10/1/1982	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.37	<0.001	<0.05	<0.01	<0.02	<0.05	0.02			0.010		4.5			
GW5A	1/1/1983																								
GW5A	4/1/1983		0.01						0.09								0.03			0.009					
GW5A	7/1/1983																								
GW5A	10/1/1983		0.01						0.09					0.03						0.007		4.4			
GW5A	5/1/1984		0.01						<0.05					0.03						<.005		3.3			
GW5A	10/1/1984		0.02						<0.05					<0.005						0.009		3.9			
GW5A	4/1/1985																								
GW5A	10/6/1993	<0.01	0.01	<0.1	<0.1	<0.1	<0.05	<0.1	0.86					0.07	<0.001	<0.1				0.000		1.2			
GW5A	9/23/1996	<0.10	0.02	<0.10	<0.10	<0.10	<0.05	<0.01	<0.025	<0.05	0.09	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.001		1.0			
GW5A	3/7/1997	<0.10	0.02		<0.10	<0.10	<0.05	<0.01	<0.025	<0.05	0.14	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			<0.00015		2.6			
GW5A	4/28/1997	<0.10	0.03	<0.10	<0.10	<0.10	<0.05	<0.01	<0.025	<0.05	0.11	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			<0.00015		1.1			
GW5A	8/20/1997	<0.10	0.03	<0.10	<0.10	<0.10	<0.05	<0.01	<0.025	<0.05	0.15	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.001		0.9			
GW5A	10/29/1997	<0.10	0.02	<0.10	<0.10	<0.005	<0.05	<0.01	<0.025	<0.05	0.17	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.001		1.0			
GW5A	8/17/1998		0.02						0.03		0.07				<0.001					0.001		2.7	<1.0		
GW5A	7/29/1999		0.03						<0.015		0.08				<0.001					0.003		3.1	<1.5		
GW5A	9/5/2006	<0.10	0.02	<0.10	<0.10	<0.005	<0.05	<0.01	0.12	<0.05	0.14	<0.001	<0.10	<0.05	<0.001	<0.10	0.02			0.000		1.3			
GW6	10/1/1981	<0.05	0.01	<0.02	<0.1	<0.05	<0.1	<0.1	0.25	<0.05	0.17	<0.001	<0.05	<0.01	<0.002	<0.05	0.75			0.009		12.0			
GW6	1/1/1982	<0.05	0.01	<0.02	<0.1	<0.05	<0.1	<0.1	0.14	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.16			0.006		10.0			
GW6	4/1/1982	<0.05	0.01	<0.02	<0.1	<0.05	<0.1	<0.1	2.50	<0.05	0.07	<0.001	<0.05	<0.01	<0.002	<0.05	0.01			0.020		16.0			
GW6	7/1/1982	<0.05	0.00	<0.02	<0.1	<0.05	<0.1	<0.1	0.89	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.01			0.009		<0.35			
GW6	10/1/1982	<0.05	0.01	<0.02	<0.1	<0.05	<0.1	<0.1	2.80	<0.05	0.09	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005			0.008		11.0			
GW6	1/1/1983																								
GW6	4/1/1983		0.00						0.60								0.01			0.009		13.0			
GW6	7/1/1983																								
GW6	10/1/1983		0.00						2.30								0.01			0.009		1.5			
GW6	5/1/1984		0.01						1.00								0.02			<0.005		3.1			
GW6	10/1/1984		0.01						1.30								0.02			<0.005		3.5			
GW6	4/1/1985																								
GW6	7/1/1985																								
GW6	10/1/1985		0.01						<0.05							<0.05	0.12								
GW7	1/1/1982	<0.05	0.01	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005			0.060		2.1			
GW7	4/1/1982	<0.05	0.01	<0.02	<0.1	<0.005	<0.01	0.03	<0.05	<0.05	0.04	<0.001	<0.05	0.02	<0.002	<0.05	0.02			0.040		4.4			
GW7	7/1/1983		0.02						<0.05								0.09			0.060					
GW7	10/1/1983		0.02						<0.05								0.05			0.070		2.8			
GW7	5/1/1984		0.01						<0.05								0.03			0.100		1.7			
GW7	10/1/1984		0.02						<0.05								0.04			0.130		1.3			
GW7	4/1/1985																								
GW7	7/1/1985																								
GW7	10/1/1985		0.02						0.07							<0.05	0.30					1.8			
GW7	10/11/1993	0.81	0.00	<0.01	<0.01	<0.01	<0.05	<0.01	<0.05	0.34	0.42	<0.001	<0.1	<0.05	0.01	<0.01	<0.01			0.050		4.9			
GW9	10/1/1981	<0.05	0.07	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.03	<0.001	<0.05	<0.01	<0.002	<0.05	0.06			0.030		2.6			
GW9	1/1/1982	<0.05	0.05	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.05	<0.001	<0.05	<0.01	<0.002	<0.05	0.03			0.030		4.7			
GW9	4/1/1982	<0.05	0.05	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.02	<0.001	<0.05	<0.01	<0.002	<0.05	0.10			0.030		3.7			
GW9	7/1/1982	0.24	0.06	<0.02	<0.1	<0.005	<0.01	<0.01	1.10	<0.05	0.13	<0.001	<0.05	<0.01	<0.002	<0.05	0.09			0.030		5.4			
GW9	10/1/1982	<0.05	0.07	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.10	<0.001	<0.05	<0.01	<0.002	<0.05	0.03			0.020		4.6			
GW9	1/1/1983																								
GW9	4/1/1983								<0.05								0.29			0.020		8.8			
GW9	7/1/1983																								
GW9	10/1/1983		0.08						<0.05								0.36			0.020		4.8			
GW9	5/1/1984		0.06						<0.05								0.07			0.020		6.4			
GW9	10/1/1984		0.08						<0.05								0.07			0.020		4.9			
GW9	4/1/1985																								
GW9	7/1/1985																								
GW9	10/1/1985		0.07						<0.05							<0.05	0.03					0.5			

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)				Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)	Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
GW9	10/6/1993	85	13	22	15	0.0	262	116	3	0.10		1.6		416		215	7.25	<0.1	0.06	<0.1	<0.1	<0.1	<0.05	<0.1	1.60	<0.05	0.08	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.055		4.0			
GW9	9/20/1996	78	14	22	14	<0.10	250	99	3	<0.10	<0.05	1.1	31.2	389	581	205	7.95	<0.10	0.06	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.022		2.8			
GW9	11/24/1996	79	15	22	14	<0.10	245	113	5	<0.10	<0.05	1.1	34.1	389	584	201	8.22	0.17	0.06	<0.10	<0.10	<0.01	<0.05	<0.01	0.07	<0.05	<0.01	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.019		5.5			
GW9	2/28/1997	73	14	23	15	<0.10	254	93	4	<0.10	<0.05	1.1	33.8	370	529	208	7.59	0.41	0.06	0.02	<0.10	<0.01	<0.05	<0.01	0.17	<0.05	<0.01	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.017		2.9			
GW9	4/23/1997	81	15	21	14	<0.10	254	101	4	<0.1	<0.05	1.1	34.2	389	583	208	8.11	0.56	0.07	<0.10	<0.10	<0.01	<0.05	<0.01	0.28	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.019		3.1			
GW9	8/25/1997	84	14	24	16	<0.10	253	103	5	<0.10	<0.05	1.2	33.1	399	599	207	8.06	0.17	0.07	<0.10	<0.10	<0.01	<0.05	<0.01	0.07	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.015		5.0			
GW9	10/30/1997	77	14	24	15	<0.10	253	97	5	0.39	<0.05	1.3	32.5	394	604	207	7.99	<0.10	0.08	<0.10	<0.10	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.017		2.0			
GW9	8/25/1998	78	15	24	14	1.0	252	93	3	<0.10	0.05	1.1		381	587		7.96		0.08								0.01				<0.001					0.020		83.0	3.1		
GW9	8/4/1999	78	15	25	15	<0.10	247	93	4	<0.10	<0.05	1.1		371	583		7.89		0.08								<0.01				<0.001					0.018		5.0	1.0		
GW9	10/25/2006	80	15	24	14	<1	271	118	3	<0.1	<0.05	1.0	35.0	394	582	222	7.46	<0.10	0.07	<0.10	<0.10	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	<0.001	<0.10	0.01	0.2	0.1	0.020		6.0	<1	37	29
GW10	10/1/1981	539	82	33	22	0.0	307	1430	12	0.58	0.14	1.1		2269	3710	252	6.80	<0.05	0.01	<0.02	<0.1	0.02	0.03	<0.1	10.00	0.12	0.79	<0.001	<0.05	0.14	<0.002	<0.05	0.02			0.040		5.6			
GW10	1/1/1982	561	70	32	20	0.0	283	1450	9	2.00	0.09	1.0		2280	2410	232	8.00	<0.05	<0.002	<0.02	<0.1	0.01	0.02	<0.1	0.27	0.13	0.56	<0.001	<0.05	0.14	<0.002	<0.05	0.01			0.020		8.0			
GW10	4/1/1982	540	63	35	20	0.0	273	1450	8	0.45	0.14	0.9		2250	1170	224	7.00	<0.05	0.02	<0.02	<0.1	0.01	0.02	<0.1	19.00	0.10	0.74	<0.001	<0.05	0.13	<0.002	<0.05	0.02			0.020		12.0			
GW10	7/1/1982	330	75	28	17	0.0	259	1050	11	1.70	0.17	0.9		1638	2380	212	6.90	0.09	0.03	<0.02	<0.1	0.01	0.03	<0.1	16.00	0.10	0.66	<0.001	<0.05	0.14	<0.002	<0.05	0.12			0.020					
GW10	10/1/1982	669	93	36	22	0.0	259	1760	12	0.24	0.14	1.0		2719	2130	212	6.70	<0.05	0.04	<0.02	0.20	0.01	0.02	<0.1	20.00	0.10	0.66	<0.001	<0.05	<0.01	<0.002	<0.05	0.09			0.020		7.4			
GW10	1/1/1983														1670		6.80																								
GW10	4/1/1983	550	76	34	20	0.0	303	1530	6	0.57	0.15			2366	1800	248	6.80		0.03						17.00											0.020		10.0			
GW10	7/1/1983														1060		6.80																								
GW10	10/1/1983	557	86	35	20	0.0	288	1520	8	4.30	0.14			2368	2360	236	6.90		0.03						20.00								0.96			0.020		1.0			
GW10	5/1/1984	583	69	37	22	0.0	293	1535	10	0.51	0.12			2400	2310	240	7.00		0.01						20.00								0.68			0.020		8.8			
GW10	10/1/1984	580	50	40	22	0.0	303	1610	10	0.19	0.23			2462	2500	249	8.10		0.03						17.00								0.49			0.060		7.7			
GW10	4/1/1985														1630		6.60																								
GW10	7/1/1985														1190		7.00																								
GW10	10/1/1985	563	79	38	19	0.0	317	1510	13	<0.05	0.15			2384	1140	260	6.50		0.02						8.30							<0.05	0.62					6.2			
GW10	10/7/1993	593	69	28	14	0.0	301	1416	4	<0.1		1.3		2464		247	6.48	<0.1	<0.001	<0.1	<0.1	<0.1	<0.05	<0.1	16.10	<0.05	1.05	<0.001	<0.1	0.17	<0.001	<0.1	<0.01			0.032		102.0			
GW10A	10/20/1997	409	72	27	19	<0.05	296	1040	5	<0.05	0.22	1.2	23.4	1760	2030	243	7.80	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	4.10	<0.05	1.09	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.021		9.2			
GW10A	1/27/1998	400	73	28	20	0.1	301	1000	6	0.05	0.27	1.2	23.7	1750	1950	247	7.62	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	4.85	<0.05	1.07	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.023		53.7			
GW10A	6/23/1998	367	72	24	17	0.1	299	1000	8	0.05	0.18	1.1	22.8	1750	1790	245	7.61	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	4.75	<0.05	1.04	<0.001	<0.10	<0.05	0.00	<0.10	0.02			0.023		51.6			
GW10A	7/13/1998	375	73	29	19	0.1	303	1000	6	0.05	0.16	1.1	22.9	1810	2010	248	7.71	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	4.80	<0.05	1.05	<0.001	<0.10	<0.05	0.00	<0.10	0.05			0.026		21.2			
GW10A	8/3/1999	367	69	29	21	<0.05	298	1010	8	<0.05	0.19	1.2		1790	2000		7.80		0.01						4.50		0.99				<0.001					0.026		12.4	11.9		
GW10A	9/5/2006	303	59	24	17	<1	305	807	4	0.20	0.13	0.9	20.6	1500	1910	250	7.20	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	2.45	<0.05	0.91	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.020		6.8			
GW10A	10/12/2011	305	59	26	19	<5	267	818	5	<0.1	0.09	1.3	25.6	1420	1680		7.81	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	4.19	<0.05	0.91	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.179		18.0	9.3	70	50
GW11	10/1/1981	58	11	82	16	0.0	93	308	11	0.34	0.82	0.7		532	920	76	6.80	<0.05	0.01	<0.02	<0.1	<0.005	<0.01	<0.01	0.44	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.03			0.020		3.0			
GW11	1/1/1982	60	10	80	14	0.0	98	281	8	1.10	0.42	0.5		501	720	80	8.00	<0.05	0.01	<0.02	<0.1	<0.005	<0.01	<0.01	0.08	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			0.020		1.9			
GW11	4/1/1982	60	10	89	13	0.0	93	276	8	0.38	1.10	0.4		502	482	76	7.70	<0.05	0.00	<0.02	<0.1	<0.005	<0.01	<0.01	0.30	<0.05	0.02	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			0.010		3.2			
GW11	7/1/1982	61	9	87	14	0.0	98	300	10	1.00	1.20	0.4		529	590	80	7.20	<0.05	1.00	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.04			0.030		2.9			
GW11	10/1/1982									0.23	1.60	1.7				64		<0.05	0.01	<0.02	<0.1	<0.005	<0.01	<0.01	0.24	<0.05	0.03	<0.001	<0.05	0.12	<0.002	<0.05	0.82			0.020		3.6			
GW11	4/1/1983									0.47	1.90					80			0.00						0.52								0.03			0.020		2.4			
GW11	10/1/1983									2.50	0.83					80			0.00						0.52								0.01			0.010		3.3			
GW11	5/1/1984									0.45	0.13					115			0.01						0.47								0.01			0.060		2.5			
GW11	10/1/1984									0.81	1.00					71			<0.002						0.11								0.02			0.050		2.6			
GW11	1/1/1985									1.30	0.65					70			<0.002						0.13							<0.05	10.00					10.0			
GW11	9/19/1996	321	49	35	14	<0.10	223	670	141	<0.1	<0.5	0.6	36.9	1450	1690	183	7.45	<0.10	0.00	<0.10	<0.10	<0.01	<0.05	<0.01	0.05	<0.05	0.02	<0.001	<0.10	<0.05	0.01	<0.10	<0.01			0.134		4.2			
GW11	9/19/1996 (D)	311	48	26	14	<0.10	223	661	135	0.12	<0.5	0.6	36.5	1430	1680	183	7.51	<0.10	0.00	<0.10	<0.10	<0.01	<0.05	<0.01	0.06	<0.05	0.01	<0.001	<0.10	<0.05	0.02	<0.10	<0.01			0.133		3.3			
GW11	11/24/1996	303	47	26	14	<0.10	221	685	122	0.27	<0.5	0.6	36.9	1410	1610	181	7.94	<0.10	0.02	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.10	<0.05	0.03	<0.10	<0.01			0.147		6.0			
GW11	2/25/1997	286	47	37	16	<0.10	218	650	112	0.17	<0.5	0.6	34.3	1350	1740	179	7.89	<0.10	0.02	0.02	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.10	<0.05	0.03	<0.10	<0.01			0.120		5.4			
GW11	4/23/1997	303	47	35	15	<0.10	216	684	106	0.19	<0.5	0.6	34.4	1423	1679	177	7.68	0.16	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.10	<0.05	0.02	<0.001	<0.10	<0.05	0.02	<0.10	<0.01			0.139		5.9			
GW11	11/4/1997	339	52	37	16	<0.10	218	741	122	0.21	0.10	0.7	33.1	1420	1800	179	7.75	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.07	<0.05	0.03	<0.001	<0.10	<0.05	0.02	<0.10	<0.01			0.159		4.5			
GW11	8/17/1998	330	52	40	16	1.0	219	749	118	0.19	0.06	0.7		1680	1840		7.93		0.01						<0.05		0.02				0.02					0.147		3.0			
GW11	8/3/1999	326	51	38	17	<0.10	221	756	137	0.14	<0.5	0.7		1560	1910		7.72		0.01						<0.05		0.03				0.03					0.191		19.7	3.1		
GW11	10/17/2006	230	39	36	14	<1	216	561	50	<0.10	0.09	0.7	27.0	958	1250	177	7.67	<0.10	0.07	<0.10	<0.10	<0.01	<0.05	<0.01	0.06	<0.05	0.13	<0.001	<0.10	<0.05	0.00	<0.10	0.03	0.1	0.1	0.059		23.7	4.4	71	54
GW11	10/12/2011	184	31	37	14	<5	198	467	24	0.10	<0.05	0.8	24.8	903	1180		7.92	<0.10	0.03	<0.10	0.10	<0.01	<0.05	<0.01	0.06	<0.05	31.00	<0.001	<0.10	<0.05	0.00	<0.10	0.04	23.8	0.3	0.034		11.0	4.9	63	42
TVA-MW1	10/1/01981	57	11	39	18	0.0	249	66	10	1.60	<0.05	0.7		323	620	204	7.20	<0.05	0.01	<0.02	<0.1	<0.005	<0.01	<0.01	0.07	<0.05	0.23	<0.001	<0.05	<0.01	<0.002	<0.05	0.03			0.008		2.0			
TVA-MW1	1/1/1982	60	7	36	18	10.0	232	60	7	1.10	<0.05	0.6		312	520	206	8.50	<0.05	0.20	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.15	<0.001	<0.05	<0.01	<0.002	<0.05	0.01			0.008		3.2			
TVA-MW1	4/1/1982	56	10	40	16	0.0	254	58	7	0.47	<0.05	0.5		312	332	208	7.50	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			<0.005		1.2			
TVA-MW1	7/1/1982	61	8	40	17	0.0	249	64	9	1.60	<0.05	0.4		321	384	204	7.60	<0.05	0.02	<0.02	0.20	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.03			<0.005		1.6			
TVA-MW1	10/1/1982	69	15	42	17	10.0	234	66	9	0.42	<0.05	1.0		344	340	216	7.00	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	<0.005			<0.005		0.9			
TVA-MW1	1/1/1983														334		6.90																								
TVA-MW1	4/1/1983	57	9	39	19	0.0	259	58	8	0.63	<0.05			317	345	212	7.50		0.02														0.02			<0.005		2.4			

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)				Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)	Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
TVA-MW1	7/1/1983														350																										
TVA-MW1	10/1/1983	58	8	42	18	0.0	259	54	7	4.70	<0.05			314	460		6.90																								
TVA-MW1	5/1/1984	57	7	43	18	0.0	250	58	9	0.62	<0.05			315	475	212	7.80		0.02						<0.05								0.05			<0.005		2.6			
TVA-MW1	10/1/1984	56	7	45	16	6.0	244	52	8	<0.05	0.07			310	450	205	8.10		0.01						<0.05								0.04			0.007		1.2			
TVA-MW1	4/1/1985													·	300	210	8.30		0.02						<0.05								0.04			<0.005		2.2			
TVA-MW1	7/1/1985														252		7.30																								
TVA-MW1	10/1/1985	55	8	50	13	0.0	256	53	12	<0.05	<0.05			311	302	210	7.60		0.02						<0.05							0.01	0.01					1.8			
TVA-MW1	9/23/1996	21	2	61	10	<0.1	199	40	5	<0.1	0.05	0.4	44.0	278	446	163	6.53	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.16	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		<0.2			
TVA-MW1	9/23/1996 (D)	21	2	60	10	<0.1	198	40	5	<0.1	0.05	0.5	43.3	264	405	162	7.18	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.16	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		<0.2			
TVA-MW1	11/24/1996	20	2	67	8	<0.1	218	46	6	<0.1	<0.05	0.4	45.1	245	400	179	8.29	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		1.1			
TVA-MW1	3/5/1997	21	2	58	9	0.0	194	38	5	<0.1	0.07	0.4	41.3	272	407	159	7.94	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.15	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			<0.0003		1.8			
TVA-MW1	4/28/1997	20	2	64	10	0.0	192	38	5	<0.1	<0.05	0.4	42.0	274	409	157	8.14	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.0003		<0.2			
TVA-MW1	10/29/1997	20	2	60	9	<0.1	194	39	5	<0.1	<0.05	0.5	42.9	283	410	159	8.06	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.0003		<0.2			
TVA-MW2	10/1/01981	61	9	33	19	0.0	220	83	11	0.60	<0.05	0.5		323	590	180	7.20	<0.05	0.03	<0.02	<0.1	<0.005	<0.01	<0.01	0.08	<0.05	0.03	<0.001	<0.05	<0.01	<0.002	<0.05	0.03			0.030		0.4			
TVA-MW2	1/1/1982	63	6	30	20	10.0	203	80	9	0.84	<0.05	0.3		318	460	182	8.40	<0.05	0.03	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.01			<0.03		1.0			
TVA-MW2	4/1/1982	62	8	35	18	0.0	220	81	7	0.37	<0.05	0.3		319	320	180	7.70	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.03	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			0.030		0.8			
TVA-MW2	7/1/1982	52	8	35	19	0.0	190	80	10	1.30	<0.05	0.2		297	380	156	8.00	<0.05	0.03	<0.02	<0.1	<0.005	<0.01	<0.01	0.53	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.05			0.040		0.8			
TVA-MW2	10/1/1982	73	13	36	19	5.0	210	97	11	0.44	<0.05	0.6		357	334	184	6.20	<0.05	0.04	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			0.030		0.5			
TVA-MW2	1/1/1983					6.5									335																										
TVA-MW2	4/1/1983	63	7	35	21	0.0	234	80	10	1.10	<0.05			331	348	192	7.50	<0.05	0.03						<0.05								0.02			0.040					
TVA-MW2	7/1/1983														365		7.10																								
TVA-MW2	10/1/1983	66	8	35	20	0.0	229	84	8	4.50	<0.05			334	470	188	7.90		0.02						<0.05								0.04			0.030		3.9			
TVA-MW2	5/1/1984	63	9	35	20	0.0	220	85	9	0.80	<0.05			328	480	180	8.10		0.03						<0.05								0.03			0.030		1.2			
TVA-MW2	10/1/1984	60	5	36	19	0.0	220	82	8	<0.05	<0.05			319	440	180	8.20		0.03						<0.05								0.05			0.050		1.1			
TVA-MW2	4/1/1985														309		7.00																								
TVA-MW2	7/1/1985														281		7.00																								
TVA-MW2	10/1/1985	66	8	35	19	0.0	244	92	13	<0.35	<0.05			360	310	200	7.20								<0.05							0.01	0.01					0.4			
TVA-MW2	9/23/1996	57	7	31	14	<.1	211	52	5	<0.1	<0.05	0.4	52.1	331	486	173	7.13	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.019		0.2			
TVA-MW2	11/24/1996	59	7	29	12	<.1	223	76	7	<0.1	<0.05	0.3	56.2	377	480	183	8.30	0.14	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.06	<0.05	<0.01	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.022		<0.2			
TVA-MW2	3/7/1997	61	8	28	13	0.0	216	63	5	<0.1	<0.05	1.3	52.1	347	473	177	8.12	0.22	0.02	0.06	<0.1	<0.01	<0.05	<0.01	0.11	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.021		1.1			
TVA-MW2	4/28/1997	63	7	29	13	0.0	210	64	5	<0.1	<0.05	0.3	56.4	325	477	172	8.03	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.018		0.9			
TVA-MW2	8/20/1997	61	7	30	14	0.0	212	61	5	<0.1	0.09	0.4	57.2	315	471	174	8.16	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.019		0.6			
TVA-MW2	11/4/1997	64	8	29	14	<0.1	215	69	6	<0.1	0.07	0.4	53.0	310	504	176	8.04	0.11	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.06	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.029		<0.2			
TVA-MW2	11/4/1997 (D)	64	8	29	14	<0.1	217	69	5	<0.1	0.06	0.4	52.4	296	501	178	8.07	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.023		0.9			
TVA_MW3	10/1/1981	19	4	62	11	0.0	181	44	10	0.55	<0.05	0.5		238	440	148	7.40	<0.05	0.01	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.11	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			0.008		<0.2			
TVA_MW3	1/1/1982	21	3	56	11	5.0	176	42	8	0.77	<0.05	0.4		232	390	152	8.30	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.01			0.009		0.6			
TVA_MW3	4/1/1982	19	4	65	10	0.0	185	40	6	0.37	<0.05	0.4		235	239	152	7.20	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	0.06	<0.001	<0.05	<0.01	<0.002	<0.05	0.02			<0.005		0.6			
TVA_MW3	7/1/1982	20	3	65	11	0.0	181	43	8	1.20	<0.05	0.3		238	225	148	7.70	0.09	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	0.24	<0.05	0.04	<0.001	<0.05	<0.01	<0.002	<0.05	0.04			<0.005		0.9			
TVA_MW3	10/1/1982	22	5	67	9	0.0	185	45	33	0.84	<0.05	0.5		272	249	152	7.70	<0.05	0.02	<0.02	<0.1	<0.005	<0.01	<0.01	<0.05	<0.05	<0.01	<0.001	<0.05	<0.01	<0.002	<0.05	0.01			<0.005		1.9			
TVA_MW3	1/1/1983														250		7.70																								
TVA_MW3	4/1/1983	19	2	65	12	0.0	190	41	8	1.50	<0.05			242	253	156	7.80		0.01						<0.05								0.02			<0.005					
TVA_MW3	7/1/1983														270		7.20																								
TVA_MW3	10/1/1983	20	7	66	11	0.0	185	41	7	3.90	<0.05			242	438	153	7.90		0.01						<0.05								0.02			<0.005		1.3			
TVA_MW3	5/1/1984	21	3	65	12	0.0	183	40	9	0.48	<0.05			241	362	150	8.10		0.01						<0.05								0.02			<0.005		7.0			
TVA_MW3	10/1/1984	18	11	69	11	0.0	195	41	9	<0.05	<0.05			256	356	160	8.10		0.02						<0.05								<0.05			<0.005		9.3			
TVA_MW3	4/1/1985														244		7.00																								
TVA_MW3	7/1/1985														192		7.00																								
TVA_MW3	10/1/1985	24	3	61	7	0.0	195	44	9	<0.005	<0.05			246	204	160	6.40		0.01						0.04							<0.05	<0.05					0.4			
TVA_MW3	9/23/1996	61	9	34	15	<0.1	265	50	5	<0.1	<0.05	0.6	45.7	335	521	217	7.68	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.20	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		2.5			
TVA_MW3	11/24/1996	61	9	33	13	<0.1	270	56	6	<0.1	<0.05	0.5	47.7	330	515	221	8.18	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.17	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.000		2.5			
TVA_MW3	3/7/1997	62	9	33	15	0.0	271	48	5	<0.1	<0.05	0.5	45.6	350	542	222	7.83	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.18	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.0003		2.9			
TVA_MW3	4/29/1997	65	10	33	14	0.0	270	53	5	<0.1	<0.05	0.5	14.2	341	523	221	7.87	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.18	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.0003		2.4			
TVA_MW3	11/4/1997	70	10	34	16	<0.1	277	55	5	<0.1	<0.05	0.7	43.9	324	555	227	8.10	<0.1	0.03	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.17	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.003		2.7			
BUSS-1	10/7/1993	555	115	41	34	0.0	22	1964	14	0.10		1.5		2820		18	5.84	<0.1	<0.001	<0.1	<0.1	<0.1	<0.05	<0.01	0.07	<0.05	2.46	<0.001	<0.1	0.20	<0.001	<0.1	0.03			0.253		1.9			
BUSS 2	10/7/1993	565	115	40	33	0.0	22	1882	8	<0.1		1.5		2695		18	5.90	<0.1	<0.001	<0.1	<0.1	<0.1	<0.05	<0.01	<0.05	<0.05	2.45	<0.001	<0.1	0.18	<0.001	<0.1	0.03			0.281		1.8			
MU96M-1	9/27/1996	65	14	132	12	<0.1	309	220	14	<0.1	0.12	1.1	18.3	662	946	235	7.78	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	0.13	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002	5100	44.3			
MU96M-1	11/19/1996	64	14	131	13	<0.1	257	223	26	<0.1	0.24	1.1	17.1	648	912	211	7.93	<0.1	0.002	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002	9480	34.9			
MU96M-1	2/27/1997	58	13	131	13	0.0	296	213	25	<0.1	0.29	1.1	16.1	599	978	243	8.21	<0.1	0.006	0.02	<0.1	<0.01	<0.05	<0.01	0.14	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.005	6280	35.7			
MU96M-1	4/23/1997	62	13	124	12	0.0	304	226	16	<0.1	0.24	1.0	16.7	625	938	249	7.94	<0.1	0.005	<0.1	0.10	<0.01	<0.05	<0.01	0.12	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.000		31.6			

