1.5 Site Maintenance and Reclamation

1.5.1 Vegetation

1.5.1.1 Invasive Plants

Vegetation surveys across the permit area reveal that the only noxious weed is Tansy Mustard (**Appendix D8**). LC ISR, LLC commits to performing annual surveys to locate and eradicate invasive plant species including but not limited to Cheat Grass. These efforts will cover the entire permit area as well as along all access roads to the site.

1.5.1.2 Conifers

Conifer invasion has not been an issue within the area of the project. However, LC ISR, LLC will work with BLM to control or eradicate conifers if they begin to move into the permit area.

1.5.1.3 Revegetation

All surface disturbances will be revegetated at the soonest appropriate season using a mixture of native seed including sage brush (seed mixture approved by both BLM and WDEQ-LQD). LC ISR, LLC will continue to reclaim disturbed areas as soon as possible after exploration and ISR activities to help ensure re-establishment of habitat, as described in the Reclamation Plan (**Section RP 4.5**).

1.5.2 Fire

1.5.2.1 Wildfire

LC ISR, LLC will implement procedures to minimize the likelihood of starting a wildfire (including but not limited to Hot Work Permits, Site Inspections, Proper Storage of Waste, etc.) All field personnel will be trained in Emergency Response Procedures, including reporting of fires. In situ uranium facilities generally use plastic piping, therefore, minimal welding and cutting takes place in the field. LC ISR, LLC will maintain a generous supply of fresh water that can be used for wildfire suppression, if necessary.

1.5.2.2 Prescribed Fire

LC ISR, LLC will not use prescribed fire to remove vegetation or to control invasive species unless prior approval is granted by the BLM and the Wyoming Game and Fish Department (WGFD).

1.5.2.3 Grazing

The area surrounding the mine units and the Plant will be removed from grazing by wildlife friendly fencing. The remainder of the Permit Area will continue to be grazed according to the existing BLM grazing permit.

1.5.3 Predation and Disease Control

1.5.3.1 Predation

LC ISR, LLC will work proactively with the WGFD to control predators on the permit area that pose a threat to species of concern, particularly sage grouse. Predators of concern include skunks, coyotes, raptors, and corvids. Above-ground transmission line supports will include perching and roosting deterrents. To the extent possible, LC ISR, LLC will also design and construct structures in a manner that does not encourage roosting or nesting by raptors.

1.5.3.2 Disease

To reduce the threat of mosquito-borne illnesses in wildlife, LC ISR, LLC will treat the two holding ponds with an approved insecticide to prevent mosquito hatches. Drilling mud pits will be backfilled as soon as possible after use in order to eliminate their use by mosquitoes. Equipment and materials will be stored in a manner that minimizes the accumulation of stagnant water. Used tires will be disposed of as they are generated or will be stored in a manner that prevents accumulation of water until taken off-site for disposal.

1.5.4 Potentially Harmful Materials

As described in the Operations Plan, LC ISR, LLC will implement several measures to prevent exposure to potentially harmful materials, and should an accident occur, procedures will be in place to promptly remove/remediate any releases. All liquid chemicals and petroleum products in and around the Plant will be maintained within bermed areas sufficient to contain any potential spill. No bulk hazardous chemicals will be used in the Mine Units. The mining solutions will have a pH of around 8.0 and will

not contain any petroleum based chemicals or elevated levels of heavy metals that present an acute hazard to wildlife or employees.

Any mortality that could be caused by exposure to toxic substances will be reported immediately to the WDEQ-LQD (and other WDEQ divisions as necessary), BLM, USFWS, and WGFD. The goal of such reporting will be to identify and solve the problem as quickly as possible.

1.5.5 Storage Ponds

The water quality in the storage ponds will be monitored quarterly and whenever a process change may result in a significant change in water quality. The ponds will contain produced groundwater and process waters with a near neutral pH. No petroleum based products will be sent to the holding ponds. LC ISR, LLC does not anticipate the water quality within the ponds will pose a risk to birds, with the use of fencing, deterrents, and control of algae and plankton, but will work with WGFD to ensure the protection of birds.

1.6 Habitat Enhancements

LC ISR, LLC will work with BLM and WGFD to develop enhancements in the Permit Area. Additional enhancements may be completed on nearby areas (areas outside the Permit Area) that are not proposed for operations or disturbance if permitting agencies deem them desirable to offset onsite impacts. These enhancements could include: placement of new raptor nest platforms, creation of new water sources, or habitat modifications/improvements to improve specific habitat conditions for sage-grouse (Section 2.2.6) or other high interest species.

2.0 WILDLIFE MONITORING

Wildlife monitoring in and near the Permit Area will be completed on an annual basis through the life of the Project. Consultation with BLM, WGFD, and USFWS will be conducted as needed prior to completing any annual survey work. An annual monitoring report will be prepared and submitted to the WDEQ-LQD, BLM, and NRC each year. The report will include: survey methods; results; any trends; an assessment of protection measures implemented during the past year; recommendations for protection measures for the coming year; recommended modifications to monitoring or surveying; and any recommendations for additional species to be monitored (e.g., a newly listed species). The Annual Wildlife Monitoring Report, data and mapping will be formatted to meet WDEQ-LQD requirements. Only qualified wildlife biologists or ecologists will be employed for wildlife monitoring.

In addition to the specific annual monitoring for wildlife, LC ISR, LLC will document all known instances where Project activities may have impacted wildlife (such as wildlife/vehicle collisions on roads, or other mortality within the Permit Area). Any large die-offs or other evidence of possible wildlife exposure to toxic chemicals will be reported immediately to WDEQ-LQD (and other WDEQ divisions as necessary), BLM, USFWS, and WGFD. A record of wildlife mortality will be kept at the mine site and included in the Annual Report.

Monitoring and survey methods are designed to be consistent with standard protocol used by the WGFD (WGFD, 2007), and to also follow monitoring requirements and recommendations from WDEQ-LQD (Wildlife Monitoring Requirements for Surface Coal Mining Operations).

Table OP-A6-6 includes the wildlife monitoring schedule, which is described in more detail in the following sections.

2.1 Big Game

2.1.1 Seasonal Distribution and Habitat Affinity

Based on current WGFD GIS mapping, the Permit Area is mapped as winter/yearlong range for pronghorn. The Permit Area is out of mapped range for mule deer, elk and moose. Both elk and mule deer have been observed on the site during baseline studies. The survey area for big game will include the Permit Area and surrounding 2-mile buffer.

One aerial survey and one ground survey will be completed between January 1 and mid-March each year to determine winter habitat use. Aerial surveys will be completed on a clear day when snow cover is near 100 percent. Transects will be flown at approximately 0.5 mile intervals (with one observer). The ground survey will be completed as soon as possible after the aerial survey. If appropriate snow conditions have not developed by March 1st, the aerial survey will be conducted when snow cover is either less than 20 percent or between 80 to 100 percent. If these snow conditions are not present the aerial survey will be cancelled for the year and only the ground survey would be completed.

To determine spring and summer habitat use, one ground survey of the Permit Area will be completed in April, early June, and August. This survey will be completed while driving a standard route within the Permit Area.

During each survey the number of pronghorn (and other big game species) will be counted, and the general location will be recorded by GPS. Data on breeding status (e.g., doe with fawn), age (e.g., adult, yearling, young-of-year), sex, and general activity (e.g., feeding, resting, etc.) will additionally be collected. The dominant vegetation/habitat type that is being used will be noted.

2.1.2 Climate Information

Climate data from the nearest NOAA weather station or the on-site weather station will be summarized year around.

2.1.3 Range Conversion

The entire Permit Area is within winter/yearlong pronghorn range; no other mapped big game ranges are present. The acreage of this range impacted will be detailed in each annual report (the total for the project life and the incremental area impacted per year will be summarized).

2.1.4 Mortality and Concentration Buildups

An annual record of all big game mortality due to fence entanglements, vehicle collisions, and other factors will be completed. Winter mortalities will be estimated each spring from observations taken during wildlife surveys and other mine activities. The data to be recorded include: species, date, probable cause of mortality, and location. A table summarizing big game mortality will be submitted in the annual report.

If concentrations of pronghorn appear suddenly or if apparent migration blocks (fences, snow drifts along roads or other blocks) are observed they will be reported immediately to the local WGFD personnel. Any big game concentrations or migration blocks will be reported in the annual report.

2.2 Sage Grouse/Upland Birds

The only upland birds in the Permit Area are greater sage-grouse (sage grouse). The sage grouse monitoring protocols presented here are designed to assess the effects of ISR activities on: sage grouse populations; seasonal habitat selection; and productivity within the Sage Grouse (SG) Monitoring Areas. The SG Monitoring Areas are shown on **Plate OP-A6-1** and include:

- The Large SG Monitoring Area which is delineated to maximize the probability that 'control' leks will be included. Control leks are considered to be leks within or near Core Area boundaries which are not influenced by ISR activities, major highways, or other anthropogenic activities except livestock grazing and public recreation; and

- The Small SG Monitoring Area which is delineated to conservatively establish the area where nesting and early brood-rearing females may be influenced by ISR activities.

LC ISR, LLC will use lek search and lek count protocols to assess potential impacts of ISR activities on sage grouse populations. The objective of lek counts is to track male breeding population size within the SG Monitoring Areas through the life of the Project. The objective of lek searches is to determine if new leks become active within the SG Monitoring Areas during the life of the Project.

To determine the potential effects of ISR activities on habitat selection, LC ISR, LLC will model the seasonal habitats existing within the Small SG Monitoring Area. The objectives of these models are to quantify the amount of habitat functionally influenced by ISR activities on a seasonal basis (e.g., nesting, early brood-rearing, summering and wintering habitats).

LC ISR, LLC will use brood survey routes and wing surveys to assess potential impacts of ISR activities on sage grouse productivity. The objective of both surveys is to track chick productivity of females potentially influenced by ISR activities through the life of the Project.

Sage grouse surveys discussed below will follow standard protocol as recommended by the WGFD Sage Grouse Technical Committee and by Connelly et al. (2003).

This comprehensive sage grouse monitoring plan is designed to accomplish definitive monitoring of the effects of ISR activities on the sage grouse. The monitoring will lead to and guide effective mitigation actions. However, it is a cost intensive, long-term commitment and is timed to establish baseline conditions. Should a situation arise which prohibits or significantly delays LC ISR. LLC's activities (before or after regulatory approvals for the Project are issued), the commitment may be curtailed and may be limited to only annual lek counts within the Small SG Monitoring Area. LC ISR, LLC will inform WGFD, BLM, WDEQ-LQD, and NRC should this monitoring change be necessary.

2.2.1 Populations

2.2.1.1 Lek Counts

Lek count data will be the primary data used to assess the population-level effects of developing the Lost Creek uranium deposits. The lek monitoring methods are therefore as comprehensive as possible. The objective of lek count monitoring is to track, as inclusively as possible, male breeding populations on leks potentially influenced by ISR activities concurrent with leks not influenced by such activities but similar in other aspects through the life of the Project.

Counts will be conducted at all known leks within the SG Monitoring Areas starting with a 2010 baseline list of known leks. The 2010 baseline list will be established from existing data (e.g., the WGFD sage grouse database) and a comprehensive lek search of the SG Monitoring Areas to be conducted in April 2010. The list of known leks will be updated on a three-year cycle based on lek search flight results (Section 2.2.1.2).

All known leks within the SG Monitoring Areas will be counted annually. This number of leks may increase, depending on results of lek searches conducted throughout the life of the Project; however, the number will not be decreased from the 2010 baseline unless leks are established as 'unoccupied' following protocols outlined by the WGFD Sage grouse Technical Committee (Section 2.2.2). LC ISR, LLC will coordinate monitoring efforts with the BLM and WGFD to avoid duplicative efforts and, as a result, undue disturbance of the leks. The count methodology that LC ISR, LLC will use is outlined below.

General Lek Count Methodology:

- Counts will be conducted during the month following the peak of mating activity (April 1 – May 7). Research has shown that the highest number of male sage grouse is observed during this period. The increased number of males is due to young males showing up later in the strutting season even though most of the breeding has already occurred.

- Counts will be conducted from the ground as close to sunrise as possible and extended for one-half hour after sunrise. The phase of the moon may affect use patterns of leks. During a full moon, grouse may display at night and consequently terminate activities earlier in the morning. This variation in activity may influence choice of counting dates.

- Counts will be conducted a minimum of three times each year for each lek (at least one count every 7 to 10 days.)

- All leks within a lek complex will be counted on the same day, with lek complexes estimated from spatial orientation of leks within the SG Monitoring Areas;

- Counts will be completed on days with good weather conditions. Optimum weather conditions for counts are clear, calm days. Wind speeds should be less than 20 mph because high winds reduce lek activity. Temperature seems to have little effect on activity. Weather conditions will be recorded during each count.

- Known lek sites are located in mid-day periods prior to completing any counts. Access routes and counting points are predetermined to allow the observer to count the lek without disturbing birds by driving or hiking. Counts are made by using binoculars and spotting scopes from observation points. Observation points for each lek will be established and noted in 2010 and each lek will be counted from these points in subsequent years.

- The location of each lek will be accurately determined and recorded in UTMs using NAD83 datum. Observers should not disturb grouse to obtain lek locations. If a lek is active, the observers should make the best estimate of the lek location and return later to confirm.

- Data will be recorded on the standardized statewide reporting form with the following format:

					LOCATION			GPS UTM			
Date	Time	Observer	Males	Females	Unk	QQ	Sec	Twn	Rng	Northing	Easting	Grouse Sign	Comments

2.2.1.2 Lek Searches

Breeding sage grouse may be displaced by some ISR activities and thereby occupy active leks or form new leks farther from those activities. Thus, lek searches will be required to accurately assess the population-level response of sage grouse to ISR activities.

During the peak breeding period in April 2010, LC ISR, LLC will systematically search for leks within the SG Monitoring Areas from the ground to ensure the baseline survey is as thorough as possible. Ground searches will be conducted from 0.5 hours prior to sunrise to 1.5 hours after sunrise. If the April full moon coincides with the peak breeding period, LC ISR, LLC will additionally conduct searches throughout the nights with good moonlight. The ground at all potential leks will be searched once the birds have left the site for evidence of consistent use (e.g., fecal droppings and feathers). Ground searches for leks can be more effective than aerial searches due to the birds' reaction to aircraft (crouching which makes the birds difficult to see and thus the leks difficult to identify, especially smaller leks.) Ground searches can also be more effective as a result of focusing all locating techniques such as listening and habitat inspection. Additionally, as grouse display all night during the full moon at the peak of the breeding period, night surveys can be effective at finding leks by sound.

LC ISR, LLC will conduct lek searches of the SG Monitoring Areas from fixed-wing aircraft every third year following establishment of baseline (i.e., 2013, 2016 ...). Searches will be conducted during the peak of the breeding period between 0.5 hours before and 1.5 hours after sunrise. Transects (approximately 1.0 km apart) will be flown along north-south lines. Flights will be limited to days with good visibility and weather. Transects will be flown from approximately 100-150 meters above ground level. Return visits from the ground to all potential new sites will be conducted to confirm a location as a lek as soon as feasible following flight. If a new lek is found, it will be added to the known lek list and counted annually. Although counting of new leks the year of discovery will be initiated later in the breeding period (i.e., after the lek search) maximum male attendance generally occurs after the peak of breeding due to the behavior of yearling males, thus counts should not be biased.

As noted above, aerial searches may not be as effective as ground searches; however, ensuring the data is collected in a standardized manner through the life of the Project is critical. Aerial searches do not require the same level of experience as a ground-based search and logistic considerations are less daunting. Therefore, aerial searches increase the likelihood that comparable data can be collected throughout the life of the Project.

2.2.1.3 Analysis of Lek Data

LC ISR, LLC is interested in investigating the effects of the Lost Creek Project on sage grouse populations, and as such, needs to account for other potential impacts to populations, particularly other energy development, grazing, and traffic. (Given the size of the Large SG Monitoring Area, natural factors influencing populations at large spatial scales (e.g., weather) should be standardized across the area.) The measures that will be taken to identify other potential impacts and the subsequent data analysis methods are described below.

Energy Development

Anthropogenic energy development data will be compiled within the SG Monitoring Areas plus a six-km buffer around that area. (Six km represents a consistently documented impact distance on breeding sage grouse in relation to natural gas development [Naugle et al., 2010].) These data will be updated annually to reflect the conditions encountered by sage grouse during each breeding season. The six-km buffer region is included to ensure that the potential cumulative effects of anthropogenic activity not associated with Lost Creek are accounted for during analyses. All energy developments (e.g., uranium, gas, oil, etc.) will be mapped.

ISR activities within this area will be quantified over a distinct spatial area. Due to the nature of ISR, mapping of mine units or groups of wells within mine units, rather than single well locations, is more representative of the ISR activities. (The mine units or groups of wells within mine units are referred to as 'ISR polygons' in the data analysis.) Gas or oil development will be mapped to individual well pads. Development data will be compiled from publically available records and verified in the field.

Currently, gas and oil leases within the SG Monitoring Areas are undeveloped. If these leases are developed, any lek within six km of a pad being drilled during the breeding season, or within three km of a producing pad, will be monitored but removed from the subsequent data analyses. (The impact distances of gas or oil development are estimated in Holloran, 2005).