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)				Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)	Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
MU96M-1	8/20/1997	60	13	127	14	0.0	301	219	23	<0.1	0.29	1.2	17.1	622	972	247	8.16	<0.1	0.005	<0.1	0.10	<0.01	<0.05	<0.01	0.08	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		29.9			
MU96M-1	11/3/1997	65	14	130	13	<0.1	312	225	15	<0.1	0.17	1.2	17.3	578	984	256	7.99	<0.1	0.006	<0.1	<0.1	<0.005	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.003		30.241.4			
MU96M-1	8/24/1998	64	15	130	12	1.0	310	223	17	<0.1	0.17	1.0		618	963		7.82		0.010						0.38		0.07				<0.001					0.003			4.5		
MU96M-1	10/24/2006	62	15	126	11	<1	311	237	12	<0.1		1.1	17.8	560	919	255	7.58	<0.1	0.009	<0.1	<0.1	<0.005	<0.05	<0.01	0.43	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.4	0.1	0.002		53.7	4.4	176	62
MU96M-1	10/12/2011	62	14	134	12	<5	282	225	16	<0.1	0.05	1.0	20.1	614	935		7.99	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	0.59	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	0.6	0.1	0.002		46.0	2.6	323	93
MU96M-2	9/27/1996	80	18	123	15	<0.1	306	254	14	<0.1	0.12	0.9	28.9	714	987	251	8.16	<0.1	0.004	<0.1	0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.004	7060	47.6			
MU96M-2	11/19/1996	72	14	138	18	<0.1	224	286	51	<0.1	0.15	1.1	14.5	727	1030	184	8.08	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.004	14500	40.8			
MU96M-2	2/27/1997	67	14	138	18	0.0	228	300	32	<0.1	0.27	1.0	14.1	682	1060	187	8.10	<0.1	0.003	0.02	0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002	9090	38.1			
MU96M-2	4/23/1997	71	15	123	16	0.0	256	290	22	<0.1	0.23	0.9	15.0	677	1012	210	8.16	<0.1	<0.001	<0.1	0.11	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		36.8			
MU96M-2	8/20/1997	71	15	131	17	0.0	243	308	25	<0.1	0.24	1.0	15.2	689	1060	199	8.18	<0.1	<0.001	<0.1	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		37.4			
MU96M-2	11/3/1997	75	17	131	16	<0.1	264	294	21	<0.1	0.16	1.0	16.0	640	1060	216	7.99	<0.1	<0.001	<0.1	0.11	<0.005	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		33.4			
MU96M-2	8/24/1998	71	19	130	15	1.0	262	298	19	<0.1	0.16	0.9		695	1080		7.85		0.002						<0.05		0.03				<0.001					0.002		41.2	3.5		
MU96M-2	10/24/2006	74	19	134	14	<1	262	327	16	<0.1		1.0	17.6	648	1050	215	7.59	<0.1	0.002	<0.1	0.10	<0.005	<0.05	<0.01	0.32	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.3	0.0	0.002		44.5	2.8	128	56
MU96 M-2	10/12/2011	73	17	137	14	<5	255	312	15	0.30	<0.05	1.1	19.7	703	1040		7.99	<0.1	0.00	<0.1	0.10	<0.01	<0.05	<0.01	0.45	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.5	0.0	0.002		16.0	5.2	118	49
MO-1	9/27/1996	50	<1.0	162	12	55.0	7	267	39	<0.1	0.21	1.3	29.5	685	1270	150	11.14	<0.1	<0.001	<0.1	0.16	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.003		8.2			
MO-1	11/19/1996	55	<1.0	160	12	44.2	6	307	38	<0.1	0.20	1.3	25.5	695	1240	134	11.14	0.72	<0.001	<0.1	0.14	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.003		1.9			
MO-1	2/27/1997	54	<1.0	166	13	53.0	17	339	38	<0.1	0.15	1.4	22.4	709	1350	114	10.75	0.64	<0.001	0.10	0.14	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.003		3.8			
MO-1	4/23/1997	61	<1	173	13	50.4	17	400	37	<0.1	0.20	1.4	21.4	770	1362	109	10.72	0.59	0.002	<0.1	0.14	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.003		1.3			
MO-1	8/20/1997	51	<1.0	168	12	55.5	20	341	38	0.53	0.19	1.4	23.6	693	1290	117	10.70	0.61	<0.001	<0.1	0.14	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.003		1.1			
MO-1	11/3/1997	60	<1.0	207	14	40.1	11	462	39	<0.1	0.18	1.6	18.5	865	1420	95	10.80	0.49	<0.001	<0.1	0.13	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.003		5.6			
MO-1	8/24/1998	46	<1	171	11	44.5	10	329	36	<0.1	0.12	1.2		714	1290		10.90		<0.001						<0.05		<0.01				<0.001					<0.003		3.0	<1.0		
MO-1	10/17/2006	17	1	187	10	4.0	17	381	33	<0.1		1.1	16.6	612	940	34	9.34	<0.1	<0.001	<0.1	0.10	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	<0.03	<0.01	0.001		28.7	1.4	36	97
MO-1	10/11/2011	23	3	166	10	<5	74	297	36	<0.1	<0.05	1.1	17.2	594	903		8.07	<0.1	<0.001	<0.1	0.20	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	<0.03	<0.01	0.001		38.0	4.1	140	51
P1	9/27/1996	76	18	114	15	<0.1	290	241	15	<0.1	0.16	<0.1	0.9	684	959	238	7.83	<0.1	0.002	<0.1	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.020	151000	1840.0			
P1	11/19/1996	76	18	109	14	<0.1	295	243	13	<0.1	0.11	<0.1	0.8	645	908	242	7.99	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.018	352000	1800.0			
P1	11/19/1996 (D)	77	19	109	14	<0.1	295	248	13	<0.1	0.10	<0.1	0.9	645	901	242	8.04	<0.1	<0.001	<0.1	<0.01	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.021	342000	1900.0			
P1	2/27/1997	71	18	109	14	0.0	298	237	14	<0.1	0.07	<0.1	0.9	590	968	244	8.03	<0.1	0.003	0.0	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.020	201900	2059.0			
P1	4/23/1997	77	18	105	14	0.0	299	250	13	<0.1	0.15	<0.1	0.8	622	950	245	7.93	<0.1	0.002	<0.1	0.10	<0.01	<0.05	<0.01	0.06	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.019		1715.0			
P1	8/20/1997	75	18	105	14	0.0	298	249	14	0.12	0.19	0.1	1.0	630	970	244	8.20	<0.1	0.002	<0.1	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.017		1100.0			
P1	11/3/1997	76	18	110	14	<0.1	300	244	12	<0.1	0.14	<0.1	1.0	630	949	246	8.06	<0.1	0.002	<0.1	0.10	<0.005	<0.05	<0.01	<0.05		0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.021		1650.0			
P1	8/24/1998	76	19	109	13	1.0	297	240	13	<0.1	0.13	<0.1	0.9	632	974		7.88		0.004						0.07		0.07				<0.001					0.024		1830.0	12.1		
P1	10/17/2006	77	19	104	13	<0.1	293	246	12	<0.1		1.0	17.1	610	864	240	7.85	<0.1	0.004	<0.1	0.10	<0.005	<0.05	<0.01	0.33	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	0.03	0.3	0.1	0.022		1680.0	5.8	3610	1120
P1	10/11/2011	74	17	112	14	<5	283	235	12	<0.1	0.06	0.9	19.3	623	933		7.93	<0.1	0.003	<0.1	0.10	<0.005	<0.05	<0.01	0.31	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	0.4	0.1	0.019		1760.0	4.4	8440	1970
MP-1	9/27/1996	60	11	105	24	<0.1	270	189	13	<0.1	0.13	0.9	19.8	589	839	221	8.16	<0.1	0.014	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.018	246000	696.0			
MP-1	11/19/1996	61	12	99	22	<0.1	271	195	13	<0.1	0.09	0.9	19.5	560	803	222	8.23	<0.1	0.009	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.021	472000	782.0			
MP-1	2/27/1997	57	12	101	21	0.0	278	187	13	<0.1	0.07	0.9	17.1	515	852	228	7.98	<0.1	0.015	0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.027	286900	958.0			
MP-1	4/23/1997	61	13	95	18	0.0	277	197	11	<0.1	0.12	0.9	17.5	545	832	227	7.98	<0.1	0.014	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.024		911.0			
MP-1	8/20/1997	62	14	98	19	0.0	282	191	12	<0.1	0.20	1.0	17.6	542	854	231	8.06	<0.1	0.013	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.023		572.0			
MP-1	11/3/1997	62	13	99	18	<0.1	282	189	12	<0.1	0.08	1.1	17.8	539	838	231	8.09	<0.1	0.015	<0.1	<0.1	<0.005	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.026		1000.0			
MP-1	8/24/1998	62	15	99	16	1.0	283	183	13	<0.1	0.12	1.0		539	857		7.99		0.02						<0.05		0.06				<0.001					0.029		1260.0	7.2		
MP-1	10/19/2006	66	15	100	12	<1	274	179	12	<0.1		1.2	17.6	544	738	225	7.62	<0.1	0.02	<0.1	<0.1	<0.005	<0.05	<0.01	0.13	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.1	0.1	0.024		1300.0	6.9	3920	951
MP-1	10/11/2011	65	13	105	13	<5	271	185	13	<0.1	0.07	1.1	19.7	540	833		7.90	<0.1	0.02	<0.1	0.1	<0.005	<0.05	<0.01	0.19	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.3	0.1	0.022		1510.0	1.7	6070	1260
MUMP97-1	10/18/1997	84	16	107	14	<0.1	301	229	13	<0.1	0.11	1.0	16.1	596	965	247	8.04	<0.1	0.03	<0.1	<0.1	<0.01	<0.05	<0.01	0.13	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.052		898.0			
MUMP97-1	1/27/1998	84	16	110	14	1.0	310	227	16	<0.1	0.14	1.0	16.5	628	944	254	8.03	<0.1	0.04	<0.1	<0.1	0.01	<0.05	<0.01	0.84	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.053		850.0			
MUMP97-1	6/23/1998	79	15	101	13	<0.1	305	253	16	<0.1	0.12	1.0	16.4	627	873	2550	7.99	<0.1	0.04	<0.1	<0.1	0.01	<0.05	<0.01	0.80	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.052		747.0			
MUMP97-1	7/11/1998	82	15	110	14	1.0	311	223	14	<0.1	0.09	1.0	15.3	628	960	255	7.96	<0.1	0.04	<0.1	<0.1	0.01	<0.05	<0.01	0.80	<0.05	0.16	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.052		783.0			
MUMP97-1	10/26/2006	77	16	105	13	4.0	296	237	12	<0.1		1.0	16.2	556	882	249	7.63	<0.1	0.04	<0.1	<0.1	0.01	<0.05	<0.01	0.61	<0.05	0.13	<0.001	<0.1	<0.05	0.00	<0.1	0.05	0.6	0.1	0.056		680.0	2.5	1060	303
MUMP97-1	10/11/2011	76	15	109	14	<5	279	224	13	<0.1	0.07	1.0	18.1	596	908		7.82	<0.1	0.03	<0.1	0.1	<0.005	<0.05	<0.01	0.67	0.00	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	0.03	0.7	0.1	0.046		538.0	6.7	2590	534
MU-1	9/26/1996	42	9	223	13	3.2	269	407	17	<0.1	0.20	1.0	13.3	897	1280	225	8.33	0.16	<0.001	<0.1	0.28	<0.01	<0.05	<0.01	0.11	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.01			0.003		2.4			
MU-1	11/24/1996	43	9	226	12	<0.1	277	404	13	0.27	<0.1	0.9	12.0	874	1200	227	8.23	<0.1	<0.001	<0.1	0.27	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.004		2.7			
MU-1	2/26/1997	39	8	228	13	0.0	270	390	13	<0.1	0.16	0.9	11.2	834	1300	221	8.11	<0.1	<0.001	<0.1	0.27	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.002		2.8			
MU-1	4/23/1997	42	9	218	12	0.0	272	415	12	<0.1	0.17	0.9	11.0	866	1276	223	8.28	<0.1	<0.001	<0.1	0.28	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.003		2.6			
MU-1	8/20/1997	42	9	221	13	0.0	277	398	11	<0.1	0.23	1.0	11.0	844	1300	227	8.25	<0.1	<0.001	<0.1	0.26	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.004		2.2			
MU-1	11/3/1997	44	9	231	13	<0.1	281	409	11	<0.1	0.16	1.1	11.1	814	1320	230	8.21	<0.1	<0.001	<0.1	0.29	<0.005	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	0.00	<0.1	<0.1			0.004		4.6			
MU-1	11/3/1997 (D)	44	9	229	13	<0.1	279	417	11	<0.1	0.17	1.1	11.1	812	1350	229	8.24	<0.1	<0.001	<0.1	0.29	<0.005	<0.05	<0.01	0.07	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.005		3.9			
MU-1	8/18/1998	42	9	238	12	1.0	271	427	11	<0.1	0.18	1.1		886	1320		8.03		<0.001						0.18		0.04				<0.001					0.005		9.5	<1.0		
MU-1	8/18/1998 (D)	42	9	236	12	<0.1	272	427	10	<0.1	0.19	1.1		874	1310		8.06		<0.001						0.20		0.04				0.001					0.004		7.0	1.0		
MU-1	10/20/2006	42	9	234	13	<1	274	396	10	<0.1	0.18	1.1	11.4	808	1100	224	7.93	<0.1	<0.001	<0.1	0.03	<0.005	<0.05	<0.01	0.25	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	0.08	0.2	0.0	0.004		15.2	1.9	60	31
MU-1	10/13/2011	26	6	245	13	6.0	196	395	17	<0.1	<0.05	1.0	16.4	787	1200		8.37	<0.1	<0.001	<0.1	0.30	<0.01	<0.05	<0.01	0.06	0.00	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	1.4	0.0	0.006		21.0	1.4	153	47

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)			
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH
M-4	9/26/1996	16	4	217	16	21.7	212	343	14	<0.1	0.17	0.8	14.8	790	1140	204	9.26
M-4	11/19/1996	24	5	217	14	10.6	242	343	11	<0.1	0.15	0.8	15.6	788	1090	213	8.89
M-4	3/6/1997	13	5	217	13	15.5	204	326	12	<0.1	0.17	0.8	16.8	733	1140	189	9.13
M-4	6/20/1997	4	3	216	14	21.9	166	339	11	<0.1	0.12	0.8	16.3	669	1140	167	9.37
M-4	8/30/1997	13	5	227	14	8.8	220	352	12	<0.1	0.17	0.9	15.4	743	1140	192	8.85
M-4	10/28/1997	27	7	223	13	5.5	270	347	9	<0.1	0.07	1.0	14.4	749	1190	229	8.56
M-4	8/31/1998	26	5	216	13	6.9	269	315	9	<0.1	0.15	0.9		764	1200		8.66
M-4	11/1/2006	30	5	216	13	<1	288	338	11	<0.1	0.18	0.9	12.8	750	1210	236	7.75
M-4	10/13/2011	28	4	241	14	8.0	255	335	10	<0.1	0.08	0.9	15.7	763	1160		8.42
MO-3	9/17/1991	35	6	161	23	0.0	214	261	34	<0.01	0.13	1.2		607	1018		8.30
MO-3	9/26/1996	60	14	164	16	<0.1	314	301	15	<0.1	0.15	0.9	20.2	775	1090	257	8.22
MO-3	11/19/1996	62	14	167	15	<0.1	318	300	12	<0.1	0.13	0.8	20.3	761	1040	261	8.16
MO-3	2/26/1997	59	13	167	15	0.0	323	294	12	<0.1	0.15	0.8	19.3	725	1140	265	8.18
MO-3	4/23/1997	63	14	159	14	0.0	323	309	12	<0.1	0.15	0.8	19.3	754	1110	265	8.00
MO-3	8/20/1997	65	14	167	16	0.0	328	308	12	<0.1	0.19	0.9	19.7	757	1140	269	8.19
MO-3	10/31/1997	61	14	168	15	<0.1	327	305	12	<0.1	0.14	0.9	19.5	744	1110	269	8.19
MO-3	8/18/1998	63	14	169	15	1.0	323	313	12	<0.1	0.16	0.9		760	1140	268	8.29
MO-3	10/20/2006	62	14	169	15	<1	315	293	11	<0.1	0.14	0.9	18.6	730	956	258	7.69
MO-3	10/12/2011	59	12	176	15	<5	305	301	12	<0.10	0.08	0.9	21.2	725	1090		8.07
P-2C	9/26/1996	11	3	183	14	43.1	142	269	13	<0.1	0.21	1.1	24.5	662	877	178	9.73
P-2C	3/6/1997	15	4	184	12	41.7	158	250	12	<0.1	0.20	1.0	25.3	648	1000	189	9.67
P-2C	5/5/1997	10	0	195	13	89.9	22	257	9	<0.1	0.20	0.9	24.4	603	1080	177	10.86
P-2C	8/30/1997	14	5	198	13	20.7	197	284	11	<0.1	0.16	1.1	22.4	652	1000	191	9.27
P-2C	10/27/1997	17	4	197	12	21.3	203	261	11	<0.1	0.09	1.2	22.4	663	997	196	9.27
M-3C	11/19/1996	25	5	227	14	6.6	268	351	11	<0.1	0.14	0.7	13.5	814	1130	229	8.64
M-3C	3/6/1997	8	1	209	13	25.4	84	374	17	<0.1	0.17	1.0	22.7	726	1120	106	9.73
M-3C	4/29/1997	26	5	237	14	4.0	276	359	8	<0.1	0.13	0.8	14.2	775	1182	232	8.41
M-3C	10/29/1997	30	6	232	13	4.1	286	352	9	<0.1	0.09	0.9	13.7	762	1220	237	8.41
M-3C	8/31/1998	29	6	226	13	3.5	286	337	9	<0.1	0.16	0.8		781	1230		8.34
M-3C	11/1/2006	29	6	219	12	<1	290	359	11	<0.1	0.22	0.8	13.2	776	1240	238	8.20
M-3C	10/13/2011	28	6	246	12	5.0	262	345	11	<0.1	0.12	0.9	16.1	782	1180		8.34
MO-2	9/26/1996	28	5	189	11	4.5	388	178	12	<0.1	0.10	1.0	17.2	688	989	324	8.31
MO-2	11/19/1996	28	5	192	10	<0.1	401	176	11	<0.1	0.08	0.9	16.7	659	945	329	8.11
MO-2	3/6/1997	33	5	181	10	0.0	403	175	14	<0.1	0.08	0.9	17.1	648	1020	330	8.26
MO-2	4/29/1997	28	5	200	11	4.5	394	181	9	<0.1	0.06	0.9	16.5	631	974	329	8.31
MO-2	10/20/1997	27	5	187	11	4.5	395	174	10	<0.1	0.14	1.0	15.9	628	1010	330	8.31
MO-2	10/28/1997	28	5	202	11	5.2	394	181	11	<0.1	<.05	1.0	16.5	630	1020	330	8.37
7-1A	9/24/1996	48	7	141	11	<0.1	346	157	15	<0.1	0.09	0.9	25.6	588	899	284	7.05
7-1A	11/19/1996	48	7	144	11	<0.1	370	142	13	0.10	0.05	0.8	22.9	637	848	303	8.13
7-1A	2/26/1997	44	7	150	11	0.0	376	142	13	<0.1	0.16	0.8	31.5	546	898	308	8.28
7-1A	6/20/1997	46	7	149	11	0.0	382	146	11	<0.1	0.23	0.8	23.7	569	913	313	8.19
BS96 M-1	9/16/1996	123	21	114	14	<0.1	228	431	17	<0.1	0.19	1.0	14.6	797	1170	187	7.99
BS96 M-1	11/11/1996	77	15	114	13	<0.1	275	260	12	<0.1	0.18	1.1	15.9	615	866	225	7.88
BS96 M-1	2/27/1997	60	11	111	12	112.0	119	182	10	<0.1	0.10	1.1	15.6	530	863	259	10.22
BS96 M-1	4/23/1997	61	11	103	10	0.0	304	181	8	<0.1	0.14	1.0	16.1	543	833	249	8.17
BS96 M-1	8/25/1997	67	11	113	12	0.0	310	186	10	<0.1	0.11	1.1	17.3	549	847	254	8.21
BS96 M-1	10/30/1997	60	11	106	11	<0.1	309	169	9	<0.1	0.08	1.2	16.5	523	820	253	8.08
BS96 M-1	8/25/1998	61	12	106	11	1.0	306	171	8		0.12	1.1		505	818		7.99
BS96 M-1	10/20/2006	58	11	110	10	<1	290	164	7	<0.1	0.12	1.2	16.3	512	712	238	7.67
BS96 M-1	10/13/2011	55	10	114	11	<5	281	171	8	<0.1	0.05	1.0	18.2	517	798		7.92
BSMP-1	9/12/1996	68	14	124	13	<0.1	272	262	14	<0.1	<0.005	1.1	16.2	601	974	223	7.95
BSMP-1	11/11/1996	66	14	128	13	<0.1	270	257	15	<0.1	0.09	1.1	15.6	600	872	221	7.89
BSMP-1	2/27/1997	65	15	128	13	0.0	281	257	15	<0.1	0.06	1.1	16.0	628	994	230	7.87
BSMP-1	4/25/1997	72	14	133	13	0.0	278	272	14	<0.1	0.10	1.0	15.6	658	965	228	8.10
BSMP-1	8/26/1997	71	14	129	13	0.0	278	267	15	<0.1	0.13	1.2	14.7	659	900	228	7.98
BSMP-1	10/30/1997	74	13	123	12	<0.1	279	275	16	<0.1	0.08	1.2	15.5	660	1000	229	8.05
BSMP-1	8/25/1998	72	14	125	12	1.0	278	266	15	<0.1	0.12	1.1		649	1010		7.85
BSMP-1	10/20/2006	76	16	136	13	<1	277	281	15	<0.1	0.15	1.2	14.9	682	944	227	7.65
BSMP-1	10/11/2011	74	14	142	14	<5	266	292	16	<0.1	0.06	1.1	17.0	684	1030		7.98

		Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
M-4	9/26/1996	0.33	<0.001	<0.1	0.23	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.136		4.0			
M-4	11/19/1996	0.15	<0.001	<0.1	0.24	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.131		10.4			
M-4	3/6/1997	0.19	<0.001	0.0	0.24	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.057		8.5			
M-4	6/20/1997	0.19	<0.001	<0.1	0.23	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.041		3.6			
M-4	8/30/1997	<0.1	<0.001	<0.1	0.23	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.039		19.8			
M-4	10/28/1997	<0.1	<0.001	<0.1	0.24	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.059		15.1			
M-4	8/31/1998		<0.001						<0.05		<0.01				<0.001					0.046		17.4	<1.0		
M-4	11/1/2006	<0.1	<0.001	<0.1	0.20	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	<0.03	<0.01	0.044		22.4	<1	111	51
M-4	10/13/2011	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	<0.03	<0.01	0.033		32.0	3.0	266	82
MO-3	9/17/1991	<0.1	0.00	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			<0.03		5.8			
MO-3	9/26/1996	<0.1	<0.001	<0.1	0.13	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.075		34.8			
MO-3	11/19/1996	<0.1	<0.001	<0.1	0.12	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.071	120300	37.2			
MO-3	2/26/1997	<0.1	<0.001	0.0	0.12	<0.01	<0.05	0.02	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.02			0.062		43.4			
MO-3	4/23/1997	<0.1	<0.001	<0.1	0.13	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.075		49.5			
MO-3	8/20/1997	<0.1	<0.001	<0.1	0.12	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.067		55.4			
MO-3	10/31/1997	<0.1	<0.001	<0.1	0.13	<0.005	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.063		78.6			
MO-3	8/18/1998		<0.001						0.07		0.03				<0.001					0.059		72.6	<1.0		
MO-3	10/20/2006	<0.1	<0.001	<0.1	0.10	<0.005	<0.05	<0.01	0.07	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.1	0.0	0.016		10.7	1.6	212	114
MO-3	10/12/2011	<0.1	<0.001	<0.1	0.10	<0.005	<0.05	<0.01	0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	0.1	0.0	0.010		33.0	3.8	218	117
P-2C	9/26/1996	0.15	0.00	<0.1	0.18	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.082		12.3			
P-2C	3/6/1997	0.14	0.00	0.01	0.18	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.093	62050	31.7			
P-2C	5/5/1997	0.28	0.01	<0.1	0.20	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.005		2.0			
P-2C	8/30/1997	<.1	0.00	<0.1	0.20	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.081		38.2			
P-2C	10/27/1997	<.1	0.00	<0.1	0.20	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.082		26.8			
M-3C	11/19/1996	<0.1	<0.001	<0.1	0.28	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.026		25.1			
M-3C	3/6/1997	0.46	<0.001	0.0	0.32	<0.01	<0.05	<0.01	0.37	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	0.04			0.025		5.1			
M-3C	4/29/1997	<0.1	<0.001	<0.1	0.30	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.027		41.9			
M-3C	10/29/1997	<0.1	<0.001	<0.1	0.29	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.027		39.6			
M-3C	8/31/1998										<0.01				<0.001					0.017		31.7	<1		
M-3C	11/1/2006	<0.1	<0.001	<0.1	0.30	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.011		61.0	<1	176	104
M-3C	10/13/2011	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	0.04	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	<0.03	0.0	0.012		67.0	3.9	502	172
MO-2	9/26/1996	0.24	0.00	<0.1	0.26	<0.01	<0.05	0.02	0.08	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.005		5.6			
MO-2	11/19/1996	<0.1	<0.001	<0.1	0.24	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.007		7.8			
MO-2	3/6/1997	<0.1	<0.001	0.01	0.25	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.006		6.2			
MO-2	4/29/1997	<0.1	<0.001	<0.1	0.23	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.004		6.0			
MO-2	10/20/1997	<0.1	<0.001	<0.1	0.23	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.007		2.9			
MO-2	10/28/1997	<0.1	<0.001	<0.1	0.24	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.1			0.007		5.8			
7-1A	9/24/1996	0.38	0.01	<0.1	0.16	<0.01	<0.05	<0.01	0.15	<.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		4.6			
7-1A	11/19/1996	0.12	0.00	0.10	0.15	0.01	0.05	0.01	0.06	0.05	0.06	0.00	0.10	0.05	0.00	0.1	0.01			0.003		6.9			
7-1A	2/26/1997	2.00	0.00	0.01	0.17	<0.01	<0.05	0.02	0.59	<.05	<0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.015		5.9			
7-1A	6/20/1997	0.61	0.00	<0.1	0.17	<0.01	<0.05	<0.01	0.15	<.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		4.6			
BS96 M-1	9/16/1996	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	0.15	<0.05	0.10	<0.001	<0.1	<0.05	<0.001	<0.1	0.02			0.082	5300	41.1			
BS96 M-1	11/11/1996	<0.1	0.03	<0.1	<0.1	<0.01	<0.05	0.02	0.09	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.030	2710	19.7			
BS96 M-1	2/27/1997	<0.1	0.02	0.02	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.016	7690	54.7			
BS96 M-1	4/23/1997	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.08	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.012		14.8			
BS96 M-1	8/25/1997	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.09	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.010		14.8			
BS96 M-1	10/30/1997	<0.1	0.03	<0.1	<0.1	<0.005	<0.05	<0.01	0.53	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.011		14.7			
BS96 M-1	8/25/1998		0.03						0.98		0.10									0.010		40.3	<1.0		
BS96 M-1	10/20/2006	<0.1	0.04	<0.1	<0.1	<0.005	<0.05	<0.01	0.72	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	0.04	0.7	0.1	0.006		80.6	<1	86	29
BS96 M-1	10/13/2011	<0.1	0.04	<0.1	<0.1	<0.005	<0.05	<0.01	0.80	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	1.2	0.1	0.006		13.0	2.6	90	3
BSMP-1	9/12/1996	<0.1	0.06	<0.1	0.10	<0.01	<0.05	<0.01	0.22	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	0.01			0.283	28700	51.3			
BSMP-1	11/11/1996	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	0.01	<0.05	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.320	1230	79.1			
BSMP-1	2/27/1997	<0.1	0.05	0.02	0.12	<0.01	<0.05	0.02	<0.05	<0.05	0.08	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.057	23290	93.5			
BSMP-1	4/25/1997	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.032		87.0			
BSMP-1	8/26/1997	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.051		91.4			
BSMP-1	10/30/1997	<0.1	0.05	<0.1	0.10	<0.005	<0.05	<0.01	0.26	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.038		83.9			
BSMP-1	8/25/1998		0.08								0.09				<0.001					0.033		98.0	<1.0		
BSMP-1	10/20/2006	<0.1	0.07	<0.1	0.10	<0.005	<0.05	<0.01	0.64	<0.05	0.09	<0.001	<0.1	<0.05	<0.001	<0.1	0.05	2.8	0.1	0.028		51.4	7.6	211	44
BSMP-1	10/11/2011	<0.1	0.07	<0.1	0.10	<0.005	<0.05	<0.01	1.06	0.00	0.11	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	2.7	0.1	0.027		111.0	0.9	773	197

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)			
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH
BSMP-2	9/13/1996	54	13	118	13	<0.1	318	206	10	<0.1	0.30	1.0	20.2	502	859	261	7.99
BSMP-2	11/11/1996	62	13	112	11	<0.1	312	183	10	<0.1	0.29	1.1	18.2	545	781	256	7.89
BSMP-2	2/28/1997	60	14	110	12	0.0	320	182	9	<0.1	0.26	1.1	16.4	546	882	262	7.76
BSMP-2	4/25/1997	67	13	116	12	0.0	317	195	9	<0.1	0.32	1.0	16.7	562	866	260	7.96
BSMP-2	8/26/1997	65	13	115	9	0.0	310	195	9	<0.1	0.34	1.2	15.1	573	779	254	7.93
BSMP-2	11/3/1997	68	13	111	11	<0.1	316	195	10	<0.1	0.29	1.3	15.6	526	902	259	8.09
BSMP-2	8/25/1998	65	13	108	11	1.0	311	190	9	<0.1	0.28	1.1		529	888		7.91
BSMP-2	10/24/2006	62	14	113	11	5.0	302	198	9	<0.1	0.06	1.2	15.4	508	825	255	7.78
BSMP-2	10/11/2011	60	12	117	12	<5	289	191	9	0.20	0.12	1.1	176.0	554	849		8.01
BSMP-3	9/16/1996	76	13	106	12	<0.1	298	219	9	<0.1	0.06	1.1	16.9	459	879	244	7.97
BSMP-3	11/11/1996	64	11	110	13	<0.1	299	188	9	<0.1	0.14	1.0	18.9	515	776	245	7.96
BSMP-3	2/28/1997	62	12	108	13	0.0	314	181	9	<0.1	0.58	0.9	21.9	547	871	257	8.14
BSMP-3	4/25/1997	72	13	112	13	0.0	316	196	9	<0.1	0.16	0.9	18.6	559	861	259	8.19
BSMP-3	8/26/1997	73	13	114	13	0.0	323	198	10	<0.1	0.14	1.0	18.4	585	815	265	8.18
BSMP-3	10/28/1997	71	14	112	13	<0.1	322	194	9	<0.1	0.07	1.1	18.0	588	896	264	8.11
BSMP-3	9/1/1998	71	14	107	12	1.0	328	179	9	<0.1	0.11	1.0		570	903		7.94
BSMP-3	10/26/2006	72	15	111	12			512		<0.1	<0.05		17.8				
BSMP-3	10/12/2011	57	13	112	12	<5	289	178	9	2.40	<0.05	0.9	16.7	525	825		7.85
BSPW-1	8/26/1992	76	15	133	13	0.0	295	275	8	<0.1	0.13	0.8		672	819	242	7.30
BSPW-1	9/16/1996	71	11	109	13	<0.1	304	199	9	<0.1	0.10	0.9	17.7	500	846	249	7.97
BSPW-1	11/11/1996	69	11	111	11	<0.1	296	202	8	<0.1	0.07	1.1	15.7	538	795	243	7.89
BSPW-1	2/27/1997	66	13	110	11	0.0	304	203	8	<0.1	<.05	1.1	16.1	570	897	249	7.78
BSPW-1	4/23/1997	72	13	105	10	0.0	301	220	8	<0.1	0.09	1.1	15.6	581	885	247	8.12
BSPW-1	8/26/1997	72	12	114	11	0.0	300	214	8	<0.1	0.10	1.2	15.2	587	787	246	7.86
BSPW-1	11/3/1997	74	13	111	11	<0.1	304	215	8	<0.1	0.10	1.2	15.7	542	949	249	8.02
BSPW-1	8/25/1998	71	13	110	11	1.0	301	206	7	<0.1	0.12	1.1		539	889		7.95
BSPW-1	10/24/2006	70	13	114	11	5.0	301	207	7	<0.1	<0.05	1.2	16.1	510	853	254	7.71
BSPW-1	10/12/2011	69	23	86	15	<5	286	200	8	<0.1	0.05	1.1	19.3	558	860		7.91
BSMU-1	9/13/1996	57	19	86	19	<0.1	250	201	10	<0.1	<0.05	0.7	15.7	442	813	205	8.02
BSMU-1	11/11/1996	58	20	54	18	<0.1	254	196	12	<0.1	0.10	0.7	15.6	515	734	208	7.94
BSMU-1	2/28/1997	39	17	86	21	0.0	199	189	12	<0.1	0.08	0.6	16.6	455	754	163	8.11
BSMU-1	4/23/1997	59	22	81	17	0.0	257	210	11	<0.1	0.10	0.6	16.9	533	822	211	8.21
BSMU-1	8/26/1997	59	23	87	18	0.0	264	202	12	<0.1	0.14	0.7	16.5	536	738	216	8.02
BSMU-1	10/28/1997	66	25	86	16	<0.1	283	199	9	<0.1	0.06	0.8	17.4	550	858	232	8.23
BSMU-1	10/25/1998	67	25	83	15	<1.0	294	199	10	<0.1	0.13	0.7		550	876		7.98
BSMU-1	10/31/2006	72	24	80	14	<1	295	216	11	<0.1	0.15	0.8	16.3	544	887	242	7.71
BSMU-1	10/31/2006 (D)	72	24	80	14	<1	295	216	11	<0.1	0.15	0.8	16.3	544	887	242	7.71
BSMU-1	10/12/2011	69	12	115	11	<5	288	201	10	<0.1	0.08	0.8	18.7	541	847		7.93
4-1A	9/24/1996	42	10	216	12	<0.1	273	410	12	<0.1	0.22	0.9	12.2	862	1270	224	7.36
4-1A	11/13/1996	41	10	213	11	<0.1	273	412	14	<0.1	0.18	0.9	11.9	832	1210	202	8.28
4-1A	3/4/1997	33	8	221	11	0.0	285	353	12	<0.1	0.25	1.0	12.9	818	1245	234	8.23
4-1A	6/20/1997	36	8	230	11	3.7	289	381	11	<0.1	0.56	1.0	17.8	834	1220	242	8.36
PEACH M-1	9/25/1996	77	22	165	14	<0.1	231	447	13	<0.1	0.27	0.5	13.9	842	1250	189	7.91
PEACH M-1	11/13/1996	73	20	163	14	<0.1	226	460	13	<0.1	0.22	0.6	13.2	823	1200	185	8.21
PEACH M-1	11/13/1996 (D)	73	20	163	14	<0.1	210	460	12	<0.1	0.22	0.6	13.2	826	1150	172	8.11
PEACH M-1	3/3/1997	72	22	162	14	0.0	224	420	11	<0.1	0.24	0.5	13.6	842	1425	184	7.97
PEACH M-1	6/20/1997	82	21	165	14	0.0	234	457	11	<0.1	0.22	0.5	13.4	834	1230	192	8.07
PEACH M-1	8/26/1997	80	21	175	14	0.0	235	452	11	<0.1	0.25	56.0	13.9	874	1160	193	8.05
PEACH M-1	10/31/1997	73	15	192	14	<0.1	242	459	13	<0.1	0.24	0.6	15.9	875	1250	198	8.11
PEACH M-1	8/17/1998	81	21	176	14	1.0	235	457	8	<0.1	0.28	0.6		893	1270		8.10
PEACH M-1	8/18/1998 (D)	79	21	170	13	<1.0	236	463	10	0.10	0.25	0.6		892	1290		8.11
PEACH M-1	10/23/2006	83	22	173	15	3.0	235	481	11	<0.1	0.19	0.5	14.3	774	1170	197	7.82
PEACH M-1	10/12/2011	80	20	177	15	<5	240	434	10	<0.1	0.22	0.7	16.5	849	1230		8.02
PEACH M-2	9/25/1996	142	<1.0	219	42	73.4	6	519	116	<0.1	1.15	0.9	8.1	1130	2240	217	11.35
PEACH M-2	11/13/1996	64	5	206	24	2.8	210	442	4	<0.1	0.55	0.7	11.9	860	1300	176	8.38
PEACH M-2	3/3/1997	47	7	212	22	15.7	90	463	38	<0.1	0.88	0.6	14.2	893	1360	97	9.49
PEACH M-2	6/20/1997	52	8	218	20	13.2	123	504	29	<0.1	0.74	0.7	12.6	882	1310	120	9.28
PEACH M-2	8/26/1997	46	8	223	18	9.9	111	499	27	<0.1	0.74	0.8	13.3	905	1190	106	9.20
PEACH M-2	10/31/1997	48	11	217	16	4.8	159	484	21	<0.1	0.46	0.7	12.1	905	1330	137	8.73

		Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
BSMP-2	9/13/1996	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.010	38600	35.5			
BSMP-2	11/11/1996	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.077	17700	37.7			
BSMP-2	2/28/1997	<0.1	0.02	0.03	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.013	21360	35.9			
BSMP-2	4/25/1997	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.009		30.7			
BSMP-2	8/26/1997	<0.1	0.03	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.012		40.4			
BSMP-2	11/3/1997	<0.1	0.02	<0.1	<0.1	<0.005	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.011		33.6			
BSMP-2	8/25/1998										0.08				<0.001					0.011		53.1	<1.0		
BSMP-2	10/24/2006	<0.1	0.05	<0.1	<0.1	<0.005	<0.05	<0.01	0.20	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.1	0.1	0.018		64.2	1.4	165	59
BSMP-2	10/11/2011	<0.1	0.05	<0.1	<0.1	<0.005	<0.05	<0.01	0.24	<0.05	0.08	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	1.2	0.1	0.016		43.0	7.5	266	75
BSMP-3	9/16/1996	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	0.51	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.330	106000	150.0			
BSMP-3	11/11/1996	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.056	123000	156.0			
BSMP-3	2/28/1997	<0.1	0.00	0.02	<0.1	<0.01	<0.05	<0.01	0.06	<0.05	0.09	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.019	25400	82.0			
BSMP-3	4/25/1997	<0.1	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.10	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.058		163.7			
BSMP-3	8/26/1997	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	0.10	<0.05	0.11	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.054		155.0			
BSMP-3	10/28/1997	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.13	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.056		143.0			
BSMP-3	9/1/1998		0.02						0.29		0.12									0.039		124.0	2.3		
BSMP-3	10/26/2006	0.30	0.02	<0.1	<0.1	<0.01	<0.05	<0.01	0.80	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	0.8	0.1	0.052		190.0	<1	405	158
BSMP-3	10/12/2011	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	0.42	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	7.5	0.2	0.030		98.0	3.0	506	129
BSPW-1	8/26/1992	<0.1	0.07	<0.1	<0.1	<0.01	<0.05	<0.01	0.46	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	0.05			<0.003		335.0			
BSPW-1	9/16/1996	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.059	89200	140.0			
BSPW-1	11/11/1996	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.032	123000	305.0			
BSPW-1	2/27/1997	<0.1	0.04	0.02	<0.1	<0.01	<0.05	<0.01	0.19	<0.05	0.14	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.042	118300	353.0			
BSPW-1	4/23/1997	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	0.42	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.036		308.0			
BSPW-1	8/26/1997	<0.1	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	0.28	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.038		325.0			
BSPW-1	11/3/1997	<0.1	0.05	<0.1	<0.1	<0.005	<0.05	<0.01	<.05	<0.05	0.15	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.035		272.0			
BSPW-1	8/25/1998		0.07								0.15				<0.001					0.041		319.0	<1		
BSPW-1	10/24/2006	<0.1	0.06	<0.1	<0.1	<0.005	<0.05	<0.01	0.58	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.4	0.2	0.034		349.0	2.9	1030	282
BSPW-1	10/12/2011	<0.1	0.06	<0.1	0.1	<0.005	<0.05	<0.01	0.16	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.03	1.1	0.1	0.030		344.0	4.7	1950	454
BSMU-1	9/13/1996	<0.1	<0.001	<0.1	0.1.1	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.005	3620	12.6			
BSMU-1	11/11/1996	<0.1	0.00	<0.1	0.1	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.006	1100	4.6			
BSMU-1	2/28/1997	<0.1	0.00	0.03	<0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.01	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			<.003	128	13.8			
BSMU-1	4/23/1997	<0.1	0.00	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		6.5			
BSMU-1	8/26/1997	<0.1	0.00	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		8.0			
BSMU-1	10/28/1997	<0.1	0.00	<0.1	0.1	<0.01	<0.05	<0.01	0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		7.2			
BSMU-1	10/25/1998		0.00						0.08		0.02				<0.001							59.8	<1		
BSMU-1	10/31/2006	<0.1	0.00	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.1	0.0	0.002		5.8	3.9	16	25
BSMU-1	10/31/2006 (D)	<0.1	0.00	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.1	0.0	0.002		5.8	3.9	16	25
BSMU-1	10/12/2011	<0.1	0.00	<0.1	<0.1	<0.01	<0.05	<0.01	0.17	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.4	0.0	0.001		5.4	2.6	19	22
4-1A	9/24/1996	0.20	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	0.22	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.02			0.031		31.5			
4-1A	11/13/1996	<0.1	0.00	<0.1	0.3	<0.01	<0.05	<0.01	0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.022		30.3			
4-1A	3/4/1997	0.39	<0.001	0.01	0.3	<0.01	<0.05	<0.01	0.17	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.037	17820	55.8			
4-1A	6/20/1997	1.53	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	0.52	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.032		28.3			
PEACH M-1	9/25/1996	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.15	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.08								
PEACH M-1	11/13/1996	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.15	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01								
PEACH M-1	11/13/1996 (D)	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.16	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01								
PEACH M-1	3/3/1997	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.09	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01								
PEACH M-1	6/20/1997	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	0.00	<0.1	<0.01								
PEACH M-1	8/26/1997	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.18	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01								
PEACH M-1	10/31/1997	<0.1	<0.001	<0.1	0.3	<0.005	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01								
PEACH M-1	8/17/1998		<0.001						0.47		0.03				<0.001										
PEACH M-1	8/18/1998 (D)		0.00						0.47		0.03				0.00										
PEACH M-1	10/23/2006	<0.1	<0.001	<0.1	0.2	<0.005	<0.05	<0.01	0.51	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.4	0.0	0.002		19.7	9.2	53	36
PEACH M-1	10/12/2011	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	0.51	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.01	1.0	0.0	0.002		15.0	13.3	103	51
PEACH M-2	9/25/1996	<0.1	0.01	<0.1	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.008	7950	22.1			
PEACH M-2	11/13/1996	<0.1	0.01	<0.1	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.038	9320	19.5			
PEACH M-2	3/3/1997	<0.1	0.01	0.10	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.032	5890	25.0			
PEACH M-2	6/20/1997	<0.1	0.00	<0.1	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.020		19.2			
PEACH M-2	8/26/1997	<0.1	0.00	<0.1	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.022		21.0			
PEACH M-2	10/31/1997	<0.1	0.00	<0.1	0.3	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.021		25.0			

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)				Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)	Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
PEACH M-2	10/31/1997 (D)	49	11	220	17	5.7	157	498	22	<0.1	0.50	0.8	12.3	908	1340	137	8.81	<0.1	0.00	<0.1	0.3	<0.005	<0.05	<0.01	<0.05	<0.05	<0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.022		23.7			
PEACH M-2	8/17/1998	50	13	229	15	2.1	172	513	17	<0.1	0.38	0.8		913	1350		8.34		0.00						<0.05		<0.01				<0.001					0.026		19.0	2.2		
PEACH M-2	8/17/1998 (D)	49	13	224	14	2.0	173	510	16	0.10	0.39	0.8		928	1370		8.32		0.00						0.05		0.01				0.00					0.025		20.8	1.6		
PEACH M-2	10/24/2006	58	16	224	13	4.0	213	436	13	<0.1	0.13	0.9	12.8	756	1200	180	7.54	<0.1	<0.001	<0.1	0.3	<0.005	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.0	0.0	0.010		46.2	2.2	223	76
PEACH M-2	10/12/2011	57	15	234	13	<5	208	481	14	<0.1	0.17	0.8	14.3	902	1340		8.19	<0.1	<0.001	<0.1	0.10	<0.01	<0.05	<0.01	0.06	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.1	0.0	0.007		27.0	5.1	172	70
PEACH MP-1	9/25/1996	67	14	202	16	9.3	223	461	23	<0.1	0.24	0.8	12.7	890	1310	196	8.87	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.10	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.307	692000	416.0			
PEACH MP-1	3/3/1996	57	14	203	12	<0.1	221	421	15	<0.1	0.22	0.8	11.9	861	1265	181	8.22	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.065	210000	525.0			
PEACH MP-1	11/13/1996	49	13	200	16	<0.1	226	419	31	<0.1	0.22	1.0	13.6	823	1200	185	8.21	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.040	15200	37.4			
PEACH MP-1	3/3/1997	51	13	202	15	3.0	210	421	16	<0.1	0.27	0.8	11.4	838	1310	176	8.41	<0.1	<0.001	0.01	0.2	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.153	729400	536.0			
PEACH MP-1	6/20/1997	59	14	209	15	2.8	217	476	20	<0.1	0.22	0.8	11.9	843	1300	182	8.36	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.089		484.0			
PEACH MP-1	8/26/1997	55	13	214	15	2.7	215	456	17	<0.1	0.28	0.8	11.6	869	1150	180	8.34	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.01	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.099		540.0			
PEACH MP-1	10/31/1997	55	14	207	14	<0.1	223	448	18	<0.1	0.24	0.8	11.7	874	1280	183	8.29	<0.1	<0.001	<0.1	0.3	<0.005	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.083		493.0			
PEACH MP-1	8/18/1998	51	13	210	15	1.0	212	454	16	<0.1	0.25	0.8		879	1310		8.21		<0.001						<0.05		0.02				<0.001					0.071		447.0	3.0		
PEACH MP-1	10/23/2006	53	14	214	14	4.0	219	464	15	<0.1	0.20	0.8	12.0	804	1220	185	8.08	<0.1	<0.001	<0.1	0.3	<0.005	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	<0.03	0.0	0.057		722.0	4.6	2770	908
PEACH MP-1	10/12/2011	52	13	221	13	<5	210	439	15	<0.1	0.21	0.9	13.9	845	1260		8.23	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	<0.03	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	0.1	0.0	0.043		560.0	11.7	2670	1060
PEACH MP-2	9/25/1996	55	14	193	14	<.1	248	432	17	<0.1	0.22	1.0	12.4	859	1250	203	7.37	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.025	12100	38.2			
PEACH MP-2	2/28/1997	48	13	192	14	3.0	207	406	15	<0.1	0.24	0.9	12.6	817	1120	174	8.41	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.05	<0.05	0.02	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.033	14980	48.4			
PEACH MP-2	6/20/1997	56	14	198	13	0.0	215	438	14	<0.1	0.21	0.9	12.0	827	1240	176	8.18	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.025		45.9			
PEACH MP-2	8/26/1997	52	13	198	13	0.0	215	421	15	<0.1	0.25	0.9	12.2	821	1070	176	8.22	<0.1	<0.001	<0.1	0.2	<0.01	<0.05	<0.01	0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.029		43.0			
PEACH MP-2	10/31/1997	51	13	192	12	<0.1	224	403	15	<0.1	0.21	1.0	12.3	805	1210	184	8.21	<0.1	<0.001	<0.1	0.3	<0.005	<0.05	<0.01	0.06	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.028		39.6			
PEACH MP-2	8/18/1998	49	13	191	12	1.0	239	379	14	<0.1	0.24	1.0		790	1190		8.13		<0.001						0.06		0.02									0.029		57.3	2.5		
PEACH MP-2	10/24/2006	51	13	202	12	3.0	218	472	15	<0.1	0.19	0.7	12.3	856	1340	182	7.53	<0.1	<0.001	<0.1	0.2	<0.005	<0.05	<0.01	0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01	<.03	0.0	0.023		53.2	2.0	292	89
PEACH MP-2	10/12/2011	52	12	211	13	<5	195	423	14	<0.1	0.17	1.0	14.3	826	1220		8.23	<0.1	<0.001	<0.1	<0.1	<0.01	<0.05	<0.01	0.08	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.1	0.0	0.020		54.0	7.3	331	115
PC	9/24/1996	72	15	167	13	<0.1	215	420	11	<0.1	0.17	1.0	16.3	846	1210	176	7.34	<0.1	<0.001	<0.1	0.3	<0.1	<0.05	<0.01	0.12	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002	2530	8.6			
PC	11/13/1996	70	14	163	12	<0.1	220	425	11	<0.1	0.12	0.9	16.1	822	1140	180	8.29	<0.1	0.00	<0.1	0.3	<0.1	<0.05	<0.01	0.06	<0.05	0.06	<0.001	<0.1	<0.05	0.00	<0.1	<0.01			0.003	2320	8.7			
PC	10/23/2006	78	16	177	14	3.0	219	457	9	<0.1	0.16	0.9	17.2	800	1140	184	7.79	<0.1	0.00	<0.1	0.3	<0.1	<0.05	<0.01	0.50	<0.05	0.06	<0.001	<0.1	<0.05	<0.001	<0.1	0.04	0.3	0.1	0.001		14.9	9.9	59	41
PE	9/25/1996	71	15	184	13	<0.1	249	452	10	<0.1	0.13	1.0	15.7	889	1270	204	6.93	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001	2400	9.6			
PE	11/13/1996	73	15	191	13	<0.1	239	454	12	<0.1	0.10	1.0	16.1	854	1200	196	8.21	<0.1	0.00	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.005	3610	11.2			
PE	11/13/1996 (D)	70	15	181	12	<0.1	242	434	12	<0.1	0.11	1.0	16.2	863	1210	198	8.29	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.004	3660	10.1			
PE	3/3/1997	68	16	184	13	0.0	226	432	11	<0.1	0.15	0.9	15.6	872	1455	185	7.98	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.004	2850	12.8			
PE	6/20/1997	56	14	198	13	0.0	215	438	14	<0.1	0.21	0.9	12.0	827	1240	176	8.18	<0.1	<0.001	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.025		45.9			
PE	8/30/1997	75	15	194	14	0.0	229	438	12	0.14	0.15	1.1	15.5	904	1300	188	8.24	<0.1	0.00	<0.1	0.3	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.009		10.9			
PE	10/31/1997	73	15	192	14	<0.1	229	459	12	<0.1	0.14	1.1	15.9	879	1290	188	8.19	<0.1	<0.001	<0.1	0.32	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.007		11.7			
PE	10/31/1997 (D)	70	15	196	14	<0.1	229	450	13	<0.1	0.15	1.1	15.7	889	1280	188	8.20	<0.1	<0.001	<0.1	0.37	<0.005	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.006		10.6			
PE	8/18/1998	74	16	194	13	1.0	226	474	12	<0.1	0.14	1.0		910	1320		8.19		<0.001			<0.005				0.30	0.05				<.001					0.007		26.7	5.8		
PE	10/23/2006	74	16	194	14	3.0	220	484	11	<0.1	0.16	1.0	16.2	804	1190	185	7.82	<0.1	<0.001	<0.1	0.30	<0.005	<0.05	<0.01	0.28	<0.05	0.05	<0.001	<0.1	<0.05	<0.001	<0.1	0.02	0.2	0.1	0.001		14.6	8.5	59	39
PF	9/25/1996	85	20	77	14	<0.1	231	268	7	<0.1	0.17	0.5	18.4	566	806	189	7.89	<0.1	<0.001	<0.1	0.12	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		15.9			
PF	9/25/1996 (D)	81	19	74	13	<0.1	231	277	7	<0.1	0.17	0.5	18.3	572	869	189	7.86	<0.1	<0.001	<0.1	0.12	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		10.4			
PF	11/5/1997	88	20	79	13	<0.1	234	269	6	<0.1	0.19	0.6	17.5	561	890	192	8.09	<0.1	<0.001	<0.1	0.13	<0.005	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.001		6.5			
PF	10/23/2006	83	20	81	14	4.0	229	265	5	<0.1	0.22	0.5	18.8	540	815	192	7.67	<0.1	<0.001	<0.1	0.10	<0.005	<0.05	<0.01	0.77	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.1	0.03	0.5	0.0	0.000		14.4	6.8	43	33
PD (PO)	9/24/1996	47	9	300	13	<0.1	265	615	14	<0.1	0.19	0.9	15.0	1150	1170	217	7.31			<0.1	0.42	<0.01	<0.05	<0.01	0.10	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		2.0			
PD (PO)	11/13/1996	49	9	308	13	<0.1	224	634	14	<0.1	0.17	0.8	15.8	1120	1570	184	8.18			<0.1	0.41	<0.01	<0.05	<0.01	<.1	<0.05	0.13	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.004	2790	4.9			
PD (PO)	3/3/1997	46	10	300	14	0.0	244	584	13	<0.1	0.28	0.8	15.0	1140	1695	200	8.13			<0.1	0.40	<0.01	<0.05	<0.01	<.05	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.003	1150	11.2			
PD (PO)	6/20/1997	41	9	303	14	2.6	203	628	15	0.51	0.90	0.8	6.8	1090	1620	170	8.34	0.17		<0.1	0.38	<0.01	<0.05	<0.01	0.23	<0.05	0.07	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.012		4.5			
PD (PO)	8/30/1997	52	9	324	14	0.0	259	615	14	<0.1	0.23	0.9	15.2	1170	1710	212	8.22		0.00	<0.1	0.40	<0.01	<0.05	<0.01	0.08	<0.05	0.13	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.002		4.2			
PD (PO)	11/4/1997	55	10	309	14	<0.1	264	627	15	<0.1	0.26	0.9	15.4	1130	1780	216	8.17		0.00	<0.1	0.43	<0.01	<0.05	<0.01	<.05	<0.05	0.14	<0.001	<0.1	<0.05	<0.001	<0.1	<0.01			0.003		2.1			
PD (PO)	8/18/1998	56	10	309	14	1.0	275	625	13	<0.1	0.24	0.9		1100	1740		8.25		0.01						0.49		0.15				<.001					0.002		25.4	2.0		
PD (PO)	10/23/2006	59	11	297	14	<1	271	605	13	<0.1	0.24	0.9	15.8	1110	1500	222	7.76	<0.10	0.01	<0.1	0.40	<0.01	<0.05	<0.01	1.00	<0.05	0.17	<0.001	<0.1	<0.05	<0.001	<0.1	0.03	1.2	0.2	0.002		8.7	3.2	115	43
PCHMO97-1	10/16/1997	62	13	198	14	<0.1	182	466	17	<0.1	0.15	0.9	13.2	841	1290	149	8.13	<0.10	0.00	<0.10	0.23	<0.01	<0.05	<0.01	0.11	<0.05	0.05	<.001	<0.10	<0.05	<0.001	<0.10	<0.01			<.0003		7.2			
PCHMO97-1	1/27/1998	58	13	199	16	1.0	167	457	23	<0.1	0.18	1.0	12.8	847	1240	137	8.03	<0.10	<.001	<0.10	0.23	0.01	<0.05	<0.01	0.18	<0.05	0.04	<.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		41.0			
PCHMO97-1	6/23/1998	53	12	192	14	<0.1	174	475	23	<0.1	0.13	0.9	12.6	873	1170	143	8.03	<0.10	<.001	<0.10	0.24	0.01	<0.05	<0.01	0.18	<0.05	0.04	<.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		7.7			
PCHMO97-1	7/11/1998	57	12	194	14	1.0	178	432	18	<0.1	0.11	0.9	11.9	864	1260	146	7.83	<0.10	<.001	<0.10	0.23	0.01	<0.05	<0.01	0.18	<0.05	0.04	<.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		26.1			
PCHMO97-1	8/2/1999	57	13	195	14	<1.0	175	453	21	<0.1	0.14	0.9		853	1250		8.22								0.34		0.05				<0.001					0.001		12.0			
PCHMO97-1	10/18/2006	56	13	194	13	<1	168	437	20	<0.1	0.15	1.1	12.6	808	1150	138	8.00	<0.10	<.001	<0.10	0.20	<0.01	<0.05	<0.01	0.28	<0.05	0.05	<.001	<0.10	<0.05	<0.001	<0.10	0.04	0.3	0.1	0.001		32.8	7.7	99	63
PCHMO97-1	10/13/2011	55	11	207	13	<5	166	445	20	<0.1	0.09	1.1	14.1	833	1220		8.03	<0.10	<.001	<0.10	0.20	<0.01	<0.05	<0.01	0.29	<0.05	0.05	<.001	<0.10	<0.05	<0.001	<0.10	0.02	0.3	0.1	0.000		6.1	11.5	25	23
PCHMP97-1	10/17/1997	73	18	174	14	<0.1	174	459	18	<0.1	0.22	0.8	12.7	826	1270	143	8.12	<0.1	<0.001	<0.1	0.23	<0.1	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.10	<0.01			0.033	44800	444.0			
PCHMP97-1	1/27/1998	74	18	176	15	1.0	176	452	20	<0.1	0.21	0.8	12.7	852	1220	144	8.04	<0.1	<0.001	<0.1	0.22	0.01	<0.05	<0.01	0.19	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.10	<0.01			0.121		511.0			
PCHMP97-1	6/23/1998	71	18	170	14	<0.1	176	467	21	<0.1	0.18	0.8	12.5	846	1140	144	8.03	<0.1	<0.001	<0.1	0.22	0.01	<0.05	<0.01	0.15	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.10	<0.01			0.124		430.0			
PCHMP97-1	7/11/1998	73	17	173	14	1.0	180	439	19	<0.1	0.20	0.8	11.9	848	1240	148	7.88	<0.1	<0.001	<0.1	<0.1	0.01	<0.05	<0.01	0.14	<0.05	0.03	<0.001	<0.1	<0.05	<0.001	<0.10	0.02			0.086		431.0			

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)			
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH
PCHMP97-1	8/2/1999	70	18	171	15	<1.0	174	458	21	<0.1	0.19	0.8	11.5	843	1240		8.14
PCHMP97-1	10/18/2006	70	18	172	14	<1	169	435	19	<0.1	0.20	0.9	12.2	812	1120	138	8.01
PCHMP97-1	10/13/2011	68	16	180	15	<5	165	443	18	<0.1	0.15	0.8	14.1	819	1190		8.02
WSL96M-1	9/27/1996	126	19	35	20	<0.05	227	249	16	<0.10	0.05	0.7	31.1	645	853	186	8.09
WSL96M-1	11/13/1996	110	15	32	18	<0.05	198	247	16	<0.10	<0.025	0.8	25.5	543	756	162	8.30
WSL96M-1	2/28/1997	99	15	32	18	0.1	185	221	12	<0.10	<0.025	0.8	23.4	507	759	152	8.18
WSL96M-1	4/23/1997	103	17	28	16	0.1	171	244	9	<0.1	0.06	0.7	23.3	523	741	140	7.87
WSL96M-1	8/25/1997	114	19	31	18	0.1	196	256	7	<0.10	<0.025	0.7	27.7	553	784	161	8.03
WSL96M-1	10/30/1997	106	19	29	16	<0.05	211	234	5	<0.10	<0.025	0.7	28.4	552	778	173	8.00
WSL96M-1	8/25/1998	114	21	30	16	1.0	222	237	3	<0.10	0.06	0.7		550	812		7.81
WSL96M-1	8/4/1999	115	21	30	16	<0.50	221	249	5	0.10	0.05	0.7		578	813		7.87
WSL96M-1	10/25/2006	107	20	28	15	<1	228	231	2	<0.1	<0.05	0.7	28.1	510	759	187	7.65
WSL96MP-1	10/3/1996	80	8	29	10	<0.10	284	61	6	<0.10	<0.05	0.4	45.7	378	558	233	8.12
WSL96MP-1	11/21/1996	87	9	30	11	<0.10	287	64	7	<0.10	<0.05	0.4	47.1	360	569	235	7.92
WSL96MP-1	3/4/2011	80	9	29	11	<0.10	283	62	6	<0.10	<0.05	0.4	45.9	366	576	232	8.03
WSL96MP-1	5/5/1997	84	9	31	11	<0.10	290	64	<1	<0.1	<0.05	0.4	45.2	380	575	238	7.97
WSL96MP-1	8/25/1997	87	8	31	12	<0.10	292	66	6	<0.10	<0.05	0.4	46.6	396	589	239	8.07
WSL96MP-1	10/30/1997	81	8	30	11	<0.10	289	63	5	<0.10	<0.05	0.5	47.0	389	582	237	7.98
WSL96MP-1	8/24/1998	86	9	31	11	1.0	290	65	6	<0.10	<0.05	0.4		374	579		7.82
WSL96MP-1	8/4/1999	86	9	31	11	<1.00	284	64	5	<0.10	0.05	0.4	44.0	376	582		7.92
WSL96MP-1	10/17/2006	84	8	29	10	<1	282	61	5	<0.1	0.10	0.4	48.2	324	584	231	7.80
PRI-1	10/11/1993	547	96	26	23	0.0	390	1548	6	0.13		0.6		2468		320	6.80
PRI-1	11/12/1996	459	26	77	6	<0.10	400	972	51	<0.10	0.12	0.5	22.8	1940	2540	328	7.16
PRI-1	3/4/1997	672	118	22	24	0.1	397	1710	8	<0.10	0.15	0.5	29.6	2975	3390	325	7.57
PRI-1	4/28/1997	629	115	29	26	0.1	400	1883	10	<0.10	0.12	0.5	56.4	3018	2988	328	7.57
PRI-1	8/25/1997	747	108	22	27	0.1	406	1870	9	<0.10	0.11	0.5	30.4	3070	3040	333	7.69
PRI-1	10/30/1997	675	102	22	24	<0.05	405	1730	9	<0.10	0.18	0.5	29.6	3060	2930	332	7.58
PRI-1	8/25/1998	601	107	22	24	1.0	398	1680	8	<0.10	0.23	0.5		2950	3030		7.85
PRI-1	8/4/1999	645	129	23	26	<0.50	394	1701	10	<0.10	0.13	0.5		3000	3010		7.54
PRI-1	9/5/2006	595	106	21	23	<1	356	1610	6	<0.10	0.26	0.4	26.1	2840	3100	292	6.95
PRI-1	9/27/2011	670	119	22	24	<0.05	400	1850	9	<0.10	0.13	0.5	33.4	3070	2810	328	7.18
PRI-1	10/12/2011	583	105	23	24	<5	337	1690	8	<0.1	0.08	0.6	30.2	2770	2800		7.89
BUMU97-1	10/20/1997	239	65	57	29	<0.10	184	823	5	<0.10	0.18	0.8	17.2	1350	1670	151	8.01
BUMU97-1	1/27/1998	337	90	65	34	1.0	215	1200	6	<0.10	0.25	0.7	18.5	1850	2070	176	7.71
BUMU97-1	6/22/1998	314	86	63	33	<0.10	216	1130	8	0.13	0.18	0.6	18.2	1910	1950	177	7.71
BUMU97-1	7/11/1998	328	87	64	32	1.0	224	1070	4	<0.10	0.17	0.6	17.0	1890	2130	183	7.85
BUMU97-1	7/11/1998 (D)	327	87	64	32	1.0	224	1080	5	<0.10	0.16	0.6	17.0	1880	2130	184	7.83
BUMU97-1	8/4/1999	299	82	60	32	<0.10	217	1120	6	<0.10	0.19	0.6		1890	2150		7.73
BUMU97-1	10/25/2006	330	90	60	31	<1	217	1220	5	<0.10	0.15	0.6	17.8	1750	2080	178	7.49
BUMU97-1	10/12/2011	331	93	64	34	<5	212	1150	5	<0.1	0.12	0.8	21.3	1850	2100		7.82
BUMP97-1	10/20/1997	392	89	48	31	<0.10	261	1190	8	<0.10	0.18	0.8	20.7	1970	2240	214	7.88
BUMP97-1	1/27/1998	382	90	47	31	1.0	267	1200	8	<0.1	0.21	0.8	21.1	1940	2140	219	7.94
BUMP97-1	6/22/1998	352	58	45	29	<0.10	270	1130	7	0.13	0.13	0.7	20.7	1980	1980	221	7.79
BUMP97-1	7/11/1998	355	86	46	29	1.0	277	1080	6	<0.10	0.15	0.7	19.5	1970	2170	227	7.87
BUMP97-1	8/4/1999	322	76	41	28	<1	265	1080	9	<0.10	0.14	0.7	18.0	1940	2170		7.75
BUMP97-1	10/25/2006	371	85	42	26	<1	258	1230	7	<0.10	0.11	0.7	19.8	1800	2100	211	7.36
BUMP97-1	10/12/2011	379	92	45	29	<5	258	1160	6	<0.1	0.07	0.8	24.8	1880	2120		7.69
BUMO97-1	10/21/1997	269	62	30	28	<0.05	103	839	17	<0.05	0.19	3.3	13.3	1340	1620	84	8.15
BUMO97-1	1/28/1998	261	61	28	23	1.0	105	825	19	0.05	0.21	2.6	13.0	1300	1530	86	8.04
BUMO97-1	6/22/1998	216	54	31	22	0.1	114	712	20	0.11	0.17	2.0	16.0	1230	1340	93	7.97
BUMO97-1	7/14/1998	237	57	31	21	1.0	136	733	16	<0.05	0.15	1.8	17.6	1280	1480	111	8.05
BUMO97-1	7/29/1999	240	56	29	22	<0.5	195	714	20	1.23	0.11	1.2		1200	1570		7.89
BUMO97-1	10/31/2006	239	54	27	17	<1	224	716	5	<0.10	0.19	1.3	23.4	1190	1540	184	7.49
BUMO97-1	10/11/2011	225	50	31	18	<5	207	647	6	<0.1	0.06	1.3	27.9	1130	1390		7.89
VECA MW-1	9/20/1996	505	106	37	42	<0.10	207	1580	80	0.70	<0.05	1.1	24.1	2660	2560	170	7.43
VECA MW-1	11/21/1996	569	114	38	45	<0.10	206	1641	97	0.61	<0.05	1.2	23.5	2660	2670	169	7.67
VECA MW-1	3/6/1997	544	120	35	42	<0.10	220	1675	76	0.74	<0.05	1.4	25.5	2710	2910	180	7.68
VECA MW-1	4/28/1997	580	110	42	47	<0.10	226	1595	118	0.23	<0.05	1.3	24.3	2682	2858	185	7.81
VECA MW-1	11/4/1997	558	109	41	45	<0.10	227	1600	124	0.24	0.16	1.6	23.4	2640	2900	186	7.74

		Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
PCHMP97-1	8/2/1999	<0.1	<0.001	<0.1	0.19				0.20		0.03	<0.001			<0.001					0.077		393.0			
PCHMP97-1	10/18/2006	<0.10	<.001	<0.10	0.20	<0.01	<0.05	<0.01	0.22	<0.05	0.03	<.001	<0.10	<0.05	<0.001	<0.10	0.05	0.2	0.0	0.037		580.0	17.3	2030	400
PCHMP97-1	10/13/2011	<0.10	<.001	<0.10	<0.1	<0.01	<0.05	<0.01	0.33	<0.05	0.03	<.001	<0.10	<0.05	<0.001	<0.10	0.01	0.4	0.0	0.036		356.0	9.1	2070	678
WSL96M-1	9/27/1996	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.10	<0.05	0.09	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.004	4160	10.1			
WSL96M-1	11/13/1996	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.08	<0.05	0.07	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.048	4330	8.7			
WSL96M-1	2/28/1997	<0.10	0.01	0.03	<0.10	<0.01	<0.05	<0.01	0.10	<0.05	0.07	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.003	4050	9.1			
WSL96M-1	4/23/1997	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.11	<0.05	0.08	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.003		8.2			
WSL96M-1	8/25/1997	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.05	<0.05	0.09	<0.001	<0.10	<0.05	0.00	<0.10	<0.005			0.005		8.1			
WSL96M-1	10/30/1997	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	0.07	<0.05	0.09	<0.001	<0.10	<0.05	<0.001	<0.10	<0.005			0.006		6.5			
WSL96M-1	8/25/1998		0.01						0.10						<0.001					0.005		27.0	4.4		
WSL96M-1	8/4/1999		0.01						0.29						<0.001					0.004		9.7	5.5		
WSL96M-1	10/25/2006	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	0.27	<0.05	0.12	<0.001	<0.10	<0.05	<0.001	<0.10	0.02	0.3	0.1	0.005		11.5	2.3	32	31
WSL96MP-1	10/3/1996	<0.10	0.02	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.008	153000	1200.0			
WSL96MP-1	11/21/1996	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.10	<0.05	0.01	<0.10	<0.01			0.016	644000	1310.0			
WSL96MP-1	3/4/2011	<0.10	0.01	0.04	<0.10	<0.01	<0.05	<0.01	0.07	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.012	782300	1320.0			
WSL96MP-1	5/5/1997	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.08	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.012		1240.0			
WSL96MP-1	8/25/1997	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.13	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.012		1250.0			
WSL96MP-1	10/30/1997	<0.10	0.01	<0.10	<0.10	<0.005	<0.05	<0.01	0.12	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.012		1050.0			
WSL96MP-1	8/24/1998		0.02						0.49		0.07				<0.001					0.014		1400.0	5.2		
WSL96MP-1	8/4/1999		0.01	<0.10					0.69		0.06				<0.001					0.013		1160.0	7.5		
WSL96MP-1	10/17/2006	<0.10	0.02	<0.10	<0.10	<0.005	<0.05	<0.01	0.10	<0.05	0.05	<0.001	<0.10	<0.05	<0.001	<0.10	0.02	0.1	0.1	0.012		1220.0	3.0	1160	531
PRI-1	10/11/1993	<0.1	0.00	<0.1	<0.1	<0.1	<0.05	<0.1	3.07	<0.05	0.87	<0.001	<0.1	0.17	0.02	<0.1	0.01			0.012		20.1			
PRI-1	11/12/1996	<0.10	0.00	<0.10	<0.10	<0.01	<0.05	<0.01	0.81	<0.05	0.32	<0.001	<0.10	<0.05	<0.001	<0.10	0.03			0.01		2.1			
PRI-1	3/4/1997	<0.10	0.00	0.10	<0.10	<0.01	<0.05	<0.01	2.95	<0.05	0.81	<0.001	<0.10	<0.05	<0.001	<0.10	0.02			0.01		26.1			
PRI-1	4/28/1997	<0.10	0.00	<0.10	<0.10	<0.01	<0.05	<0.01	0.05	<0.05	0.86	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.01		18.0			
PRI-1	8/25/1997	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	3.60	<0.05	0.84	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.01		16.4			
PRI-1	10/30/1997	<0.10	<0.001	<0.10	<0.10	<0.005	<0.05		2.10	<0.05	0.85	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.01		14.5			
PRI-1	8/25/1998		0.00						3.30		0.82				0.00					0.01		56.1	9.7		
PRI-1	8/4/1999		<0.001						2.69		0.70				<0.001					0.01		43.5	8.7		
PRI-1	9/5/2006	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	3.00	<0.05	0.88	<0.001	<0.10	<0.05	0.00	<0.10	0.04			0.01		12.1			
PRI-1	9/27/2011	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	3.40	<0.05	0.91	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.01		21.5			
PRI-1	10/12/2011	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	3.55	<0.05	0.88	<0.001	<0.10	<0.05	<0.001	<0.10	0.03	10.1	1.0	0.01		14.0	6.5	58	52
BUMU97-1	10/20/1997	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	0.82	<0.05	0.05	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		11.0			
BUMU97-1	1/27/1998	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	1.79	<0.05	0.07	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.003		41.6			
BUMU97-1	6/22/1998	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	1.70	<0.05	0.06	<0.001	<0.10	<0.05	0.00	<0.10	0.02			0.003		23.1			
BUMU97-1	7/11/1998	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	1.80	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.003		34.3			
BUMU97-1	7/11/1998 (D)	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	1.80	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.003		25.8			
BUMU97-1	8/4/1999		<0.001						1.70		0.05				<0.001					0.003		21.5	12.6		
BUMU97-1	10/25/2006	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	1.77	<0.05	0.06	<0.001	<0.10	<0.05	0.00	<0.10	0.03	1.8	0.1	0.002		35.9	8.3	179	99
BUMU97-1	10/12/2011	<0.10	<0.001	<0.10	0.10	<0.01	<0.05	<0.01	2.12	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	0.02	2.2	0.1	0.003		24.0	11.1	98	78
BUMP97-1	10/20/1997	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	1.58	<0.05	0.06	<0.001	<0.10	<0.05	<0.001	<0.10	0.02			0.033	21300	128.0			
BUMP97-1	1/27/1998	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	2.93	<0.05	0.06	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.023		105.0			
BUMP97-1	6/22/1998	<0.10	0.00	<0.10	<0.10	0.01	<0.05	<0.01	2.80	<0.05	0.07	<0.001	<0.10	<0.05	0.00	<0.10	0.03			0.021		71.6			
BUMP97-1	7/11/1998	<0.10	<0.001	<0.10	<0.10	0.01	<0.05	<0.01	3.00	<0.05	0.06	<0.001	<0.10	<0.05	0.00	<0.10	0.02			0.020		100.0			
BUMP97-1	8/4/1999	<0.10	<0.001	<0.10	<0.10				2.40		0.05				<0.001					0.019		54.8	11.5		
BUMP97-1	10/25/2006	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	2.78	<0.05	0.06	<0.001	<0.10	<0.05	0.00	<0.10	0.03	3.0	0.1	0.017		88.9	7.3	478	179
BUMP97-1	10/12/2011	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	3.32	<0.05	0.07	<0.001	<0.10	<0.05	<0.001	<0.10	0.03	3.8	0.1	0.015		63.0	11.2	348	159
BUMO97-1	10/21/1997	<0.10	0.25	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.33	<0.001	<0.10	<0.05	0.02	<0.10	<0.01			0.216		6.1			
BUMO97-1	1/28/1998	<0.10	0.14	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.43	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.392		9.7			
BUMO97-1	6/22/1998	<0.10	0.12	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.22	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.837		5.5			
BUMO97-1	7/14/1998	<0.10	0.13	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.31	<0.001	<0.10	<0.05	0.00	<0.10	<0.01			0.924		15.9			
BUMO97-1	7/29/1999		0.08						0.03		0.50	<0.001			<0.0005					0.247		8.7	7.7		
BUMO97-1	10/31/2006	<0.10	0.02	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.73	<0.001	<0.10	<0.05	<0.0005	<0.10	<0.01	0.1	0.8	0.012		10.8	9.8	47	44
BUMO97-1	10/11/2011	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.11	<0.05	0.72	<0.001	<0.10	<0.05	<0.0005	<0.10	0.03	0.4	0.8	0.007		6.0	9.5	44	37
VECA MW-1	9/20/1996	<0.10	<0.001	<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.10	<0.05	0.09	<0.10	<0.01			0.095		8.4			
VECA MW-1	11/21/1996	<0.10	0.00	<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.10	<0.05	0.08	<0.10	<0.01			0.058		16.6			
VECA MW-1	3/6/1997	<0.10	0.00	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.10	<0.05	0.10	<0.10	0.07			0.075		22.2			
VECA MW-1	4/28/1997	<0.10	0.01	<0.10	0.11	<0.01	<0.05	<0.01	<0.05	<0.05	0.06	<0.001	<0.10	<0.05	0.04	<0.10	0.01			0.068		9.4			
VECA MW-1	11/4/1997	<0.10	0.00	<0.10	0.11	<0.01	<0.05	<0.01	<0.05	<0.05	0.08	<0.001	<0.10	<0.05	0.04	<0.10	<0.01			0.076		10.2			