Grazing

LC ISR, LLC will use BLM grazing records to determine if livestock management in any particular grazing allotment differs dramatically. If LC ISR, LLC finds such a lease, any lek where at least 20% of a five-km buffer around that lek includes that grazing allotment will be removed from analyses (Connelly et al., 2000). [A majority of females bred on a lek nest, within five- km of that lek in contiguous habitats (Holloran and Anderson, 2005)].

Traffic

Traffic will be quantified on all improved surface roads within this area using pneumatic axle counters. Axle counters will be checked as working and data recorded at least weekly during the breeding season; all counters will be checked the day following a snow storm to ensure plowing has not damaged or pushed the counter tubing from roadway. Although traffic volume changes will be directly related to the Lost Creek Project, to assess the effects of traffic on breeding sage grouse, LC ISR, LLC will need to standardize for activities associated with uranium recovery. LC ISR, LLC will remove any lek within six km of developed uranium polygons (Lost Creek plus other companies), and investigate annual changes in the number of males (response variable) on the remaining leks in terms of distance to the closest point along an improved surface road and traffic levels (predictor variables). Scatter plots will be used to establish linearity of predictor variables; transformations will be used to generate linear predictive data. LC ISR, LLC will use multiple regression to assess the effects of distance to and traffic volumes on improved surface roads to the number of males on leks.

Models assessing the effects of traffic will be used to estimate distance to a road with a given level of traffic where impacts to grouse activity are minimized. These estimates will be used to assess which leks that are greater than six km from the Lost Creek Permit Area, and are potentially influenced by traffic and, therefore, will be removed from analysis of the impacts of ISR activities.

Data Analysis

Initially, LC ISR, LLC will plot annual change in the number of males per lek against distance to the closest ISR polygon. If there is a 'distance effect', then a best-fit line through this data should flatten at the distance where impacts to the number of males per leks are eliminated. LC ISR, LLC will use this 'distance effect', if it is evident, to categorize leks as either within or outside of the area of ISR influence. If new leks are found, they will be included.

A drawback to this approach is that annual changes in lek size may be unduly influenced by smaller leks. For example, a five-male lek that loses two birds will have an annual change estimate of -40%, where a 30-male lek would be required to lose 12 males to equal the same decline. Therefore, in the third year after the 'baseline year' (2013), there will be sufficient data to use an analytical technique independent of lek size. (This technique cannot be used until at least three years after the baseline year, because it depends on the slopes of best-fit lines, and three points are required to generate an acceptable line for establishing slope).

Starting in the third year after the baseline year, the maximum number of males per lek will be plotted by year and the best-fit straight line will be fit to these data. There will be a plot for each lek, and the slope of that plot will represent the rate of increase or decrease in the lek size. The slope of the line for each plot will, in turn, be plotted against distance to the closest ISR polygon. Then, the best-fit line for this plot of change in lek size versus distance will be used to assess distance effect of ISR activities on male occupancy of leks. As this effect may generate a pattern that cannot be fit to single line, LC ISR, LLC may have to bin the data into distance categories and generate lines separately by bin. For example, if grouse are displaced from areas of ISR activity to leks within a given distance of that activity the curve that fits the close leks will not accurately reflect the relationship farther from the activity. In addition, LC ISR, LLC will also note the type of activity in the nearest ISR polygon as that may influence grouse displacement. For example, during mine unit installation in a given polygon, sage grouse may avoid that polygon, but during production, sage grouse may return to that polygon.

To quantify the population-level effects of developing the Lost Creek Project, LC ISR, LLC will use results from the above analyses. These analyses are designed to establish the potential reaction of populations to ISR activities, and the techniques for quantifying population-level effects will depend on these modeled reactions. For a more detailed discussion of the analytical techniques to be applied, see Holloran, 2005.These analyses have the added advantage of indicating the habitats selected by individual birds (e.g., displaced individuals) directly influenced by ISR activities . By pinpointing these locations, LC ISR, LLC will be able to focus habitat enhancements on areas used by birds actually influenced by ISR activities (Section 2.2.5).

2.2.2 Habitat Selection

Non-invasive techniques for monitoring sage grouse nesting and early brood-rearing habitat selection and success are limited to radio telemetry [Spotlight capture and collaring of females during the peak of breeding appears to have negligible effect on subsequent behavior.(Holloran, verbal communication, January 2010)]. However, given the potential reaction of females to ISR activities, the probability of maintaining a sample of radio-equipped birds in areas affected by ISR activities through the life of the Project may be low (deduced from Walker, 2007). Therefore, for the purposes of designing the monitoring program, LC ISR, LLC has assumed that uranium extraction in the Lost Creek Permit Area will have an influence on nesting and early brood-rearing females similar to the influence of natural gas development.

Information from nesting female long-term reaction to natural gas development suggests that the area within one km of infrastructure associated with energy development is functionally lost as nesting habitat (Holloran et al., 2010). Holloran et al. (2010) also

report that sage grouse females in Wyoming rear their broods during the early brood-rearing period within 1.65 km of their nest. Thus, the amount of nesting and early brood-rearing habitat that will be influenced by developing the Lost Creek Permit Area will be conservatively estimated as all suitable habitats within the Permit Area and within 2.65 km of the Permit Area. Additionally, UR Energy Inc.'s (LC ISR, LLC's parent company) two-year proposed exploratory drilling plan suggests activity south and southeast of the Lost Creek Permit Area. LC ISR, LLC will buffer this area of proposed activity by 2.65 km and include this as potentially impacted habitats (i.e., as part of the Small SG Monitoring Area). Given the nature of exploratory drilling, this portion of the Small SG Monitoring Area may be modified to reflect on-the-ground activities that occur that differ from proposed future plans.

To establish suitable habitats within the Small SG Monitoring Area, LC ISR, LLC will conduct seasonal habitat selection monitoring in 2010-2011 using radio-equipped female sage grouse. Forty female sage grouse will be captured in April 2010 from leks closely associated with the Lost Creek Permit Area using spotlighting and hoop-netting techniques. The leks where females will be captured include: Eagles Nest Draw, Prospects (and Prospects South), Discover (and satellite), Green Ridge (and satellite), Minex West, and Sooner (Plate OP-A6-1). Each captured female will be: fitted with a 19.5-g, necklace style radio-transmitter (Advanced Telemetry Systems); identified as yearling or adult (at least two years old) by shape of outermost wing primaries; and released at point of capture. Starting in late April, pre-nesting females will be located at least twice weekly to determine nest initiation. Nesting locations of radio-equipped females will be found by circling the signal source until females can be observed; nest sites will be marked with a GPS to facilitate location following the completion of incubation. Incubating females will be monitored at least twice weekly.

Nest success (hatched or not) will be assessed by visual examination of eggshell fragments after a female has left her nesting area. Conditions at unsuccessful nests will be examined to determine cause of failure. Females with broods will be found twice between 5 days and 14 days post-hatch to determine early brood-rearing habitat selection. At 14 days post-hatch, early brood-rearing success will be determined (at least one chick alive 14 days post-hatch is a successful female); the existence of chicks will be assessed either through direct visual confirmation of a chick, or through the reaction of the female to researcher. Brooding females will be located at least once per week from 14 days post-hatch through August (It is expected that late brood-rearing habitat selection will be associated with mesic sites.) At 35 and 36 days post-hatch, spotlight surveys of brood-rearing females will be conducted on consecutive nights to determine fledge rates (e.g., the number of chicks fledged per brood). Barren females (e.g., females that were unsuccessful nesters or brooders) will be located at least bi-weekly from nest or brood loss through August to determine seasonal habitats selection.

From September through March, all radio-equipped grouse will be located from fixed wing aircraft at least once per month. Reference transmitters (i.e., transmitters of known location deployed pre-flight by observers) will be used to determine flight location accuracy. Radio transmitters from birds that die during the 2010-11 field season will be redeployed April 2011 using capture techniques described above. (If possible, the cause of death will also be identified.) The radio telemetry work will be completed following the March 2012 telemetry flight.

Seasonal habitat selection data (nest, early brood, late brood, summer, and winter) will be used to generate Resource Selection Functions (RSF) in a 'used' versus 'available' analysis. RSFs will be applied to map the suitable seasonal habitats existing within the Small SG Monitoring Area. LC ISR, LLC will assume that ISR activities within the Lost Creek Permit Area will influence the total acreage of suitable area by season that occurs within the boundaries of the Small SG Monitoring Area.

2.2.3 Productivity

Three approaches will be used to used in evaluating sage grouse productivity: transects; wing barrels; and climate.

Transects

Late brood-rearing and barren female summer locations from radio-equipped birds will be used to identify areas where birds using nesting or early brood-rearing habitats closely associated with the Lost Creek Permit Area concentrate during the summer. LC ISR, LLC will establish at least two permanent walking transects 1000 m in length in each of these areas. An equal number of transects will be established in areas where radio-equipped females were not closely associated with Lost Creek Permit Area during nesting or early brood-rearing summer. Transects will be surveyed twice during a one-week period in late July from sunrise to two hours after sunrise to ensure feeding times are captured in monitoring efforts. All grouse observed will be counted and classified (adult male, adult female, young of the year). All transects will be surveyed annually through the life of the Project. Data collected from these efforts will be compared by total grouse use by sex and numbers of chicks per female.

Wing Barrels

LC ISR, LLC will work with biologists from WGFD to establish wing-barrel locations to further investigate annual differences in productivity relative to ISR activities. Wing barrels with signs designed to explain the reasoning for monitoring will be placed at

access routes to areas where females closely associated with the Lost Creek Permit Area during nesting or early brood-rearing summer (treatment area). A comparable area in terms of available summering habitats and spatial scale will also be monitored in this fashion to act as a control. Barrels will be placed and monitored each hunting season through the life of the Project. Wings collected from these barrels will be compared (treatment versus control area) by the number of chicks per female in the harvest.

Climate

Seasonal weather patterns may dictate sage grouse use of traditional summering areas. In particular, brood-rearing females will remain in sagebrush upland habitats until range desiccation forces them onto more mesic sites. LC ISR, LLC will use seasonal weather data as described in Section 2.1.2 to assist in assessing the potential effects of this behavior on productivity results.

2.2.4 Mitigation

Based on available information, LC ISR, LLC is conservatively anticipating that at least some ISR activities within the Lost Creek Permit Area will negatively influence populations at least within the Small SG Monitoring Area. (For example, activities during mine unit installation may be more disruptive than activities during production.) LC ISR, LLC proposes to mitigate these consequences by enhancing habitats within the buffered region around ISR activities where lek numbers increase above that expected by controls. LC ISR, LLC will use the results from the RSF analyses (Section 2.2.2) to focus enhancement efforts on the seasonal habitat(s) most influenced by ISR activities. This focus will dictate the objectives of enhancements. For example, if suitable nesting habitat is most influenced, then habitat enhancements will focus on increasing grass height and cover within relatively dense sagebrush stands and maintaining that height and cover to the following nesting season as residual grass.

Upon identification of a locale where grouse are being displaced, LC ISR, LLC will initially use the RSFs established from the telemetry study (Section 2.2.2) to map the seasonal habitat(s) occurring in this locale. LC ISR, LLC will then conduct vegetation surveys of the focus seasonal habitat(s). The surveys will be designed to establish current vegetative condition(s) at the patch scale, and to gather the data necessary to estimate a patch's vegetative potential (e.g., soil characteristics). Using this information, LC ISR, LLC will be able to identify suitable patches of habitat that are of low quality relative to the conditions that could occur within that patch. Once these patches are identified, LC ISR, LLC will develop pro-active enhancement options on a patch-by-patch basis.

LC ISR, LLC will use published information to develop management options that have been shown to result in the desired changes. Unless conditions of a site are such that no other options are feasible, LC ISR, LLC will not suggest shrub manipulating management (e.g., prescribed fire, herbicide application), but will focus on alternative forms of habitat enhancement (e.g., interseeding native cool-season bunchgrasses and livestock management modifications). LC ISR, LLC will develop the habitat enhancement plan at a relatively large spatial scale to increase the probability that actions taken will have a population-level effect. Vegetation and sage grouse post-treatment monitoring protocol will be established, and these activities will be continued for at least five years post-treatment, and at regular intervals (e.g., every three to five years) while Ur-Energy, Inc. is active within the general region. This enhancement plan will be developed and implemented with the assistance of BLM and WGFD rangeland specialists.

The relatively short temporal scale of mine unit installation, along with the reclamation that occurs within a producing mine unit (**Section OP 2.7**), additionally suggests LC ISR, LLC may be able to manage for individual grouse using habitats within the Small SG Monitoring Area (e.g., the time proposed from initial ISR activities to reclamation is less than the average life-span of a female sage grouse). Sage grouse show remarkable fidelity, especially to nesting locations, and it has been shown in a developing natural gas field that adult females will not vacate their nesting areas regardless of the level of development that occurs within those areas (Holloran, 2005). Because of this fidelity, maintaining individuals that are using habitats within the Small SG Monitoring Area may expedite re-colonization of the Lost Creek Permit Area following completion of production. LC ISR, LLC will curtail personnel activities that may disturb females using habitats under LC ISR., LLC control (e.g., dogs must be leashed at all times, walking into undisturbed habitats will be discouraged, speed limits will be strictly enforced, etc.). LC ISR, LLC will pick up all trash and road kill on a regular basis to minimize corvid occurrence within the Small SG Monitoring Area. Whenever a nesting female is discovered, LC ISR, LLC may institute additional protective measures including but not limited to delaying or limiting ISR activities close to her nest until she has left the area. Protective measures will be determined on a case-by-case basis depending on factors such as proximity and timing relative to critical ISR activities.

2.3 Raptors

2.3.1 Nest Status and Production Success

Existing raptor nests are located more than one mile away from proposed ISR activities (**Figure D9-7**). Annual monitoring of known raptor nests will be completed each spring

between April and July to determine nest status. Nest surveys can be completed by air or from the ground.

A ground or aerial survey of the Permit Area and surrounding one-mile radius will be completed during the first two weeks of February each year for signs of golden eagle and great-horned owl nesting and or courtship. LC ISR, LLC will document early courtship behavior in new nesting areas and consult with USFWS and WGFD to determine appropriate mitigation measures.

Three thorough surveys for nesting raptors will be completed for the Permit Area and surrounding one-mile perimeter through the spring. One survey will be completed during March to locate great-horned owl and golden eagle nests. A second survey will be completed in April to locate most of the nests of other species. Reporting will indicate whether nesting territory is: not occupied (inactive); occupied by one raptor (active); or occupied by a pair (active).

One survey will be completed from mid-May to mid-June to locate new raptor nests (nests that have become established since the April survey) and to check the status (activity, number of young birds) of all nests. Follow-up visits to previously identified nests will be timed to facilitate documentation of nesting activity, according to the biology of the species present and variations in breeding chronology, including: nest building; reproductive attempts and success; and fledging success. The status and productivity of all nests will be reported annually (by location, nest type and characteristics, species, and number of fledged birds.

Nest surveys will be completed either from the air or the ground. Nest checks will be brief and conducted to avoid flushing incubating raptors.

2.3.2 Measures of Disturbance

The linear distance of each nest site (active and inactive) from the nearest known regular human or equipment activity will be determined each breeding season. The presence of visual barriers (does a direct line of site exists between the disturbance and the nest) will be noted. It will be determined if the activity/disturbance is unrelated or related to ISR activities. This information will be shown on a raptor monitoring map with each year's annual report.

2.3.3 Prey Abundance

2.3.3.1 Lagomorphs

Lagomorphs present include desert cottontails and white-tailed jackrabbits. Pygmy rabbits are also present in lowland sagebrush habitat.

Desert cottontail and white-tailed jackrabbit populations will be evaluated using spotlight surveys through native habitat in the Permit Area. Surveys will be completed on a night as close to the full moon as possible. One survey will be completed in June and another survey will be completed in August of each year. Transects will be established along approximately 1.5 mile of road within the Permit Area. Once reclaimed/restored areas are established, a transect will be established in these areas. All transect locations will be presented on a map in the Wildlife Monitoring Report.

Based on current wildlife inventories, pygmy rabbits are restricted to lowland sagebrush habitat areas within the Permit Area. Pygmy rabbits will be surveyed using techniques described in Ulmschneider et al. (2004). Four transects will be established in pygmy rabbit occupied lowland sagebrush swales within the Permit Area. Lowland sagebrush occurs in narrow swales and drainages on the site. Transect length (from start and stop point) will be 0.5 miles. Transects will not be linear but will meander through the habitat area. Meandering transects will start and end at the same points each year. Data will be recorded on standard data forms using the recommended data recording methods (Ulmschneider et al., 2004). Annual transect tracts will be recorded and presented on a map in the Wildlife Monitoring Report.

2.3.3.2 Small Mammals

Surveys for other small mammals are not proposed at this time.

2.4 Migratory Birds of High Federal Interest (MBHFI)

Nesting non-game bird surveys will be conducted in representative vegetation/habitat types within the Permit Area. These surveys will be used to document breeding MBHFI that are present in the area.

Surveys will follow techniques recommended by the WDEQ (WDEQ-LQD, 1994). Two transects will be established in each vegetation type of the Permit Area. Transects will be 1,000 meters in length (2,000 meters per habitat type). The two vegetation types in the Permit Area are Upland Big Sagebrush and Lowland Big Sagebrush (**Appendix D8**).

Based on already completed baseline breeding bird surveys, the Lowland Big Sagebrush habitat provides the most important nesting habitat to MBHFI on the site.

In the both vegetation types, belt transects (100 meters) wide will be walked. All birds (including non-game and non-MBHFI birds) observed or heard will be recorded. Transect start and stop points will be located by GPS. Transect locations will be shown on a 1:24,000 scale quad map.