		Major Ions (mg/l) DISSOLVED												Non-Metals (mg/L)			
		Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarbonate	Sulfate	Chloride	Nitrite + Nitrate as N	Ammonium	Fluoride	Silica	Total Dissolved Solids @ 180°C	Conductivity (umho/cm)	Alkalinity as CaCO3	pH (std units)
Sample ID	Sample Date	Ca	Mg	Na	K	CO3	HCO3	SO4	Cl	NO2+NO3	NH3	F	SiO2	TDS	Cond.	ALK	pH
VECA MW-1	8/31/1998	523	104	41	44	1.0	231	1410	102	0.18	0.06	1.3		2670	2880		7.51
VECA MW-1	8/10/1999	527	127	45	47	<0.10	231	1450	150	0.48	<0.05	1.4		2710	2950		7.69
VECA MW-1	10/16/2006	498	109	35	42	<1	246	1530	58	<0.10	0.13	1.0	24.6	2380	2540	201	7.46
VECA MW-3A	9/20/1996	344	52	39	13	<0.10	226	871	55	<0.10	<0.05	0.9	19.8	1560	1710	185	7.42
VECA MW-3A	11/19/1996	378	57	41	14	<0.10	235	893	58	<0.10	0.10	0.8	19.5	1720	1800	193	7.82
VECA MW-3A	3/6/1997	419	58	37	13	<0.10	227	995	67	<0.10	0.09	0.9	19.9	1580	1870	186	7.55
VECA MW-3A	4/28/1997	431	65	44	16	<0.10	248	1070	74	<0.10	0.08	0.8	20.1	1857	2131	203	7.68
VECA MW-3A	10/29/1997	440	62	42	15	<0.10	254	1060	71	<0.10	0.01	0.9	19.3	1950	2190	208	7.71
VECA MW-3A	9/1/1998	365	65	44	15	1.0	246	1010	60	<0.10	0.16	0.8		1920	2200		7.75
VECA MW-3A	8/10/1999	532	129	44	46	<0.10	233	1440	150	0.47	<0.05	1.4		2710	2960		7.78
VECA MW-3A	10/31/2006	521	94	55	18	<1	276	1460	104	<0.10	0.30	0.8	20.0	2490	2830	226	7.07
VECA MW-3A	10/14/2011	532	90	61	18	<5	261	1380	100	<0.1	<0.05	1.0	25.9	2400	2660		7.40
PIXMP97-1	10/17/1997	180	32	39	14	<0.10	210	456	6	<0.10	0.06	0.6	19.3	852	1160	172	7.94
PIXMP97-1	1/27/1998	178	32	39	14	1.0	211	458	6	<0.10	0.12	0.6	19.6	864	1120	173	7.97
PIXMP97-1	6/23/1998	186	33	37	13	<0.10	212	468	7	<0.10	0.09	0.6	19.1	870	1040	174	7.89
PIXMP97-1	7/13/1998	182	33	39	13	1.0	210	453	5	<0.10	0.08	0.6	18.8	891	1140	173	7.95
PIXMP97-1	8/3/1999	173	32	38	14	<0.10	206	453	7	<0.10	0.08	0.6	18.0	859	1120		8.00
PIXMP97-1	10/16/2006	172	32	37	13	<1	191	461	5	<0.10	0.12	0.6	19.2	738	998	157	7.74
PIXMP97-1	10/13/2011	160	29	39	13	<5	191	432	5	<0.1	0.06	0.7	20.7	807	1070		7.87
PIXMO97-1	10/19/1997	179	31	39	15	<0.10	194	442	10	<0.10	0.14	0.7	18.7	824	1130	159	8.00
PIXMO97-1	1/28/1998	178	31	38	14	1.0	206	451	8	<0.10	0.13	0.6	19.2	826	1100	169	7.99
PIXMO97-1	1/28/1998 (D)	177	31	39	14	1.0	204	455	8	<0.10	0.13	0.6	19.1	833	1100	167	8.05
PIXMO97-1	6/22/1998	157	29	38	13	<0.10	209	421	7	0.22	0.09	0.6	17.7	840	1010	171	7.85
PIXMO97-1	6/22/1998 (D)	164	29	39	14	<0.10	206	426	8	<0.10	0.08	0.6	18.2	843	1020	169	7.89
PIXMO97-1	7/13/1998	178	32	39	13	1.0	209	442	6	<0.10	0.10	0.6	18.5	874	1120	171	7.97
PIXMO97-1	8/3/1999	171	31	38	14	<1	209	450	7	<0.10	0.01	0.7		851	1120		7.81
PIXMO97-1	10/16/2006	173	32	37	13	<1	200	469	7	<.10	0.12	0.7	19.0	748	1010	164	7.73
PIXMO97-1	10/13/2011	163	30	38	14	<5	196	448	8	<0.1	0.06	0.8	20.6	814	1080		7.76
PIXMU97-1	10/18/1997	179	42	53	24	<0.10	221	513	18	<0.10	0.15	0.4	18.6	962	1310	181	8.12
PIXMU97-1	1/28/1998	181	38	54	25	1.0	212	526	19	<0.10	0.17	0.4	17.6	949	1250	174	8.23
PIXMU97-1	6/22/1998	164	39	50	19	<0.10	216	485	10	<0.10	0.13	0.4	16.6	954	1140	177	7.79
PIXMU97-1	7/14/1998	176	41	50	17	1.0	221	513	8	<0.10	0.12	0.4	17.9	978	1260	181	8.02
PIXMU97-1	8/10/1999	179	42	52	18	<1.0	222	494	12	<0.10	0.01	0.4		924	1240		7.80
PIXMU97-1	10/30/2006	178	41	47	16	<1	222	511	6	<0.10	0.13	0.4	18.4	930	1250	182	7.45
PIXMU97-1	10/14/2011	168	37	47	17	<5	189	496	11	0.10	0.09	0.5	19.6	886	1170		7.63
MW-1	5/25/1989	509	104	38	39	0.0	232	1589	13	0.34	0.10	<0.7		2542	2636	190	7.20
MW-2	5/18/1989	374	62	25	13	0.0	320	919	10	0.13	0.24	0.8		1550	1788	262	6.90
MW-2	6/26/1989	418	81	19	11	0.0	300	1113	12	0.02	0.11	0.5		1875	2267	240	6.80
MW-3A	5/17/1989	248	37	78	13	0.0	188	744	8	0.11	0.15	0.9		1248	1617	1545	7.30
MW-3A	6/26/1989	240	31	62	11	0.0	201	683	10	0.02	0.08	0.9		1124	1507	165	7.20

		Trace Metals (mg/l) DISSOLVED																Trace Metals (mg/l) TOTALS		Radiometrics (pCi/L) DISSOLVED					
		Aluminum	Arsenic	Barium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc	Iron	Manganese	Uranium (mg/L)	Radium 222	Radium 226	Radium 228	Gross Alpha	Gross Beta
Sample ID	Sample Date	Al	As	Ba	B	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Mo	Ni	Se	V	Zn	Fe	Mn	NatU	222Ra	226Ra	228Ra	-	-
VECA MW-1	8/31/1998		0.00						<0.05		0.06				0.04					0.058		26.0	7.0		
VECA MW-1	8/10/1999		0.01						<0.05		0.09				0.06					0.079		23.9	8.4		
VECA MW-1	10/16/2006	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.14	<0.001	<0.10	<0.05	0.01	<0.10	0.05	<0.03	0.1	0.035		10.1	9.8	73	74
VECA MW-3A	9/20/1996	<0.10	0.03	<0.10	<0.10	<0.01	<0.05	<0.01	2.89	<0.05	0.67	<0.001	0.10	<0.05	<0.001	<0.10	<0.01			0.184		0.9			
VECA MW-3A	11/19/1996	<0.10	0.01	<0.10	<0.10	<0.01	<0.05	<0.01	0.49	<0.05	0.69	<0.001	0.11	<0.05	<0.001	<0.10	<0.01			0.144		2.4			
VECA MW-3A	3/6/1997	<0.10	0.02	<0.10	<0.10	<0.01	<0.05	<0.01	1.04	<0.05	0.78	<0.001	<0.10	<0.05	<0.001	<0.10	0.02			0.135		1.2			
VECA MW-3A	4/28/1997	<0.10	0.08	<0.10	<0.10	<0.01	<0.05	<0.01	2.98	<0.05	0.78	<0.001	0.15	<0.05	<0.001	<0.10	<0.01			0.202		1.6			
VECA MW-3A	10/29/1997	<0.10	0.03	<0.10	<0.10	<0.01	<0.05	<0.01	0.79	<0.05	0.84	<0.001	0.17	<0.05	<0.001	<0.10	<0.01			0.209		0.7			
VECA MW-3A	9/1/1998		0.08						6.30						0.00					0.158		2.2	5.1		
VECA MW-3A	8/10/1999		<0.001						<0.05						0.06					0.081		1.1	6.3		
VECA MW-3A	10/31/2006	<0.10	0.02	<0.10	<0.10	<0.01	<0.05	<0.01	4.38	<0.05	1.16	<0.001	0.10	<0.05	0.00	<0.10	0.03	13.4	1.2	0.153		17.5	8.0	146	91
VECA MW-3A	10/14/2011	<0.10	0.07	<0.10	<0.10	<0.01	<0.05	<0.01	12.10	<0.05	1.15	<0.001	<0.10	<0.05	<0.001	<0.10	0.03	28.9	1.2	0.173		16.0	10.0	228	115
PIXMP97-1	10/17/1997	<0.10		<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.20	<0.001	<0.10	<0.05	<0.001	<0.10	0.02			0.012		647.0			
PIXMP97-1	1/27/1998	<0.10		<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.20	<0.001	<0.10	<0.05	<0.001	0.10	<0.01			0.013		663.0			
PIXMP97-1	6/23/1998	<0.10		<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.20	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.012		669.0			
PIXMP97-1	7/13/1998	<0.10		<0.10	<0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.21	<0.001	<0.10	<0.05	<0.001	<0.10	0.01			0.012		639.0			
PIXMP97-1	8/3/1999	<0.10		<0.10	<0.10				0.15		0.19				<0.001					0.012		690.0	8.9		
PIXMP97-1	10/16/2006	<0.10	<0.001	<0.10	<0.10	<0.01	<0.05	<0.01	0.08	<0.05	0.20	<0.001	<0.10	<0.05	<0.001	<0.10	0.01	1.3	0.2	0.010		562.0	2.2	614	220
PIXMP97-1	10/13/2011	<0.10	<0.001	<0.10	0.10	<0.01	<0.05	<0.01	0.10	<0.05	0.19	<0.001	<0.10	<0.05	<0.001	<0.10	0.02	0.2	0.2	0.014		584.0	5.1	2180	507
PIXMO97-1	10/19/1997	<0.10	0.01	<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.20	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			<.0003		5.5			
PIXMO97-1	1/28/1998	<0.10	0.01	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.22	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		9.9			
PIXMO97-1	1/28/1998 (D)	<0.10	0.01	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.22	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		7.4			
PIXMO97-1	6/22/1998	<0.10	0.01	<0.10	0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.21	<0.001	<0.10	<0.05	<0.001	<0.10	0.01			0.001		5.4			
PIXMO97-1	6/22/1998 (D)	<0.10	0.01	<0.10	0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.20	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.001		7.1			
PIXMO97-1	7/13/1998	<0.10	0.01	<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.22	<0.001	<0.10	<0.05	<0.001	<0.10	0.01			0.001		86.5			
PIXMO97-1	8/3/1999	<0.10							0.23		0.22				<0.001					0.001		23.3	6.7		
PIXMO97-1	10/16/2006		0.01		0.10				0.08		0.23						0.02	0.1	0.2	0.000		4.0	1.8	11	18
PIXMO97-1	10/13/2011	<0.10	0.01	<0.10	0.10	<0.01	<0.05	<0.01	0.11	<0.05	0.23	<0.001	<0.10	<0.05	<0.001	<0.10	0.04	0.3	0.3	0.001		4.5	5.6	15	21
PIXMU97-1	10/18/1997	<0.10	0.00	<0.10	0.11	<0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.004		19.1			
PIXMU97-1	1/28/1998	<0.10	0.00	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.02	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.004		15.3			
PIXMU97-1	6/22/1998	<0.10	0.00	<0.10	<0.10	0.01	<0.05	<0.01	<0.05	<0.05	0.03	<0.001	<0.10	<0.05	<0.001	<0.10	0.04			0.003		18.9			
PIXMU97-1	7/14/1998	<0.10	0.00	<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.04	<0.001	<0.10	<0.05	<0.001	<0.10	<0.01			0.003		41.0			
PIXMU97-1	8/10/1999		<0.001						<0.05		0.03				<0.001					0.002		35.6	5.8		
PIXMU97-1	10/30/2006	<0.10	0.00	<0.10	0.10	<0.01	<0.05	<0.01	<0.05	<0.05	0.05	<0.001	<0.10	<0.05	<0.001	<0.10	0.02	0.1		0.003		15.3	5.1	55	42
PIXMU97-1	10/14/2011	<0.10	<0.001	<0.10	0.10	<0.01	<0.05	<0.01	0.11	<0.05	0.04	<0.001	<0.10	<0.05	<0.001	<0.10	0.02	0.4	0.0	0.002		22.0	4.2	86	40
MW-1	5/25/1989	0.11	0.07	<0.1	<0.1	<0.01	<0.05	<0.01	0.14	<0.05	0.36	<0.001	<0.1	<0.05	0.00	<0.1	0.05			0.060		23.0			
MW-2	5/18/1989	0.13	0.05	<0.1	<0.1	<0.01	<0.05	<0.01	13.00	<0.05	1.90	<0.001	<0.1	0.12	0.01	<0.1	0.04			0.090		22.0			
MW-2	6/26/1989	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	5.80	<0.05	1.60	<0.001	<0.1	<0.05	<0.001	<0.1	0.02								
MW-3A	5/17/1989	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	3.20	<0.05	0.75	<0.001	<0.1	<0.05	<0.001	<0.1	0.07			0.180		13.0			
MW-3A	6/26/1989	<0.1	0.01	<0.1	<0.1	<0.01	<0.05	<0.01	<0.05	<0.05	0.48	<0.001	<0.1	<0.05	<0.001	<0.1	0.03			0.150		16.0			

Table 3.4-15 Groundwater Rights within 2 kilometers of Gas Hills

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P215.0W	08/24/1959	Incomplete	Water Well #3	IND	033N	089W	18	SW1/4SW1/4	250	1668	20	-107.55782	42.82682
P67075.0W	02/16/1984		Guard Well 3B	IND; MIS	033N	089W	15	SE1/4SW1/4	7	159	114.1	-107.494	42.82656
P67076.0W	02/16/1984		Guard Well 3C	IND; MIS	033N	089W	15	SE1/4SW1/4	10	159	105	-107.494	42.82656
P104730.0W	11/25/1996	Incomplete	Aliob #2	MIS	033N	089W	15	SE1/4NE1/4	45	537	270	-107.48437	42.83367
P175221.0W	06/26/2006		Gunnel #1	MIS	033N	090W	25	NE1/4NW1/4	350	1495	108	-107.57221	42.80875
P179593.0W	02/14/2007		Gas Hills Water Well-1	MIS	033N	089W	32	SE1/4NW1/4	80			-107.53292	42.7906
P184398.0W	01/07/2008	Complete	Carol Well # 1	MIS	033N	089W	28	NE1/4SW1/4	50	400	200	-107.512689	42.803047
P38624.0W	07/01/1977		Peach #6	MIS	032N	090W	03	SE1/4SE1/4	0	460	309	-107.58526	42.7693
P44612.0W	11/25/1977	Incomplete	Carol Well #1	MIS	033N	089W	28	NE1/4SW1/4	50	400	200	-107.51346	42.80136
P82562.0W	04/27/1990		MWC-33	MIS	033N	089W	15	NE1/4NW1/4	2	210	121.81	-107.49405	42.83744
P82563.0W	04/27/1990		MWC-34	MIS	033N	089W	15	NE1/4NW1/4	3	200	157.06	-107.49405	42.83744
P82564.0W	04/27/1990		MWC-35	MIS	033N	089W	10	SE1/4SW1/4	5	190	148.03	-107.49404	42.84107
P82565.0W	04/27/1990		MWC-36	MIS	033N	089W	10	SE1/4SW1/4	12	200	143.41	-107.49404	42.84107
P83269.0W	08/15/1990		MWC-42	MIS	033N	089W	10	SE1/4SW1/4	10	240	138	-107.49404	42.84107
P84751.0W	03/18/1991		MWC-45	MIS	033N	089W	15	NW1/4NE1/4	15	240	195.24	-107.48922	42.83737
P84753.0W	03/18/1991		MWC-47	MIS	033N	089W	15	NW1/4NE1/4	15	255	188	-107.48922	42.83737
P84754.0W	03/18/1991		MWC-48	MIS	033N	089W	15	NW1/4NE1/4	15	245	177.92	-107.48922	42.83737
P84755.0W	03/18/1991		MWC-49	MIS	033N	089W	15	NW1/4NE1/4	15	240	156.35	-107.48922	42.83737
P87214.0W	12/24/1991	Incomplete	Area 4 Reclamation Reservoir	MIS	033N	090W	35	SE1/4SE1/4	12	460	270	-107.58219	42.78501
P91278.0W	03/19/1993		MWC 56	MIS	033N	089W	15	NE1/4NW1/4	5	261	171	-107.49405	42.83744
P91279.0W	03/19/1993		MWC 57	MIS	033N	089W	15	NE1/4NW1/4	6	252	165	-107.49405	42.83744
P91280.0W	03/19/1993		MWC 58	MIS	033N	089W	10	SE1/4SW1/4	6	250	154	-107.49404	42.84107
P91281.0W	03/19/1993		MWC 59	MIS	033N	089W	10	SE1/4SW1/4	6	250	147	-107.49404	42.84107
P91282.0W	03/19/1993		MWC 60	MIS	033N	089W	15	SE1/4SW1/4	4	160	111	-107.494	42.82656
P91283.0W	03/19/1993		MWC 61	MIS	033N	089W	15	SE1/4SW1/4	3.5	150	116	-107.494	42.82656
P91284.0W	03/19/1993		MWC 62	MIS	033N	089W	15	SE1/4SW1/4	4	165	107	-107.494	42.82656
P95290.0W	04/26/1994	Fully Adjudicated	Buss I Reservoir	MIS	033N	089W	27	SE1/4NW1/4	2000	210	171	-107.493869	42.8049
P103584.0W	08/29/1996	Complete	BS 96 M-1	MON	033N	089W	32	NE1/4NW1/4	0	305	194.1	-107.53293	42.79425
P103585.0W	08/29/1996	Complete	Peach M1	MON	032N	090W	03	SW1/4NE1/4	0	320	214.2	-107.59168	42.77659
P103586.0W	08/29/1996	Complete	WSL96M-1	MON	033N	089W	28	NE1/4SE1/4	0	365	175.25	-107.50366	42.80128
P103587.0W	08/29/1996	Complete	MU 96 M-2	MON	033N	089W	31	NE1/4SW1/4	0	475	256.7	-107.55259	42.78704
P103588.0W	08/29/1996	Complete	MU 96 M-1	MON	033N	089W	31	NE1/4SW1/4	0	465	244.5	-107.55259	42.78704
P103589.0W	08/29/1996	Complete	Peach M-2	MON	032N	090W	03	NE1/4SE1/4	0	305	270.9	-107.58529	42.77295
P103590.0W	08/29/1996	Complete	Peach MP-1	MON	032N	090W	03	NE1/4SE1/4	0	310	248.9	-107.58529	42.77295
P103591.0W	08/29/1996	Complete	WSL96MP1	MON	033N	089W	28	NW1/4SE1/4	0	275	148.25	-107.50856	42.80133
P104183.0W	10/15/1996		MW 75	MON	033N	089W	14	NE1/4SW1/4	0	205	120.93	-107.47455	42.83006
P104185.0W	10/15/1996	Complete	MW 77	MON	033N	089W	09	SW1/4SE1/4	0	279	231.01	-107.5087	42.84119
P104391.0W	10/30/1996	Complete	Peach MP-2	MON	032N	090W	03	NE1/4SE1/4	0	340	242.05	-107.58529	42.77295
P105492.0W	04/11/1997	Complete	MW 70A	MON	033N	089W	10	SW1/4SW1/4	0	151	141	-107.49889	42.84115
P105493.0W	04/11/1997		MW 70B	MON	033N	089W	10	SW1/4SW1/4	0	265	138	-107.49889	42.84115
P105494.0W	04/11/1997		MW 71A	MON	033N	089W	16	NE1/4NE1/4	0	237	224	-107.50376	42.83756
P105495.0W	04/11/1997	Complete	MW 71B	MON	033N	089W	16	NE1/4NE1/4	0	329	223	-107.50376	42.83756
P105496.0W	04/11/1997	Complete	MW 72	MON	033N	089W	22	NW1/4NW1/4	0	85	56	-107.49882	42.82301
P105497.0W	04/11/1997		MW 73	MON	033N	089W	22	NE1/4NW1/4	0	153	104	-107.49398	42.82294
P105498.0W	04/11/1997		MW 74	MON	033N	089W	22	NW1/4NW1/4	0	60	21	-107.49882	42.82301
P106686.0W	07/01/1997	Complete	PIX MU 97-1	MON	033N	089W	22	NE1/4SW1/4	0	245	90	-107.49391	42.81574

Table 3.4-15 Groundwater Rights within 2 kilometers of Gas Hills

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P107839.0W	10/06/1997	Complete	MUMP 97-1	MON	033N	089W	31	NE1/4SE1/4	0	440	237	-107.54272	42.78699
P108001.0W	11/04/1997		MW78	MON	033N	089W	15	SE1/4SW1/4	0	150	111.45	-107.494	42.82656
P108002.0W	11/04/1997		MW79	MON	033N	089W	15	SE1/4SW1/4	0	150	118.83	-107.494	42.82656
P108003.0W	11/04/1997		MW80	MON	033N	089W	15	SE1/4SW1/4	0	155	117.48	-107.494	42.82656
P108004.0W	11/04/1997		MW81	MON	033N	089W	10	SW1/4SW1/4	0	240	171	-107.49889	42.84115
P112329.0W	10/08/1998	Complete	BSPW-1	MON	033N	089W	32	SE1/4NW1/4	0	425	257.4	-107.53292	42.7906
P112330.0W	10/08/1998	Complete	BSMU-1	MON	033N	089W	32	NE1/4NW1/4	0	485	266.9	-107.53293	42.79425
P112331.0W	10/08/1998	Complete	BSMP-1	MON	033N	089W	32	NE1/4NW1/4	0	376	212	-107.53293	42.79425
P112332.0W	10/08/1998	Complete	BSMP-2	MON	033N	089W	32	NE1/4NW1/4	0	410	230	-107.53293	42.79425
P112333.0W	10/08/1998	Complete	BSMP-3	MON	033N	089W	32	NE1/4NW1/4	0	372	221	-107.53293	42.79425
P112334.0W	10/08/1998	Complete	MO-3	MON	032N	090W	02	NW1/4NE1/4	0	331	257.3	-107.57077	42.7801
P112335.0W	10/08/1998	Complete	M-3C	MON	032N	090W	02	SW1/4NE1/4	0	380	355	-107.57071	42.77675
P112336.0W	10/08/1998	Complete	M-4	MON	032N	090W	02	NW1/4NE1/4	0	382	300	-107.57077	42.7801
P144110.0W	04/26/2002	Complete	MW82	MON	033N	089W	22	NW1/4NW1/4	0	115	86	-107.49882	42.82301
P182078.0W	07/06/2007		S1-GV-M-07	MON	033N	090W	27	SW1/4SE1/4	0			-107.60687	42.79772
P194061.0W	10/15/2010	Incomplete	RHS-1-M-10	MON	033N	089W	08	SW1/4SE1/4				-107.526136	42.840143
P31496.0W	11/12/1975	Complete	BS12-1025P	MON	033N	089W	32	SW1/4NE1/4	0	777	345	-107.52804	42.79059
P31497.0W	11/12/1975	Complete	BS12-1026P	MON	033N	089W	32	SW1/4NE1/4	0	640	345	-107.52804	42.79059
P31498.0W	11/12/1975	Complete	BS12-1027P	MON	033N	089W	32	SW1/4NE1/4	0	565	325	-107.52804	42.79059
P31499.0W	11/12/1975	Complete	BS12-1028P	MON	033N	089W	32	NW1/4SE1/4	0	827	440	-107.52803	42.78696
P31500.0W	11/12/1975	Complete	BS12-1029P	MON	033N	089W	32	NW1/4SE1/4	0	735	440	-107.52803	42.78696
P31501.0W	11/12/1975	Complete	BS12-1030P	MON	033N	089W	32	NW1/4SE1/4	0	640	435	-107.52803	42.78696
P38619.0W	07/01/1977	Complete	Peach #1	MON	032N	090W	03	NE1/4SE1/4	0	446.4	287	-107.58529	42.77295
P38620.0W	07/01/1977	Complete	Peach #2	MON	032N	090W	03	NE1/4SE1/4	0	240	191	-107.58529	42.77295
P38621.0W	07/01/1977	Complete	Peach #3	MON	032N	090W	03	NE1/4SE1/4	0	400	245	-107.58529	42.77295
P38622.0W	07/01/1977	Complete	Peach #4	MON	032N	090W	03	NE1/4SE1/4	0	290	116	-107.58529	42.77295
P38623.0W	07/01/1977	Complete	Peach #5	MON	032N	090W	03	NE1/4SE1/4	0	420	290	-107.58529	42.77295
P38625.0W	07/01/1977	Complete	Peach #7	MON	032N	090W	03	SE1/4SE1/4	0	310	109	-107.58526	42.7693
P38626.0W	07/01/1977	Complete	Peach #8	MON	032N	090W	10	NW1/4NE1/4	0	420	133.3	-107.58906	42.76653
P38627.0W	07/01/1977	Complete	Peach #9	MON	032N	090W	03	NE1/4NE1/4	0	400	294	-107.58534	42.7804
P40467.0W	08/05/1977	Complete	RHW-1	MON	033N	089W	09	SE1/4SW1/4	0	160	154	-107.51362	42.84118
P41022.0W	11/16/1977	Complete	RHW-3	MON	033N	089W	09	SE1/4SE1/4	0	310	257	-107.50378	42.84119
P41023.0W	11/16/1977	Complete	RHW-5	MON	033N	089W	09	SW1/4SW1/4	0	180	0	-107.51854	42.84117
P45237.0W	09/05/1978	Complete	Peach Piezometer A	MON	032N	090W	11	NW1/4SW1/4	0	452	340	-107.58024	42.75859
P45238.0W	09/05/1978	Complete	Peach Piezometer B	MON	032N	090W	03	SW1/4NW1/4	0	738	240	-107.6002	42.77659
P45239.0W	09/05/1978	Complete	Peach Piezometer C	MON	032N	090W	03	SW1/4SE1/4	0	420	306	-107.58912	42.76928
P45240.0W	09/05/1978	Complete	Peach Piezometer D	MON	032N	090W	10	NW1/4NE1/4	0	540	415.21	-107.58906	42.76653
P45241.0W	09/05/1978	Complete	Peach Piezometer E	MON	032N	090W	02	SW1/4SE1/4	0	414	32	-107.57057	42.76953
P45242.0W	09/05/1978		Peach Piezometer G	MON	032N	090W	10	NW1/4SE1/4	0	691	507	-107.59014	42.75857
P45348.0W	10/02/1978	Complete		MON	032N	090W	03	SW1/4NW1/4	0	400	45	-107.6002	42.77659
P45368.0W	09/26/1978	Complete	Monitor Well GW 7	MON	033N	089W	27	NE1/4SE1/4	0	660	82	-107.48416	42.80125
P45369.0W	09/26/1978	Complete	Monitor Well GW 8	MON	033N	089W	27	NE1/4NE1/4	0	360	98	-107.4842	42.80843
P45370.0W	09/26/1978	Complete	Monitor Well GW 9	MON	033N	089W	28	NE1/4SE1/4	0	325	111	-107.50366	42.80128
P45371.0W	09/26/1978		Monitor Well GW 10	MON	033N	089W	21	SE1/4SE1/4	0	475	153	-107.50368	42.81217
P46773.0W	02/22/1978	Complete	Muskrat P 3	MON	033N	089W	31	SE1/4SW1/4	0	515	194	-107.55263	42.78344
P46774.0W	02/22/1978	Complete	Muskrat P 4	MON	033N	089W	31	NE1/4SW1/4	0	530	244	-107.55259	42.78704

Table 3.4-15 Groundwater Rights within 2 kilometers of Gas Hills

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P46775.0W	02/22/1978	Complete	Muskrat P 2	MON	033N	089W	31	SW1/4SE1/4	0	530	134	-107.54763	42.7834
P46776.0W	02/22/1978	Complete	Muskrat P 1	MON	033N	089W	31	NW1/4SE1/4	0	440	201	-107.54764	42.78701
P67146.0W	04/23/1984	Complete	MW1	MON	033N	089W	10	SW1/4SE1/4	0	79	58.24	-107.48923	42.84099
P67147.0W	04/23/1984		MW2	MON	033N	089W	10	SW1/4SW1/4	0	170	125	-107.49889	42.84115
P67148.0W	04/23/1984		MW4	MON	033N	089W	10	SW1/4SE1/4	0	140	82	-107.48923	42.84099
P67149.0W	04/23/1984		MW6	MON	033N	089W	15	NW1/4SE1/4	0	220	162	-107.48918	42.83011
P67150.0W	04/23/1984		MW7	MON	033N	089W	15	NE1/4SW1/4	0	220	145	-107.49402	42.83018
P67151.0W	04/23/1984		MW8	MON	033N	089W	15	SW1/4NE1/4	0	159	57.15	-107.4892	42.83374
P67152.0W	04/23/1984		MW10	MON	033N	089W	15	SW1/4NE1/4	0	160	95	-107.4892	42.83374
P67156.0W	04/23/1984		MW19	MON	033N	089W	10	SE1/4SE1/4	0	110	67	-107.4844	42.84091
P67157.0W	04/23/1984		MW20	MON	033N	089W	15	NE1/4NE1/4	0	90	65	-107.48439	42.83729
P67158.0W	04/23/1984		MW21	MON	033N	089W	10	SW1/4SW1/4	0	159	-7.00	-107.49889	42.84115
P67160.0W	04/23/1984		GW1	MON	033N	089W	15	SE1/4SW1/4	0	160	105	-107.494	42.82656
P67161.0W	04/23/1984		GW2	MON	033N	089W	15	SE1/4SW1/4	0	158	114	-107.494	42.82656
P67162.0W	04/23/1984		GW3	MON	033N	089W	15	SE1/4SW1/4	0	160	107	-107.494	42.82656
P67163.0W	04/23/1984		GW4	MON	033N	089W	22	NE1/4NW1/4	0	165	112.42	-107.49398	42.82294
P67164.0W	04/23/1984		GW5	MON	033N	089W	15	SW1/4SE1/4	0	160	100	-107.48916	42.82649
P67165.0W	04/23/1984		GW6	MON	033N	089W	22	NW1/4NE1/4	0	121	86.18	-107.48914	42.82288
P67166.0W	04/23/1984	Complete	GW7	MON	033N	089W	15	SE1/4SW1/4	0	190	0.3	-107.494	42.82656
P67167.0W	04/23/1984	Complete	GW8	MON	033N	089W	22	NE1/4NW1/4	0	172	125	-107.49398	42.82294
P67168.0W	04/23/1984		PW1	MON	033N	089W	15	NE1/4SW1/4	0	220	168	-107.49402	42.83018
P67169.0W	04/23/1984		PW2	MON	033N	089W	15	SW1/4SW1/4	0	220	192	-107.49884	42.82663
P67170.0W	04/23/1984		PW3	MON	033N	089W	15	SW1/4SW1/4	0	220	148	-107.49884	42.82663
P67171.0W	04/23/1984	Complete	PW4	MON	033N	089W	22	NE1/4NW1/4	0	230	100	-107.49398	42.82294
P67172.0W	04/23/1984		PW5	MON	033N	089W	22	NE1/4NW1/4	0	160	120.72	-107.49398	42.82294
P67173.0W	04/23/1984		PW6	MON	033N	089W	22	NE1/4NW1/4	0	136	122.39	-107.49398	42.82294
P67174.0W	04/23/1984		PW7	MON	033N	089W	15	SW1/4SE1/4	0	260	-7.00	-107.48916	42.82649
P67175.0W	04/23/1984		EPW1	MON	033N	089W	16	SE1/4SE1/4	0	155	110	-107.50372	42.82667
P67176.0W	04/23/1984		EPW2	MON	033N	089W	22	NW1/4NW1/4	0	115	89	-107.49882	42.82301
P67177.0W	04/23/1984		EPW3	MON	033N	089W	22	NW1/4NW1/4	0	110	70	-107.49882	42.82301
P67178.0W	04/23/1984		DW2	MON	033N	089W	15	SE1/4SW1/4	0	260	140	-107.494	42.82656
P67179.0W	04/23/1984		DW3	MON	033N	089W	15	SW1/4NW1/4	0	228	210	-107.49887	42.83387
P67180.0W	04/23/1984		MW30026	MON	033N	089W	22	NW1/4NW1/4	0	193	77	-107.49882	42.82301
P67181.0W	04/23/1984		RW1	MON	033N	089W	22	NW1/4NW1/4	0	130	87.04	-107.49882	42.82301
P67182.0W	04/23/1984		RW2	MON	033N	089W	22	NW1/4NW1/4	0	120	76	-107.49882	42.82301
P67183.0W	04/23/1984		HW1	MON	033N	089W	15	SW1/4SW1/4	0	267.6	152.35	-107.49884	42.82663
P67184.0W	04/23/1984		HW2	MON	033N	089W	16	NE1/4SE1/4	0	117	104.72	-107.50373	42.83028
P67185.0W	04/23/1984		HW3	MON	033N	089W	15	SW1/4NW1/4	0	135.5	113.34	-107.49887	42.83387
P67186.0W	04/23/1984		HW4	MON	033N	089W	15	SW1/4NW1/4	0	155.4	123.85	-107.49887	42.83387
P67187.0W	04/23/1984		RIM 1	MON	033N	089W	09	SW1/4SW1/4	0	300	179	-107.51854	42.84117
P76332.0W	02/19/1988	Complete	MW25	MON	033N	089W	15	NW1/4NW1/4	0	256	227.5	-107.49888	42.83752
P76334.0W	02/19/1988		MW27	MON	033N	089W	11	SW1/4SW1/4	0	121	41	-107.47955	42.84088
P76996.0W	05/23/1988	Complete	JGW 1	MON	033N	090W	26	SE1/4NE1/4	0	300	136.9	-107.58195	42.80542
P76998.0W	05/23/1988	Complete	JGW 3	MON	033N	090W	26	SW1/4SE1/4	0	200	175.75	-107.58682	42.79933
P77793.0W	08/03/1988	Complete	MW 28	MON	033N	089W	09	SE1/4SE1/4	0	282	178.4	-107.50378	42.84119
P80432.0W	08/04/1989		MW 29	MON	033N	089W	15	NE1/4SW1/4	0	195	188	-107.49402	42.83018

Table 3.4-15 Groundwater Rights within 2 kilometers of Gas Hills

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P80433.0W	08/04/1989		MW 31	MON	033N	089W	15	NE1/4SW1/4	3	180	130.77	-107.49402	42.83018
P80434.0W	08/04/1989		MW 32	MON	033N	089W	15	SE1/4SW1/4	0	160	102	-107.494	42.82656
P80484.0W	08/14/1989	Complete	LA 1	MON	033N	089W	14	SW1/4NW1/4	0	60	43	-107.4795	42.83365
P80485.0W	08/14/1989	Complete	LA 2	MON	033N	089W	14	SW1/4SW1/4	0	165	128.5	-107.47943	42.8264
P80486.0W	08/14/1989	Complete	LA 3	MON	033N	089W	15	SE1/4SE1/4	0	195	183	-107.48433	42.82642
P80487.0W	08/14/1989		LA 4	MON	033N	089W	14	SW1/4SW1/4	0	184.5	145	-107.47943	42.8264
P80488.0W	08/14/1989	Complete	LA 5	MON	033N	089W	22	NW1/4NE1/4	0	128	115	-107.48914	42.82288
P80489.0W	08/14/1989	Complete	LA 6	MON	033N	089W	22	NE1/4NE1/4	0			-107.4843	42.82281
P80490.0W	08/14/1989	Complete	LA 7	MON	033N	089W	23	NW1/4NW1/4	0	105	71.5	-107.47941	42.82279
P82566.0W	04/27/1990		MWI-37	MON	033N	089W	10	SW1/4SW1/4	0	240	222.9	-107.49889	42.84115
P82567.0W	04/27/1990		MWI-38	MON	033N	089W	10	SW1/4SW1/4	0	230	195.88	-107.49889	42.84115
P82568.0W	04/27/1990		MWI-39	MON	033N	089W	10	SW1/4SW1/4	0	253	222	-107.49889	42.84115
P82823.0W	06/28/1990	Complete	Muskrat-MO	MON	033N	089W	31	NE1/4SW1/4	0	381	198	-107.55259	42.78704
P82824.0W	06/28/1990	Complete	Muskrat Pump	MON	033N	089W	31	NW1/4SE1/4	0	455	266	-107.54764	42.78701
P82825.0W	06/28/1990	Complete	Muskrat MP	MON	033N	089W	31	NW1/4SE1/4	0	453	249	-107.54764	42.78701
P84648.0W	03/18/1991		MWI 43	MON	033N	089W	15	NW1/4NW1/4	0	240	194.8	-107.49888	42.83752
P84649.0W	03/18/1991		MWI-44	MON	033N	089W	10	SW1/4SW1/4	0	240	169.22	-107.49889	42.84115
P84650.0W	03/18/1991		MWI-50	MON	033N	089W	15	NE1/4NE1/4	0	240	171	-107.48439	42.83729
P84651.0W	03/18/1991		MWI-51	MON	033N	089W	15	NE1/4NE1/4	0	240	159	-107.48439	42.83729
P84652.0W	03/18/1991		MWI-52	MON	033N	089W	15	NE1/4NE1/4	0	245	144	-107.48439	42.83729
P85345.0W	06/10/1991	Complete	West Muskrat MO-1	MON	032N	090W	02	NW1/4NE1/4	0	345	257.3	-107.57077	42.7801
P85346.0W	06/10/1991		West Muskrat P-1	MON	032N	090W	02	SW1/4NE1/4	0	400	327.15	-107.57071	42.77675
P85347.0W	06/10/1991		West Muskrat M-2	MON	032N	090W	02	SW1/4NE1/4	0	400	331.95	-107.57071	42.77675
P85348.0W	06/10/1991		West Muskrat MO-2	MON	032N	090W	02	SW1/4NE1/4	0	325	272	-107.57071	42.77675
P85349.0W	06/10/1991	Complete	West Muskrat MU-1	MON	032N	090W	02	SW1/4NE1/4	0	614	427.6	-107.57071	42.77675
P85350.0W	06/10/1991	Complete	West Muskrat M-1	MON	032N	090W	02	NW1/4NE1/4	0	400	300.35	-107.57077	42.7801
P85351.0W	06/10/1991	Complete	West Muskrat M-2	MON	032N	090W	02	SW1/4NE1/4	0	390	327.1	-107.57071	42.77675
P91082.0W	03/19/1993	Complete	MW-64	MON	033N	089W	10	SW1/4SW1/4	0	260	160	-107.49889	42.84115
P92914.0W	10/01/1993	Complete	PRI #1	MON	033N	089W	28	SE1/4NE1/4	0	275	153.58	-107.50367	42.80491
P93567.0W	12/10/1993	Complete	LA-8	MON	033N	089W	22	NE1/4NE1/4	0	163	72.9	-107.4843	42.82281
P182674.0W	07/09/2007		Cross MeadowS 12-1	STK	033N	089W	12	SW1/4SW1/4	25			-107.45986	42.84099
P44457.0W	08/02/1978	Fully Adjudicated	Cameron Springs #1	STK	032N	090W	11	NE1/4NE1/4	3	4	0	-107.56564	42.76602
P46378.0W	08/14/1978	Complete	Sage Hen #1	STK	033N	089W	26	SE1/4SE1/4	1	5	-4.00	-107.46452	42.79767
P46389.0W	08/14/1978	Fully Adjudicated	Iron Spring #1	STK	033N	089W	08	SE1/4SW1/4	3	3	-4.00	-107.53338	42.84123
P49333.0W	08/06/1979	Complete	Barrell Springs #1	STK	032N	089W	08	SW1/4SW1/4	1	4	-4.00	-107.52333	42.75531
P71766.0W	01/17/1986	Complete	Beaver Rim #2	STK	033N	089W	27	NE1/4NE1/4	15	10	-4.00	-107.4842	42.80843
P89649.0W	11/01/1982	Fully Adjudicated	Willow Springs Well	STK	033N	090W	34	SW1/4SW1/4	5	190	168	-107.6162	42.78359
P196429.0W	08/09/2011	Incomplete	Gas Hills DDW #1	TST	033N	089W	29	SW1/4NE1/4	0			-107.527925	42.8051
P196430.0W	08/10/2011	Incomplete	Gas Hills DDW #2	TST	032N	090W	03	NE1/4NW1/4	0			-107.594844	42.779986
Water rights information collected from Wyoming State Engineer e-permit database													

Table 3.4-16 Surface Water Rights within 2 kilometers of the Ruth Remote Satellite

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Source Name	Longitude	Latitude
P15536.0S	02/13/2004	Complete	Moore 12-12-4277 Stock Reservoir	STO	042N	077W	12	SW1/4NW1/4	Teamster Draw	-106.06688	43.627467
P15538.0S	02/13/2004	Complete	Moore 23-10-4277 Stock Reservoir	STO	042N	077W	10	NE1/4SW1/4	Hoffa Draw	-106.09877	43.623675
P15539.0S	02/13/2004	Complete	Moore 34-14-4277 Stock Reservoir	STO	042N	077W	14	SW1/4SE1/4	Lone Duck Draw	-106.07519	43.607472
P15540.0S	02/13/2004	Complete	Moore 42-21-4277 Stock Reservoir	STO	042N	077W	21	SE1/4NE1/4	Woody Gulch	-106.11003	43.597806
P15832.0S	08/20/2004	Complete	Moore 41-14-4277 Stock Reservoir	STO	042N	077W	14	NE1/4NE1/4	Lone Tree Draw	-106.07031	43.615861
P15879.0S	02/10/2004	Unadjudicated	Moore 34-15-4277 Stock Reservoir	STO	042N	077W	15	SW1/4SE1/4	Single Draw	-106.08942	43.604333
P15884.0S	03/02/2004	Complete	Moore 11-22-4277 Stock Reservoir	STO	042N	077W	22	NE1/4NW1/4	Lone Tree Draw	-106.10239	43.601889
P15902.0S	03/02/2004	Complete	BLM 23-22-4277 Stock Reservoir	STO	042N	077W	22	NE1/4SW1/4	Tree House Draw	-106.10075	43.593194
P15910.0S	02/23/2004	Complete	Moore 31-15-4277 B Stock Reservoir	STO	042N	077W	15	NW1/4NE1/4	Teamster Draw	-106.09609	43.616808
P16109.0S	05/17/2004	Complete	BLM 24-27-4277 Stock Reservoir	STO	042N	077W	27	SE1/4SW1/4	Star Draw	-106.09904	43.576933
P16271.0S	04/23/2004	Incomplete	Moore 24-26-4277 Stock Reservoir	STO	042N	077W	26	SE1/4SW1/4	Crawford Draw	-106.07989	43.575333
P16281.0S	02/10/2004	Incomplete	Moore 21-14-4277 Stock Reservoir	STO	042N	077W	14	NE1/4NW1/4	Lone Bark Draw	-106.0815	43.616672
P16287.0S	02/10/2004	Incomplete	Moore 14-15-4277 Stock Reservoir	STO	042N	077W	15	SW1/4SW1/4	Lone Stump Draw	-106.10455	43.604947
P16288.0S	02/10/2004	Incomplete	Moore 44-21-4277 Stock Reservoir	STO	042N	077W	21	SE1/4SE1/4	Lone Leaf Draw	-106.11015	43.589681
P16328.0S	05/17/2004	Incomplete	Moore 23-35-4277 Stock Reservoir	STO	042N	077W	35	NE1/4SW1/4	Crawford Draw	-106.08072	43.566028
P16329.0S	05/17/2004	Complete	Moore 33-26-4277 Stock Reservoir	STO	042N	077W	26	NW1/4SE1/4	Red Carpet Draw	-106.07331	43.579389
P16536.0S	01/20/2005	Complete	Colby Stock Reservoir	STO	042N	077W	13	SE1/4NW1/4	Cheese Draw	-106.06296	43.613883
P16586.0S	01/20/2005	Complete	Iberlin Fork Stock Reservoir	STO	042N	076W	6	SE1/4SW1/4	Mouse Nest Draw	-106.04287	43.637785
P16680.0S	01/20/2005	Complete	Lisa Stock Reservoir	STO	042N	077W	25	SE1/4NW1/4	Fan Draw	-106.06076	43.583989
P16697.0S	01/31/2005	Complete	Mark Stock Reservoir	STO	042N	077W	25	NE1/4SW1/4	Pan Draw	-106.06082	43.580231
P16721.0S	01/31/2005	Incomplete	Gale Stock Reservoir	STO	042N	077W	13	SE1/4SE1/4	Can Draw	-106.05067	43.606961
P16722.0S	01/20/2005	Incomplete	Alex Stock Reservoir	STO	042N	077W	13	SE1/4SE1/4	Oil Draw	-106.05067	43.606961
P16723.0S	01/20/2005	Incomplete	Jamie Stock Reservoir	STO	042N	077W	23	NE1/4SW1/4	Lone Duck Draw	-106.08074	43.594861
P17026.0S	01/20/2005	Incomplete	Tommy Stock Reservoir	STO	042N	077W	23	SE1/4NW1/4	T Draw	-106.08077	43.598569
P17414.0S	10/06/2005	Complete	BLM 22-23-4277 Stock Reservoir	STO	042N	077W	23	SE1/4NW1/4	Lone Duck Draw	-106.07908	43.597611
P17968.0S	04/28/2006	Unadjudicated	Jim Moore #2 Stock Reservoir	STO	042N	077W	11	NW1/4NW1/4	Hoffa Draw	-106.08618	43.63186
P18612.0S	07/13/2007	Complete	T42NR76W7SWSW Stock Reservoir	STO	042N	076W	7	SW1/4SW1/4	Holloway Draw	-106.04463	43.620756
P18636.0S	09/12/2007	Complete	T42NR76W19NWNE Stock Reservoir	STO	042N	076W	19	NW1/4NE1/4	Can Draw	-106.03565	43.603461
P19158.0S	02/11/2009	Complete	14-14-4277 Stock Reservoir	STO	042N	077W	14	SW1/4SW1/4	Lone Tree Draw	-106.08642	43.607278
P19305.0S	04/29/2009	Complete	Enl. Moore 11-22-4277 (P15884S)	STO	042N	077W	22	NE1/4NW1/4	Lone Tree Draw	-106.10239	43.601889
P6490.0R	12/11/1958	Unadjudicated	Shearing Pen Stock Reservoir	STO	042N	077W	26	SW1/4NE1/4	Crawford Draw	-106.07578	43.583703
P8432.0R	04/12/1982	Complete	Ruth ISL Retention Reservoir	IND	042N	077W	14	NE1/4SE1/4	Dry Fork Powder River	-106.06984	43.611208
Water rights information collected from Wyoming State Engineer e-permit database.											

Table 3.4-17 Groundwater Rights within 2 kilometers of Ruth Remote Satellite

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P142688.0W	02/12/2002	Complete	BCU State 43-16-4277	CBM	042N	077W	16	NE1/4SE1/4	20	1505	726	-106.11087	43.60949
P160603.0W	07/09/2004	Complete	Moore Trust Fed 21-26-4277	CBM	042N	077W	26	NE1/4NW1/4	100			-106.08072	43.587461
P160617.0W	07/09/2004		Moore Trust Fed 21-27-4277	CBM	042N	077W	27	NE1/4NW1/4	100			-106.10083	43.58745
P160622.0W	07/09/2004	Incomplete	Moore Trust Fed 41-26-4277	CBM	042N	077W	26	NE1/4NE1/4	100			-106.07069	43.587369
P160623.0W	07/09/2004	Incomplete	Moore Trust Fed 32-26-4277	CBM	042N	077W	26	SW1/4NE1/4	100			-106.07578	43.5837
P160624.0W	07/09/2004		Moore Trust Fed 23-26-4277	CBM	042N	077W	26	NE1/4SW1/4	100			-106.08083	43.5801
P160625.0W	07/09/2004	Incomplete	Moore Trust Fed 12-26-4277	CBM	042N	077W	26	SW1/4NW1/4	100			-106.0858	43.583811
P160626.0W	07/09/2004	Incomplete	Moore Trust Fed 41-25-4277	CBM	042N	077W	25	NE1/4NE1/4	100			-106.05059	43.588161
P160628.0W	07/09/2004	Incomplete	Moore Trust Fed 32-25-4277	CBM	042N	077W	25	SW1/4NE1/4	100			-106.05569	43.584231
P160630.0W	07/09/2004	Incomplete	Moore Trust Fed 21-25-4277	CBM	042N	077W	25	NE1/4NW1/4	100			-106.06066	43.587689
P160631.0W	07/09/2004		Moore Trust Fed 14-25-4277	CBM	042N	077W	25	SW1/4SW1/4	100			-106.06591	43.57634
P160632.0W	07/09/2004	Incomplete	Moore Trust Fed 12-25-4277	CBM	042N	077W	25	SW1/4NW1/4	100			-106.06582	43.58375
P160633.0W	07/09/2004		Moore Land Federal 43-22-4277	CBM	042N	077W	22	NE1/4SE1/4	100			-106.0908	43.5949
P160634.0W	07/09/2004		Moore Land Federal 41-22-4277	CBM	042N	077W	22	NE1/4NE1/4	100			-106.09028	43.602089
P160635.0W	07/09/2004		Moore Land Federal 34-22-4277	CBM	042N	077W	22	SW1/4SE1/4	100			-106.09544	43.591078
P160636.0W	07/09/2004		Moore Land Federal 32-22-4277	CBM	042N	077W	22	SW1/4NE1/4	100			-106.09619	43.598019
P160637.0W	07/09/2004		Moore Land Federal 23-22-4277	CBM	042N	077W	22	NE1/4SW1/4	100			-106.10083	43.59483
P160638.0W	07/09/2004		Moore Land Federal 21-22-4277	CBM	042N	077W	22	NE1/4NW1/4	100			-106.1005	43.602158
P160639.0W	07/09/2004		Moore Land Federal 14-22-4277	CBM	042N	077W	22	SW1/4SW1/4	100			-106.10563	43.591119
P160640.0W	07/09/2004		Moore Land Federal 12-22-4277	CBM	042N	077W	22	SW1/4NW1/4	100			-106.10584	43.598469
P160642.0W	07/09/2004	Complete	Moore Land Federal 43-21-4277	CBM	042N	077W	21	NE1/4SE1/4	100			-106.11103	43.594589
P160643.0W	07/09/2004	Complete	Moore Land Federal 41-21-4277	CBM	042N	077W	21	NE1/4NE1/4	100			-106.11082	43.602119
P160648.0W	07/09/2004	Complete	BCU 43-15-4277	CBM	042N	077W	15	NE1/4SE1/4	11	1391	618	-106.09089	43.60967
P160649.0W	07/09/2004	Complete	BCU 41-15-4277	CBM	042N	077W	15	NE1/4NE1/4	12	1405	652	-106.09094	43.61706
P160650.0W	07/09/2004	Complete	BCU 34-15-4277	CBM	042N	077W	15	SW1/4SE1/4	12	1313	582	-106.09586	43.60594
P160651.0W	07/09/2004	Complete	BCU 32-15-4277	CBM	042N	077W	15	SW1/4NE1/4	11	1438	672	-106.09592	43.61333
P160652.0W	07/09/2004	Complete	BCU 23-15-4277	CBM	042N	077W	15	NE1/4SW1/4	11	1407	541	-106.10088	43.6096
P160654.0W	07/09/2004	Complete	BCU 14-15-4277	CBM	042N	077W	15	SW1/4SW1/4	11	1336	519	-106.10584	43.60587
P160656.0W	07/09/2004	Complete	Moore Land Federal 41-14-4277	CBM	042N	077W	14	NE1/4NE1/4	14	1235	335	-106.07079	43.61708
P160657.0W	07/09/2004	Complete	Moore Land Federal 34-14-4277	CBM	042N	077W	14	SW1/4SE1/4	14	1231	394	-106.0758	43.60596
P160658.0W	07/09/2004	Complete	Moore Land Federal 32-14-4277	CBM	042N	077W	14	SW1/4NE1/4	14	1272	313	-106.07582	43.61337
P160659.0W	07/09/2004	Complete	Moore Land Federal 23-14-4277	CBM	042N	077W	14	NE1/4SW1/4	14	1244	322	-106.08084	43.60968
P160660.0W	07/09/2004	Complete	Moore Land Federal 21-14-4277	CBM	042N	077W	14	NE1/4NW1/4	14	1399	504	-106.08088	43.61708
P160661.0W	07/09/2004	Complete	Moore Land Federal 12-14-4277	CBM	042N	077W	14	SW1/4NW1/4	15	1403	469	-106.0859	43.61338
P160662.0W	07/09/2004	Complete	Federal 14-14-4277	CBM	042N	077W	14	SW1/4SW1/4	14	1248	272	-106.08586	43.60599
P160663.0W	07/09/2004		Moore Land Federal 43-11-4277	CBM	042N	077W	11	NE1/4SE1/4	12	1322	646	-106.07087	43.62451
P160664.0W	07/09/2004	Complete	Moore Land Federal 41-11-4277	CBM	042N	077W	11	NE1/4NE1/4	13	1382	872	-106.07098	43.63194
P160665.0W	07/09/2004	Complete	Moore Land Federal 34-11-4277	CBM	042N	077W	11	SW1/4SE1/4	13	1395	731	-106.07587	43.62079
P160666.0W	07/09/2004	Complete	Moore Land Federal 32-11-4277	CBM	042N	077W	11	SW1/4NE1/4	13	1422	864	-106.07599	43.62821
P160667.0W	07/09/2004	Complete	Moore Land Federal 23-11-4277	CBM	042N	077W	11	NE1/4SW1/4	13	1332	585	-106.08098	43.62449
P160668.0W	07/09/2004	Complete	Moore Land Federal 21-11-4277	CBM	042N	077W	11	NE1/4NW1/4	13	1462	530	-106.08111	43.63189
P160669.0W	07/09/2004	Complete	Moore Land Federal 14-11-4277	CBM	042N	077W	11	SW1/4SW1/4	13	1445	640	-106.08597	43.62078
P160670.0W	07/09/2004	Complete	Moore Land Federal 12-11-4277	CBM	042N	077W	11	SW1/4NW1/4	13	1330	487	-106.08611	43.62817
P161866.0W	08/17/2004	Complete	Moore 12-13-4277	CBM	042N	077W	13	SW1/4NW1/4	45	1290		-106.06575	43.6135
P161867.0W	08/17/2004	Complete	Moore 23-12-4277	CBM	042N	077W	12	NE1/4SW1/4	45	1300		-106.06081	43.62486
P161868.0W	08/17/2004	Complete	Moore 34-12-4277	CBM	042N	077W	12	SW1/4SE1/4	45	1213		-106.05576	43.6214

Table 3.4-17 Groundwater Rights within 2 kilometers of Ruth Remote Satellite

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P163401.0W	10/19/2004		Moore Land 32-35-4277	CBM	042N	077W	35	SW1/4NE1/4	60			-106.07589	43.56916
P165745.0W	02/09/2005	Complete	Moore 14-13-4277	CBM	042N	077W	13	SW1/4SW1/4	45	1176		-106.06574	43.60608
P165746.0W	02/09/2005	Complete	Moore 12-24-4277	CBM	042N	077W	24	SW1/4NW1/4	45	1180		-106.06569	43.59863
P165749.0W	02/09/2005	Complete	Moore 23-24-4277	CBM	042N	077W	24	NE1/4SW1/4	45	1149	0	-106.06064	43.59516
P169643.0W	08/24/2005		WPTU 7S-13	CBM	042N	076W	7	SW1/4SW1/4	25			-106.0458	43.62174
P169646.0W	08/24/2005		WPTU 7S-11	CBM	042N	076W	7	NE1/4SW1/4	25			-106.04087	43.62534
P169682.0W	08/25/2005		WPTU Ranch 7S-15	CBM	042N	076W	7	SW1/4SE1/4	25			-106.03582	43.62167
P172043.0W	12/07/2005	Complete	WPTU 18S-11	CBM	042N	076W	18	NE1/4SW1/4	25			-106.04079	43.610778
P172044.0W	12/07/2005	Complete	WPTU 18S-13	CBM	042N	076W	18	SW1/4SW1/4	25			-106.04573	43.60711
P172045.0W	12/07/2005		WPTU 18S-15	CBM	042N	076W	18	SW1/4SE1/4	25			-106.03568	43.60716
P172055.0W	12/07/2005	Complete	WPTU 7S-3	CBM	042N	076W	7	NE1/4NW1/4	25			-106.04138	43.632631
P172056.0W	12/07/2005		WPTU 7S-5	CBM	042N	076W	7	SW1/4NW1/4	25			-106.04584	43.62905
P172057.0W	12/07/2005		WPTU 7S-7	CBM	042N	076W	7	SW1/4NE1/4	25			-106.03585	43.62888
P172196.0W	11/14/2005		Federal (Moore) 41-13-4277	CBM	042N	077W	13	NE1/4NE1/4	45			-106.05072	43.61797
P172197.0W	11/14/2005		Federal (Moore) 34-13-4277	CBM	042N	077W	13	SW1/4SE1/4	45			-106.05569	43.60666
P172198.0W	11/14/2005		Federal (Moore) 32-13-4277	CBM	042N	077W	13	SW1/4NE1/4	45			-106.05572	43.61403
P172199.0W	11/14/2005		Moore Federal 23-13-4277	CBM	042N	077W	13	NE1/4SW1/4	45			-106.06072	43.61007
P172200.0W	11/14/2005		Moore Federal 21-13-4277	CBM	042N	077W	13	NE1/4NW1/4	45			-106.06074	43.61746
P172201.0W	11/14/2005		Federal (Moore) 43-12-4277	CBM	042N	077W	12	NE1/4SE1/4	45			-106.05077	43.62531
P172202.0W	11/14/2005		Moore 41-12-4277	CBM	042N	077W	12	NE1/4NE1/4	45			-106.05081	43.63265
P172203.0W	11/14/2005		Moore Federal 32-12-4277	CBM	042N	077W	12	SW1/4NE1/4	45			-106.05582	43.62877
P172204.0W	11/14/2005		Moore Federal 21-12-4277	CBM	042N	077W	12	NE1/4NW1/4	45			-106.06089	43.63225
P172205.0W	11/14/2005		Moore Federal 14-12-4277	CBM	042N	077W	12	SW1/4SW1/4	45			-106.06579	43.62092
P172213.0W	11/14/2005		Moore Federal 12-12-4277	CBM	042N	077W	12	SW1/4NW1/4	45			-106.06588	43.628339
P172216.0W	11/14/2005		Moore Federal 34-1-4277	CBM	042N	077W	1	SW1/4SE1/4	45			-106.05586	43.63609
P172220.0W	11/14/2005		Moore Federal 14-1-4277	CBM	042N	077W	1	SW1/4SW1/4	45			-106.0659	43.63576
P172229.0W	11/14/2005		Moore Federal 43-24-4277	CBM	042N	077W	24	NE1/4SE1/4	45			-106.05061	43.59567
P172230.0W	11/14/2005		Federal (Moore) 41-24-4277	CBM	042N	077W	24	NE1/4NE1/4	45			-106.05065	43.60323
P172231.0W	11/14/2005		Moore Federal 34-24-4277	CBM	042N	077W	24	SW1/4SE1/4	45			-106.0556	43.59165
P172232.0W	11/14/2005		Federal(Moore) 32-24-4277	CBM	042N	077W	24	SW1/4NE1/4	45			-106.05565	43.59918
P172235.0W	11/14/2005		Federal (Moore) 43-13-4277	CBM	042N	077W	13	NE1/4SE1/4	45			-106.05069	43.61063
P172330.0W	11/14/2005		Iberlin Federal 14-6-4276	CBM	042N	076W	6	SW1/4SW1/4	45			-106.04588	43.6363
P174890.0W	05/15/2006		Federal 14-23-4277	CBM	042N	077W	23	SW1/4SW1/4	100			-106.08606	43.5914
P174891.0W	05/15/2006		Federal 21-23-4277	CBM	042N	077W	23	NE1/4NW1/4	100			-106.08154	43.6019
P174892.0W	05/15/2006	Complete	Federal 23-23-4277	CBM	042N	077W	23	NE1/4SW1/4	100			-106.07916	43.594739
P174893.0W	05/15/2006		Moore Land Fed 32-23-4277	CBM	042N	077W	23	SW1/4NE1/4	100			-106.07574	43.59854
P174894.0W	05/15/2006		Moore Land Fed 34-23-4277	CBM	042N	077W	23	SW1/4SE1/4	100			-106.07568	43.59112
P174895.0W	05/15/2006	Complete	Moore Land Fed 43-23-4277	CBM	042N	077W	23	NE1/4SE1/4	100			-106.07068	43.5948
P174897.0W	05/15/2006	Incomplete	Federal 14-27-4277	CBM	042N	077W	27	SW1/4SW1/4	100			-106.10585	43.57636
P174898.0W	05/15/2006	Incomplete	Federal 23-27-4277	CBM	042N	077W	27	NE1/4SW1/4	100			-106.10085	43.58008
P174899.0W	05/15/2006		Moore Land Fed 32-27-4277	CBM	042N	077W	27	SW1/4NE1/4	100			-106.09582	43.58379
P174900.0W	05/15/2006		Moore Land Fed 41-27-4277	CBM	042N	077W	27	NE1/4NE1/4	100			-106.09078	43.58751
P176009.0W	07/17/2006		Federal 34-2-4277	CBM	042N	077W	2	SW1/4SE1/4	100			-106.076	43.63563
P187427.0W	05/15/2008	Complete	WPTU 19S-15	CBM	042N	076W	19	SW1/4SE1/4	25			-106.03557	43.591661
P187428.0W	05/15/2008	Complete	WPTU 19S-13	CBM	042N	076W	19	SW1/4SW1/4	25			-106.04568	43.591553
P187429.0W	05/15/2008	Complete	WPTU 19S-11	CBM	042N	076W	19	NE1/4SW1/4	25	1281	296	-106.04064	43.596061