Surveys will be completed during the peak of the nesting season during the 1st week of June. Surveys will be completed from 0.5 hours before sunrise to 9:30 am. Nesting bird surveys were completed during the spring of 2007.

2.5 Federally Listed Threatened and Endangered Species

Any observation of a federally listed (threatened or endangered) species will be recorded and promptly reported. Any mortality of a listed species will be reported to the USFWS within one day of discovery.

If new species (that are present in the Permit Area) are listed as threatened or endangered during the period of mine operation, the USFWS will be consulted to develop specific mitigation and monitoring measures.

2.6 Non-Game Mammals

Specific monitoring surveys of non-game mammals are not proposed. Incidental observations of non-game mammals will be made while completing other wildlife surveys. These incidental observations will be summarized in a table in the Annual Report.

2.7 Non-Game Birds

Specific surveys for non-game birds are not proposed. However, as noted in Section 2.4, during the surveys for MBHFI, all birds observed or heard will be recorded. In addition, incidental observations of non-game birds will be made while completing other wildlife surveys. These incidental observations will be summarized in a table in the Annual Report.

2.8 Reptiles and Amphibians

Specific surveys for reptiles and amphibians are not proposed. Incidental observations of reptiles and amphibians will be made while completing other wildlife surveys. These incidental observations will be summarized in a table in the Annual Report.

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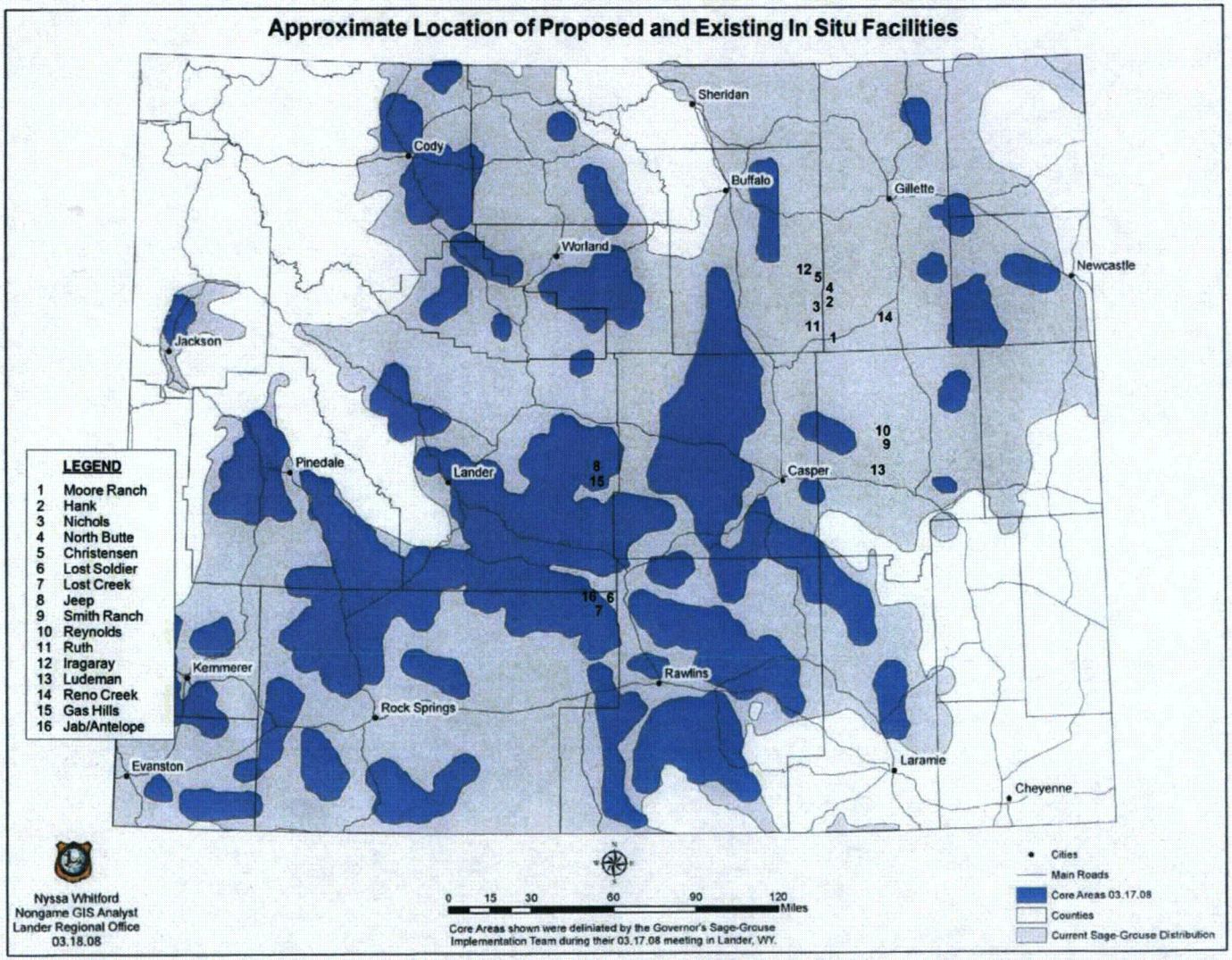
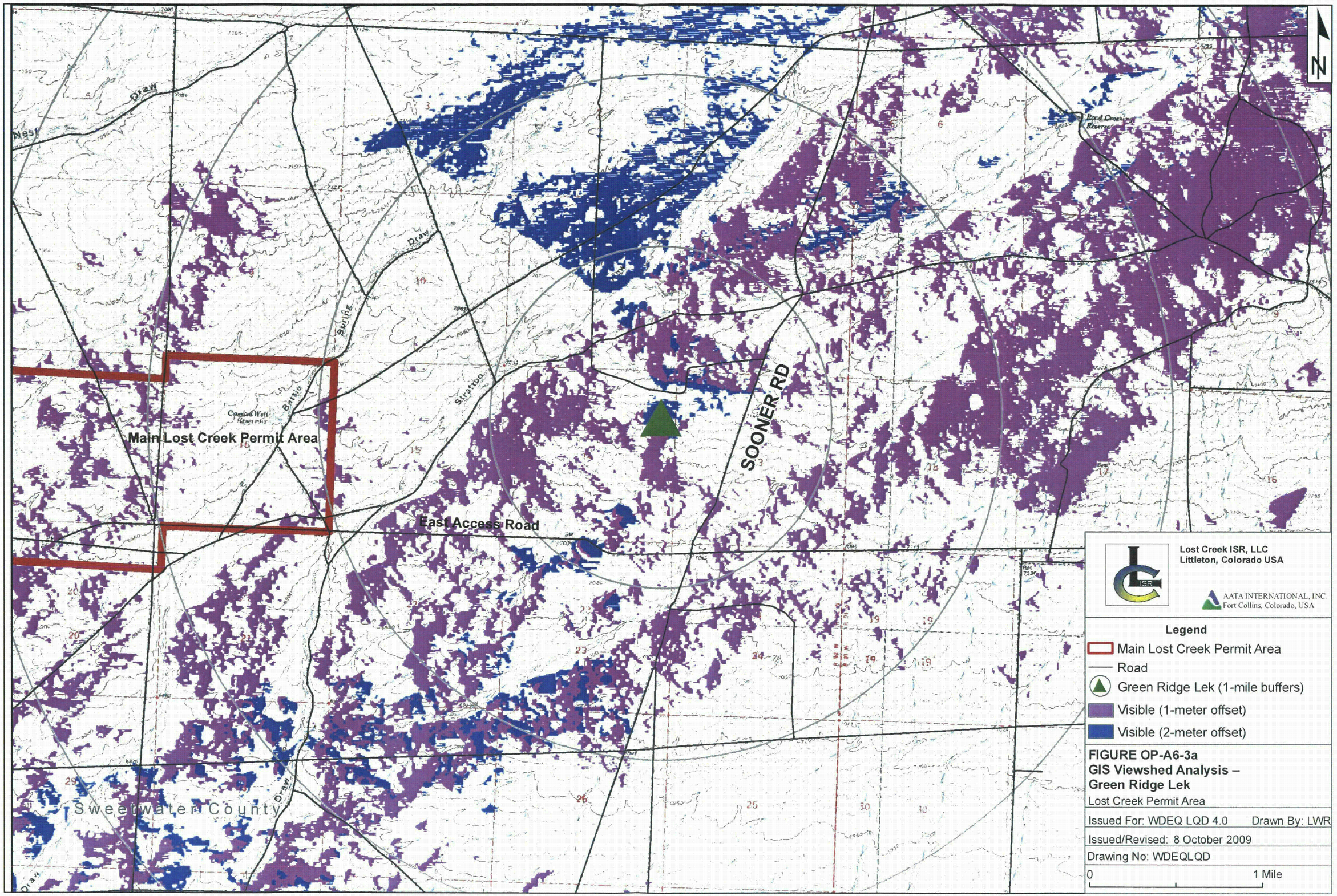
Figure OP-A6-1 Location of Sage Grouse Core Population Areas




Sand Gully
Prospects
Osborne Draw
Eagles Nest Draw
Prospects South
Little Osborne
Eagles Nest Reservoir
Wamsutter Crooks Gap Road
Crooked Well
Green Ridge
Green Ridge Satellite
Southland Well
West Access Road
East Access Road
Discover
Discover 2
Sooner Road (BLM 3215)
Battle
Stratton
Sooner Reservoir
Sooner Oil
Minex West
Sooner
N
Lost Creek ISR, LLC
Littleton, Colorado USA
AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA
Legend
Lost Creek Permit Area
County/BLM Road
Sage Grouse Leks
Occupied and Active
Unoccupied and Active
Inactive
0.25-Mile Buffer (lighter for unoccupied)
2-Mile Buffer (lighter for unoccupied)
Lands to be Affected by Operations
Mine Unit 1
Mine Unit 2
Mine Unit 3
Mine Unit 4
Mine Unit 5
Mine Unit 6
Pipeline
Powerline
Main On-Site Access Roads
Deep Well Locations
Plant Site
FIGURE OP-A6-2
SAGE GROUSE LEKS - 2009
Lost Creek Permit Area
Issued For: WDEQ and USFWS
Issued/Revised: 9.25.09
Drawn By: HN
Drawing No: WDEQLQD FIGOP-A6-2
0
1 Mile
1 inch = 4,000 feet


N
Draw
West
Spring
Draw
Stratton
Draw
Bailey
Coastal Well
Reservoir
Main Lost Creek Permit Area
East Access Road
SOONER RD
Red Crossing
Reservoir
Sweetwater County
Draw
Lost Creek ISR, LLC
Littleton, Colorado USA
AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA
Legend
Main Lost Creek Permit Area
Road
Green Ridge Lek (1-mile buffers)
Visible (1-meter offset)
Visible (2-meter offset)
FIGURE OP-A6-3a
GIS Viewshed Analysis –
Green Ridge Lek
Lost Creek Permit Area
Issued For: WDEQ LQD 4.0
Drawn By: LWR
Issued/Revised: 8 October 2009
Drawing No: WDEQLQD
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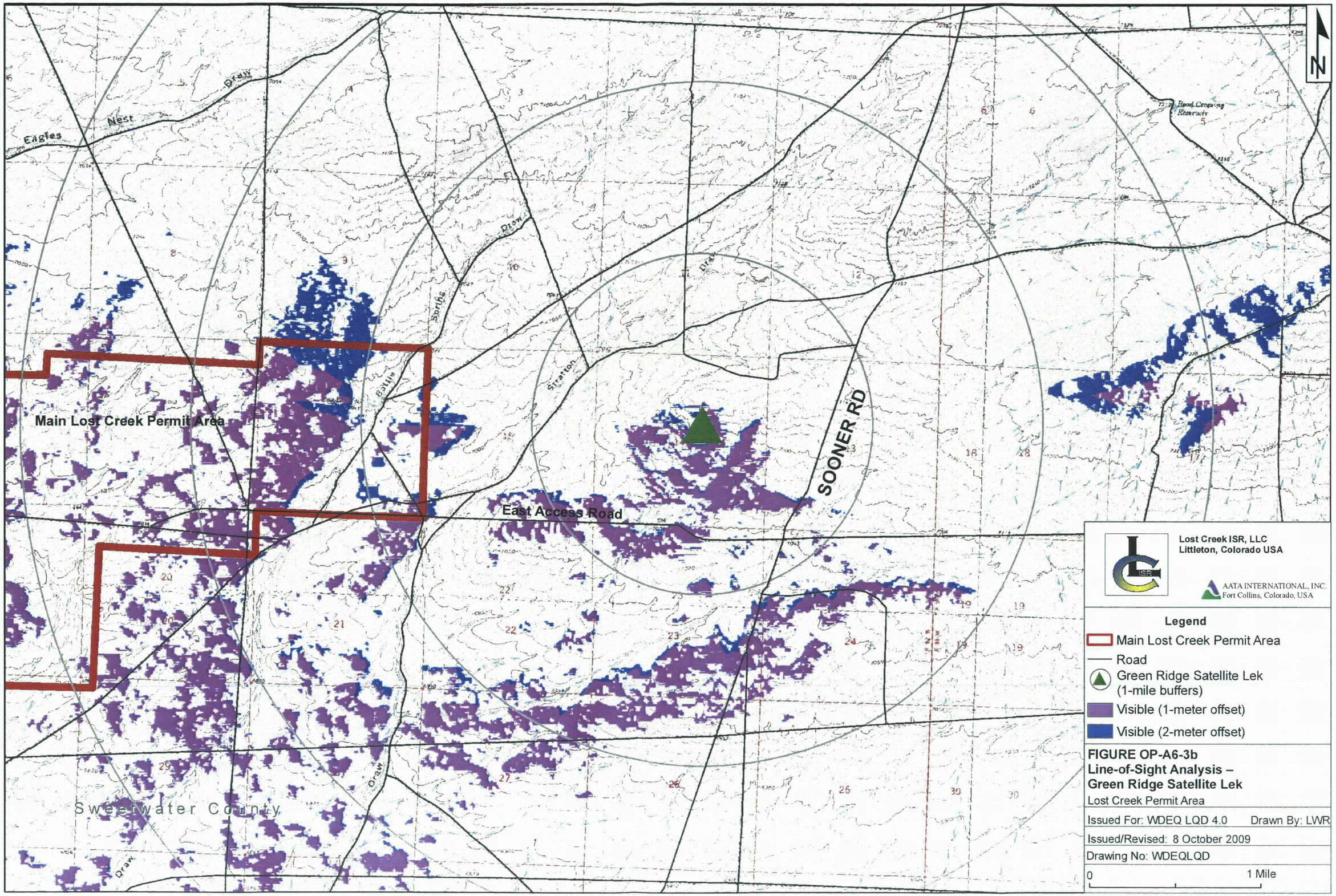
1 Mile