Table 3.4-17 Groundwater Rights within 2 kilometers of Ruth Remote Satellite

Water Right Number	Priority Date	Water Right Status	Facility Name	Uses	T	R	Sec	Qtr/Qtr	Total Flow	Total Depth (ft)	Static Water Level (ft)	Longitude	Latitude
P187431.0W	05/15/2008	Complete	WPYU 19S-7	CBM	042N	076W	19	SW1/4NE1/4	25			-106.03563	43.599214
P187432.0W	05/15/2008	Incomplete	WPTU 19S-5	CBM	042N	076W	18	SW1/4NW1/4	25			-106.0458	43.613961
P187433.0W	05/15/2008	Complete	WPTU 19S-3	CBM	042N	076W	19	NE1/4NW1/4	25	1365	896	-106.04076	43.603239
P192375.0W	01/25/2010	Incomplete	Moore Federal 21-24-4277	CBM	042N	077W	24	NE1/4NW1/4	45			-106.06059	43.602144
P192376.0W	01/25/2010	Incomplete	Moore Federal 14-24-4277	CBM	042N	077W	24	SW1/4SW1/4	45			-106.06565	43.590719
P160627.0W	07/09/2004		Moore Trust Fed 34-25-4277	CBM; MIS	042N	077W	25	SW1/4SE1/4	100			-106.05581	43.57665
P151115.0W	05/05/2003	Complete	1 Ranch 18S-5	CBM; STK	042N	076W	18	SW1/4NW1/4	25	1500	195	-106.04576	43.61443
P151338.0W	05/12/2003	Complete	Moore Land 14-2-4277	CBM; STK	042N	077W	2	SW1/4SW1/4	13	1481	646	-106.08614	43.63556
P151343.0W	05/12/2003	Complete	Moore Land 43-14-4277	CBM; STK	042N	077W	14	NE1/4SE1/4	15	1217	85	-106.07077	43.60966
P151344.0W	05/12/2003	Complete	Moore Land 41-23-4277	CBM; STK	042N	077W	23	NE1/4NE1/4	75			-106.07114	43.601708
P152882.0W	07/25/2003	Complete	BCU Gibson 43-10-4277	CBM; STK	042N	077W	10	NE1/4SE1/4	19	1444	606	-106.09107	43.62444
P152883.0W	07/25/2003	Complete	BCU Gibson 41-10-4277	CBM; STK	042N	077W	10	NE1/4NE1/4	20	1409	606	-106.09121	43.63183
P152884.0W	07/25/2003	Complete	BCU Gibson 34-10-4277	CBM; STK	042N	077W	10	SW1/4SE1/4	18.5	1471	723	-106.096	43.62071
P152885.0W	07/25/2003	Complete	BCU Gibson 32-10-4277	CBM; STK	042N	077W	10	SW1/4NE1/4	20	1578	660	-106.09615	43.6281
P169688.0W	08/25/2005		WPTU 18S-3	CBM; STK	042N	076W	18	NE1/4NW1/4	25			-106.04083	43.61807
P169690.0W	08/25/2005	Complete	WPTU 18S-7	CBM; STK	042N	076W	18	SW1/4NE1/4	25	1477	416	-106.03576	43.614408
P25860.0P	12/31/1941	Complete	UT Windmill	DOM; STK	042N	077W	25	NE1/4SE1/4	1	-1	-6	-106.05062	43.58077
P49731.0W	08/13/1979	Complete	Uranerz 42-77-14-4M-20	MON	042N	077W	14	NE1/4SE1/4	0	561	-6	-106.07077	43.60966
P54187.0W	10/20/1980	Complete	Uranerz 42-77-13-1-M-20	MON	042N	077W	13	SW1/4SW1/4	0	540	-6	-106.06574	43.60608
P54188.0W	10/20/1980	Complete	Uranerz 42-77-14-8-M-20	MON	042N	077W	14	NE1/4SE1/4	0	556	-6	-106.07077	43.60966
P14652.0P	10/31/1964	Complete	Taylor #23-2	STK	042N	076W	6	SE1/4SW1/4	3	275	100	-106.04092	43.6362
P25843.0P	09/12/1951	Complete	Sorry Spring #1	STK	042N	077W	10	SW1/4SE1/4	0.5	5	4	-106.096	43.62071
P25846.0W	12/29/1972	Complete	Mark #1	STK	042N	076W	31	NE1/4NW1/4	3	1000	-6	-106.04061	43.57359
P25850.0P	12/14/1960	Complete	Middle Creek Well	STK	042N	077W	24	NE1/4SW1/4	3	530	-6	-106.06064	43.59516
P25851.0P	12/07/1960	Complete	Buck Pasture Well #1	STK	042N	076W	19	SE1/4SW1/4	2	812	-6	-106.04067	43.59212
P25852.0P	06/01/1953	Complete	Red Rock Shed	STK	042N	077W	14	NE1/4NE1/4	1.5	460	-6	-106.07079	43.61708
P25853.0W	12/29/1972	Complete	Jamie #1	STK	042N	077W	12	NE1/4NW1/4	3	560	-6	-106.06089	43.63225
P25856.0P	12/30/1954	Complete	South Bullwhacker #1	STK	042N	077W	22	NE1/4SW1/4	1	720	-6	-106.10083	43.59483
P25857.0P	07/26/1967	Complete	N Shearing Pens	STK	042N	077W	23	NE1/4SW1/4	7.5	585	6	-106.08074	43.59486
P25858.0P	04/14/1947	Complete	Shearing Pens Well #1	STK	042N	077W	26	NW1/4SE1/4	3	200	-6	-106.07586	43.58004
P63601.0W	04/06/1983	Complete	West Shearing Pens #1	STK	042N	077W	27	NW1/4SE1/4	0.5	1945	-4	-106.09584	43.58012
Water rights information collected from Wyoming State Engineer e-permit database													

Table 3.6-1 AQS Data

	Year	CO	NH_3	NOx	PM_{10}	$PM_{2.5}$	SO_2	VOC	All
Fuel Combustion – Electric Utility	2002	7,309	386	85,236	9,602	7,938	83,415	872	194,758
Fuel Combustion – Industrial	2002	13,922	71	31,180	1,203	482	27,781	1,688	76,326
Fuel Combustion – Other	2002	11,522	9	2,059	2,085	1,466	2,569	3,306	23,017
Chemical and Allied Product Mfg.	2002	290	0	1,359	9,434	8,749	4,814	2,493	27,139
Metals Processing	2002	12	0	804	467	214	8	85	1,591
Petroleum and Related Industries	2002	3,789	0	2,495	558	356	4,021	7,063	18,282
Other Industrial Processes	2002	5,507	303	2,345	18,696	6,690	349	5,995	39,884
Solvent Utilization	2002	0	0	0	0	0	0	4,668	4,668
Storage and Transport	2002	14	0	5	1,387	379	0	6,442	8,227
Waste Disposal and Recycling	2002	4,901	2	234	890	802	43	740	7,581
Highway Vehicles	2002	246,059	893	32,643	799	606	905	18,072	299,977
Off-Highway Vehicles	2002	58,309	13	35,839	1,555	1,516	2,647	10,657	110,536
Miscellaneous Sources	2002	97,703	20,175	961	391,317	46,587	682	22,468	579,893
	Sum	**449,337**	**21,852**	**195,160**	**437,963**	**75,785**	**127,234**	**84,549**	**1,391,879**

Table 3.6-2 Cameco Global Reporting Initiative Reporting

GRI Indicators	Units	2009	2010	2011
ENC[1]	**GJoules**	**2,800,000**	**2,700,000**	**3,000,000**
EN4[2]	**GJoules**	**1,500,000**	**1,600,000**	**1,650,000**
EN16[3] (direct and indirect)	**Tonnes CO2e**	**475,000**	**475,000**	**500,000**
EN20[4]	**NOx (kg)**	**275,878**	**287,306**	**353,396**
	SOx (as SO2) (kg)	**346,782**	**210,542**	**313,569**
	NH_3 (kg)	**101,057**	**76,924**	**67,436**

Notes:

1. **EN3 – Direct Energy Use (by primary source)**
2. **EN4 – Indirect Energy Use (by primary source)**
3. **EN16 – GHG Emissions (by weight)**
4. **EN20 – Air Emissions (by type and weight)**

Table 3.9-1 Scenic Quality Inventory and Evaluation for Smith Ranch

Key Factor	Rating Criteria	Score
Landform	Low rolling hills; few interesting landscape features.	1
Vegetation	Very little variety and contrast in the vegetation; vegetation consists mostly of grassy plains, sparse sagebrush, and some trees.	1
Water	Any water sources present are not noticeable.	0
Color	Mostly muted tones; very little contrast or variations in the color.	1
Influence of Adjacent Scenery	Adjacent scenery has little or no influence on the overall visual quality of the project site.	0
Scarcity	All scenic characteristics are interesting within their settings, but are very common within the region.	1
Cultural Modifications	Modifications add very little visual variety to the area and introduce very few discordant elements.	1
	Total Score	**5**

Table 3.9-2 Scenic Quality Inventory and Evaluation for the North Butte Remote Satellite

Key Factor	Rating Criteria	Score
Landform	Low rolling hills and several creek beds; few interesting landscape features.	1
Vegetation	Little contrast or variety in vegetation; no more than a couple of types of vegetation.	1
Water	Flowing or still, but not dominant in the landscape.	3
Color	Some variety in colors and contrast of soil, rock, and vegetation, but not a dominant scenic element.	3
Influence of Adjacent Scenery	Adjacent scenery greatly enhances the visual quality as expressed by the neighboring buttes which are dominant in the landscape.	5
Scarcity	Adjacent butte is distinctive, though somewhat similar to the neighboring buttes. Neighboring buttes are scarce in the region however.	4
Cultural Modifications	Modifications add little or no visual variety to the area and introduce no discordant elements.	0
	Total Score	17

Table 3.9-3 Scenic Quality Inventory and Evaluation for the Gas Hills Remote Satellite

Key Factor	Rating Criteria	Score
Landform	Low rolling hills; primary interesting feature is the Beaver Rim, which is located approximately 16 km (10 miles) from the site boundary.	2
Vegetation	Very little variety and contrast in the vegetation; vegetation consists mostly of grassy plains and sparse sagebrush.	1
Water	Any water sources present are not visible.	0
Color	Mostly muted tones; very little contrast or variations in the color.	1
Influence of Adjacent Scenery	Adjacent scenery moderately enhances the visual quality as expressed by the neighboring Beaver Rim, which is dominate in the landscape.	3
Scarcity	The Beaver Rim is distinctive, yet somewhat similar to other rims off in the distance from the satellite.	3
Cultural Modifications	Modifications add little or no visual variety to the area, and introduce no discordant elements.	0
	Total Score	10

Table 3.9-4 Scenic Quality Inventory and Evaluation for the Ruth Remote Satellite

Key Factor	Rating Criteria	Score
Landform	Low rolling hills; few interesting landscape features	1
Vegetation	Very little variety and contrast in the vegetation; vegetation consists mostly of grassy plains, sparse sagebrush, and some trees	1
Water	Any water sources are not noticeable	0
Color	Mostly muted tones; very little contrast or variations in the color	1
Influence of Adjacent Scenery	Adjacent scenery has little or no influence on the overall visual quality of the project site	1
Scarcity	All scenic characteristics are interesting within their settings, but are very common within the region	1
Cultural Modifications	Modifications add very little visual variety to the area and introduce very few discordant elements	0
	Total Score	5

Table 3.10-1 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of Smith Ranch

State / County / City	Year								Average Annual Percent Change						
	1980	1990	2000	2002	2004	2006	2008	2010	1980/1990	1990/2000	2000/2002	2002/2004	2004/2006	2006/2008	2008/2010
Wyoming	469,557	453,588	493,782	498,973	505,534	515,004	532,668	563,626	-0.3	8.9	1.0	1.3	1.9	3.4	5.8
Campbell	24,367	29,370	33,698	36,142	36,629	38,934	41,473	46,133	20.5	14.7	7.3	1.3	6.3	6.5	11.2
Douglas	-	-	5,317	5,340	5,373	5,539	5,971	6,120	-	-	0.4	0.6	3.1	7.8	2.5
Gillette	12,134	17,635	19,646	21,819	22,174	-	26,871	29,087	45.3	11.4	11.1	1.6	-	-	8.2
Wright	-	1,236	1,347	1,426	1,408	-	1,462	1,807	-	9.0	5.9	-1.3	-	-	23.6
Converse	14,069	11,128	12,052	12,352	12,501	12,866	13,267	13,833	-20.9	8.3	2.5	1.2	2.9	3.1	4.3
Glenrock	2,736	2,153	2,231	2,290	2,302	-	2,423	2,576	-21.3	3.6	2.6	0.5	-	-	6.3
Rolling Hills	-	330	449	460	461	-	505	440	-	36	2.5	0.2	-	-	-12.9
Johnson	6,700	6,145	7,075	7,412	7,609	8,014	8,464	8,569	-8.3	15.1	4.8	2.7	5.3	5.6	1.2
Kaycee	271	256	249	261	269	-	290	263	-5.5	-2.7	4.8	3.1	-	-	-9.3
Natrona	71,856	61,226	66,533	67,509	68,989	70,401	73,129	74,809	-14.8	8.7	1.5	2.2	2.0	3.9	2.3
Casper	-	-	49,729	50,116	50,969	51,971	54,047	55,316	-	-	0.8	1.7	2.0	4.0	2.3
Bar Nunn	-	835	936	955	1,139	1,521	1,828	2,213	-	12.1	2.0	19.3	33.5	20.2	21.1
Edgerton	510	247	169	170	172	-	176	195	-	-31.6	0.6	1.2	-	-	10.8
Midwest	638	495	408	411	427	-	435	404	-22.4	-17.6	0.7	3.9	-	-	-7.1
Niobrara County	2,924	2,499	2,407	2,266	2,283	2,253	2,428	2,484	-14.5	-3.7	-5.9	-7.5	-1.3	7.8	2.3
Source: U.S. Department of Commerce, Bureau of the Census, 2010c: U.S. Department of Commerce, Bureau of Census: State and County Quickfacts, 2000-2010b															

Table 3.10-2 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of Smith Ranch

Area	Age	Male	Female	Total	Total Percent Breakdown
State of Wyoming	Under 5	20,705	19,636	40,341	6.8
	5-19	56,073	51,853	107,926	18.2
	20-39	79,370	71,476	150,846	25.5
	40-64	146,380	87,983	234,363	39.6
	65+	27,586	30,474	58,060	9.8
	Total	330,114	261,422	591,536	100.0
Campbell County	Under 5	2,040	2,023	4,063	8.8
	5-19	5,336	4,828	10,164	22.0
	20-39	7,572	6,487	14,059	30.5
	40-64	8,112	7,119	15,231	33.0
	65+	1,198	1,418	2,616	5.7
	Total	24,258	21,875	46,133	100.0
Converse County	Under 5	519	451	970	7.0
	5-19	1,470	1,399	2,869	20.7
	20-39	1,648	1,601	3,249	23.5
	40-64	2,555	2,414	4,969	35.9
	65+	825	951	1,776	12.8
	Total	7,017	6,816	13,833	100.0
Johnson County	Under 5	318	255	573	6.7
	5-19	744	735	1,479	17.3
	20-39	930	868	1,798	21.0
	40-64	1,601	1,530	3,131	36.5
	65+	772	816	1,588	18.5
	Total	4,365	4,204	8,569	100.0
Natrona County	Under 5	2,770	2,607	5,377	7.1
	5-19	7,538	7,182	14,720	19.5
	20-39	10,578	9,876	20,554	27.2
	40-64	12,919	12,488	25,407	33.7
	65+	4,077	5,315	9,392	12.4
	Total	37,982	37,468	75,450	100.0
Niobrary County	Under 5	46	50	96	3.9
	5-19	236	178	414	16.7
	20-39	206	349	555	22.3
	40-64	436	470	906	36.5
	65+	235	278	513	20.7
	Total	1,159	1,325	2,484	100.0
Source: U.S. Department of Commerce, Bureau of the Census 2010b					

Table 3.10-3 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of Smith Ranch

Area	Census 2010	Projected 2015	Projected 2020	Projected 2025	Projected 2030
Wyoming	563,626	594,710	622,360	644,050	668,830
Campbell County	46,133	51,790	56,890	61,350	66,060
Converse County	13,833	15,050	15,950	16,610	17,270
Johnson County	8,569	8,940	9,450	9,910	10,450
Natrona County	75,450	79,020	82,490	85,190	88,320
Niobrara County	2,484	2,590	2,660	2,690	2,710
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2011					

Table 3.10-4 2010 Population within the 80 kilometer Radius of Smith Ranch

Sector	Radius in km													Total
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	
N	0	0	0	0	0	0	2	0	0	0	4	6	1,474	1,486
NNE	0	0	0	0	0	0	0	0	20	12	0	8	8	48
NE	0	0	0	0	0	0	0	0	10	0	0	0	6	16
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	2	0	1,787	0	0	2	0	1,791
ESE	0	0	0	0	0	0	0	0	14	0	0	2	0	16
SE	0	0	0	0	0	0	0	0	4	70	10	30	6	120
SSE	0	0	0	0	0	0	0	18	0	5,665	2	2	34	5,721
S	0	0	0	0	0	0	0	32	0	8	8	0	0	48
SSW	0	0	0	0	0	0	4	2	0	0	0	0	0	2
SW	0	0	0	0	0	0	0	2,932	0	14	0	321	2	3,269
WSW	0	0	0	0	0	0	0	0	865	243	56,230	4,357	170	61,865
W	0	0	0	0	0	0	4	0	4	0	324	0	16	348
WNW	0	0	0	0	0	0	0	0	0	0	8	0	0	8
NW	0	0	0	0	0	0	0	0	2	0	4	615	41	664
NNW	0	0	0	0	0	0	0	0	4	0	0	8	2	14
Total	0	0	0	0	0	0	12	2,984	2,710	6,012	56,590	5,351	1,759	75,420
Notes: Each town from 0 to 80 km from the mine site was assigned its population value according to the 2010 Census and the intercensal year 2007. All ranches and individual homes between these towns were counted individually using aerial photos, dated 2009. The population was estimated with the average household size in 2010 for each individual house (two persons per house), and was doubled for the average household size for each ranch (four persons per ranch). See section 3.10.1 for a detailed description of the methodology.														

Table 3.10-5 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Converse County

	State of Wyoming		Converse County	
Industry	**Number of Employees**	**%**	**Number of Employees**	**%**
Labor Force	290,502	70.3	7,189	71.1
Armed Forces	3,759	0.9	70	0.0
Civilian Labor Force	286,743	69.4	7,189	71.1
Employed	273,892	66.3	6,901	68.3
Unemployed	12,851	3.1	288	2.9
Not in Labor Force	122,631	29.7	2,916	28.9
Agriculture, Fishing, Forestry, and Mining	31,999	11.7	1,720	24.9
Construction	24,230	8.8	606	8.8
Manufacturing	13,500	4.9	297	4.3
Transportation, Warehousing, and Public Utilities	18,011	6.6	642	9.3
Information	4,408	1.6	71	1.0
Wholesale Trade	6,482	2.4	106	1.5
Retail Trade	31,534	11.5	459	6.7
Finance, Insurance, and Real Estate	11,952	4.4	402	5.8
Professional, Scientific, Management, Administrative, and Waste Management	17,606	6.4	266	3.9
Educational Services, Health Care, Social Assistance	58,226	21.3	1,340	19.4
Arts, Entertainment, Recreation, Accommodation, and Food Services	27,679	10.1	501	7.3
Other Services, Except Public Administration	11,752	4.3	217	3.1
Public Administration	16,513	6.0	274	4.0
Occupation				
Managerial and Professional Specialty	84,131	30.7	1,949	28.2
Sales and Office	61,729	22.5	1,348	19.5
Service	47,141	17.2	986	14.3
Farming, Forestry, and Fishing	3,813	1.4	236	3.4
Construction, Extraction, Maintenance, and Repair	41,170	15.0	1,325	19.2
Production, Transportation, and Material Moving	35,908	13.1	1,057	15.3
Source: U.S. Department of Commerce, Bureau of the Census, 2009				

Table 3.10-6 Labor Force Statistics for Locations within the 80 kilometer Area Surrounding Smith Ranch

Location/Year	Civilian Labor Force	Employed	Unemployed	Unemployment Rate (%)
Wyoming				
2000	254,508	241,055	13,453	5.3
2005-2009 Estimates	286,743	273,892	12,851	4.5
Campbell County				
2000	18,805	17,975	830	4.4
2005-2009 Estimates	24,314	23,286	1,210	4.0
Converse County				
2000	6,244	5,951	288	4.6
2005-2009 Estimates	7,185	6,902	404	4.0
Johnson County				
2000	3,472	3,242	209	6.1
2005-2009 Estimates	4,126	3,965	110	1.7
Natrona County				
2000	35,081	33,213	1,811	5.2
2005-2009 Estimates	38,888	37,084	2,649	4.7
Niobrara County				
2000	1,193	1,153	40	3.4
2005-2009 Estimates	1,223	1,208	25	1.3
Casper				
2000	26,343	25,003	1,298	4.9
2005-2009 Estimates	28,525	27,160	1,943	4.7
Douglas				
2000	2,736	2,637	99	3.6
2005-2009 Estimates	3,137	3,044	128	2.9
Gillette				
2000	10,991	10,494	497	4.5
2005-2009 Estimates	15,459	14,707	828	4.4
Glenrock				
2000	1,658	1,012	58	5.4
2005-2009 Estimates	1,527	1,460	92	4.5
Kaycee				
2000	116	116	0	0.0
2005-2009 Estimates	165	165	0	0.0
Wright				
2000	756	735	21	2.8
2005-2009 Estimates	620	602	23	2.9
Source: U.S. Department of Commerce, Bureau of the Census, 2009b				

Table 3.10-7 Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties within an 80 kilometer Radius of Smith Ranch

	Apartment[1]		Mobile Home Lot[2]		House[3]		Mobile Home[4]		Housing Unit Estimate	Rental Vacancy		
	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change		Total	Vacant Units	Vacancy Rate
Wyoming	$651	0.4	$281	1.6	$928	3.0	$619	-1.9	-	-	-	-
Campbell County	$717	-7.4	$377	4.1	$1,222	0.9	$860	-8.2	16,085	2,318	289	8.61
Converse County	$555	-6.5	$191	3.2	$735	7.8	$668	17.5	3,806	172	14	8.14
Johnson County	$603	1.7	$245	NA	$823	-3.6	$618	4.0	1,353	120	11	9.17
Natrona County	$676	-1.1	$314	18.4	$1,035	1.9	$598	-1.4	4,758	173	11	6.36
Niobrara County	$435	0.6	NA	NA	$582	2.7	NA	NA	3,357	89	1	1.12

Source: Wyoming Community Development Authority, 2010; 2011

[1]Two-bedroom, unfurnished, excluding gas and electric.

[2]Single-wide, including water.

[3]Two- or three-bedroom, single family, excluding gas and electric.

[4]Total monthly rental expense, including lot rent.

Table 3.10-8 Personal Income Levels for Smith Ranch and Nearby Communities

State / County / City	Median Earnings for Full-Time Year-Round Workers		Median Household Income	Median Family Income	Per Capita Income
	Women	Men			
Wyoming	46,875	30,047	51,990	63,245	26,925
Campbell County	35,589	57,886	74,757	82,626	30,319
Converse County	28,867	51,053	55,240	66,494	26,658
Johnson County	30,200	39,162	42,849	56,531	24,111
Natrona County	30,093	45,159	50,382	62,869	27,261
Niobrara County	29,185	40,385	43,580	58,000	23,582
Casper	30,505	45,910	48,607	62,773	19,409
Douglas	27,028	53,685	51,488	67,625	17,634
Edgerton	14,375	24,583	28,750	33,750	14,331
Glenrock	35,541	49,474	63,472	71,116	17,088
Midwest	20,625	28,000	30,000	33,125	12,891
Wright	37,361	70,703	84,345	86,136	20,126
Source: U.S. Department of Commerce, Bureau of the Census: American FactFinder, 2000-2010a					

Table 3.10-9 State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of Smith Ranch

Neighboring Counties	Use Tax		Sales Tax		Gross Revenue
	State	Local	State	Local	
Campbell	$15,898,351	$4,456,008	$126,102,084	$36,984,996	$183,441,439
Converse	$2,458,154	$614,198	$19,055,836	$5,763,951	$26,892,139
Johnson	$632,502	$157,787	$12,586,211	$3,146,566	$16,523,066
Natrona	$7,800,467	$1,949,753	$81,932,735	$20,482,918	$112,165,873
Niobrara	$225,100	$92,679	$1,674,976	$723,646	$2,716,401
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2009					

Table 3.10-10 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of the North Butte Remote Satellite

State / County / City	Year								Average Annual Percent Change						
	1980	1990	2000	2002	2004	2006	2008	2010	1980/1990	1990/2000	2000/2002	2002/2004	2004/2006	2006/2008	2008/2010
Wyoming	469,557	453,588	493,782	498,973	505,534	515,004	532,668	563,626	-0.3	8.9	1.0	1.3	1.9	3.4	5.8
Campbell	24,367	29,370	33,698	36,142	36,629	38,934	41,473	46,133	20.5	14.7	7.3	1.3	6.3	6.5	11.2
Gillette	12,134	17,635	19,646	21,819	22,174	-	26,871	29,087	45.3	11.4	11.1	1.6	-	-	8.2
Wright	-	1,236	1,347	1,426	1,408	-	1,462	1,807	-	9.0	5.9	-1.3	-	-	23.6
Converse	14,069	11,128	12,052	12,352	12,501	12,866	13,267	13,833	-20.9	8.3	2.5	1.2	2.9	3.1	4.3
Johnson	6,700	6,145	7,075	7,412	7,609	8,014	8,464	8,569	-8.3	15.1	4.8	2.7	5.3	5.6	1.2
Kaycee	271	256	249	261	269	-	290	263	-5.5	-2.7	4.8	3.1	-	-	-9.3
Natrona	71,856	61,226	66,533	67,509	68,989	70,401	73,129	74,809	-14.8	8.7	1.5	2.2	2.0	3.9	2.3
Edgerton	510	247	169	170	172	-	176	195	-	-31.6	0.6	1.2	-	-	10.8
Midwest	638	495	408	411	427	-	435	404	-22.4	-17.6	0.7	3.9	-	-	-7.1
Source: U.S. Department of Commerce, Bureau of the Census, 2010c: U.S. Department of Commerce, Bureau of Census: State and County Quickfacts, 2000-2010b															

Table 3.10-11 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of the North Butte Remote Satellite

Area	Age	Male	Female	Total	Total Percent Breakdown
State of Wyoming	Under 5	20,705	19,636	40,341	6.8
	5-19	56,073	51,853	107,926	18.2
	20-39	79,370	71,476	150,846	25.5
	40-64	146,380	87,983	234,363	39.6
	65+	27,586	30,474	58,060	9.8
	Total	330,114	261,422	591,536	100.0
Campbell County	Under 5	2,040	2,023	4,063	8.8
	5-19	5,336	4,828	10,164	22.0
	20-39	7,572	6,487	14,059	30.5
	40-64	8,112	7,119	15,231	33.0
	65+	1,198	1,418	2,616	5.7
	Total	24,258	21,875	46,133	100.0
Converse County	Under 5	519	451	970	7.0
	5-19	1,470	1,399	2,869	20.7
	20-39	1,648	1,601	3,249	23.5
	40-64	2,555	2,414	4,969	35.9
	65+	825	951	1,776	12.8
	Total	7,017	6,816	13,833	100.0
Johnson County	Under 5	318	255	573	6.7
	5-19	744	735	1,479	17.3
	20-39	930	868	1,798	21.0
	40-64	1,601	1,530	3,131	36.5
	65+	772	816	1,588	18.5
	Total	4,365	4,204	8,569	100.0
Natrona County	Under 5	2,770	2,607	5,377	7.1
	5-19	7,538	7,182	14,720	19.5
	20-39	10,578	9,876	20,554	27.2
	40-64	12,919	12,488	25,407	33.7
	65+	4,077	5,315	9,392	12.4
	Total	37,982	37,468	75,450	100.0
Source: U.S. Department of Commerce, Bureau of the Census 2010b					

Table 3.10-12 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of the North Butte Remote Satellite

Area	Census 2010	Projected 2015	Projected 2020	Projected 2025	Projected 2030
Wyoming	563,626	594,710	622,360	644,050	668,830
Campbell County	46,133	51,790	56,890	61,350	66,060
Converse County	13,833	15,050	15,950	16,610	17,270
Johnson County	8,569	8,940	9,450	9,910	10,450
Natrona County	75,450	79,020	82,490	85,190	88,320
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2011					

Table 3.10-13 2010 Population within the 80 kilometer Radius of the North Butte Remote Satellite

Sector	Radius in km													Total
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	
N	0	0	0	0	0	0	4	8	0	8	2	0	0	22
NNE	0	0	0	0	0	0	8	16	20	56	114	29,091	0	29,305
NE	0	0	0	0	0	0	24	32	10	24	80	1,284	10	1,464
ENE	0	0	0	0	0	0	0	2	0	76	2	0	12	92
E	0	0	0	0	0	0	0	4	1,787	32	4	4	4	1,835
ESE	0	0	0	0	0	0	6	4	14	4	0	4	4	36
SE	0	4	0	0	0	0	4	0	4	0	12	4	0	28
SSE	0	0	0	0	0	0	0	0	0	4	8	4	0	16
S	0	0	0	0	0	0	0	0	0	2	0	0	0	2
SSW	0	0	0	0	0	0	4	2	0	194	8	0	0	210
SW	0	0	0	0	0	0	0	44	0	394	20	2	0	460
WSW	0	0	0	0	0	0	2	2	865	2	0	4	8	883
W	0	0	0	0	0	4	0	4	4	2	280	10	14	318
WNW	0	0	0	0	0	0	0	12	0	0	0	16	8	36
NW	0	0	0	0	0	0	0	0	0	0	0	32	124	156
NNW	0	0	0	0	0	0	0	0	0	0	0	16	12	28
Total	0	4	0	0	0	4	52	130	2,704	798	530	30,471	196	34,891
Notes: Each town from 0 to 80 km from the mine site was assigned its population value according to the 2010 Census and the intercensal year 2007. All ranches and individual homes between these towns were counted individually using aerial photos, dated 2009. The population was estimated with the average household size in 2010 for each individual house (two persons per house), and was doubled for the average household size for each ranch (four persons per ranch). See section 3.10.1 for a detailed description of the methodology.														

Table 3.10-14 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Campbell County

	State of Wyoming		Campbell County	
Industry	**Number of Employees**	**%**	**Number of Employees**	**%**
Labor Force	290,502	70.3	24,321	80.4
Armed Forces	3,759	0.9	67	0.2
Civilian Labor Force	286,743	69.4	24,254	80.2
Employed	273,892	66.3	23,276	77.0
Unemployed	12,851	3.1	978	3.2
Not in Labor Force	122,631	29.7	5,920	19.6
Agriculture, Fishing, Forestry, and Mining	31,999	11.7	5,565	23.9
Construction	24,230	8.8	2,545	10.9
Manufacturing	13,500	4.9	652	2.8
Transportation, Warehousing, and Public Utilities	18,011	6.6	1,740	7.5
Information	4,408	1.6	172	0.7
Wholesale Trade	6,482	2.4	981	4.2
Retail Trade	31,534	11.5	2,675	11.5
Finance, Insurance, and Real Estate	11,952	4.4	511	2.2
Professional, Scientific, Management, Administrative, and Waste Management	17,606	6.4	1,109	4.8
Educational Services, Health Care, Social Assistance	58,226	21.3	3,995	17.2
Arts, Entertainment, Recreation, Accommodation, and Food Services	27,679	10.1	1,789	7.7
Other Services, Except Public Administration	11,752	4.3	1,036	4.5
Public Administration	16,513	6.0	506	2.2
Occupation				
Managerial and Professional Specialty	84,131	30.7	5,340	22.9
Sales and Office	61,729	22.5	4,945	21.2
Service	47,141	17.2	2,821	12.1
Farming, Forestry, and Fishing	3,813	1.4	123	0.5
Construction, Extraction, Maintenance, and Repair	41,170	15.0	5,755	24.7
Production, Transportation, and Material Moving	35,908	13.1	4,292	18.4
Source: U.S. Department of Commerce, Bureau of the Census, 2009				

Table 3.10-15 Labor Force Statistics for Locations within the 80 kilometer Area Surrounding the North Butte Remote Satellite

Location/Year	Civilian Labor Force	Employed	Unemployed	Unemployment Rate (%)
Wyoming				
2000	254,508	241,055	13,453	5.3
2005-2009 Estimates	286,743	273,892	12,851	4.5
Campbell County				
2000	18,805	17,975	830	4.4
2005-2009 Estimates	24,314	23,286	1,210	4.0
Converse County				
2000	6,244	5,951	288	4.6
2005-2009 Estimates	7,185	6,902	404	4.0
Johnson County				
2000	3,472	3,242	209	6.1
2005-2009 Estimates	4,126	3,965	110	1.7
Natrona County				
2000	35,081	33,213	1,811	5.2
2005-2009 Estimates	38,888	37,084	2,649	4.7
Edgerton City				
2000	66	66	0	0.0
2005-2009 Estimates	98	98	0	0.0
Gillette City				
2000	10,991	10,494	497	4.5
2005-2009 Estimates	15,459	14,707	828	4.4
Kaycee Town				
2000	116	116	0	0.0
2005-2009 Estimates	165	165	0	0.0
Midwest Town				
2000	187	165	22	11.8
2005-2009 Estimates	227	210	27	7.5
Wright Town				
2000	756	735	21	2.8
2005-2009 Estimates	620	602	23	2.9
Source: U.S. Department of Commerce, Bureau of the Census, 2009				

Table 3.10-16 **Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties within an 80 kilometer Radius of the North Butte Remote Satellite**

	Apartment[1]		Mobile Home Lot[2]		House[3]		Mobile Home[4]		Housing Unit Estimate	Rental Vacancy		
	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change		Total	Vacant Units	Vacancy Rate
Wyoming	$651	0.4	$281	1.6	$928	3.0	$619	-1.9	-	-	-	-
Campbell County	$717	-7.4	$377	4.1	$1,222	0.9	$860	-8.2	16,085	2,318	289	8.61
Converse County	$555	-6.5	$191	3.2	$735	7.8	$668	17.5	3,806	172	14	8.14
Johnson County	$603	1.7	$245	NA	$823	-3.6	$618	4.0	1,353	120	11	9.17
Natrona County	$676	-1.1	$314	18.4	$1,035	1.9	$598	-1.4	4,758	173	11	6.36

Source: Wyoming Community Development Authority, 2010; 2011

[1]Two-bedroom, unfurnished, excluding gas and electric.