Eagles Nest Draw
Stratton Draw
Battle Draw
Draw
Draw
Draw
Road Crossing Reservoir
Main Lost Creek Permit Area
East Access Road
SOONER RD
Sweetwater County
N
Lost Creek ISR, LLC
Littleton, Colorado USA
AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA
Legend
Main Lost Creek Permit Area
Road
Green Ridge Satellite Lek
(1-mile buffers)
Visible (1-meter offset)
Visible (2-meter offset)
FIGURE OP-A6-3b
Line-of-Sight Analysis –
Green Ridge Satellite Lek
Lost Creek Permit Area
Issued For: WDEQ LQD 4.0 Drawn By: LWR
Issued/Revised: 8 October 2009
Drawing No: WDEQLQD
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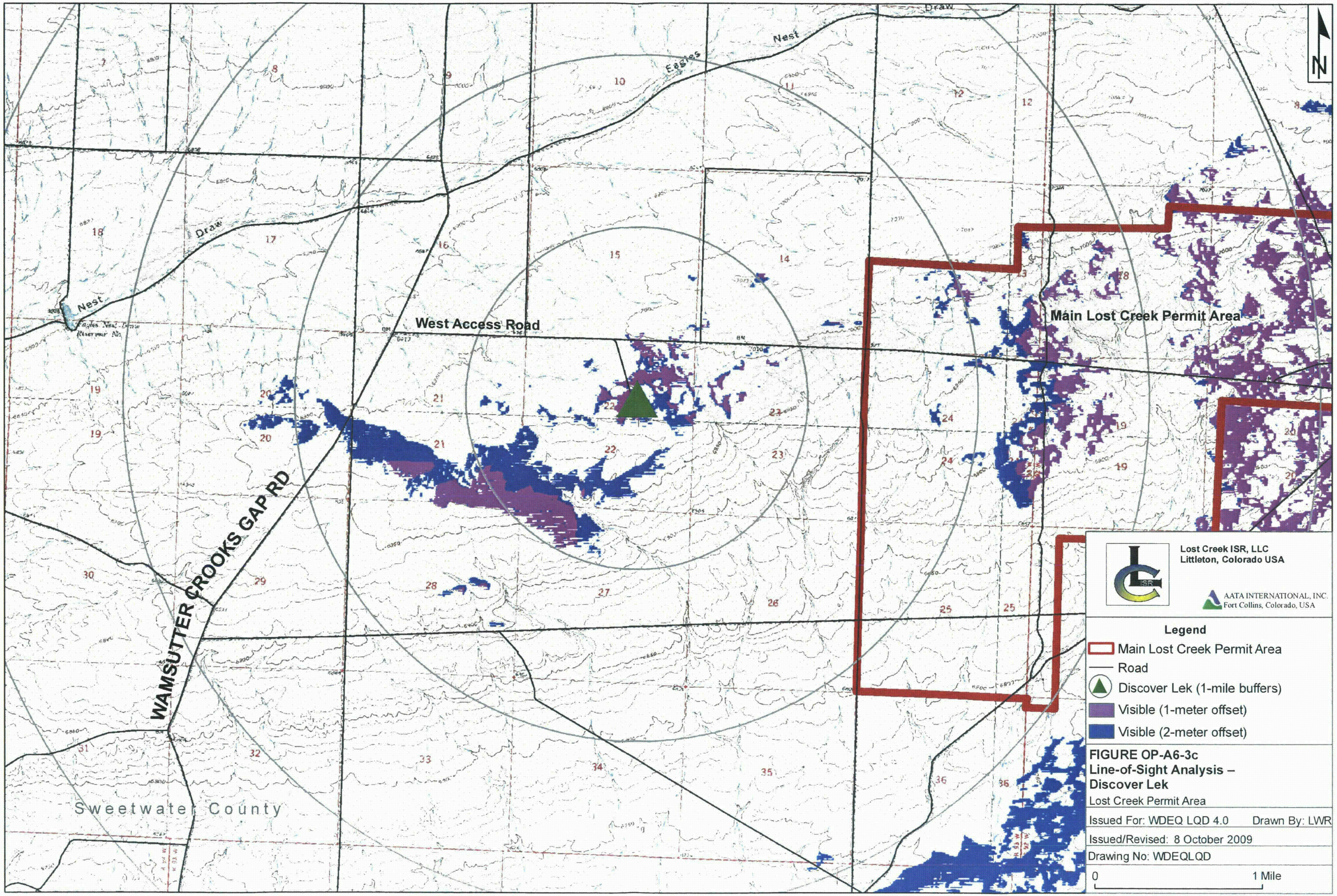
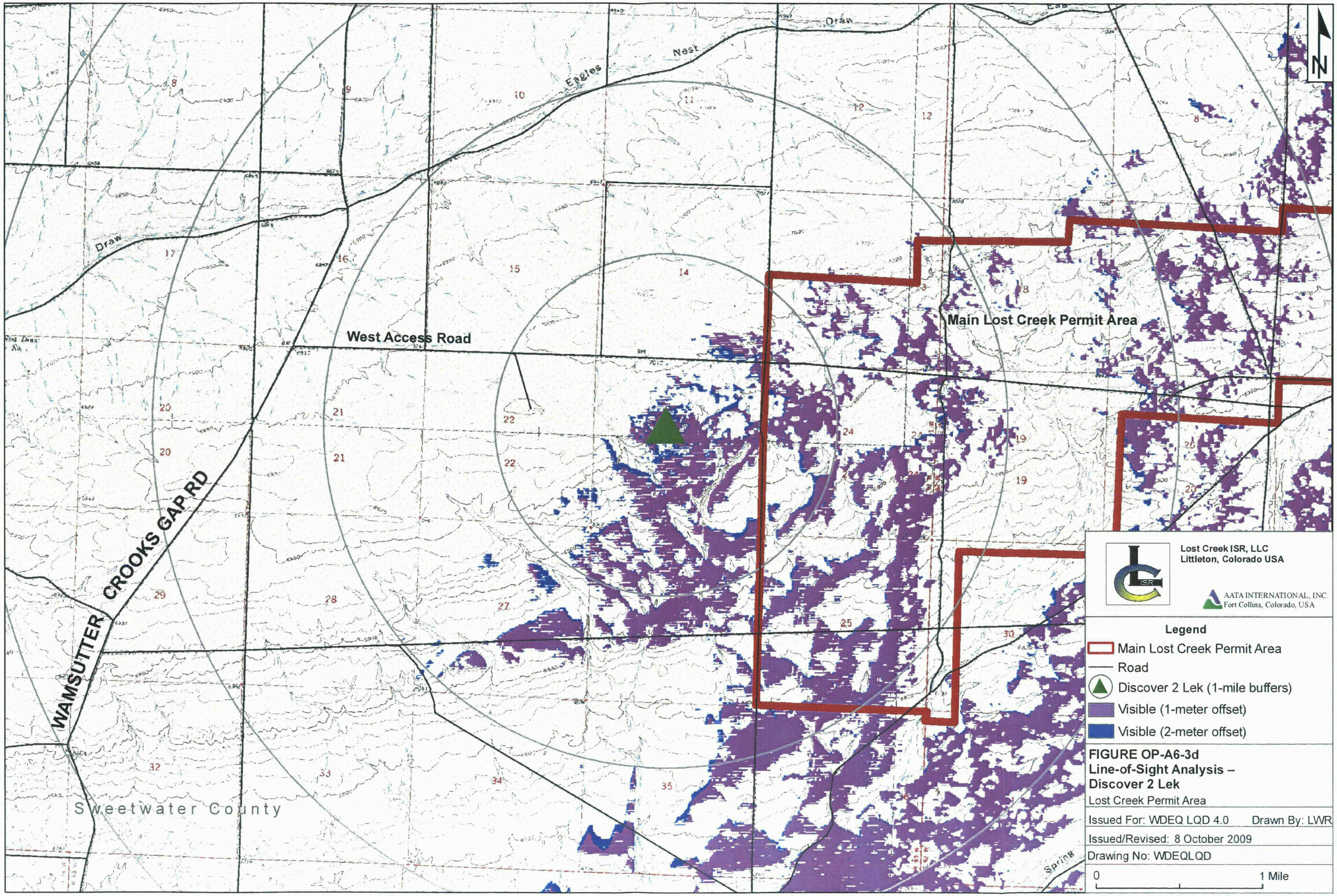
1 Mile


Draw
Nest
Eagles
Draw
Nest
West Access Road
Main Lost Creek Permit Area
WAMSUTTER CROOKS GAP RD
Sweetwater County
N
Lost Creek ISR, LLC
Littleton, Colorado USA
AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA
Legend
Main Lost Creek Permit Area
Road
Discover Lek (1-mile buffers)
Visible (1-meter offset)
Visible (2-meter offset)
FIGURE OP-A6-3c
Line-of-Sight Analysis –
Discover Lek
Lost Creek Permit Area
Issued For: WDEQ LQD 4.0 Drawn By: LWR
Issued/Revised: 8 October 2009
Drawing No: WDEQLQD
0
1 Mile


N
Draw
Nest
Eagles
Draw
West Access Road
Main Lost Creek Permit Area
WAMSUTTER CROOKS GAP RD
Sweetwater County
Spring
Lost Creek ISR, LLC
Littleton, Colorado USA
AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA
Legend
Main Lost Creek Permit Area
Road
Discover 2 Lek (1-mile buffers)
Visible (1-meter offset)
Visible (2-meter offset)
FIGURE OP-A6-3d
Line-of-Sight Analysis –
Discover 2 Lek
Lost Creek Permit Area
Issued For: WDEQ LQD 4.0
Drawn By: LWR
Issued/Revised: 8 October 2009
Drawing No: WDEQLQD
0
1 Mile

Main Lost Creek Permit Area

East Access Road

SOONER RD.

Sweetwater County

Eagles Nest Draw

Battle Draw

Skeleton Draw

Crooked Well Lek

Draw

Draw

N

Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC.
Fort Collins, Colorado, USA

Legend

- Main Lost Creek Permit Area
- Road
- Crooked Well Lek (1-mile buffers)
- Visible (1-meter offset)
- Visible (2-meter offset)

FIGURE OP-A6-3e
Line-of-Sight Analysis –
Crooked Well Lek
Lost Creek Permit Area

Issued For: WDEQ LQD 4.0 Drawn By: LWR

Issued/Revised: 8 October 2009

Drawing No: WDEQLQD

0 1 Mile

Figure OP-A6-4 - 360° Panoramas from the Discover and Discover 2 Leks - September 2009

Discover Lek
North **East** **South** **West** **North**

Discover 2 Lek
North **East** **South** **West** **North**

Figure OP-A6-5 Drilling Rig Noise versus Distance

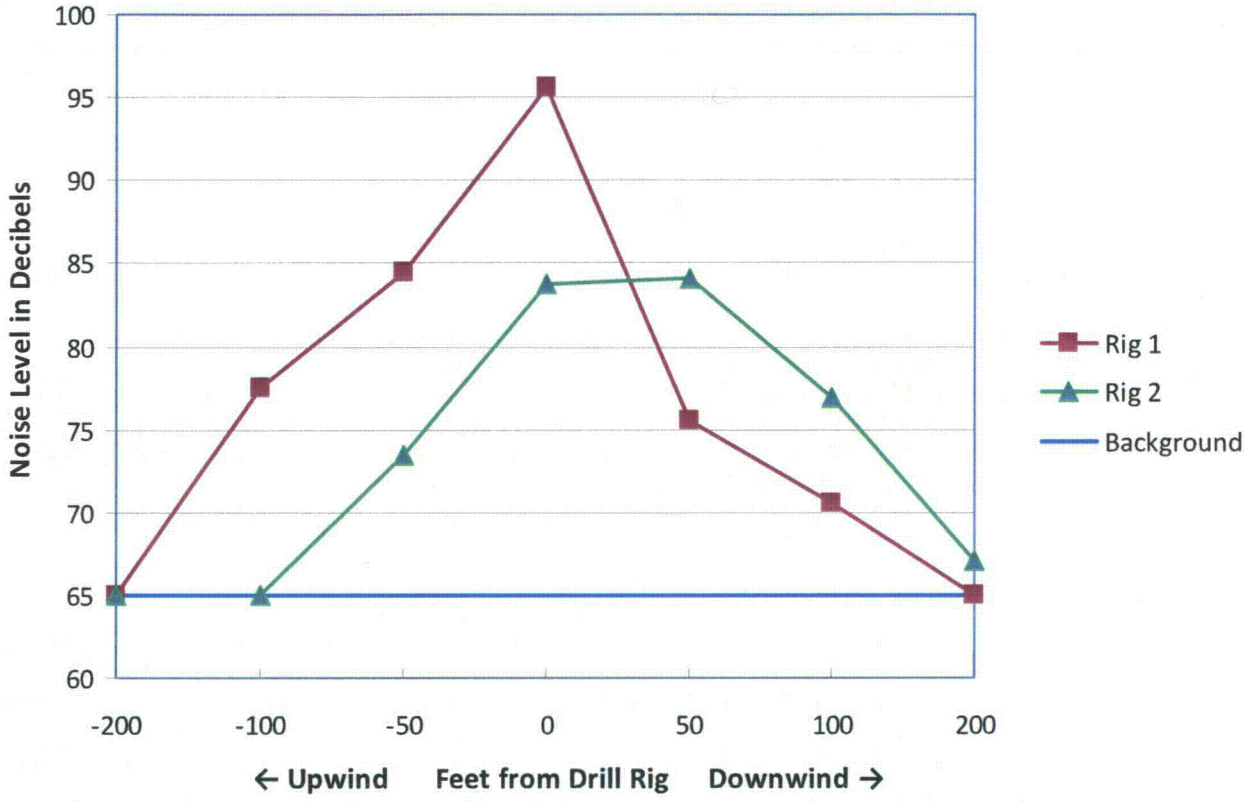


Table OP-A5-1 Mitigation based on Stipulations for Development in Core Sage Grouse Population Areas - Wyoming Game and Fish Department - July 2008 (Page 1 of 3)

WGF Oil and Gas Lease Stipulation [1]	LC ISR, LLC Mitigation
1) One well pad per 640 acres. No more than 11 well pads within 1.9 miles of the perimeter of occupied sage grouse leks with densities not to exceed 1 pad per 640 acres (Holloran 2005). Clustering of well pads may be considered and approved on a case-by-case basis.	a) Production of oil and gas generally occur by draining, pumping, or venting the petroleum fluid from the host formation. The rate of production depends on the permeability of the host formation and the fluid reservoir pressures. As production progresses, secondary and tertiary production techniques, which involve injection of water or carbon dioxide, may be used to 'wash' more fluid from the host formation. Permeability enhancement techniques, e.g. hydraulic fracturing, may also be used to improve fluid movement in oil and gas fields. In contrast, the uranium is not present as a fluid in the host formation. Rather, it is part of solid mineral assemblages. ISR depends on injection of a solution (essentially carbonated water) to mobilize the uranium into ground water and then pumping out the ground water. Permeability enhancement techniques are not appropriate for ISR development as they allow for preferential flow pathways which would bypass ore. b) Oil and gas development is generally grouped by 'fields', each of which may cover many square miles and be in production for decades. ISR development generally occurs by 'mine units', and at Lost Creek, each mine unit of the six mine units may cover about 50 acres (**Section OP 1.0**, **Figure OP-2a**). A mine unit is generally in production for a few years, and ground water restoration and surface reclamation are required once production ceases. Mine units are generally developed and reclaimed in succession. At Lost Creek, six mine units are planned, and the anticipated life-of-mine is ten years (**Section OP 2.1**, **Figure OP-4a**). c) Oil and gas wells are required to be spaced apart for optimum field development and to protect correlative rights of adjacent owners (i.e., to reduce the possibility of 'draining' petroleum out from under neighboring properties). In contrast, the spacing of ISR wells is dependent upon the ore distribution, which in Wyoming is generally in long, narrow 'roll front' deposits (**Figure OP-2b**), and on the permeability of the host rock. As a result, ISR development is generally occurs in a much smaller area than oil and gas development. In addition, once the general outlines of the deposit are known from exploration drilling, the more detailed delineation drilling necessary to determine ore grade and producible ore zones only occurs within the narrow deposit outline. Geophysical exploration techniques, such as 3D seismic surveying, are not applicable to uranium ore deposits. d) Well pads for oil and gas development may be on the order of three to four acres during drilling to accommodate the relatively large drilling rigs and associated equipment and on the order of 0.5 acres during production to accommodate the necessary equipment. In contrast, the well pads for drilling of ISR wells are on the order of 0.25 acre, and once the wells are completed, the area is reclaimed with the exception of the wellhead, which occupies a few square feet. (**Sections OP 2.5** and **OP 3.2**). e) The closest lek to the Mine Units is the Crooked Well Lek, which is considered 'occupied but inactive' (**Figure OP-A6-2**). No sage grouse have been seen on the lek during seasonal surveys in the last four years (**Appendix D9**), and none were seen during informal surveys after 1994 (**Attachment D9-4**).

Table OP-A5-1 Mitigation based on Stipulations for Development in Core Sage Grouse Population Areas - Wyoming Game and Fish Department - July 2008 (Page 2 of 3)

WGF Oil and Gas Lease Stipulation [1]	LC ISR, LLC Mitigation
2) Surface disturbance will be limited to <5% of sagebrush habitat per 640 acres. Distribution of disturbance may be considered and approved on a case-by-case basis.	a) Surface disturbance will be limited to less than 6% of the Permit Area, which covers about 4,500 acres. The disturbance, by section, is outlined on **Table OP-A6-3**. The size of the Permit Area is based on several factors in addition to ore distribution. Those factors include historic claims boundaries, spacing of disposal wells, and other practical considerations. b) The type of disturbance in an ISR permit area differs from that in an oil and gas field. As noted above (Item 1d), the well pads are smaller because the rig sizes are smaller. Also, after drilling is complete, access to the area is almost always by pickup, not the larger haul tankers used in oil and gas fields. Testing and repair equipment are also proportionately smaller for ISR than for oil and gas wells. In contrast to the large-scale workover rigs generally needed for oil and gas wells, the ISR workover rigs are mounted on F550 pickup trucks and are significantly quieter. As a result, road widths, turn-arounds, garages, and other support facilities are also proportionately smaller. c) Unlike many oil and gas exploration and development activities, exploration and development work at ISR operations generally occurs only during the day, not round-the-clock..
3) No Surface Occupancy within 0.6 mi of the perimeter of occupied sage grouse leks. (Carr 1967, Wallestad and Schadweiler 1974, Rothenmaier 1979, Emmons 1980, Schoenber 1982 as analyzed by Colorado Greater Sage Grouse Conservation Plan Steering Committee 2008).	a) No surface occupancy is planned within 0.6 miles of the sage grouse leks in the vicinity of the Lost Creek Project.
4) Locate main haul trunk roads used to transport production and/or waste products to a centralized facility or market point >1.9 miles from the perimeter of occupied sage grouse leks (Lyon and Anderson 2003). Locate other roads used to provide facility site access and maintenance >0.6 miles from the perimeter of occupied sage grouse leks. Construct roads to minimum design standards needed for production activities while minimizing surface disturbance and traffic.	a) Main roads to the vicinity of the site include the already established Sooner Road (BLM Road 3215) and Wamsutter-Crooks Gap Road (Sweetwater County Road 23), which are both public, improved roads. No additional habitat disturbance will be needed for use of either of these roads. The Green Ridge Lek is located approximately 0.12 miles east of Sooner Road, and the Discover Lek is located about 1.5 miles east of the Wamsutter-Crooks Gap Road. b) Access to the site from the Sooner Road and Wamsutter-Crooks Gap Road will follow an existing east-west two-track to minimize new habitat disturbances. The two-track will need to be upgraded for the project. Three existing leks are about 0.5 miles from the access roads; however, line-of-sight analyses indicate there is limited visibility of the roads from the lek. Roads within the site will also follow existing two-tracks, wherever possible, and will be designed and constructed to the lowest appropriate standard, to adequately accommodate their intended functions and safety considerations.
5) Locate electrical supply lines at least 750 m (0.5 miles) from the perimeter of occupied sage grouse leks. Design electrical lines to be raptor- proof by installing anti-perching devices, or burying them when possible.	a) All supply lines will be located greater than 0.5 miles from any active lek perimeters Anti-perching devices will be installed on all new power poles and cross-arms to reduce raptor and corvid use.