[2]Single-wide, including water.

[3]Two- or three-bedroom, single family, excluding gas and electric.

[4]Total monthly rental expense, including lot rent.

Table 3.10-17 Personal Income Levels for the North Butte Remote Satellite and Nearby Communities

State County City	Median Earnings for Full-Time Year-Round Workers		Median Household Income	Median Family Income	Per Capita Income
	Women	Men			
Wyoming	46,875	30,047	51,990	63,245	26,925
Campbell County	35,589	57,886	74,757	82,626	30,319
Converse County	28,867	51,053	55,240	66,494	26,658
Johnson County	30,200	39,162	42,849	56,531	24,111
Natrona County	30,093	45,159	50,382	62,869	27,261
Edgerton	14,375	24,583	28,750	33,750	14,331
Gillette	56,682	29,964	69,581	78,377	19,749
Kaycee	62,917	10,625	49,375	51,875	16,584
Midwest	20,625	28,000	30,000	33,125	12,891
Wright	37,361	70,703	84,345	86,136	20,126
Source: U.S. Department of Commerce, Bureau of the Census: American FactFinder, 2000-2010a					

Table 3.10-18 State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of the North Butte Remote Satellite

Neighboring Counties	Use Tax		Sales Tax		Gross Revenue
	State	Local	State	Local	
Campbell	$15,898,351	$4,456,008	$126,102,084	$36,984,996	$183,441,439
Converse	$2,458,154	$614,198	$19,055,836	$4,763,951	$26,892,139
Johnson	$632,502	$157,787	$12,586,211	$3,146,566	$16,532,066
Natrona	$7,800,467	$1,949,753	$81,932,735	$20,482,918	$112,165,873
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2009					

Table 3.10-19 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of the Gas Hills Remote Satellite

State County City	Year								Average Annual Percent Change						
	1980	1990++	2000	2002	2004	2006	2008	2010+++	1980/1990	1990/2000	2000/2002	2002/2004	2004/2006	2006/2008	2008/2010
Wyoming	469,557	453,588	493,782	498,973	505,534	515,004	532,668	563,626	-3.4	8.9	1.0	1.3	1.9	3.4	5.8
Carbon	21,896	16,659	15,580	15,233	15,202	15,056	15,624	15,885	-23.9	-6.5	-2.2	-0.2	-1.0	3.8	1.7
Fremont	38,992	33,662	35,818	35,800	35,941	36,770	38,113	39,612	-13.7	6.4	-0.05	0.4	2.3	3.7	3.9
Riverton	9,562	9,202	9,256	9,321	9,300	9,608	10,032	10,615	-3.8	0.6	0.7	-0.2	3.3	4.4	5.8
Lander	7,867	7,023	6,915	6,867	6,837	6,989	7,264	7,487	-10.7	-1.5	-0.7	-0.4	2.2	3.9	3.1
Natrona	71,856	61,226	66,533	67,509	68,989	70,401	73,129	74,809	-14.8	8.7	1.5	2.2	2.0	3.9	2.3
Sweetwater	41,723	38,823	37,483	36,483	36,883	38,001	39,944	43,371	-7.0	-3.5	-1.7	0.1	-3.0	5.1	8.6
Bairoil	-	228	97	95	94	95	96	106	-	-57.5	-2.1	-1.1	1.1	1.1	10.4
Source: U.S. Department of Commerce, Bureau of the Census, 2010c: U.S. Department of Commerce, Bureau of Census: State and County Quickfacts, 2000-2010b															

Table 3.10-20 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of the Gas Hills Remote Satellite

Area	Age	Male	Female	Total	Total Percent Breakdown
State of Wyoming	Under 5	20,705	19,636	40,341	6.8
	5-19	56,073	51,853	107,926	18.2
	20-39	79,370	71,476	150,846	25.5
	40-64	146,380	87,983	234,363	39.6
	65+	27,586	30,474	58,060	9.8
	Total	330,114	261,422	591,536	100.0
Carbon County	Under 5	602	531	1,133	7.1
	5-19	1,547	1,378	2,925	18.4
	20-39	2,315	1,786	4,101	25.8
	40-64	3,070	2,612	5,682	35.8
	65+	1,019	1,025	2,044	12.9
	Total	8,553	7,332	15,885	100.0
Fremont County	Under 5	1,591	1,554	3,145	7.8
	5-19	4,187	3,955	8,142	20.3
	20-39	4,815	4,642	9,457	23.6
	40-64	6,741	6,833	13,574	33.8
	65+	2,696	3,109	5,805	14.5
	Total	20,030	20,093	40,123	100.0
Natrona County	Under 5	2,770	2,607	5,377	7.1
	5-19	7,538	7,182	14,720	19.5
	20-39	10,578	9,876	20,554	27.2
	40-64	12,919	12,488	25,407	33.7
	65+	4,077	5,315	9,392	12.4
	Total	37,982	37,468	75,450	100.0
Sweetwater County	Under 5	1,877	1,789	3,666	8.4
	5-19	4,938	4,493	9,431	21.5
	20-39	6,795	6,118	12,913	29.5
	40-64	7,505	6,648	14,153	32.3
	65+	1,734	1,909	3,643	8.3
	Total	22,849	20,957	43,806	100.0
Source: U.S. Department of Commerce, Bureau of the Census 2010b					

Table 3.10-21 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of the Gas Hills Remote Satellite

Area	Census 2010	Projected 2015	Projected 2020	Projected 2025	Projected 2030
Wyoming	563,626	594,710	622,360	644,050	668,830
Carbon County	15,885	16,030	16,380	16,360	16,270
Fremont County	40,123	42,540	44,360	45,670	47,120
Natrona County	75,450	79,020	82,490	85,190	88,320
Sweetwater County	43,806	46,430	49,280	50,820	51,960
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2011					

Table 3.10-22 2010 Population within the 80 kilometer Radius of the Gas Hills Remote Satellite

Sector	Radius in km													Total
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	
N	0	0	0	0	0	4	0	0	0	0	6	4	0	14
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	4	0	0	0	44	0	0	48
E	0	0	0	0	0	0	0	0	0	0	0	0	149	149
ESE	0	0	0	0	0	0	0	0	0	2	0	0	76	78
SE	0	0	0	0	0	0	0	0	0	2	6	0	2	10
SSE	0	0	0	0	0	0	0	0	0	0	0	2	0	2
S	0	0	0	0	0	0	12	0	0	0	0	106	0	118
SSW	0	0	0	0	0	0	4	8	0	0	0	0	0	12
SW	0	0	0	0	0	0	0	2	0	64	0	0	0	66
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0	0	0	0	0	0	12,271	12,271
NW	0	0	0	0	0	4	4	0	0	0	0	691	10	709
NNW	0	0	0	0	0	0	4	2	0	0	20	0	0	26
Total	**0**	**0**	**0**	**0**	**0**	**8**	**28**	**12**	**0**	**68**	**76**	**803**	**12,508**	**13,503**

Notes: Each town from 0 to 80 km from the mine site was assigned its population value according to the 2010 Census and the intercensal year 2007. All ranches and individual homes between these towns were counted individually using aerial photos, dated 2009. The population was estimated with the average household size in 2010 for each individual house (two persons per house), and was doubled for the average household size for each ranch (four persons per ranch). See section 3.10.1 for a detailed description of the methodology.

Table 3.10-23 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Fremont County

	State of Wyoming		Fremont County	
Industry	**Number of Employees**	**%**	**Number of Employees**	**%**
Labor Force	290,502	70.3	19,593	67.4
Armed Forces	3,759	0.9	3	0.0
Civilian Labor Force	286,743	69.4	19,590	67.4
Employed	273,892	66.3	18,305	63.0
Unemployed	12,851	3.1	1,285	4.4
Not in Labor Force	122,631	29.7	9,468	32.6
Agriculture, Fishing, Forestry, and Mining	31,999	11.7	1,934	10.6
Construction	24,230	8.8	1,699	9.3
Manufacturing	13,500	4.9	808	4.4
Transportation, Warehousing, and Public Utilities	18,011	6.6	738	4.0
Information	4,408	1.6	256	1.4
Wholesale Trade	6,482	2.4	223	1.3
Retail Trade	31,534	11.5	1,788	9.8
Finance, Insurance, and Real Estate	11,952	4.4	619	3.4
Professional, Scientific, Management, Administrative, and Waste Management	17,606	6.4	1,021	5.6
Educational Services, Health Care, Social Assistance	58,226	21.3	4,694	25.6
Arts, Entertainment, Recreation, Accommodation, and Food Services	27,679	10.1	1,884	10.3
Other Services, Except Public Administration	11,752	4.3	1,085	5.9
Public Administration	16,513	6.0	1,546	8.4
Occupation				
Managerial and Professional Specialty	84,131	30.7	6,073	33.2
Sales and Office	61,729	22.5	3,950	21.6
Service	47,141	17.2	3,595	19.6
Farming, Forestry, and Fishing	3,813	1.4	249	1.4
Construction, Extraction, Maintenance, and Repair	41,170	15.0	2,574	14.1
Production, Transportation, and Material Moving	35,908	13.1	1,864	10.2
Source: U.S. Department of Commerce, Bureau of the Census, 2009				

Table 3.10-24 Labor Force Statistics for Locations within the 80 kilometer Area Surrounding the Gas Hills Remote Satellite

Location/Year	Civilian Labor Force	Employed	Unemployed	Unemployment Rate (%)
Wyoming				
2000	254,508	241,055	13,453	5.3
2005-2009 Estimates	286,743	273,892	12,851	4.5
Carbon County				
2000	7,744	7,335	409	5.3
2005-2009 Estimates	8,207	7,798	409	5.0
Fremont County				
2000	17,637	16,052	1,562	8.9
2005-2009 Estimates	19,590	18,305	1,285	6.6
Natrona County				
2000	35,081	33,213	1,811	5.2
2005-2009 Estimates	38,888	37,084	2,649	4.7
Sweetwater County				
2000	19,988	18,845	1,143	5.7
2005-2009 Estimates	22,033	21,192	841	3.8
Bairoil City				
2000	42	42	0	0.0
2005-2009 Estimates	48	48	0	0.0
Riverton Town				
2000	4,694	4,258	436	9.3
2005-2009 Estimates	5,208	4,687	764	10.1
Source: U.S. Department of Commerce, Bureau of the Census, 2009				

Table 3.10-25 Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties within an 80 kilometer Radius of the Gas Hills Remote Satellite

	Apartment[1]		Mobile Home Lot[2]		House[3]		Mobile Home[4]		Housing Unit Estimate	Rental Vacancy		
	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change		Total	Vacant Units	Vacancy Rate
Wyoming	$651	0.4	$281	1.6	$928	3.0	$619	-1.9	NA	7,783	1,401	18.3
Carbon County	$671	-0.7	$278	-1.8	$792	-6.2	$733	2.1	8,711	731	103	14.09
Fremont County	$571	0.5	$199	0.0	$821	8.6	$724	3.7	17,796	1,388	45	3.24
Natrona County	$676	-1.1	$314	18.4	$1,035	1.9	$598	-1.4	4,758	173	11	6.36
Sweetwater County	$688	0.7	$319	3.9	$932	-0.5	$801	-2.0	18,735	2,687	156	5.81

Source: Wyoming Community Development Authority, 2010; 2011

[1]Two-bedroom, unfurnished, excluding gas and electric.

[2]Single-wide, including water.

[3]Two- or three-bedroom, single family, excluding gas and electric.

[4]Total monthly rental expense, including lot rent.

Table 3.10-26 Personal Income Levels for the Gas Hills Remote Satellite and Nearby Communities

State / County / City	Median Earnings for Full-Time Year-Round Workers		Median Household Income	Median Family Income	Per Capita Income
	Men	Women			
Wyoming	46,875	30,047	51,990	63,245	26,925
Carbon County	50,422	32,453	50,963	60,349	25,606
Fremont County	40,352	26,973	43,872	54,040	23,868
Natrona County	30,093	45,159	50,382	62,869	27,261
Sweetwater County	63,407	29,163	67,210	74,615	29,825
Bairoil	59,375	41,250	49,167	46,250	22,707
Riverton	41,546	27,192	39,331	44,375	24,205
Source: U.S. Department of Commerce, Bureau of the Census: American FactFinder, 2000-2010a					

Table 3.10-27 State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of the Gas Hills Remote Satellite

Neighboring Counties	Use Tax		Sales Tax		Gross Revenue
	State	Local	State	Local	
Carbon	$2,871,311	$805,374	$25,175,135	$6,748,201	$35,600,021
Fremont	$4,800,614	$475,559	$27,378,928	$2,952,070	$35,607,171
Natrona	$7,800,467	$1,949,753	$81,932,735	$20,482,918	$112,165,873
Sweetwater	$14,247,199	$7,166,318	$75,549,214	$37,667,624	$134,630,355
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2009					

Table 3.10-28 1980-2010 Historical and Current Population Change for Counties and Communities within the 80 kilometer Radius of the Ruth Remote Satellite

State County City	Year								Average Annual Percent Change						
	1980	1990	2000	2002	2004	2006	2008	2010	1980/1990	1990/2000	2000/2002	2002/2004	2004/2006	2006/2008	2008/2010
Wyoming	469,557	453,588	493,782	498,973	505,534	515,004	532,668	563,626	-0.3	8.9	1.0	1.3	1.9	3.4	5.8
Campbell	24,367	29,370	33,698	36,142	36,629	38,934	41,473	46,133	20.5	14.7	7.3	1.3	6.3	6.5	11.2
Gillette	12,134	17,635	19,646	21,819	22,174	-	26,871	29,087	45.3	11.4	11.1	1.6	-	-	8.2
Wright	-	1,236	1,347	1,426	1,408	-	1,462	1,807	-	9.0	5.9	-1.3	-	-	23.6
Converse	14,069	11,128	12,052	12,352	12,501	12,866	13,267	13,833	-20.9	8.3	2.5	1.2	2.9	3.1	4.3
Johnson	6,700	6,145	7,075	7,412	7,609	8,014	8,464	8,569	-8.3	15.1	4.8	2.7	5.3	5.6	1.2
Kaycee	271	256	249	261	269	-	290	263	-5.5	-2.7	4.8	3.1	-	-	-9.3
Natrona	71,856	61,226	66,533	67,509	68,989	70,401	73,129	74,809	-14.8	8.7	1.5	2.2	2.0	3.9	2.3
Edgerton	510	247	169	170	172	-	176	195	-	-31.6	0.6	1.2	-	-	10.8
Midwest	638	495	408	411	427	-	435	404	-22.4	-17.6	0.7	3.9	-	-	-7.1
Source: U.S. Department of Commerce, Bureau of the Census, 2010c: U.S. Department of Commerce, Bureau of Census: State and County Quickfacts, 2000-2010b															

Table 3.10-29 2010 Population by Age and Sex for Wyoming and the Counties within the 80 kilometer Radius of the Ruth Remote Satellite

Area	Age	Male	Female	Total	Total Percent Breakdown
State of Wyoming	Under 5	20,705	19,636	40,341	6.8
	5-19	56,073	51,853	107,926	18.2
	20-39	79,370	71,476	150,846	25.5
	40-64	146,380	87,983	234,363	39.6
	65+	27,586	30,474	58,060	9.8
	Total	330,114	261,422	591,536	100.0
Campbell County	Under 5	2,040	2,023	4,063	8.8
	5-19	5,336	4,828	10,164	22.0
	20-39	7,572	6,487	14,059	30.5
	40-64	8,112	7,119	15,231	33.0
	65+	1,198	1,418	2,616	5.7
	Total	24,258	21,875	46,133	100.0
Converse County	Under 5	519	451	970	7.0
	5-19	1,470	1,399	2,869	20.7
	20-39	1,648	1,601	3,249	23.5
	40-64	2,555	2,414	4,969	35.9
	65+	825	951	1,776	12.8
	Total	7,017	6,816	13,833	100.0
Johnson County	Under 5	318	255	573	6.7
	5-19	744	735	1,479	17.3
	20-39	930	868	1,798	21.0
	40-64	1,601	1,530	3,131	36.5
	65+	772	816	1,588	18.5
	Total	4,365	4,204	8,569	100.0
Natrona County	Under 5	2,770	2,607	5,377	7.1
	5-19	7,538	7,182	14,720	19.5
	20-39	10,578	9,876	20,554	27.2
	40-64	12,919	12,488	25,407	33.7
	65+	4,077	5,315	9,392	12.4
	Total	37,982	37,468	75,450	100.0
Source: U.S. Department of Commerce, Bureau of the Census 2010b					

Table 3.10-30 2010-2030 Population Projections for Wyoming and the Counties within the 80 kilometer Radius of the Ruth Remote Satellite

Area	Census 2010	Projected 2015	Projected 2020	Projected 2025	Projected 2030
Wyoming	563,626	594,710	622,360	644,050	668,830
Campbell County	46,133	51,790	56,890	61,350	66,060
Converse County	13,833	15,050	15,950	16,610	17,270
Johnson County	8,569	8,940	9,450	9,910	10,450
Natrona County	75,450	79,020	82,490	85,190	88,320
Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2011					

Table 3.10-31 2010 Population within the 80 kilometer Radius of the Ruth Remote Satellite

Sector	Radius in km													Total
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	
N	0	0	0	0	0	0	4	0	2	0	0	0	0	6
NNE	0	0	0	0	0	0	0	12	12	32	6	48	48	158
NE	0	0	0	0	0	0	0	8	18	28	8	92	56	210
ENE	0	0	0	0	0	0	0	0	8	1,197	610	24	4	1,843
E	0	0	0	0	0	0	0	0	4	12	0	0	0	16
ESE	0	0	0	0	0	0	0	0	0	8	8	4	0	20
SE	0	0	0	0	0	0	2	0	4	4	0	0	0	10
SSE	0	0	0	0	0	0	0	0	0	0	0	0	448	448
S	0	0	0	0	0	0	0	0	0	2	0	0	0	2
SSW	0	0	0	0	0	0	0	4	4	2	54	97	2,491	2,652
SW	0	0	0	0	0	0	2	8	580	2	0	0	0	592
WSW	0	0	0	0	0	0	8	0	0	0	2	0	0	10
W	0	0	0	0	0	0	0	0	2	4	4	22	4	36
WNW	0	0	0	0	0	0	0	847	10	290	0	4	8	1,159
NW	0	0	0	0	0	0	4	0	0	0	0	8	28	40
NNW	0	0	0	0	0	0	0	16	2	0	0	0	52	70
Total	0	0	0	0	0	0	20	895	646	1,581	692	299	3,139	2,272
Notes: Each town from 0 to 80 km from the mine site was assigned its population value according to the 2010 Census and the intercensal year 2007. All ranches and individual homes between these towns were counted individually using aerial photos, dated 2009. The population was estimated with the average household size in 2010 for each individual house (two persons per house), and was doubled for the average household size for each ranch (four persons per ranch). See section 3.10.1 for a detailed description of the methodology.														

Table 3.10-32 2009 Annual Average Labor Force Characteristics and Employment in Economic Sectors for State of Wyoming and Johnson County

	State of Wyoming		Johnson County	
Industry	**Number of Employees**	**%**	**Number of Employees**	**%**
Labor Force	290,502	70.3	4,125	63.9
Armed Forces	3,759	0.9	92	1.4
Civilian Labor Force	286,743	69.4	4,033	62.5
Employed	273,892	66.3	3,963	61.4
Unemployed	12,851	3.1	70	1.1
Not in Labor Force	122,631	29.7	2,332	36.1
Agriculture, Fishing, Forestry, and Mining	31,999	11.7	732	18.5
Construction	24,230	8.8	487	12.3
Manufacturing	13,500	4.9	91	2.3
Transportation, Warehousing, and Public Utilities	18,011	6.6	93	2.3
Information	4,408	1.6	80	2.0
Wholesale Trade	6,482	2.4	93	2.3
Retail Trade	31,534	11.5	391	9.9
Finance, Insurance, and Real Estate	11,952	4.4	317	8.0
Professional, Scientific, Management, Administrative, and Waste Management	17,606	6.4	279	7.0
Educational Services, Health Care, Social Assistance	58,226	21.3	736	18.6
Arts, Entertainment, Recreation, Accommodation, and Food Services	27,679	10.1	294	7.4
Other Services, Except Public Administration	11,752	4.3	63	1.6
Public Administration	16,513	6.0	307	7.7
Occupation				
Managerial and Professional Specialty	84,131	30.7	1,291	32.6
Sales and Office	61,729	22.5	1,031	26.0
Service	47,141	17.2	555	14.0
Farming, Forestry, and Fishing	3,813	1.4	232	5.9
Construction, Extraction, Maintenance, and Repair	41,170	15.0	499	12.6
Production, Transportation, and Material Moving	35,908	13.1	355	9.0

Source: U.S. Department of Commerce, Bureau of the Census, 2009

Table 3.10-33 Labor Force Statistics for Locations within the 80 kilometer Area Surrounding the Ruth Remote Satellite

Location/Year	Civilian Labor Force	Employed	Unemployed	Unemployment Rate (%)
Wyoming				
2000	254,508	241,055	13,453	5.3
2005-2009 Estimates	286,743	273,892	12,851	4.5
Campbell County				
2000	18,805	17,975	830	4.4
2005-2009 Estimates	24,314	23,286	1,210	4.0
Converse County				
2000	6,244	5,951	288	4.6
2005-2009 Estimates	7,185	6,902	404	4.0
Johnson County				
2000	3,472	3,242	209	6.1
2005-2009 Estimates	4,126	3,965	110	1.7
Natrona County				
2000	35,081	33,213	1,811	5.2
2005-2009 Estimates	38,888	37,084	2,649	4.7
Edgerton				
2000	66	66	0	0.0
2005-2009 Estimates	98	98	0	0.0
Gillette				
2000	10,991	10,494	497	4.5
2005-2009 Estimates	15,459	14,707	828	4.4
Kaycee				
2000	116	116	0	0.0
2005-2009 Estimates	165	165	0	0.0
Midwest				
2000	187	165	22	11.8
2005-2009 Estimates	227	210	27	7.5
Wright				
2000	756	735	21	2.8
2005-2009 Estimates	620	602	23	2.9
Source: U.S. Department of Commerce, Bureau of the Census, 2009b				

Table 3.10-34 Housing Characteristics and the Average Rental Rates in Fourth Quarter 2010 and Change from Fourth Quarter 2009 for Counties within an 80 kilometer Radius of the Ruth Remote Satellite

	Apartment[1]		*Mobile Home Lot*[2]		*House*[3]		*Mobile Home*[4]		Housing Unit Estimate	*Rental Vacancy*		
	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change	Q4 2010	% Change		Total	Vacant Units	Vacancy Rate
Wyoming	$651	0.4	$281	1.6	$928	3.0	$619	-1.9	-	-	-	-
Campbell County	$717	-7.4	$377	4.1	$1,222	0.9	$860	-8.2	16,085	2,318	289	8.61
Converse County	$555	-6.5	$191	3.2	$735	7.8	$668	17.5	3,806	172	14	8.14
Johnson County	$603	1.7	$245	NA	$823	-3.6	$618	4.0	1,353	120	11	9.17
Natrona County	$676	-1.1	$314	18.4	$1,035	1.9	$598	-1.4	4,758	173	11	6.36

Source: Wyoming Community Development Authority, 2010; 2011

[1]Two-bedroom, unfurnished, excluding gas and electric.

[2]Single-wide, including water.

[3]Two- or three-bedroom, single family, excluding gas and electric.

[4]Total monthly rental expense, including lot rent.

Table 3.10-35 Personal Income Levels for the Ruth Remote Satellite and Nearby Communities

State / County / City	Median Earnings for Full-Time Year-Round Workers		Median Household Income	Median Family Income	Per Capita Income
	Women	Men			
Wyoming	46,875	30,047	51,990	63,245	26,925
Campbell County	35,589	57,886	74,757	82,626	30,319
Converse County	28,867	51,053	55,240	66,494	26,658
Johnson County	30,200	39,162	42,849	56,531	24,111
Natrona County	30,093	45,159	50,382	62,869	27,261
Edgerton	14,375	24,583	28,750	33,750	14,331
Gillette	56,682	29,964	69,581	78,377	19,749
Kaycee	62,917	10,625	49,375	51,875	16,584
Midwest	20,625	28,000	30,000	33,125	12,891
Wright	37,361	70,703	84,345	86,136	20,126

Source: U.S. Department of Commerce, Bureau of the Census: American FactFinder, 2000-2010a

Table 3.10-36 State and Local Sales and Use Tax Distribution for the Counties within 80 kilometers of the Ruth Remote Satellite

Neighboring Counties	Use Tax		Sales Tax		Gross Revenue
	State	Local	State	Local	
Campbell	$15,898,351	$4,456,008	$126,102,084	$36,984,996	$183,441,439
Converse	$2,458,154	$614,198	$19,055,836	$5,763,951	$26,892,139
Johnson	$632,502	$157,787	$12,586,211	$3,146,566	$16,523,066
Natrona	$7,800,467	$1,949,753	$81,932,735	$20,482,918	$112,165,873

Source: Wyoming Department of Administration and Information, Economic Analysis Division, 2009

Table 3.11-1 Labor Statistics

(thousands)

Industry[1]	NAICS code[2]	2009 Annual average employment[3]	Total recordable cases	Cases with days away from work, job transfer, or restriction: Total	Cases with days away from work[4]	Cases with job transfer or restriction	Other recordable cases
All industries including State and local government[5]		130,315.8	4,140.7	2,041.5	1,238.5	803.0	2,099.2
Private industry[5]		111,469.1	3,277.7	1,667.4	965.0	702.4	1,610.4
Goods producing[5]		21,063.8	842.1	457.1	241.3	215.8	385.1
Natural resources and mining[5,6]		1,666.8	62.5	34.9	21.6	13.3	27.6
Agriculture, forestry, fishing and hunting[5]	11	977.7	44.9	24.2	13.8	10.4	20.6
Crop production[5,7]	111	414.2	17.9	9.9	5.3	4.6	8.0
Animal production[5,7]	112	164.2	12.7	6.7	3.7	2.9	6.0
Forestry and logging	113	59.5	2.1	.9	.8	.1	1.2
Fishing, hunting and trapping	114	8.6	.1	([8])	([8])	–	([8])
Support activities for agriculture and forestry	115	331.3	12.1	6.7	3.9	2.8	5.4
Mining[6]	21	689.1	17.7	10.7	7.8	2.9	6.9
Oil and gas extraction	211	158.3	2.6	1.5	1.1	.3	1.1
Mining (except oil and gas)[9]	212	220.6	7.3	4.9	3.8	1.1	2.4
Support activities for mining	213	310.3	7.8	4.4	2.9	1.5	3.5
Construction		6,700.5	251.0	136.5	92.5	44.0	114.5
Construction	23	6,700.5	251.0	136.5	92.5	44.0	114.5
Construction of buildings	236	1,552.0	49.8	25.8	17.0	8.8	24.1
Heavy and civil engineering construction	237	926.2	32.5	18.6	12.3	6.3	13.9
Specialty trade contractors	238	4,222.2	168.7	92.2	63.3	28.9	76.5
Manufacturing		12,696.5	528.6	285.6	127.1	158.5	243.0
Manufacturing	31-33	12,696.5	528.6	285.6	127.1	158.5	243.0
Food manufacturing	311	1,469.7	83.8	53.3	19.2	34.1	30.5
Beverage and tobacco product manufacturing	312	194.2	12.0	8.7	3.3	5.4	3.4
Textile mills	313	137.2	3.7	2.1	1.0	1.2	1.6
Textile product mills[7]	314	137.5	4.6	2.3	1.0	1.4	2.3
Apparel manufacturing[7]	315	193.0	4.5	2.4	.8	1.6	2.1
Leather and allied product manufacturing	316	32.0	1.8	1.0	.3	.7	.8
Wood product manufacturing	321	402.4	24.1	12.3	6.8	5.5	11.8
Paper manufacturing	322	421.8	13.8	7.9	4.0	3.9	5.9

See footnotes at end of table.

Table 3.11-1 Labor Statistics

(thousands)

Industry[1]	NAICS code[2]	2009 Annual average employment[3]	Total recordable cases	Cases with days away from work, job transfer, or restriction: Total	Cases with days away from work[4]	Cases with job transfer or restriction	Other recordable cases
Printing and related support activities	323	562.4	14.4	8.3	3.7	4.6	6.1
Petroleum and coal products manufacturing	324	116.0	1.9	1.1	.6	.5	.8
Chemical manufacturing	325	848.4	20.0	11.7	5.4	6.3	8.3
Plastics and rubber products manufacturing[7]	326	674.2	31.1	17.4	7.6	9.7	13.7
Nonmetallic mineral product manufacturing	327	429.0	21.5	12.5	6.5	6.0	9.0
Primary metal manufacturing	331	404.9	24.2	12.8	5.9	6.9	11.5
Fabricated metal product manufacturing	332	1,441.0	75.8	36.4	18.3	18.1	39.4
Machinery manufacturing[7]	333	1,118.3	47.2	21.9	10.3	11.7	25.3
Computer and electronic product manufacturing	334	1,198.7	19.0	9.2	4.4	4.8	9.8
Electrical equipment, appliance, and component manufacturing	335	405.5	14.0	7.3	2.9	4.3	6.8
Transportation equipment manufacturing[7]	336	1,461.1	72.8	37.5	16.0	21.5	35.3
Furniture and related product manufacturing[7]	337	430.4	20.5	10.5	5.0	5.5	9.9
Miscellaneous manufacturing	339	618.9	18.0	9.2	4.4	4.9	8.8
Service providing		90,405.3	2,435.6	1,210.3	723.7	486.6	1,225.3
Trade, transportation, and utilities[10]		25,648.4	898.3	517.4	295.7	221.7	380.9
Wholesale trade	42	5,850.7	185.9	112.2	62.4	49.8	73.7
Merchant wholesalers, durable goods	423	2,965.3	88.8	47.9	29.1	18.8	40.9
Merchant wholesalers, nondurable goods	424	2,035.9	83.3	55.8	28.8	27.0	27.5
Retail trade	44-45	15,058.9	487.2	254.3	137.0	117.3	233.0
Motor vehicle and parts dealers	441	1,723.8	62.2	28.2	19.3	8.9	34.0
Furniture and home furnishings stores	442	481.8	15.2	8.7	5.3	3.4	6.5
Electronics and appliance stores	443	504.6	7.5	3.6	2.1	1.4	3.9
Building material and garden equipment and supplies dealers	444	1,218.4	57.1	35.5	16.3	19.2	21.6
Food and beverage stores	445	2,888.8	110.6	60.4	31.2	29.2	50.2
Health and personal care stores	446	1,015.9	17.9	7.5	4.9	–	10.5
Gasoline stations	447	843.8	22.4	9.6	6.9	2.7	12.8
Clothing and clothing accessories stores	448	1,419.1	25.9	9.4	6.6	–	16.6
Sporting goods, hobby, book, and music stores	451	641.2	12.4	4.3	2.3	1.9	8.1
General merchandise stores	452	3,061.3	117.5	70.8	31.0	39.7	46.7
Miscellaneous store retailers	453	827.4	24.7	9.1	5.8	3.2	15.7
Nonstore retailers	454	432.8	14.0	7.4	5.2	2.2	6.6
Transportation and warehousing[10]	48-49	4,171.2	206.9	141.0	90.7	50.3	65.9
Air transportation	481	477.5	32.5	24.5	17.5	7.0	8.0
Rail transportation[10]	482	–	4.7	3.4	3.0	.4	1.2

See footnotes at end of table.

Table 3.11-1 Labor Statistics

Industry[1]	NAICS code[2]	2009 Annual average employment[3]	Total recordable cases	Cases with days away from work, job transfer, or restriction: Total	Cases with days away from work[4]	Cases with job transfer or restriction	Other recordable cases
Water transportation	483	66.4	1.9	1.2	0.9	0.4	0.6
Truck transportation	484	1,333.8	63.6	41.7	31.4	10.3	21.9
Transit and ground passenger transportation	485	417.0	15.7	9.7	6.8	2.9	6.0
Pipeline transportation	486	41.0	.8	.3	.2	.1	.5
Scenic and sightseeing transportation	487	28.8	.7	.4	.4	([8])	.3
Support activities for transportation	488	580.0	21.6	14.5	9.7	4.8	7.1
Couriers and messengers	492	560.0	29.4	19.1	10.7	8.3	10.3
Warehousing and storage	493	661.7	36.0	26.1	10.1	15.9	9.9
Utilities	22	567.6	18.4	10.0	5.6	4.4	8.4
Utilities	221	567.6	18.4	10.0	5.6	4.4	8.4
Information		2,932.2	49.3	25.1	17.0	8.1	24.2
Information	51	2,932.2	49.3	25.1	17.0	8.1	24.2
Publishing industries (except Internet)	511	843.5	11.4	5.8	3.1	–	5.6
Motion picture and sound recording industries	512	369.5	7.0	1.2	.9	.3	5.8
Broadcasting (except Internet)	515	315.0	5.7	3.0	1.9	1.1	2.7
Telecommunications[7]	517	1,010.4	23.1	14.4	10.6	3.8	8.7
Data processing, hosting, and related services[7]	518	256.5	1.4	.5	.3	.2	.9
Other information services[7]	519	137.3	.7	.2	.2	([8])	.5
Financial activities		7,904.9	104.6	45.6	30.3	15.4	58.9
Finance and insurance	52	5,813.6	45.3	12.3	8.7	3.7	32.9
Monetary authorities - central bank	521	21.8	.2	.1	.1	([8])	.1
Credit intermediation and related activities	522	2,681.0	25.9	5.8	4.3	1.5	20.1
Securities, commodity contracts, and other financial investments and related activities	523	857.2	1.4	.6	.5	.1	.9
Insurance carriers and related activities	524	2,164.3	17.2	5.7	3.6	2.0	11.5
Funds, trusts, and other financial vehicles	525	89.4	.6	.2	.1	.1	.3
Real estate and rental and leasing	53	2,091.3	59.3	33.3	21.6	11.7	26.0
Real estate[7]	531	1,477.3	39.1	21.2	14.3	6.9	17.8
Rental and leasing services	532	586.8	20.1	12.0	7.3	4.8	8.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	27.2	.1	.1	.1	–	.1
Professional and business services		17,366.8	246.9	122.7	80.6	42.0	124.2

See footnotes at end of table.