Table OP-A5-1 Mitigation based on Stipulations for Development in Core Sage Grouse Population Areas - Wyoming Game and Fish Department - July 2008 (Page 3 of 3)

WGF Oil and Gas Lease Stipulation [1]	LC ISR, LLC Mitigation
6) Exploration and development activity will be allowed from July 1 to March 14. In Core Population Areas that also contain sage grouse winter concentration areas, exploration and development activity will be allowed only from July 1 to December 1 in the winter concentration areas.	a) LC ISR, LLC has, and will continue to limit, exploration activities to the specified time frames. As noted in Stipulation 1, delineation drilling and development within the Permit Area only occurs in a narrow swath along the ore zone, and generally only within two mine units at one time. In order for surface coal mining to progress effectively, an exemption is generally granted to allow for year-round activity once topsoil is stripped from a specified mine pit area - the 'first step' in mining (development) in that area, Although topsoil is not stripped from entire ISR mine units during delineation drilling (see Stipulation 2), the beginning of delineation drilling is analogous to topsoil stripping at coal mines as it represents the 'first step' in mining. Therefore, a similar exemption for ISR mine units is necessary for mining to progress effectively. b) No data on winter concentration areas has been found for the vicinity.
7) Limit noise sources to 10 dBA above natural, ambient noise (~39 dBA) measured at the perimeter of a lek from March 1 to May 15 (Inglefinger 2001, Nicholoff 2003).	a) Baseline noise measurements were made in 2007 and again in 2009. In 2007, the noise measurements less than 40 dB(A), and in 2009, the noise measurements ranged from 68 to 89 dB(A); the difference being the substantially higher wind speed when the measurements were made in 2009. b) Noise measurements for various equipment indicate the highest levels are on the order of 95 dB(A) at the equipment, with levels declining below background (wind noise) within a couple of hundred feet (Figure OP-A5-5 and Tables OP-A5-4a and 4b).

[1] http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/FINALStateLandCoreAreaSageGrouseStips7312008.pdf. The oil and gas lease stipulations are included in accordance with the following provision: "There is no published research on specific impacts on sage grouse. Since development scenarios (well density, roads, activity) are similar to oil and gas, assume impacts are similar to oil and gas development. Use same stipulations used for oil and gas. In-situ uranium permitting should include a requirement to acquire data on sage grouse response to development and operation." The references as cited in the stipulations (WGFD, 2008) are:

Carr, H. D. 1967. Effects of sagebrush control on abundance, distribution, and movements of sage grouse. Job Completion Report. W-37-R-20.Job 8a. Colorado Game, Fish and Parks Department, Colorado, USA.

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Holloran, M. J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Dissertation. University of Wyoming, Laramie, USA.

Inglefinger, F. M. 2001. The effects of natural gas development on sagebrush steppe passerines in Sublette County, Wyoming. M.S. Thesis, Univ. of Wyoming, Laramie. 110pp.

Lyon, A. G. and S. H. Anderson. 2003. Potential gas development impacts on sage grouse nest initiation and movement. Wildlife Society Bulletin 31:486-491.

Nicholoff, S. H., compiler. 2003. Wyoming Bird Conservation Plan, Version 2.0 Wyoming Partners In Flight. Wyoming Game and Fish Department, Lander, Wy.

Rothenmaier, D. 1979. Sage grouse reproductive ecology: breeding season movements, strutting ground attendance and nesting. Thesis, Univ. of Wyoming, Laramie, Wyoming, USA.

Schoenberg, T. J. 1982. Sage grouse movements and habitat selection in North Park, Colorado. Thesis, Colorado State University, Fort Collins, Colorado, USA.

Wallestad, R. O., and P. Schladweiler. 1974. Breeding season movements and habitat selection of male sage grouse. Journal of Wildlife Management 38:634-637.

Table OP-A6-2 BLM Surface Activity Restrictions for Protection of Wildlife

Species [1]	Exclusion Period [2]		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Sage Grouse [3]	Occupied Leks	No surface disturbance or occupancy within ¼-mile of lek.												
		No human activity between 6 pm and 9 am from March 1st through May 20th within ¼-mile of lek.												
	Active Lek in Suitable Nesting Habitat	No surface disturbance or other disruptive activity from March 1st through July 15th within 2 miles of lek.												
Raptors	Avoid disturbance within 1-mile nest buffer from February 1st to July 31st.													

Notes:
(1) Includes species, observed at the site, for which timing restrictions are in place per the Rawlins BLM 2007 Draft Resource Management Plan (RMP). If additional species, listed in the RMP, are observed then BLM will be consulted to determine applicable timing and distance restrictions for those species.
(2) The timing and distance restrictions are based on the most conservative alternative in the Draft RMP. If the Final RMP includes different restrictions, those will be adopted after consultation with the BLM.
(3) Table OP-A6-1 lists more detailed stipulations related to protection of sage grouse, including activity restrictions.

Table OP-A6-3 Disturbance Acreage by Section and Year (Page 1 of 4)

	Year												
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Section 13, T25N, R93W													
Main Road	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
MU 5 Secondary Road					0.08	0.08	0.08	0.08	0.08	0.08	0.08		
Deep Well Road	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Deep Well Pad	2.80	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Deep Well Trunkline	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26
Sub-Total	8.06	4.20	4.20	4.20	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.20	5.46
% of Section	1.26	0.66	0.66	0.66	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.85
Section 14, T25N, R93W													
Main Road	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Sub-Total	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
% of Section	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Section 15, T25N, R93W													
Main Road	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Sub-Total	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
% of Section	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Section 16, T25N, R93W													
Main Road	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Sub-Total	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
% of Section	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Section 24, T25N, R93W													
MU 5 Pattern Area					38.50	38.50	38.50	38.50	38.50	38.50	38.50		
MU 5 Two Track Road					1.36	1.36	1.36	1.36	1.36	1.36	1.36		
MU 3 Two Track Road			0.14	0.14	0.14	0.14	0.14	0.14	0.14				
Secondary Roads					0.87	0.87	0.87	0.87	0.87	0.87	0.87		
Deep Well Trunkline	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24		
MU 5 Trunkline					1.20	0.00	0.00	0.00	0.00	0.00	1.20		
Sub-Total	1.24	0.00	0.14	0.14	42.07	40.87	40.87	40.87	40.87	40.73	43.17	0.00	0.00
% of Section	0.19	0.00	0.02	0.02	6.57	6.39	6.39	6.39	6.39	6.36	6.75	0.00	0.00

Table OP-A6-3 Disturbance Acreage by Section and Year (Page 2 of 4)

	Year												
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Section 25, T25N, R93W													
Deep Well Road	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Deep Well Pad	2.80	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Deep Well Trunkline	1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18
Sub-Total	4.62	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64	2.82
% of Section	0.72	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.44
Section 16, T25N, R92W													
Main Road	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
Secondary Road	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Deep Well Pad	2.80	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Deep Well Trunkline	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
Sub-Total	7.38	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.36	4.78
% of Section	1.15	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.75
Section 17, T25N, R92W													
Main Road	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
Secondary Road	0.08	0.08	0.08	0.08	0.08	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
MU 4 Pattern Area				30.37	30.37	30.37	30.37	30.37	30.37	30.37			
MU 6 Pattern Area						2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73
MU 4 Two Track Roads				0.25	0.25	0.25	0.25	0.25	0.25	0.25			
MU 6 Two Track Roads						0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
MU 2 Two Track Road		0.34	0.34	0.34	0.34	0.34	0.34	0.34					
Deep Well Trunkline	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30
MU 4/6 Trunkline				1.33	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	2.07
Sub-Total	5.08	4.12	4.12	36.07	34.74	38.79	38.05	38.05	37.71	37.71	7.09	7.09	10.46
% of Section	0.79	0.64	0.64	5.64	5.43	6.06	5.95	5.95	5.89	5.89	1.11	1.11	1.63

Table OP-A6-3 Disturbance Acreage by Section and Year (Page 3 of 4)

	Year												
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Section 18, T25N, R92W													
Plant Compound	10.00	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	4.40	6.00
Main Road	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Secondary Road	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
MU 1 Pattern Area	10.51	10.51	10.51	10.51	10.51	10.51	10.51						
Deep Well Pad	2.80	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MU 1 Pattern Area	10.51	10.51	10.51	10.51	10.51	10.51	10.51						
MU 4 Pattern Area				4.02	4.02	4.02	4.02	4.02	4.02	4.02			
MU 1 Two Track Road	0.20	0.20	0.20	0.20	0.20	0.20	0.20						
MU 2 Two Track Road		0.11	0.11	0.11	0.11	0.11	0.11	0.11					
MU 4 Two Track Road				0.09	0.09	0.09	0.09	0.09	0.09	0.09			
Laydown Area/Drillers Shed	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18
Deep Well Trunkline	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78
Main Trunkline	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06
Sub-Total	43.18	33.05	33.05	37.16	37.16	37.16	37.16	15.94	15.83	15.83	11.72	11.72	16.16
% of Section	6.75	5.16	5.16	5.81	5.81	5.81	5.81	2.49	2.47	2.47	1.83	1.83	2.53
Section 19, T25N, R92W													
MU 1 Two Track Road	0.62	0.62	0.62	0.62	0.62	0.62	0.62						
MU 3 Two Track Road			1.10	1.10	1.10	1.10	1.10	1.10	1.10				
MU 2 Two Track Road		0.16	0.16	0.16	0.16	0.16	0.16	0.16					
MU 5 Two Track Road					0.28	0.28	0.28	0.28	0.28	0.28	0.28		
MU 4 Two Track Road				0.11	0.11	0.11	0.11	0.11	0.11	0.11			
MU 1 Pattern Area	25.39	25.39	25.39	25.39	25.39	25.39	25.39						
MU 2 Pattern Area		3.89	3.89	3.89	3.89	3.89	3.89	3.89					
MU 3 Pattern Area			36.80	36.80	36.80	36.80	36.80	36.80	36.80				
Deep Well Road	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Deep Well Pad	2.80	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
WF Trunkline	1.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.81
Deep Well Trunkline	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99
MU 1 Main Trunkline	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
MU 3 Main Trunkline			1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
MU 5 Main Trunkline					0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
Sub-Total	32.17	31.46	70.36	69.47	69.95	69.75	69.75	43.74	39.69	1.79	1.68	1.40	5.56
% of Section	5.03	4.92	10.99	10.85	10.93	10.90	10.90	6.83	6.20	0.28	0.26	0.22	0.87

Table OP-A6-3 Disturbance Acreage by Section and Year (Page 4 of 4)

	Year												
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Section 20, T25N, R92W													
MU 6 Pattern Area						36.18	36.18	36.18	36.18	36.18	36.18	36.18	36.18
MU 2 Pattern Area		31.51	31.51	31.51	31.51	31.51	31.51	31.51					
Secondary Road						0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
MU 1 Two Track Road	0.01	0.01	0.01	0.01	0.01	0.01	0.01						
MU 2 Two Track Road		0.44	0.44	0.44	0.44	0.44	0.44	0.44					
MU 4 Two Track Road				0.18	0.18	0.18	0.18	0.18	0.18	0.18			
MU 6 Two Track Road						0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Sub-Total	0.01	31.96	31.96	32.14	32.14	68.98	68.98	68.97	37.02	37.02	36.84	36.84	36.84
% of Section	0.00	4.99	4.99	5.02	5.02	10.78	10.78	10.78	5.78	5.78	5.76	5.76	5.76
Section 20, T25N, R92W													
MU 6 Two Track Road						0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Sub-Total	0.00	0.00	0.00	0.00	0.00	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
% of Section	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Section 14, T25N, R92W													
Main Road	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
Sub-Total	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
% of Section	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Section 15, T25N, R92W													
Main Road	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
Sub-Total	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
% of Section	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Section 23, T25N, R92W													
Main Road	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
Sub-Total	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
% of Section	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Section 24, T25N, R92W													
Main Road	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Sub-Total	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
% of Section	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Total Disturbance - All Sections [1]	**119.63**	**128.68**	**167.72**	**203.07**	**244.23**	**283.90**	**283.16**	**235.92**	**199.47**	**161.43**	**128.85**	**85.32**	**100.15**

[1] For comparison, the total Permit Area is 4,254 acres.

Table OP-A6-4 Estimated Water Quality of the Storage Ponds

Analyte	Estimated Range (mg/l)	
Major Constituents	**Low**	**High**
Aluminum	ND	0.2
Ammonia as Nitrogen	ND	4
Bicarbonate as HCO_3	1,200	2,500
Calcium	50	300
Carbonate as CO_3	ND	25
Chloride	200	1,000
Magnesium	4	50
pH	7	9
Potassium	10	200
Ra-226 (pCi/l)	200	1,500
Silica	14	20
Sodium	150	2,000
Sulfate	50	500
TDS	1,600	6,500
Uranium as U_3O_8	1	15
Trace Parameters	**Low**	**High**
Arsenic	0.002	0.020
Barium	ND	ND
Boron	ND	ND
Cadmium	ND	ND
Chromium	ND	ND
Copper	ND	ND
Fluoride	0.2	0.5
Lead	ND	ND
Manganese	0.04	0.5
Mercury	ND	ND
Molybdenum	ND	ND
Nickel	ND	ND
Selenium	0.01	0.2
Vanadium	ND	0.01

Table OP-A6-5a Background Noise Measurements

Cardinal Direction	Date	
	June 13, 2007	April 28, 2009
	dB(A)	dB(A)
N	<40	69
NE	<40	73
E	<40	87
SE	<40	85
S	<40	68
SW	<40	89
W	<40	89
NW	<40	73

Table OP-A6-5b Spot Noise Surveys of Equipment at the Lost Creek Project (Page 1 of 2)

Equipment	Location	Comment	Noise Level in Db [1]		
			Low	High	Avg
Background	Northwest Hi-Vol Station	Hi-Vol station off & no other equipemnt running; light breeze	60.1	70.1	65.7
Pulling Unit (swabbing)	100' upwind	Light breeze blowing east; unit running	60.0	70.0	65.0
	50' upwind	Light breeze blowing east; unit running	60.0	68.0	65.0
	At operators station at end of truck	Light breeze blowing east; unit running	66.0	77.0	70.0
	50' downwind	Light breeze blowing east; unit running	64.0	70.0	67.0
	100' downwind	Light breeze blowing east; unit running	64.0	67.0	65.0
Eu 6500is Honda Generator	100' upwind	Light breeze blowing east; unit running	65.0	65.0	65.0
	50' upwind	Light breeze blowing east; unit running	65.0	65.8	65.2
	At unit	Light breeze blowing east; unit running			80.9
	50' downwind	Light breeze blowing east; unit running	65.0	66.1	65.3
	100' downwind	Light breeze blowing east; unit running	65.0	65.1	65.0
110KeV 75 HP Generator	100' upwind	Light breeze blowing east; unit running	65.0	65.1	65.1
	50' upwind	Light breeze blowing east; unit running	65.0	65.0	65.0
	At fender of unit	Light breeze blowing east; unit running			76.6
	50' downwind	Light breeze blowing east; unit running	65.0	65.3	65.0
	100' downwind	Light breeze blowing east; unit running	65.0	65.2	65.1
John Deere 710J Backhoe (idling)	100' upwind	Light breeze blowing east; unit running	65.0	65.0	65.0
	50' upwind	Light breeze blowing east; unit running	65.0	65.1	65.1
	At unit	Light breeze blowing east; unit running			81.5
	50' downwind	Light breeze blowing east; unit running	65.0	65.7	65.4
	100' downwind	Light breeze blowing east; unit running	65.0	65.0	65.0

Table OP-A6-5b Spot Noise Surveys of Equipment at the Lost Creek Project (Page 2 of 2)

Equipment	Location	Comment	Noise Level in Db (1)		
			Low	High	Avg
Water Truck (idling)	100' upwind	Light breeze blowing east; unit running	65.0	65.1	65.0
	50' upwind	Light breeze blowing east; unit running	65.0	65.8	65.1
	At front left fender	Light breeze blowing east; unit running			76.6
	50' downwind	Light breeze blowing east; unit running	65.0	65.2	65.1
	100' downwind	Light breeze blowing east; unit running	65.0	65.0	65.0

(1) Surveys performed by Ahmad Jodeh on February 6, 2009. The instrument was checked against a calibrated standard both before and after the spot surveys were completed and found to be within 0.1 decibals of the standard. The standard had been calibrated within the past year by the manufacturer. It appears that the wind is the dominant source of noise once the meter is greater than 50 feet away from these specific pieces of equipment.

Table OP-A6-6 Summary of Wildlife Monitoring Schedule [1]

Species [2]	Purpose of Monitoring [2]		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Big Game	Winter Habitat Use		1 aerial survey / 1 ground survey											
	Spring & Summer Habitat Use					1 ground survey		1 ground survey		1 ground survey				
	Lek Counts					3 ground surveys								
Sage Grouse	Search for New Leks					Aerial survey 2010 & every 3rd year after 2010. / Ground survey 2010 & each year after 2010.								
	Habitat Selection Study		Aerial tracking			Ground tracking					Aerial tracking			
	Measure Disturbance	Traffic:				Axle Counters								
		Grazing & Energy Development	Review of plans											
	Productivity	Brood Transects							Ground survey					
		Wing Barrels									Hunting season			
Raptors	Nest Location			1 ground or aerial survey										
	Production Success						1+ ground or aerial [3]							
Lagomorphs	Prey Abundance							1 ground survey		1 ground survey				
Non-Game Birds, with MBHFI	Breeding Numbers							1 ground survey						
All	Occurrence		Incidental Observations											

Notes: (1) Details of the monitoring timing and protocols are described in Section 2.0 of Attachment OP2-6.

(2) Species selection is based on observed wildlife within and near the Lost Creek Permit Area (Appendix D9).

(3) At least one survey will be performed from mid-May through mid-June to locate new nests and check status of all known nests. Number and timing of other surveys will depend on whether nesting is observed.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

Ur Energy USA
"PLATE OP-A6-1
Sage Grouse Leks in the
LOST CREEK REGION"
Seawater County, Wyoming

WITHIN THIS PACKAGE... OR, BY SEARCHING USING THE DOCUMENT/REPORT

D-03

Addendum OP-A6-A

Agency Review Letters

USWFWS

Letter of December 18, 2009 from B.T. Kelly (USFWS) to J.W. Cash (LC ISR, LLC) is included after this cover page.

WGFD

To be provided after review by WGFD.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/WY10EC0003

DEC 18 2009

Mr. John W. Cash
Lost Creek ISR, LLC
5880 Enterprise Dr., Suite 200
Casper, Wyoming 82609

Dear Mr. Cash:

Thank you for your letter dated October 28, 2009, received in our office on November 2, and attached Wildlife Monitoring and Protection Plan (Plan) for the proposed Lost Creek ISR, LLC (Lost Creek) Lost Creek in-situ uranium Project (Project). You have requested that the U.S. Fish and Wildlife Service (Service) review the Plan and provide comments as per the Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD) regulations. The proposed Project is an in-situ uranium mine in Sections 13, 24, and 25, T. 25 N., R. 93 W., and Sections 16, 17, 18, 19, 20, 30, and 31, T. 25 N., R. 92 W., Sweetwater County, Wyoming.

In response to your request, the Service is providing you with the following information pursuant to the Endangered Species Act (Act) of 1973 as amended, (16 U.S.C. 1531 *et seq.*), Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j.

The National Environmental Protection Act (NEPA) analysis should disclose the full extent of proposed development as well as the direct and indirect effects of all aspects of the project and the cumulative impacts of past, present, and reasonably foreseeable future actions regardless of who is responsible for those actions.

In accordance with section 7 of the Act, the Service believes the following species may be present within or near the permit area. We would appreciate receiving information as to the current status of this species prior to implementation of the permit.

SPECIES	STATUS	HABITAT
Blowout Penstemon (*Penstemon haydenii*)	Endangered	Sand dunes

Blowout penstemon: Blowout penstemon is a perennial herb with stems less than 12 inches tall. The inflorescence is 2-6 inches long and has 6-10 compact whorls of milky-blue to pale lavender flowers. Blowout penstemon was listed as endangered on October 1, 1987. The plant's current known range in Wyoming consists of the Ferris dunes area in northwest Carbon County where the plant is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25-40 percent vegetative cover. Recent surveys have indicated that systematic surveys are warranted in all lower elevations (below 6700 feet) in Wyoming where sand blowout features are located.

Blowouts are formed as strong winds deposit sands from the windward side of a dune to the leeward side and result in a sparsely vegetated crater-like depression. Associated vegetation includes blowout grass, thickspike wheatgrass, lemon scurfpea, Indian ricegrass and western wheatgrass. Threats to the plant occur when sand dunes are removed or overly disturbed by vehicular traffic. Known populations in Wyoming are found between 6680-7440 feet (Fertig 2001). However, recent surveys by Blomquist and Heidel (June 2002) indicate that surveys may be warranted in some lower elevations where active sand blowout features occur. Surveys should be conducted from mid-June to early-July when flowering occurs by knowledgeable botanists trained in conducting rare plant surveys. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the blowout penstemon to experts who can provide training/services.

Migratory Birds

The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. Section 703 of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird..." The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing. If the activity may impact migratory birds, please contact our office to discuss protective measures.

The Service has reviewed the proposed nesting and production status surveys for raptors and migratory birds of high federal interest. We have also enclosed the Wyoming Ecological Services Field Office Raptor Recommendations, which outlines recommended steps for addressing raptors in the planning process, provides information regarding seasonal and spatial buffers, and provides links to additional planning resources.

Sensitive Species

Greater sage-grouse: The Service is currently conducting a status review of the greater sage-grouse (*Centrocercus urophasianus*) for possible listing under the Act (73 FR 10218). We continue to have concerns regarding sage-grouse population status, trends and threats, as well as concerns for other sagebrush obligate species. The following information is provided for your use in the evaluation of this permit and the potential effects to sage-grouse.

Greater sage-grouse are dependent on sagebrush habitats year-round. Habitat loss and degradation, as well as loss of population connectivity have been identified as important factors contributing to the decline of greater sage-grouse populations rangewide (Braun 1998, Wisdom et al. 2002). Therefore, any activities that result in loss or degradation of sagebrush habitats that are important to this species should be closely evaluated for their impacts to sage-grouse. If important breeding habitat (leks, nesting or brood rearing habitat) is present in the project area, the Service recommends no project-related disturbance March 15 through June 30, annually. Minimization of disturbance during lek activity, nesting, and brood rearing is critical to sage-grouse persistence within these areas. Likewise, if important winter habitats are present, we recommend no project-related disturbance from November 15 through March 14.

We recommend you contact the Wyoming Game and Fish Department to identify important greater sage-grouse habitats within the project area, and appropriate mitigative measures to minimize potential impacts from the proposed project. The Service recommends surveys and mapping of important greater sage-grouse habitats where local information is not available. The results of these surveys should be used in project planning, to minimize potential impacts to this species. No project activities that may exacerbate habitat loss or degradation should be permitted in important habitats.

In Wyoming, information suggests that greater sage-grouse populations are negatively affected by energy development activities, especially those that degrade important sagebrush habitat, even when mitigative measures are implemented (Braun 1998, Lyon 2000, Naugle et al. 2006). Greater sage-grouse populations can repopulate areas developed for resource extraction after habitat reclamation for the species (Braun 1987). However, there is no evidence that populations attain their previous levels and reestablishment of sage-grouse in a reclaimed area may take 20 to 30 years, or longer (Braun 1998). Therefore, this project should be carefully evaluated for long-term and cumulative effects on the greater sage-grouse, since reclamation may not restore populations to pre-activity levels. The project proponent should ensure this activity does not exacerbate greater sage-grouse declines on either a local or range-wide level.

Mountain Plover: The Service has agreed to reopen the comment period in 2010 on the proposed rule to list the mountain plover as a threatened species (67 FR 72396, December 5, 2002) and to complete a new final determination on the proposal by May 1, 2011. Once the comment period is reopened and pending the completion of the new final determination, the mountain plover will be proposed for listing. Section 7(a)(4) of the Act, requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of

any species proposed for listing. Federal action agencies may also request a conference on any proposed action that may affect a species proposed for listing.

We encourage project planners to develop and implement protective measures should mountain plovers occur within project areas. Measures to protect the mountain plover from further decline may include: (1) avoidance of suitable habitat during the plover nesting season (April 10 through July 10), (2) prohibition of ground disturbing activities in prairie dog towns, and (3) prohibition of any permanent above ground structures that may provide perches for avian predators or deter plovers from using preferred habitat. Suitable habitat for nesting mountain plovers includes grasslands, mixed grassland areas and short-grass prairie, shrub-steppe, plains, alkali flats, agricultural lands, cultivated lands, sod farms, and prairie dog towns. We strongly encourage you to develop protective measures with an assurance of implementation should mountain plovers be found within the project areas.

Pygmy Rabbit: The Service is currently conducting a status review of the pygmy rabbit (*Brachylagus idahoensis*) for possible listing under the Act (78 FR 1312). Pygmy rabbits occur in portions of many western states including southwestern Wyoming where they have been confirmed to occur in isolated populations in Carbon, Lincoln, Uinta, Sweetwater, Sublette and Fremont counties. Pygmy rabbits are sagebrush obligates, and are primarily found in dense sagebrush communities where there is a forb understory. Conversion of sagebrush grasslands, habitat fragmentation and overgrazing are potential threats to pygmy rabbits. Project measures that retain large tracts of suitable habitat and corridors to adjacent habitat will aid in the conservation of this species.

In situ Uranium Mining

High selenium concentrations can occur in wastewater from in situ mining of uranium ore as uranium-bearing formations are usually associated with seleniferous strata (Boon 1989). The disposal of this wastewater can expose migratory birds to selenium which is known to cause impaired reproduction and mortality in sensitive species of birds such as waterfowl.

The in situ mining wastewater is typically disposed of through deep-well injection or discharge into large evaporation ponds. One mining operation in Converse County disposes of the wastewater through land application using center-pivot irrigation after treatment for removal of uranium and radium.

In 1998, the Service conducted a study of grassland irrigated with wastewater from an *in situ* uranium mine and found that selenium was mobilized into the food chain and bioaccumulated by grasshoppers and songbirds (Ramirez and Rogers 2002). Disposal of the *in situ* wastewater through irrigation is not recommended by the Service due to the potential for selenium bioaccumulation in the food chain and adverse effects to migratory birds and aquatic species. Additionally, land application may result in the contamination of groundwater and eventually seep out and reach surface waters. Additionally, the selenium-contaminated groundwater could seep into low areas or basins in upland sites and create wetlands which would attract migratory birds and other wildlife.

The Service is also concerned with the potential for elevated selenium in evaporation ponds receiving *in situ* wastewater. Waterborne selenium concentrations $\geq$ 2 µg/L are considered hazardous to the health and long-term survival of fish and wildlife (Lemly 1996). Additionally, water with more than 20 µg/L is considered hazardous to aquatic birds (Skorupa and Ohlendorf 1991). Chronic effects of selenium manifest themselves in immune suppression to birds (Fairbrother et al. 1994), which can make affected birds more susceptible to disease and predation. Selenium toxicity will also cause embryonic deformities and mortality (See et al. 1992, Skorupa and Ohlendorf 1991, Ohlendorf 2002).

If submerged aquatic vegetation and/or aquatic invertebrates are present in evaporation ponds with high waterborne selenium concentrations, extremely high dietary levels of this contaminant can be available to aquatic migratory birds. Ramirez and Rogers (2000) documented selenium concentrations ranging from 434 to 508 µg/g in pondweed (*Potamogeton vaginatus*) collected from a uranium mine wastewater storage reservoir that had waterborne selenium concentrations ranging from 260 to 350 µg/L.

We look forward to working with you throughout the planning process for this project. If you have any questions regarding this letter, please contact Travis Sanderson at the letterhead address or phone (307) 328-4333.

Sincerely,

Scott Hicks

for Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosure (1)

cc: WDEQ-LQD, District Supervisor, Program Supervisor, Sheridan, WY (M. Rogaczewski)
WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)

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U.S. Fish and Wildlife Service, Wyoming Ecological Services Field Office

Protections for Raptors

Raptors, or birds of prey, and the majority of other birds in the United States are protected by the Migratory Bird Treaty Act, 16 U.S.C. 703 (MBTA). A complete list of migratory bird species can be found in the Code of Federal Regulations at 50 CFR 10.13. Eagles are also protected by the Bald and Golden Eagle Protection Act, 16 U.S.C. 668 (Eagle Act).

The MBTA protects migratory birds, eggs and nests from possession, sale, purchase, barter, transport, import, export, and take. The regulatory definition of take, defined in 50 CFR 10.12, means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to hunt, shoot, wound, kill, trap, capture, or collect a migratory bird. Activities that result in the unpermitted take (e.g., result in death, possession, collection, or wounding) of migratory birds or their eggs are illegal and fully prosecutable under the MBTA. Removal or destruction of active nests (i.e., nests that contain eggs or young), or causing abandonment of an active nest, could constitute a violation of the MBTA, the Eagle Act, or both statutes. Removal of any active migratory bird nest or any structure that contains an active nest (e.g., tree) where such removal results in take is prohibited. Therefore, if nesting migratory birds are present on or near a project area, project timing is an important consideration during project planning. As discussed below, the Eagle Act provides additional protections for bald and golden eagles and their nests. For additional information concerning nests and protections under the MBTA, please see the U.S. Fish and Wildlife Service's (Service) Migratory Bird Permit Memorandum, MBMP-2.

The Service's Wyoming Ecological Services Field Office works to raise public awareness about the possible occurrence of birds in proposed project areas and the risk of violating the MBTA, while also providing guidance to minimize the likelihood that take will occur. We encourage you to coordinate with our office before conducting actions that could lead to the take of a migratory bird, their young, eggs, or active nests (e.g., construction or other activity in the vicinity of a nest that could result in a take). If nest manipulation is proposed for a project in Wyoming, the project proponent should also contact the Service's Migratory Bird Office in Denver at 303-236-8171 to see if a permit can be issued. Permits generally are not issued for an active nest of any migratory bird species, unless removal of the nest is necessary for human health and safety. If a permit cannot be issued, the project may need to be modified to ensure take of migratory birds, their young or eggs will not occur.

For infrastructure (or facilities) that have potential to cause direct avian mortality (e.g., wind turbines, guyed towers, airports, wastewater disposal facilities, transmission lines), we recommend locating structures away from high avian-use areas such as those used for nesting, foraging, roosting or migrating, and the travel zones between high-use areas. If the wildlife survey data available for the proposed project area and vicinity do not provide the detail needed to identify normal bird habitat use and movements, we recommend collecting that information prior to determining locations for any infrastructure that may create an increased potential for avian mortalities. We also recommend contacting the Service's Wyoming Ecological Services office for project-specific recommendations.

Additional Protections for Eagles

The Eagle Act protections include provisions not included in the MBTA, such as the protection of unoccupied nests and a prohibition on disturbing eagles. Specifically, the Eagle Act prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagle or their body parts, nests, chicks or eggs, which includes collection, possession, molestation, disturbance, or killing. The term "disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (50 CFR 22.3 and see also 72 FR 31132).

The Eagle Act includes limited exceptions to its prohibitions through a permitting process. The Service has issued regulations concerning the permit procedures for exceptions to the Eagle Act's prohibitions (74 FR 46836), including permits to take golden eagle nests which interfere with resource development or recovery operations (50 CFR 22.25). The regulations identify the conditions under which a permit may be issued (i.e., status of eagles, need for action), application requirements, and other issues (e.g., mitigation, monitoring) necessary in order for a permit to be issued.

For additional recommendations specific to Bald Eagles please see our Bald Eagle information web page (http://www.fws.gov/wyominges).

Recommended Steps for Addressing Raptors in Project Planning

Using the following steps in early project planning, agencies and proponents can more easily minimize impacts to raptors, streamline planning and permitting processes, and incorporate measures into an adaptive management program:

1. Coordinate with appropriate Service offices, Wyoming Game and Fish Department, Tribal governments, and land-management agencies at the earliest stage of project planning.
2. Identify species and distribution of raptors occurring within the project area by searching existing data sources (e.g., Wyoming Game and Fish Department, Federal land-management agencies) and by conducting on-site surveys.
3. Plan and schedule short-term and long-term project disturbances and human-related activities to avoid raptor nesting and roosting areas, particularly during crucial breeding and wintering periods
4. Determine location and distribution of important raptor habitat, nests, roost sites, migration zones and, if feasible, available prey base in the project impact area.
5. Document the type, extent, timing, and duration of raptor activity in important use areas to establish a baseline of raptor activity.
6. Ascertain the type, extent, timing, and duration of development or human activities proposed to occur, and the extent to which this differs from baseline conditions.
7. Consider cumulative effects to raptors from proposed projects when added to past, present, and reasonably foreseeable actions. Ensure that project mitigation adequately addresses cumulative effects to raptors.
8. Minimize loss of raptor habitats and avoid long-term habitat degradation. Mitigate for unavoidable losses of high-valued raptor habitats, including (but not limited to) nesting, roosting, migration, and foraging areas.
9. Monitor and document the status of raptor populations and, if feasible, their prey base post project completion, and evaluate the success of mitigation efforts.
10. Document meaningful data and evaluations in a format that can be readily shared and incorporated into wildlife databases (contact the Service's Wyoming Ecological Services office for details).

Protection of nesting, wintering (including communal roost sites), and foraging activities is considered essential to conserving raptors. In order to promote the conservation of migratory bird populations and their habitats, Federal agencies should implement those strategies directed by Executive Order 13186, "Responsibilities of Federal Agencies To Protect Migratory Birds" (66 FR 3853).

Recommended Seasonal and Spatial Buffers to Protect Nesting Raptors

Because many raptors are particularly sensitive to disturbance (that may result in take) during the breeding season, we recommend implementing spatial and seasonal buffer zones to protect individual nest sites/territories (Table 1). The buffers serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. The size and shape of effective buffers vary depending on the topography and other ecological characteristics surrounding the nest site. In open areas where there is little or no forested or topographical separation, distance alone must serve as the buffer. Adequate nesting buffers will help ensure activities do not take breeding birds, their young or eggs. For optimal conservation benefit, we recommend that no temporary or permanent surface occupancy occur within species-specific spatial buffer zones. For some activities with very substantial auditory impacts (e.g., seismic exploration and blasting) or visual impacts (e.g., tall drilling rig), a larger buffer than listed in Table 1 may be necessary, please contact the Service's Wyoming Ecological Services office for project specific recommendations on adequate buffers.