Table 3.11-1 Labor Statistics

(thousands)

Industry[1]	NAICS code[2]	2009 Annual average employment[3]	Total recordable cases	Cases with days away from work, job transfer, or restriction: Total	Cases with days away from work[4]	Cases with job transfer or restriction	Other recordable cases
Professional, scientific, and technical services	54	7,832.1	82.2	34.0	24.0	10.0	48.2
Professional, scientific, and technical services[7]	541	7,832.1	82.2	34.0	24.0	10.0	48.2
Management of companies and enterprises	55	1,933.4	30.3	14.0	7.3	6.7	16.3
Administrative and support and waste management and remediation services	56	7,601.4	134.3	74.7	49.4	25.3	59.7
Administrative and support services[7]	561	7,241.2	115.1	62.7	42.6	20.1	52.4
Waste management and remediation services	562	360.1	19.2	12.0	6.7	5.2	7.2
Education and health services		18,359.5	708.4	318.5	183.3	135.2	389.9
Educational services	61	2,454.9	41.0	14.5	10.4	4.1	26.5
Educational services	611	2,454.9	41.0	14.5	10.4	4.1	26.5
Health care and social assistance	62	15,904.6	667.3	304.0	172.8	131.1	363.4
Ambulatory health care services	621	5,787.4	124.2	41.7	29.4	12.4	82.4
Hospitals	622	4,637.1	270.6	106.0	60.9	45.1	164.6
Nursing and residential care facilities	623	3,060.4	201.5	120.1	57.4	62.6	81.4
Social assistance	624	2,419.7	71.1	36.2	25.1	11.0	34.9
Leisure and hospitality		13,586.3	340.6	138.0	87.7	50.3	202.6
Arts, entertainment, and recreation	71	2,106.0	63.2	29.5	16.6	12.8	33.8
Performing arts, spectator sports, and related industries	711	415.4	16.9	7.9	4.2	–	9.0
Museums, historical sites, and similar institutions	712	129.5	4.3	2.2	1.3	.9	2.1
Amusement, gambling, and recreation industries	713	1,561.1	42.1	19.4	11.1	8.2	22.7
Accommodation and food services	72	11,480.3	277.4	108.5	71.1	37.4	168.9
Accommodation	721	1,884.1	70.6	36.0	19.9	16.1	34.6
Food services and drinking places	722	9,596.2	206.8	72.5	51.2	21.3	134.3
Other services		4,607.1	87.4	43.0	29.0	13.9	44.5
Other services, except public administration	81	4,607.1	87.4	43.0	29.0	13.9	44.5
Repair and maintenance	811	1,199.8	41.2	19.8	14.3	5.5	21.3
Personal and laundry services	812	1,324.5	24.1	13.8	8.2	5.7	10.3

See footnotes at end of table.

Table 3.11-1 Labor Statistics

(thousands)

Industry[1]	NAICS code[2]	2009 Annual average employment[3]	Total recordable cases	Cases with days away from work, job transfer, or restriction			Other recordable cases
				Total	Cases with days away from work[4]	Cases with job transfer or restriction	
Religious, grantmaking, civic, professional, and similar organizations	813	1,360.7	22.1	9.3	6.5	2.8	12.8
State and local government[5]		18,846.7	862.9	374.1	273.5	100.6	488.8
State government[5]		4,883.2	193.0	96.8	75.8	21.0	96.1
Goods producing[5]		84.9	4.1	2.2	1.9	.3	1.9
Construction		81.8	3.9	2.1	1.8	.3	1.8
Construction	23	81.8	3.9	2.1	1.8	.3	1.8
Heavy and civil engineering construction	237	81.6	3.9	2.1	1.8	.3	1.8
Service providing		4,798.2	188.9	94.6	73.9	20.7	94.2
Education and health services		2,624.7	98.5	48.1	34.1	14.0	50.4
Educational services	61	1,991.2	39.1	15.9	10.2	5.7	23.2
Educational services	611	1,991.2	39.1	15.9	10.2	5.7	23.2
Health care and social assistance	62	633.5	59.4	32.1	23.9	8.2	27.2
Hospitals	622	347.6	34.7	17.3	11.8	5.6	17.4
Public administration		1,991.9	81.8	41.0	35.0	6.0	40.8
Public administration	92	1,991.9	81.8	41.0	35.0	6.0	40.8
Justice, public order, and safety activities	922	765.6	46.3	24.8	21.8	3.0	21.5
Local government[5]		13,963.6	670.0	277.2	197.7	79.6	392.7
Goods producing[5]		111.3	13.4	6.3	4.8	1.5	-
Construction		110.3	13.4	6.2	4.7	1.5	-
Construction	23	110.3	13.4	6.2	4.7	1.5	-
Heavy and civil engineering construction	237	107.6	13.1	6.1	4.6	1.5	-

See footnotes at end of table.

Table 3.11-1 Labor Statistics

(thousands)

Industry[1]	NAICS code[2]	2009 Annual average employment[3]	Total recordable cases	Cases with days away from work, job transfer, or restriction			Other recordable cases
				Total	Cases with days away from work[4]	Cases with job transfer or restriction	
Service providing		13,852.3	656.6	271.0	192.9	78.1	385.6
Trade, transportation, and utilities[10]		516.0	33.0	19.3	14.2	5.2	13.6
Transportation and warehousing[10]	48-49	270.8	17.9	11.1	9.8	1.4	6.8
Transit and ground passenger transportation	485	220.6	14.8	9.5	8.7	.8	5.2
Utilities	22	241.9	15.0	8.2	4.4	–	6.8
Utilities	221	241.9	15.0	8.2	4.4	–	6.8
Education and health services		8,720.4	312.5	102.1	69.9	32.2	210.4
Educational services	61	7,813.7	259.4	78.1	54.5	23.6	181.3
Educational services	611	7,813.7	259.4	78.1	54.5	23.6	181.3
Health care and social assistance	62	906.8	53.1	24.0	15.4	8.6	29.1
Hospitals	622	660.4	38.5	14.9	9.5	5.4	23.6
Nursing and residential care facilities	623	71.7	6.5	4.3	2.9	1.4	2.3
Public administration		4,075.8	285.3	135.4	99.4	36.0	150.0
Public administration	92	4,075.8	285.3	135.4	99.4	36.0	150.0
Justice, public order, and safety activities	922	1,002.6	107.9	52.1	43.0	9.1	55.9

[1] Totals include data for industries not shown separately.
[2] *North American Industry Classification System* — United States, 2007
[3] Employment is expressed as an annual average and is derived primarily from the BLS-Quarterly Census of Employment and Wages (QCEW) program.
[4] *Days-away-from-work cases* include those that result in days away from work with or without job transfer or restriction.
[5] Excludes farms with fewer than 11 employees.
[6] Data for Mining (Sector 21 in the *North American Industry Classification System* — United States, 2007) include establishments not governed by the Mine Safety and Health Administration rules and reporting, such as those in Oil and Gas Extraction and related support activities. Data for mining operators in coal, metal, and nonmetal mining are provided to BLS by the Mine Safety and Health Administration, U.S. Department of Labor. Independent mining contractors are excluded from the coal, metal, and nonmetal mining industries. These data do not reflect the changes the Occupational Safety and Health Administration made to its recordkeeping requirements effective January 1, 2002; therefore, estimates for these industries are not comparable to estimates in other industries.
[7] Industry scope changed in 2009.
[8] Data too small to be displayed.
[9] Data for mining operators in this industry are provided to BLS by the Mine Safety and Health Administration, U.S. Department of Labor. Independent mining contractors are excluded. These data do not reflect the changes the Occupational Safety and Health Administration made to its recordkeeping requirements effective January 1, 2002; therefore, estimates for these industries are not comparable to estimates in other industries.
[10] Data for employers in railroad transportation are provided to BLS by the Federal Railroad Administration, U.S. Department of Transportation.

NOTE: Because of rounding, components may not add to totals. Dash indicates data do not meet publication guidelines.
SOURCE: Bureau of Labor Statistics, U.S. Department of Labor

Table 3.12-1 Deep Disposal Well Volumes

Well ID	Disposal to Date (gallons)	Reporting Period
SHRUP #6	18,386,280	**December 2010 to September 2011**
SHRUP #9	10,649,753	**March 2011 to September 2011**
SHRUP #10	1,801,648	**March 2011 to September 2011**
Morton 120	13,182,870	**October 1, 2010 to September 2011**
Vollman	2,253,744	**April 2011 to September 2011**
DDW-1	19,506,328	**October 1, 2010 to September 2011**
DDW-2	50,003,621	**October 1, 2010 to September 2011**

Table 4.6-1 Selected National and Wyoming Air Quality Standards

Pollutant/Averaging Time	NAAQS[1] ($\mu g/m^3$)	WAAQS[2] ($\mu g/m^3$)	PSD Class I Increment[3]	PSD Class II Increment[3]
Carbon Monoxide (CO)				
1-hour[4]	40,000	40,000	--[5]	--[5]
8-hour[4]	10,000	10,000	--	--
Nitrogen Dioxide (NO_2)				
Annual[6]	100	100	2.5	25
Ozone				
1-hour[4]	--[7]	--[8]	--[5]	--[5]
8-hour[9]	157	157	--	--
Particulate Matter at Less than 10 Microns (PM_{10})				
24-hour[4]	150	150	8	30
Annual[6]	--[8]	50	4	17
Particulate Matter at Less than 2.5 Microns ($PM_{2.5}$)				
24-hour[10]	35	35	--[5]	--[5]
Annual[7]	15	15	--	--
Sulfur Dioxide (SO_2)				
3-hour[4]	1,300[11]	1,300	25	512
24-hour[4]	365	260	5	91
Annual[3]	80	60	2	20

Notes:

1. NAAQS = National Ambient Air Quality Standards (adapted from 40 CFR 50.5-50.12). Primary standard unless otherwise noted. National Primary Standards establish the level of air quality necessary to protect public health from any known or anticipated effects of a pollutant, allowing a margin of safety to protect sensitive members of the population.
2. WAAQS = Wyoming Ambient Air Quality Standard.
3. The prevention of significant deterioration (PSD) demonstrations serve informational purposes only and do not constitute a regulatory PSD increment consumption analysis.
4. No more than one exceedance per year.
5. No PSD increments have been established for this pollutant.
6. Annual arithmetic mean.
7. The NAAQS for this averaging time for this pollutant has been revoked by EPA.
8. There is no 1-hour WAAQS established for ozone.
9. Average of annual fourth-highest daily maximum 8-hour average.
10. An area is in compliance with the standard if the 98th percentile of 24-hour $PM_{2.5}$ concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
11. Secondary standard. National Secondary Standards establish the level of air quality to protect the public welfare by preventing injury to agricultural crops and livestock deterioration of materials and property and adverse impacts to the environment.

Table 4.7-1 Peak Noise Levels for Equipment Used at the SUA-1548 Project Sites and the Noise Levels at the Six Smith Ranch Testing Sites

	Peak Noise Level (dBA)
Equipment	
Flatbed Trucks	74
Pickup Trucks	75
Dump Trucks	76
Drill Rigs	79
Cranes	81
Bulldozers	82
Scrapers	84
Road Graders	85
Jack Hammers	89
PVC/Wood Chipper	125
Smith Ranch Test Sites	
Header House 202 in Mine Unit 2	76
Selenium Treatment Facility	79
Satellite No. 1	80
Personnel Sampling (Transfer Truck)	80
Vac-Truck	101
PVC Chipper	125
Source: Cameco Resources, 2010; U.S. Department of Transportation, 2001.	

Table 4.11-1 2010 Race Characteristics for the Census Tract Included in the 6.4 kilometer Radius Surrounding Smith Ranch

	Total	White Alone	Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic or Latino	Total Inside Urbanized Areas	Total Inside Urban Clusters	Total Rural
State of Wyoming	**563,626**	**483,874**	**4,351**	**11,784**	**4,279**	**365**	**437**	**8,305**	**50,231**	**61,697**	**101,177**	**98,994**
Percent	100.0	85.8	0.8	2.1	0.8	0.1	0.1	1.5	8.9	10.9	18.0	17.6
Converse County, Tract 9566	**3,194**	**2,968**	**8**	**11**	**15**	**0**	**0**	**29**	**163**	**0**	**35**	**1,564**
Percent	100.0	92.9	0.3	0.3	0.5	0.0	0.0	0.9	5.1	0.0	1.1	49.0
Source: U.S. Department of Commerce, Bureau of the Census, 2010b												

Table 4.11-2 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding Smith Ranch

	State of Wyoming	Converse County Tract 9566	Census Tract Average
Total Population	554,697	2,966	2,966
Medium Household Income	56,380	58,347	58,347
Per Capita Income	28,952	30,277	30,277
Population Below Poverty Level	62,629	240	240
Percent Below Poverty Level	11.3	8.1	8.1
Source: U.S. Department of Commerce, Bureau of the Census, 2007-2011 American Community Survey 5-Year Estimates			

Table 4.11-3 2010 Race Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding North Butte Remote Satellite

	Total	White Alone	Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic or Latino	Total Inside Urbanized Areas	Total Inside Urban Clusters	Total Rural
State of Wyoming	**563,626**	**483,874**	**4,351**	**11,784**	**4,279**	**365**	**437**	**8,305**	**50,231**	**61,697**	**101,177**	**98,994**
Percent	100.0	85.8	0.8	2.1	0.8	0.1	0.1	1.5	8.9	10.9	18.0	17.6
Campbell County, Tract 1	**8,924**	**8,199**	**10**	**86**	**30**	**1**	**5**	**112**	**481**	**0**	**1,069**	**2,651**
Percent	100.0	91.9	0.1	1.0	0.3	0.0	0.1	1.3	5.4	0.0	12.0	29.7
Johnson County, Tract 9551	**2,475**	**2,372**	**1**	**8**	**4**	**0**	**0**	**11**	**79**	**0**	**0**	**1,569**
Percent	100.0	95.8	0.0	0.3	0.2	0.0	0.0	0.4	3.2	0.0	0.0	63.4
Source: U.S. Department of Commerce, Bureau of the Census, 2010b												

Table 4.11-4 Race Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding Ruth Remote Satellite

	Total	White Alone	Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic or Latino	Total Inside Urbanized Areas	Total Inside Urban Clusters	Total Rural
State of Wyoming	**563,626**	**483,874**	**4,351**	**11,784**	**4,279**	**365**	**437**	**8,305**	**50,231**	**61,697**	**101,177**	**98,994**
Percent	100.0	85.8	0.8	2.1	0.8	0.1	0.1	1.5	8.9	10.9	18.0	17.6
Campbell County, Tract 1	**8,924**	**8,199**	**10**	**86**	**30**	**1**	**5**	**112**	**481**	**0**	**1,069**	**2,651**
Percent	100.0	91.9	0.1	1.0	0.3	0.0	0.1	1.3	5.4	0.0	12.0	29.7
Johnson County, Tract 9551	**2,475**	**2,372**	**1**	**8**	**4**	**0**	**0**	**11**	**79**	**0**	**0**	**1,569**
Percent	100.0	95.8	0.0	0.3	0.2	0.0	0.0	0.4	3.2	0.0	0.0	63.4
Source: U.S. Department of Commerce, Bureau of the Census, 2010b												

Table 4.11-5 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the North Butte Remote Satellite

	State of Wyoming	Campbell County Tract 1	Johnson County Tract 9551	Census Tract Average
Total Population	554,697	7,546	2,643	5,095
Medium Household Income	56,380	92,757	55,929	74,343
Per Capita Income	28,952	38,403	30,983	34,693
Population Below Poverty Level	62,629	365	172	269
Percent Below Poverty Level	11.3	4.9	6.5	5.7
Source: U.S. Department of Commerce, Bureau of the Census, 2007-2011 American Community Survey 5-Year Estimates				

Table 4.11-6 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the Ruth Remote Satellite

	State of Wyoming	Campbell County Tract 1	Johnson County Tract 9551	Census Tract Average
Total Population	554,697	7,546	2,643	5,095
Medium Household Income	56,380	92,757	55,929	74,343
Per Capita Income	28,952	38,403	30,983	34,693
Population Below Poverty Level	62,629	365	172	269
Percent Below Poverty Level	11.3	4.9	6.5	5.7
Source: U.S. Department of Commerce, Bureau of the Census, 2007-2011 American Community Survey 5-Year Estimates				

Table 4.11-7 Race Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding North Butte Remote Satellite

	Total	White Alone	Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic or Latino	Total Inside Urbanized Areas	Total Inside Urban Clusters	Total Rural
State of Wyoming	**563,626**	**483,874**	**4,351**	**11,784**	**4,279**	**365**	**437**	**8,305**	**50,231**	**61,697**	**101,177**	**98,994**
Percent	100.0	85.8	0.8	2.1	0.8	0.1	0.1	1.5	8.9	10.9	18.0	17.6
Natrona County, Tract 18	**4,136**	**3,873**	**16**	**74**	**22**	**0**	**5**	**49**	**97**	**175**	**0**	**2,289**
Percent	100.0	93.6	0.4	1.8	0.5	0.0	0.1	1.2	2.3	4.2	0.0	55.3
Fremont County, Tract 3	**4,422**	**4,000**	**6**	**140**	**26**	**0**	**4**	**80**	**166**	**0**	**384**	**2,077**
Percent	100.0	90.5	0.1	3.2	0.6	0.0	0.1	1.8	3.8	0.0	8.7	47.0
Source: U.S. Department of Commerce, Bureau of the Census, 2010b												

Table 4.11-8 2011 Estimated Poverty Level Characteristics for the Census Tracts Included in the 6.4 kilometer Radius Surrounding the Gas Hills Remote Satellite

	State of Wyoming	Fremont County Tract 3	Natrona County Tract 18	Census Tract Average
Total Population	554,697	4,232	4,086	4,159
Medium Household Income	56,380	57,946	72,917	65,432
Per Capita Income	28,952	28,426	33,787	31,107
Population Below Poverty Level	62,629	288	250	269
Percent Below Poverty Level	11.3	6.9	6.6	6.8
Source: U.S. Department of Commerce, Bureau of the Census, 2007-2011 American Community Survey 5-Year Estimates				

Location	New or Existing	Instrumentation (as spececified or equivallent)	LLD's
ENVIRONMENTAL SAMPLING			
AS-1 Background Station (Daves water well	existing	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	existing	Global Environmental TLD	10 mrem
	New	Modified Kusnetz Method	0.033 WL
AS-2 Fence Line	existing	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	existing	Global Environmental TLD	10 mrem
	New	Modified Kusnetz Method	0.033 WL
AS-3 Volmans	existing	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	existing	Global Environmental TLD	10 mrem
	New	Modified Kusnetz Method	0.033 WL
AS-4 HUP Overlook	reinstated	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	reinstated	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	reinstated	Global Environmental TLD	10 mrem
	New	Modified Kusnetz Method	0.033 WL
AS-5 Fowlers	reinstated	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	reinstated	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	reinstated	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
AS-6 Reynolds	new	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	existing	Global Environmental TLD	10 mrem
	New	Modified Kusnetz Method	0.033 WL
RG-1 West end of wellfield 4	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	New	Modified Kusnetz Method	0.033 WL
RG-2 Cattle guard into MU K	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
RG-3 Near PSR-2	existing	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NP-1 Smith Ranch Warehouse	new	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NP-2 Smith Ranch Central Processing Plant North end	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL

Location	New or Existing	Instrumentation (as specefied or equivallent)	LLD's
NP-3 Smith Ranch Central Processing Plant south end	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NP-4 Smith Ranch Central Processing Plant east end	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NP-5 Smith Ranch Central Processing Plant west end	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NS-2 Satelltie SR-2 north end	new	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NS-3 Satelltie SR-2 south end	new	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NS-4 Satelltie SR-2 east end	new	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
NS-5 Satelltie SR-2 west end	new	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Global Environmental TLD	10 mrem
	new	Modified Kusnetz Method	0.033 WL
Header House 15-20	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Modified Kusnetz Method	0.033 WL
Header House 9-9	new	Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
	new	Modified Kusnetz Method	0.033 WL
ISOTOPIC ANALYSIS (Mixed DAC)			
Central Processing Plant	New	RADECO Model HD-29A	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
Satellitte Facilitiys	New	RADECO Model HD-29A	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
BETA CAMPAIGN			
α/β/γ Campaign for Personal Contamination	New	To be determined	To be determined
α/β/γ Campaign for Contamination Control	New	To be determined	To be determined
α/β/γ Campaign for Offsite releases	New	To be determined	To be determined
DOSE TO PUBLIC			
Dose to public (on site vendors)	New	Regulated air pump 50 LPM	$^{Nat}U - 1x10^{-16}$, $^{226}Ra - 1x10^{-16}$, $^{230}Th - 1x10^{-16}$, $^{210}Pb - 1x10^{-15}$ uCi/mL
At locations NP-1, NS-2 and NS-4		Radtrak© Type DRNF	$2x10^{-10}$ uCi/mL
		Global Environmental TLD	10 mrem
		Modified Kusnetz Method	0.033 WL
OCCUPATIONAL DOSE			
Evaluate dose for Office and Wellfield workers	New	Global TLD	10 mrem

Table 7-1 Trends in Wyoming Expenditures by Cameco Resources

	2005	2006	2007	2008	2009
Payroll (including benefits)	$4,593,000	$4,952,000	$7,522,100	$8,480,100	$10,525,000
Wyoming Taxes and Royalties[1]	$1,383,400	$1,818,000	$4,393,000	$4,693,000	$3,737,000
Wyoming Vendors Purchases	$10,036,600	$12,311,000	$14,801,000	$24,247,000	$26,065,000
Total Wyoming Expenditures	$16,013,000	$19,081,000	$26,716,100	$37,420,100	$40,327,000

Source: Taylor, David T. & Foulke, Thomas. ***The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.*** **University of Wyoming, Department of Agricultural & Applied Economics. Pg. 13. October, 2010.**
Notes:
1. Wyoming taxes include: Use, Ad Valorem, Severance, and Property.

Table 7-2 Current Economic Impact of Cameco's Wyoming Payroll

Sector	Direct Impacts	Secondary Impacts	Total Impacts
Employment			
Agriculture	0.0	0.1	0.1
Mining	169.0	0.0	169.0
Construction	0.0	0.8	0.8
Manufacturing	0.0	0.2	0.2
TIPU[1]	0.0	1.6	1.6
Trade	0.0	18.1	18.1
Service	0.0	46.8	46.8
Government	0.0	1.0	1.0
Total Jobs	**169.0**	**68.6**	**237.6**
Labor Income			
Agriculture	$0	$772	$772
Mining	$12,483,873	$1,510	$12,485,383
Construction	$0	$36,360	$36,360
Manufacturing	$0	$10,629	$10,629
TIPU[1]	$0	$110,009	$110,009
Trade	$0	$591,290	$591,290
Service	$0	$1,441,098	$1,441,098
Government	$0	$62,280	$62,280
Total Labor Income	**$12,483,873**	**$2,253,948**	**$14,737,821**
Total Output			
Agriculture	$0	$10,001	$10,001
Mining	$12,483,873	$5,783	$12,489,656
Construction	$0	$78,714	$78,714
Manufacturing	$0	$98,676	$98,676
TIPU[1]	$0	$412,586	$412,586
Trade	$0	$1,474,775	$1,474,775
Service	$0	$5,541,677	$5,541,677
Government	$0	$193,823	$193,823
Total Output	**$12,483,873**	**$7,816,035**	**$20,299,908**

Source: Taylor, David T. & Foulke, Thomas. ***The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.*** **University of Wyoming, Department of Agricultural & Applied Economics. Pg. 15. October, 2010.**
Notes:
1. Transportation/Information/Public Utilities

Table 7-3 Current Economic Impact of Cameco's Wyoming Taxes and Royalties

Sector	Direct Impacts	Secondary Impacts	Total Impacts
Employment			
Agriculture	0.0	0.0	0.0
Mining	0.0	0.0	0.0
Construction	0.0	0.2	0.2
Manufacturing	0.0	0.0	0.0
TIPU[1]	0.0	0.5	0.5
Trade	0.0	5.0	5.0
Service	0.0	12.8	12.8
Government and Households	26.3	0.2	26.5
Total Jobs	**26.3**	**18.7**	**45.0**
Labor Income			
Agriculture	$0	$211	$211
Mining	$0	$435	$435
Construction	$0	$10,109	$10,109
Manufacturing	$0	$2,922	$2,922
TIPU[1]	$0	$30,544	$30,544
Trade	$0	$160,900	$160,900
Service	$0	$391,018	$391,018
Government and Households	$3,406,863	$17,140	$3,424,003
Total Labor Income	**$3,406,863**	**$613,279**	**$4,020,142**
Total Output			
Agriculture	$0	$2,740	$2,740
Mining	$0	$1,670	$1,670
Construction	$0	$21,782	$21,782
Manufacturing	$0	$26,992	$26,992
TIPU[1]	$0	$114,013	$114,013
Trade	$0	$400,704	$400,704
Service	$0	$1,499,992	$1,499,992
Government and Households	$3,737,000	$53,000	$3,790,000
Total Output	**$3,737,000**	**$2,120,893**	**$5,857,893**

Source: Taylor, David T. & Foulke, Thomas. *The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.* University of Wyoming, Department of Agricultural & Applied Economics. Pg. 16. October, 2010.

Notes:

1. Transportation/Information/Public Utilities

Table 7-3.1 Distribution of Cameco's Tax Expenditures

Type	Amount	Amount Per Pound	Distribution			Total
			Local Government	State Government	All Schools	
Use Tax	**$178,000**	**$0.09**	**44.6%**	**55.4%**	**NA**	**100%**
Severance Tax	**$456,000**	**$0.24**	**3.3%**	**96.7%**	**NA**	**100%**
Ad Valorem-Production	**$694,000**	**$0.37**	**27%**	**NA**	**73%**	**100%**
Ad Valorem-Property	**$316,000**	**$0.17**	**27%**	**NA**	**73%**	**100%**
Total	**$1,644,000**					

Table 7-4 Distribution of Cameco's Economic Impact in Wyoming

Sector	Total Employment	Total Income	Total Output	Percent Employment	Percent Income	Percent Output
Agriculture	0.3	$2,083	$27,944	0.1	<0.1	<0.1
Mining	169.9	$12,579,762	$12,787,292	38.2	46.3	21.6
Construction	84.0	$4,591,729	$12,156,594	18.9	16.9	20.6
Manufacturing	0.9	$50,086	$379,576	0.2	0.2	0.6
TIPU[1]	13.6	$1,194,604	$5,122,825	3.1	4.4	8.7
Trade	48.1	$1,928,153	$12,757,019	10.8	7.1	21.6
Service	99.4	$3,267,923	$11,721,242	22.4	12.0	19.8
Government	28.4	$3,545,234	$4,133,976	6.4	13.1	7.0
Total	**444.6**	**$27,159,574**	**$59,086,468**	**100**	**100**	**100**

Source: Taylor, David T. & Foulke, Thomas. *The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.* University of Wyoming, Department of Agricultural & Applied Economics. Pg. 20. October, 2010.
Notes:
1. Transportation/Information/Public Utilities

Table 7-5 Current Economic Impact of Cameco's Wyoming Vendor Purchases

Sector	Direct Impacts	Secondary Impacts	Total Impacts
Employment			
Agriculture	0.0	0.2	0.2
Mining	0.8	0.1	0.9
Construction	82.1	0.9	83.0
Manufacturing	0.0	0.7	0.7
TIPU[1]	8.8	2.7	11.5
Trade	11.7	13.3	25.0
Service	2.1	37.7	39.8
Government	0.0	0.9	0.9
Total Jobs	**105.5**	**56.5**	**162.0**
Labor Income			
Agriculture	$1	$1,099	$1,100
Mining	$77,989	$15,955	$93,944
Construction	$4,495,164	$50,096	$4,545,260
Manufacturing	$739	$35,796	$36,535
TIPU[1]	$881,717	$172,334	$1,054,051
Trade	$694,468	$481,495	$1,175,963
Service	$94,954	$1,340,853	$1,435,807
Government	$1,092	$57,859	$58,951
Total Labor Income	**$6,246,124**	**$2,155,487**	**$8,401,611**
Total Output			
Agriculture	$0	$15,203	$15,203
Mining	$237,496	$58,470	$295,966
Construction	$11,959,805	$96,293	$12,056,098
Manufacturing	$0	$253,908	$253,908
TIPU[1]	$4,016,458	$579,768	$4,596,226
Trade	$9,666,157	$1,215,383	$10,881,540
Service	$185,084	$4,494,489	$4,679,573
Government	$0	$150,153	$150,153
Total Output	**$26,065,000**	**$6,863,667**	**$32,928,667**

Source: Taylor, David T. & Foulke, Thomas. *The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.* University of Wyoming, Department of Agricultural & Applied Economics. Pg. 18. October, 2010.
Notes:
1. Transportation/Information/Public Utilities

Table 7-6 Current Economic Impact Summary for Cameco in Wyoming

	Employment (jobs)	Labor/Household Income	Total Output	Average Earnings Per Job
Direct impacts				
Payroll (including benefits)	169.0	$12,483,873	$12,483,873	$73,869
Wyoming Taxes and Royalties	26.3	$3,406,863	$3,737,000	$50,299[1]
Wyoming Vendors	105.5	$6,246,124	$26,065,000	$59,205
Total Direct Impacts	**300.8**	**$22,136,860**	**$42,285,873**	**$66,665[1]**
Secondary Impacts				
Payroll (including benefits)	68.6	$2,253,948	$7,816,035	$32,856
Wyoming Taxes and Royalties	18.7	$613,279	$2,120,893	$32,796
Wyoming Vendors	56.5	$2,155,487	$6,863,667	$38,150
Total Secondary Impacts	**143.8**	**$5,022,714**	**$16,800,595**	**$34,928**
Total Impacts				
Payroll (including benefits)	237.6	$14,737,821	$20,299,908	$62,028
Wyoming Taxes and Royalties	45.0	$4,020,142	$5,857,893	$43,026[1]
Wyoming Vendors	162.0	$8,401,611	$32,928,667	$51,862
Total Impacts	**444.6**	**$27,159,574**	**$59,086,468**	**$56,400[1]**
Uranium Mining Multipliers	2.6	2.2		

Source: Taylor, David T. & Foulke, Thomas. *The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.* University of Wyoming, Department of Agricultural & Applied Economics. Pg. 19. October, 2010.

Notes:

1. Royalty payments excluded from calculation.

Table 7-7 Economic Impact of Construction Expenditures

	Employment (jobs)	Labor Earnings	Total Output	Average Earnings Per Job
2011 Capital Expenditures				
Direct Impacts	96.9	$5,385,010	$17,000,000	$55,573
Secondary Impacts	45.1	$1,843,018	$5,845,766	$40,865
Total Impacts	**142.0**	**$7,228,028**	**$22,845,766**	**$50,902**
2012 Capital Expenditures				
Direct Impacts	164.9	$9,373,046	$30,000,000	$56,841
Direct Impacts	76.7	$3,207,922	$10,134,035	$41,824
Total Impacts	**241.6**	**$12,580,968**	**$40,134,035**	**$452,074**
2013 Capital Expenditures				
Direct Impacts	185.5	$10,780,415	$35,000,000	$58,115
Secondary Impacts	86.3	$3,689,595	$11,616,174	$42,753
Total Impacts	**271.8**	**$14,470,010**	**$46,616,174**	**$53,238**
3-Year Summary	**2011**	**2012**	**2013**	**Total**
Expenditures	$17,000,000	$30,000,000	$35,000,000	$82,000,000
Employment	142.0	241.6	271.8	655.4
Labor Earnings	$7,228,028	$12,580968	$14,470,010	$34,279,006
Average Earnings per Job	**$50,902**	**$52,074**	**$53,238**	**$52,302**

Source: Taylor, David T. & Foulke, Thomas. *The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.* University of Wyoming, Department of Agricultural & Applied Economics. Pg. 21. October, 2010.

Table 7-8 Economic Impact of Cameco's Expanded Production

	Employment (jobs)	Labor/Household Income	Total Output
Direct Impacts			
Payroll (including benefits)	320.6	$23,681,074	$23,681,074
Wyoming Taxes and Royalties	49.9	$6,462,592	$7,088,840
Wyoming Vendors	200.1	$11,848,481	$49,443,566
Total Direct Impacts	**570.6**	**$41,992,147**	**$80,213,480**
Secondary Impacts			
Payroll (including benefits)	130.1	$4,275,589	$14,826,497
Wyoming Taxes and Royalties	35.5	$1,163,349	$4,023,193
Wyoming Vendors	107.2	$4,088,815	$13,019,918
Total Direct Impacts	**272.8**	**$9,527,753**	**$31,869,608**
Total Impacts			
Payroll (including benefits)	450.7	$27,956,663	$38,507,571
Wyoming Taxes and Royalties	85.4	$7,625,941	$11,112,032
Wyoming Vendors	307.3	$15,937,296	$62,463,485
Total Direct Impacts	**843.4**	**$51,519,900**	**$112,083,088**

Source: Taylor, David T. & Foulke, Thomas. *The Economic Impact of Cameco on Wyoming: Existing Uranium Operations and Planned Expansion.* University of Wyoming, Department of Agricultural & Applied Economics. Pg. 22. October, 2010.
Notes:
1. Royalty payments excluded from calculation.