As discussed above, for infrastructure that may create an increased potential for raptor mortalities, the spatial buffers listed in Table 1 may not be sufficient to reduce the incidence of raptor mortalities (for example, if a wind turbine is placed outside a nest disturbance buffer, but inadvertently still within areas of normal daily or migratory bird movements); therefore, please contact the Service's Wyoming Ecological Services office for project specific recommendations on adequate buffers.

Buffer recommendations may be modified on a site-specific or project-specific basis based on field observations and local conditions. The sensitivity of raptors to disturbance may be dependent on local topography, density of vegetation, and intensity of activities. Additionally, individual birds may be habituated to varying levels of disturbance and human-induced impacts. Modification of protective buffer recommendations may be considered where biologically supported and developed in coordination with the Service's Wyoming Ecological Services Field Office.

Because raptor nests are often initially not identified to species (e.g., preliminary aerial surveys in winter), we first recommend a generic raptor nest seasonal buffer guideline of January 15th – August 15th. Similarly, for spatial nesting buffers, until the nesting species has been confirmed, we recommend applying a 1-mile spatial buffer around the nest. Once the raptor species is confirmed, we then make species-specific and site-specific recommendations on seasonal and spatial buffers (Table 1).

Activities should not occur within the spatial/seasonal buffer of any nest (occupied or unoccupied) when raptors are in the process of courtship and nest site selection. Long-term land-use activities and human-use activities should not occur within the species-specific spatial buffer of occupied nests. Short-term land use and human-use activities proposed to

occur within the spatial buffer of an occupied nest should only proceed during the seasonal buffer after coordination with the Service, State, and Tribal wildlife resources management agencies, and/or land-management agency biologists. If, after coordination, it is determined that due to human or environmental safety or otherwise unavoidable factors, activities require temporary incursions within the spatial and seasonal buffers, those activities should be planned to minimize impacts and monitored to determine whether impacts to birds occurred. Mitigation for habitat loss or degradation should be identified and planned in coordination with applicable agencies.

Please contact the Service's Wyoming Ecological Services Field Office if you have any questions regarding the status of the bald eagle, permit requirements, or if you require technical assistance regarding the MBTA, Eagle Act, or the above recommendations. The recommended spatial and seasonal buffers are voluntary (unless made a condition of permit or license) and are not regulatory, and they do not supersede provisions of the MBTA, Eagle Act, Migratory Bird Permit Memorandum (MBMP-2), and Endangered Species Act. Assessing legal compliance with the MBTA or the Eagle Act and the implementing regulations is ultimately the authority and responsibility of the Service's law enforcement personnel. Our recommendations also do not supersede Federal, State, local, or Tribal regulations or permit conditions that may be more restrictive.

Table 1. Service's Wyoming Ecological Services Field Office's Recommended Spatial and Seasonal Buffers for Breeding Raptors

Raptors of Conservation Concern (see below for more information)

Common Name	Spatial buffer (miles)	Seasonal buffer
Golden Eagle	0.5	January 15 - July 31
Ferruginous Hawk	1	March 15 - July 31
Swainson's Hawk	0.25	April 1 - August 31
Bald Eagle	see our Bald Eagle information web page	
Prairie Falcon	0.5	March 1 - August 15
Peregrine Falcon	0.5	March 1 - August 15
Short-eared Owl	0.25	March15- August 1
Burrowing Owl	0.25	April 1 – September 15
Northern Goshawk	0.5	April 1 - August 15

Additional Wyoming Raptors

Common Name	Spatial buffer (miles)	Seasonal buffer
Osprey	0.25	April 1 - August 31
Cooper's Hawk	0.25	March 15 – August 31
Sharp-shinned Hawk	0.25	March 15 – August 31
Red-tailed Hawk	0.25	February 1 – August 15
Rough-legged Hawk (winter resident only)	----	----
Northern Harrier	0.25	April 1 - August 15
Merlin	0.5	April 1 - August 15
American Kestrel	0.125	April 1 – August 15
Common Barn Owl	0.125	February 1 – September 15
Northern Saw-whet Owl	0.25	March 1 - August 31
Boreal Owl	0.25	February 1 – July 31
Long-eared Owl	0.25	February 1 – August 15
Great Horned Owl	0.125	December 1 – September 31
Northern Pygmy-Owl	0.25	April 1 – August 1
Eastern Screech -owl	0.125	March 1 – August 15
Western Screech-owl	0.125	March 1 – August 15
Great Gray Owl	0.25	March 15 – August 31

Raptors of Conservation Concern

The Service's Birds of Conservation Concern (2008) report identifies "species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing" under the Endangered Species Act (16 U.S.C 1531 et seq.). This report is intended to stimulate coordinated and proactive conservation actions among Federal, State, and private partners. The Wyoming Partners in Flight Wyoming Bird Conservation Plan identifies priority bird species and habitats, and establishes objectives for bird populations and habitats in Wyoming. This plan also recommends conservation actions to accomplish the population and habitat objectives.

We encourage project planners to develop and implement protective measures for the Birds of Conservation Concern as well as other high-priority species identified in the Wyoming Bird Conservation Plan. For additional information on the Birds of Conservation Concern that occur in Wyoming, please see our Birds of Conservation Concern web page.

Additional Planning Resources

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Edison Electric Institute and the Raptor Research Foundation. 1996. Suggested Practices for Raptor Protection on Power Lines - The State of the Art in 1996. Washington, D.C.

Edison Electric Institute's Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service. 2005. Avian Protection Plan Guidelines.

Edison Electric Institute and the Raptor Research Foundation. 1994. Mitigating Bird Collisions with Power Lines - The State of the Art in 1994. Washington, D.C.

U.S. Fish and Wildlife Service. 2000. Siting, Construction, Operation and Decommissioning of Communications Towers and Tower Site Evaluation Form (Directors Memorandum September 14, 2000), Arlington, Virginia.

U.S. Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. United States Department of Interior, Fish and Wildlife Service, Arlington, Virginia. 23 pp.

Wyoming Game and Fish Department Internet Link to Raptor Information

References

50 CFR 10.12 – Code of Federal Regulations. Title 50--Wildlife and Fisheries, Chapter I--United States Fish and Wildlife Service, Department of the Interior, Part 10--General Provisions.

50 CFR 10.13– Code of Federal Regulations. Title 50--Wildlife and Fisheries, Chapter I--United States Fish and Wildlife Service, Department of the Interior, Part 10--General Provisions.

50 CFR 22.3 – Code of Federal Regulations. Title 50--Wildlife and Fisheries, Chapter I--United States Fish and Wildlife Service, Department of the Interior, Part 22—Eagle Permits.

50 CFR 22.25– Code of Federal Regulations. Title 50--Wildlife and Fisheries, Chapter I--United States Fish and Wildlife Service, Department of the Interior, Part 22—Eagle Permits.

66 FR 3853 - Presidential Documents. Executive Order 13186 of January 10, 2001. Responsibilities of Federal Agencies To Protect Migratory Birds. Federal Register, January 17, 2001.

72 FR 31132 - Protection of Eagles; Definition of "Disturb". Final Rule. Federal Register, June 5, 2007.

74 FR 46836 - Eagle Permits; Take Necessary To Protect Interests in Particular Localities. Final Rule. Federal Register, September 11, 2009.

U.S. Fish and Wildlife Service. 2003. Migratory Bird Permit Memorandum, MBMP-2, Nest Destruction (Directors Memorandum April 15, 2003), Washington, D.C.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp.

ATTACHMENT OP-7

Specifications for Storage Ponds

TECHNICAL SPECIFICATIONS

Section TS-1 General Requirements

TS 1.1 Summary Of Work

The Work under this contract includes construction of two lined evaporation ponds which includes installation of embankment raises, installation of double ponds with leak detection systems.

The site is located east of the Proposed Lost Creek Plant. Site location maps are provided in the Drawings.

TS 1.2 General Description Of Work

1.2.1 Location

Ponds 1&2 Reservoirs are located in the E1/2, Section 18, T25N, R92W, in Sweetwater County, Wyoming.

1.2.2 Statement Of Work

The work to be performed is shown on the Drawings and described in these specifications. The Work includes, but is not limited to, the following components:

- Site preparation which includes clearing and grubbing, topsoil and subsoil removal and stockpiling;
- Excavation of key cut;
- Construction of embankments;
- Installation of geomembrane and collections system for double lining with leak detection.

1.2.3 List Of Drawings

Included with these specification are the following drawings:

Drawing Number	Title
0802.100	Index, Legend and General Notes
0802.101	Overall Site Plan
0802.102	Embankment Plan
0802.103	Embankment Details
0802.104	Leak Detection Details

TS 1.3 Equipment, Materials, and Labor

The Contractor shall furnish all supervision, personnel, labor, materials, Plant, machinery, tools, equipment, repairs, maintenance and service, and all other facilities and incidentals necessary for the execution and completion of the Work. The Owner shall provide fresh water for soil compaction and dust abatement. The Contractor shall be responsible for all pumping, hauling and dispensing of such water.

TS 1.4 On-Site Material Definitions

For purposes of these specifications, other than payment, materials of earthwork and construction are defined as follows:

A. TOPSOIL

Surficial soil material selectively salvaged and stockpiled for use in reclamation. The depth of topsoil to be salvaged at any particular location shall be directed by the Engineer.

B. SUBSOIL

Soil material beneath topsoil selectively salvaged and stockpiled for use in reclamation. The depth of subsoil to be salvaged shall be directed by the Engineer.

C. UNSUITABLE MATERIAL

Material excavated or removed from the borrow areas, foundation or embankments which is not suitable for embankment fill or foundation. The Engineer shall determine if excavated material is unsuitable.

D. FILL MATERIAL

Material from the borrow excavation which is suitable for embankment construction. The Engineer shall determine if excavated material is suitable for fill material.

TS 1.5 Standard Of Construction

The Work covered by these specifications will be completed in such a manner as to meet the requirements of all applicable federal, state, and local laws, regulations and ordinances, and to conform to modern practices for this type of work.

TS 1.6 Environmental

The Contractor shall insure that no contamination of topsoil, water, and air occurs from oil, fuel, or other fluid spills; from vehicle emissions; or from garbage, waste, or other debris.

The Contractor shall service all equipment in designated areas, and maintain all equipment to prevent leakage of oil, fuel or other fluids; and to prevent unacceptable levels of emissions.

The Contractor shall provide approved sanitary facilities on-site and these facilities shall be properly maintained.

The Contractor shall collect, remove, and properly dispose of all trash, garbage, debris, used oil, and other waste materials off-site at an approved disposal area.

The Contractor shall comply with all State of Wyoming Department of Environmental Quality rules and regulations during construction, including, but not limited to, the handling and storage of fuel, oil, and other liquids.

The Contractor shall keep all access roads and work areas wetted, as directed by the Engineer, to abate fugitive dust.

TS 1.7 Field Engineering

The Engineer will provide initial slope stakes for the embankment raises and will stake topsoil stripping limits and depths. The Engineer will also determine the suitability of borrow material depth.

TS 1.8 OSHA Requirements

The Contractor shall be required to obtain a contractor identification number from the U.S. Office of Safety and Heath Administration (OSHA) and shall assume sole responsibility for compliance with OSHA requirements.

Section TS-2 Mobilization and Demobilization

TS 2.1 Scope

The Work in this Section comprises the Contractor's establishment on Site of all the temporary accommodation, Plant and equipment necessary for the successful completion of the Work and shall include, but not necessarily be limited to the following:

(1) Assemble all necessary Plant and transport to Site.

(2) Establish the Contractor's maintenance facilities, temporary workshops, temporary office accommodation and sanitation facilities.

(3) Provide the Engineer's temporary office accommodations.

(4) Provide temporary accommodation for the Contractor's personnel.

(5) Maintain Plant and services for the duration of the Work.

(6) All things required to move onto the Site for execution of the Work.

(7) On completion of the Work remove all Plant from the Site, and restore the Site to a clean and tidy condition to the satisfaction of the Engineer.

TS 2.2 Execution

2.2.1 Mobilization

The Contractor shall mobilize on the Site, sufficient labor, materials, and equipment to allow commencement of the Work, and shall bring on to the Site, as and when necessary, any additional equipment, labor and materials which may be required to complete the Work as scheduled.

2.2.2 Contractor's Workshops, Stores and Offices

The Contractor shall either transport mobile units or erect, in the area designated on the Drawings or indicated by the Engineer, adequate workshops, offices and other buildings and structures for the completion of the Work. Such workshops and offices, etc., shall be maintained in a neat and tidy condition throughout the duration of the Work to the satisfaction of the Engineer.

2.3.3 Sanitation

The Contractor shall provide and maintain adequate sanitary facilities for his personnel at the Site, including his offices and temporary accommodation and Engineer's office in compliance with local health regulations and to the satisfaction of the Engineer.

2.2.4 Construction Roads

All temporary construction roads which the Contractor may require to complete the Work shall be constructed at the Contractor's expense.

The location of any temporary roads, or portions thereof, on the Site shall be subject to the Engineer's approval.

The Contractor's construction roads shall be available for use by others having permission from the Engineer to carry out work on the Site.

2.2.5 Drainage

Adequate drainage facilities in the form of ditches, culverts or other conduits shall be installed as necessary to maintain temporary construction access roads. These temporary drainage facilities shall be constructed to the satisfaction of the Engineer.

2.2.6 Demobilization

Upon completion of the Work, the Contractor shall remove all Plant from the Site, restore all damaged roads, and remove all haul roads not authorized by the Owner, and shall leave the Site in workman-like condition, to the satisfaction of the Engineer.

TS 2.3 Measurement and Payment

2.3.1 Mobilization

Payment shall be full compensation for Mobilization and shall be limited to an amount not greater than seven percent of the total contract price.

2.3.2 Demobilization

Payment shall be full compensation for Demobilization and shall be limited to an amount not greater than three percent of the total contract price.

PAY ITEMS	PAY UNIT
2-1 Mobilization	LS
2-2 Demobilization	LS

Section TS-3 Earthwork

TS 3.1 Scope

The Work in this Section covers stripping of all topsoil, subsoil, the construction of the downstream embankment raise, installation of the cutoff trench and construction of access roads. The Work shall include the necessary manpower and equipment to construct the embankments from material designated as borrow material on the Drawings or as approved by the Engineer.

TS 3.2 Products/Materials/Equipment

3.2.1 Soils

The following soil types shall be encountered during the Work:

- Topsoil - Topsoil shall be determined using WDEQ-LQD Guideline 1 standards and as shown in Appendix D7 of the Permit to Mine. Stockpiling and protection will also follow WDEQ-LQD Guideline 1 standards.

- Subsoil - Subsoil shall be considered the three feet of soil below the topsoil unless otherwise determined by the Engineer.

- Fill Material-Downstream Embankment - Fill material shall be that material suitable for embankment construction. This material shall be a sand with clay lenses from the Designated Borrow Areas. and from the Interior Borrow Area.

- Road Base Material - Road Base Material shall consist of gravely material imported to the site from a suitable quarry as approved by the Engineer.

3.2.2 Compaction Equipment

The Contractor shall provide sufficient compaction equipment of the types and sizes specified herein as is necessary for compaction of the various fill materials. If the Contractor wishes to use alternative equipment, he shall submit to the Engineer for approval complete details of such equipment and the methods proposed for its use. The Engineer's approval of the use of alternative equipment will be dependent upon the contractor's successful demonstration of the equipment. Suitable test fills will be constructed to the satisfaction of the Engineer. Alternative equipment will compact the fill materials to a density not less than that which would be produced by the equipment and number of coverages specified herein.

Compaction equipment, which includes the following, shall be maintained in good working condition at all times to ensure that the amount of compaction obtained is a maximum for the equipment. The Contractor shall immediately make adjustments to the equipment to achieve this end when necessary.

Smooth Drum Vibratory Roller

Smooth drum vibratory rollers shall be equipped with a suitable cleaning device to prevent the accumulation of material on the drum during rolling. Each roller shall have a total static weight of not less that 20,000 pounds at the drum when the roller is standing on level ground. The drum shall be not less than 60 inches in diameter and 78 inches in width. The vibration frequency of the roller drum during operation shall be between 1100 and 1500 vibrations per minute and the centrifugal force developed by the roller at 1250 vibrations per minute shall not be less than 38,000 pounds. The smooth drum roller compactor shall also contain a timing device for indicating actual roller operating time.

Sheepsfoot Roller

The Contractor may be required to compact the fill with a sheepsfoot roller.

The sheepsfoot roller shall be a self-propelled, fully-ballasted, standard sheepsfoot design developing 6000 lbs. in weigh per liner foot of width at rest on level ground, or equivalent as approved by the Engineer. The sheepsfoot roller machine shall be equipped with a timing device which will indicate actual roller operating time.

Special Compactors

Special compactors shall be used to compact materials which, in the opinion of the Engineer, cannot be compacted properly by the specified sheepsfoot or vibratory rollers because of location or accessibility.

The Contractor shall adopt special compaction measures such as hand-held vibratory compactors or other methods approved by the Engineer to compact fill in trenches, around structures and in other confined areas which are not accessible to the larger vibratory roller or sheepsfoot roller. Such compaction shall consist of not less than 4 coverages of the compaction equipment.

Before commencing work with the proposed compaction equipment, the Contractor will provide the Engineer with a list of each piece of equipment to be used, together with the Manufacturer's specification.

3.2.3 Moisture Conditioning of Soil

In areas requiring moisture conditioning, the Contractor will apply clean water to the borrow area and use a heavy duty discing unit to thoroughly blend the soil producing an even mixture of soil and water.

TS 3.3 Execution

3.3.1 Topsoil/Subsoil Stripping

Topsoil and subsoil shall be removed from the borrow areas.

During all phases of topsoil and subsoil removal, the Contractor shall use extreme caution to avoid a conflict with or contact or damage to existing utilities, overhead or buried, such as gas or oil lines, power lines, poles, cased wells, or other appurtenances. The Contractor shall be responsible for location of, and any damage to, existing utilities during construction activities. Cost of utility location and damage repair shall be solely borne by the Contractor.

Stockpile slopes shall not be steeper than 5h:1v (horizontal:vertical) unless otherwise directed by the Engineer.

3.3.3 Key Cut Installation

A key cut shall be installed under the entire embankment. The key cut shall be a minimum of five feet deep, bottom width of 10 feet and 2:1 (h:v) side slopes. Material from the cutoff trench is suitable embankment fill.

3.3.4 Foundation Preparation

The foundation material shall be over excavated by three to four feet. Unsuitable material as determined by the Engineer shall be put aside for possible embankment fill material. The remaining material shall be placed back in the foundation in six inch minimum lifts. Each lift shall be compacted to 95% of the Modified Proctor Density as determined by ASTM 1557 D and to within plus or minus two percent of the optimum moisture as determined by ASTM 1557 D and must have a permeability of less than 10^{-7} cm/sec as determined by ASTM 2434. The foundation shall be constructed to the exact lines and grades as determined by the Engineer.

3.3.5 Fill Placement

The Contractor should expect cold weather conditions during a portion of this project. This will require the fill area to be scarified at the beginning of each working shift to insure additional lifts are not placed on frozen surfaces.

All material used for fill shall be loaded and hauled to the placement site, dumped in layers no greater than eight inches, spread and leveled, moisture conditioned if required, and compacted to form a dense integral fill as required by the Engineer. The Contractor shall at all times exercise care to avoid segregation of the material being placed and shall, if required by the Engineer, remove all pockets of segregated or undesirable material and replace it with material which matches the surrounding material. All material in excess of one foot in diameter shall be removed from the fill material either prior to its being placed or after it is dumped and spread but before the compaction operations are started.

For most construction conditions, the fill is to be constructed in near horizontal layers with each layer being completed over the full length and breadth of the embankment before placement of subsequent layers. Each layer shall be constructed only with materials meeting the specified requirements and shall be free from lenses, pockets and layers of materials which are substantially different in gradation from the surrounding material, as determined by the Engineer.

The Contractor shall spread, level and compact the material to ninety percent (90%) of the Modified Density (ASTM D 1557). The Contractor shall control the routing of the scrapers to achieve the specified compaction where practical. In areas where this cannot be accomplished, the embankment shall be rolled with four (4) passes from a vibratory roller or as approved by the Engineer.

Except in areas approved by the Engineer, where space is limited or as otherwise specified, fill shall be placed by routing the hauling and spreading units approximately parallel to the axis of fill. Where impractical limits exist, the hauling units shall be so routed that they do not follow in the same paths but spread their traveled paths evenly over the surface of the fill.

Materials requiring moisture control shall be moisture conditioned in the borrow areas, as required by the Engineer. Moisture conditioning is the operation required to increase or decrease the moisture content of material to within specified limits.

If materials require moisture conditioning, the Contractor shall employ whatever method and equipment are necessary to condition the material to the moisture content designated by the Engineer. The Contractor shall adopt all measures necessary to achieve a moisture content within plus two percent (2%) or minus two percent (2%) of the optimum moisture content, and the moisture shall be distributed uniformly throughout each layer of material being placed, immediately prior to compaction. The Contractor shall adopt whatever measures are necessary to ensure that the designated moisture content is preserved after compaction, until the succeeding layer is placed.

Should the surface of the fill become rutted or uneven subsequent to compaction, it shall be re-leveled and re-compacted, by and at the expense of the Contractor, before the next layer of fill is placed.

If the surface of the fill becomes too dry or hard to permit suitable bonding with the subsequent layer, the material shall be loosened by scarifying or disk harrowing, moistened and re-compacted before an additional lift is placed.

All particles of dimensions such that they interfere with compaction in the layer thicknesses specified, as determined by the Engineer, shall be removed, either prior to or during compaction as specified.

The rolling pattern of all construction joints shall be such that the full number of roller passes required in one side of the construction joint extends completely across the joint.

3.3.6 Compaction Procedures

The Contractor's procedures for compaction of fill shall be subject to the approval of the Engineer. Compaction of each layer of fill shall proceed in a systematic, orderly and continuous manner approved by the Engineer, such as to ensure that all of each layer receives the compaction specified. The compaction shall be carried out by routing the compaction equipment parallel to the axis of the embankment or fill, except that where such routing is impractical such as in roller turning areas, in areas adjacent to foundations or at the lower elevations of the fill, in areas adjacent to pipework and where otherwise required by the Engineer, the compaction equipment may be routed in any direction approved by the Engineer.

For compaction by the vibratory roller, one coverage shall consist of one pass of the roller. A minimum overlap of 12 inches shall be maintained between the surfaces traversed by adjacent passes of the roller drum. During compaction the roller shall be propelled at 2 miles per hour or such lesser speed as may be determined by the Engineer. The power of the motor driving the vibrator shall be sufficient to maintain the specified frequency and centrifugal force under the most adverse conditions which may be encountered during the compaction of the fill. Propulsion equipment for the roller shall be adequate to propel the roller at speeds up to 4 mph.

3.3.7 Road Base Material

Road Base Material shall be placed on the top surface of all embankments and final access roads. The road base shall be placed a minimum of six inches thick and shall be compacted by using a roller compactor or by wheel rolling with loaded scrapers.

3.3.8 Quality Control

The Contractor shall give the Engineer full cooperation in sample taking or making tests and shall render such assistance as is necessary to enable sampling and testing to be carried out expeditiously. Each lift of embankment or other type fill will need

to be approved by the Engineer prior to placement of further fill. The Contractor shall allow sufficient time for the Engineer to carry out the required test work in order to determine the acceptability of each lift. The making of such tests by the Engineer or the time taken to interpret their results shall not constitute grounds for a claim by the Contractor for additional compensation or an extension of time.

The Engineer will take samples of fill materials and perform gradation and moisture content tests and will carry out field density tests on the compacted fill and other tests that he considers necessary to ascertain that the fill being placed or already placed meets the specified requirements. The results of the tests carried out by the Engineer will be final and conclusive in determining compliance with the Technical Specifications.

Tests carried out by the Engineer will be performed in accordance with the principles and methods prescribed by the American Society for Testing and Materials (ASTM) and other such recognized authorities. The following quality control testing is anticipated:

Tests on Fill Material Prior to Compaction

Tests for gradation and moisture content where applicable will be made by the Engineer. Samples of fill materials will be taken from test pits after spreading and prior to compaction. Sampling will be at frequencies sufficient to ensure that the placement of fill material is in full compliance with the Specification.

Tests on Fill After Compaction

The Engineer will conduct density and other tests on the fill compacted in place. Samples of the fill for related laboratory testing will be taken at such frequency the Engineer considers necessary for the proper evaluation of the properties of the compacted fill materials.

TS 3.4 Measurement and Payment

3.4.1 Measurement for Payment

Topsoil

Measurement for payment for Topsoil shall be based on volumes determined by the number of scraper loads multiplied by the rated capacity of the scraper.

Foundation Preparation

Measurement for payment for Foundation Preparation shall be the net volume of over excavation and replacement of foundation material as determined by survey prior and after foundation preparation.

Embankment Fill

Measurement for payment for Embankment Fill will be made of the net volume in cubic yards of fill placed with scrapers as determined by survey prior to and after completion of the embankment construction.

The surveys shall be performed by the Engineer. The Contractor may have his representative present during field or office work related to the surveys and may obtain copies of field notes, drawings, or calculations to the extent sufficient to verify the calculations.

Key Cut

The key cut shall be considered subsidiary to Embankment Fill and will not be paid separately.

3.4.2 Payment

Topsoil Removal

Payment for topsoil removal shall be for compensation for excavating, hauling and stockpiling the topsoil. Payment will be based on the contracted unit cost per cubic yard of material removed.

Foundation Preparation

Payment shall be full compensation for removing, replacing, moisture conditioning and compacting of foundation material. Payment for foundation preparation sahll be based on the contract unit cost per cubic yard of material removed for foundation preparation.

Fill Material

Payment shall be full compensation for ripping, hauling, placing, spreading, shaping, moisture conditioning, and compacting the material. Payment for embankment fill shall be based on the contract unit cost per cubic yard for both downstream embankment and upstream embankment regardless of the source of borrow material.

No separate measurement or payment will be made for moisture conditioning the soil nor other equipment to obtain the specified moisture and density. The cost of moisture conditioning and compacting shall be included in the unit price for the various earthwork items.

PAY ITEMS	PAY UNIT
3-1 Topsoil Removal	CY
3-2 Subsoil Removal	CY
3-3 Foundation Preparation	CY
3-4 Embankment Fill	CY

Section TS-4 Double Liner w/ Leak Detection

TS 4.1 Scope

Work in this Section covers all Work associated with the installation of the double pond liner with a leak detection system.

Work shall include all labor, material and equipment necessary to perform site preparation to install the liner and leak detection.

The Work consists of installing one layer of liner, placing collection system and placing top layer of liner.

TS 4.2 Products/Equipment

4.1.1 Geomembrane

The impermeable liner shall be a polypropylene geomembrane, manufactured by Lange Containment Systems, Inc. and supplied by Geotech Industrial Supplies, Casper, WY, at telephone number 307-472-0084 or approved equivalent. The geomembrane shall conform to the following values and test methods:

Property	Test Method	Value	Qualifier
Gauge		.048 mil	
Plies		1	
Thickness (min.)	ASTM D 751	41 mil	MIN
Breaking Strength	ASTM D-751	225lbf	MIN
Low Temp Flax °F	ASTM D-2136	-40	
Puncture Resistance	FTMS 101C	350 lbs	MIN
Tear Strengh	ASTM D-5884	55 lbf	MIN
Dim Stability	ASTM D-1204	1.0 %	MAX
Hydrostatic Resistivity	ASTM D-751	70%	MARV
Ply Adhesion	ASTM D-431	20 lbs/in	MIN
Water Absorption	ASTM D-4632	203 lbs	MARV
ESCR Env Stress Check Resistance		Not affected by ESC	
UV Resistance	ASTM G-26	Pass	

Typical Fabricated Seam Properties			
Bonded seam strength Adhesive	ASTM D 751	200	MIN
Peel Adhesion	ASTM D-431	20 or FTB	MIN

4.2.2 Sand

The sand and fine gravel used to cover the drain pipe shall meet the following gradation:

Sieve Designation	Percent Passing
3/8	100
200	<5

4.2.3 Pipe

The leak detection system shall use 4 inch perforated PVC Schedule 40 pipe.

4.2.4 Sump

The sump shall be 24"x24"x24" heavy duty reinforces plastic sump box manufactured by Zurn Industries, Inc. or approved equal.

4.2.4 Alarm System

The Alarm System shall be composed of the following products manufactured by Netmon, Inc. or approved equals:

- Sensorhawk 2-Port Base Unit SH2
- Sensorhawk Smart Liquid Detection Sensor SH-LD-12
- Sensorhawk Smart Siren/Strobe Sensor SH-STR-00

4.2.5 Sump Pump

Any 1/6 HP approved 110V submersible pump with high and low level detectors shall be acceptable for this project.

4.2.6 Flow Meter

A flow meter with totalizer as approved by the Engineer shall be install in the discharge line.

TS 4.3 Execution

4.3.1 Site Preparation

The bottom of the pond shall be graded as smooth as practicable prior to laying geomembrane.

4.3.2 Geomembrane (Bottom Layer)

The geomembrane shall be installed to the lines and grades as shown on the Drawings.

The geomembrane shall be placed in accordance with manufactured specification. A factory representative shall be on site to supervise and direct the welding of seams.

4.3.3 Leak Detection Collection Pipe with Sand Cover

The perforated pipe shall be placed as shown in the drawings. The pipe is place in a herringbone pattern leading to a central non-perforated drainage pipe going down the center. At each arm of the herringbone pattern is placed, sand shall be placed over the pipe to a nominal thickness of 12 inches.

Factory supplied boots shall be used where pipe penetrates the liner.

4.3.4 Leak Detection Alarm, Sump and Pumpback system.

The alarm, sump and pumpback system including flow meter shall be installed as shown in the Drawings. The control panels controlling the alarm and incoming power shall me mounted on a pole as shown in the drawings and installed to the manufactures specifications.

4.3.4 Geomembrane (Top Layer)

The top layer of geomembrane shall be placed to the lines and grades as shown on the drawings.

The geomembrane shall be placed in accordance with manufactured specification. A factory representative shall be on site to supervise and direct the welding of seams.

Construction Quality Control - Field Quality Control seam testing involves both non-destructive and destructive testing. The non-destructive testing is primarily centered around determination of "water tightness"; whereas destructive testing is based on ASTM D 882 and ASTM D 413 test methods.

Each seam must be checked visually for uniformity of width and surface continuity. Proper fusion chemical application visually changes the surface appearance. Usually the installer will use an air lance or blunt - end pick to check for voids or gaps under the overlapping geomembrane.

When unbonded areas are located, they can sometimes be repaired by inserting more chemical fusion agent into the opening and applying pressure. If that is not satisfactory, a round or oval patch must be placed over them with at least 6 inches of geomembrane extending on all sides.

Any area of the geomembrane sheets where puncture holes are observed must be patched as above, with at least 6 inches of geomembrane extending beyond the affected areas.

Note that with the above items, it is not practical to use a seaming board or slip sheet beneath the geomembrane. However, a piece of the liner material can be used for added support under the liner, if needed, even if the hole must be enlarged to insert the piece before the patch is made. This added piece is left in place. In either situation, additional care should be used to ensure a proper bond.

TS 4.4 Measurement and Payment

4.4.1 Measurement for Payment

Geomembrane - The measurement for payment for placed geomembrane shall be the net square yards of geomembrane placed.

Perforated PVC Pipe - The measurement for payment for placed perforated PVC pipe shall be the lineal feet of placed pipe.

Non - Perforated PVC Pipe - The measurement for payment for placed PVC pipe shall be the lineal feet of placed pipe.

Sand - The measurement for sand shall be the placed be the placed cubic yards of sand placed.

Leak Detection Alarm, Sump and Pumpback System - the measurement for payment for the leak detection shall be the successful installation of all the components of the system.

4.4.2 Payment

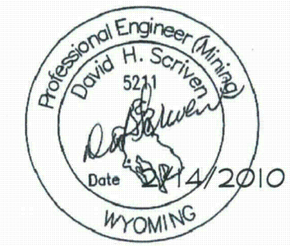
Payment for the double geomembrane liner with leak detection shall be full compensation for the work and be made at the contract price and for those item listed

below. Site preparation shall be considered subsidiary to the placement of geomembrane.

PAY ITEMS	PAY UNITS
4-1 Geomembrane	SY
4-2 4 in Perforated Pipe	LF
4-3 Sand	CY
4-4 Leak Detection Alarm, Etc.	LS

Ponds 1 & 2 Reservoir Construction Drawings

Lost Creek ISR, LLC
Casper, Wyoming, USA



WESTERN STATES MINING CONSULTANTS, P.C.
6911 Casper Mountain Road • Casper, Wyoming 82601 • (307) 266-9117

Project No. 0802

April 2008

FNAME

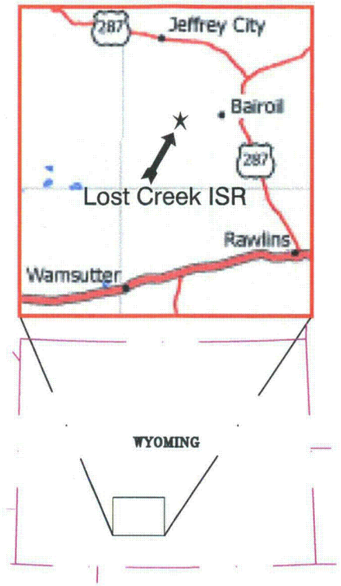
REVDATE

USER

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

INDEX OF DRAWINGS

Drawing No.	Title
0802.100	Index, Legend & General Notes
0802.100	Overall Site Plan
0802.101	Embamkment Plan
0802.103	Embankment Details
0802.104	Liner and Leak Detection Details



INDEX MAP

NTS

LEGEND

- Existing ground surface or bottom of excavation
- Groundwater table
- 6520 Existing grade elevation
- Slope
- 3:1 3 horizontal to 1 vertical slope
- 1 / 00802.000 Section number; Drawing No. where section is shown or called out
- W.S. Water surface

UNIFIED SOIL CLASSIFICATION SYSTEM

- Gravels; include GP, GM and GC
- Clean sands; include SW and Sp
- Clayey sands and silts; include SM, SC and ML
- Clays; include CL and CH
- Borrow Area

ABBREVIATIONS

PWPC	Process water collection pond	MH	Manhole
LCRS	Leachate collection and removal system	ID	Inside diameter
		OD	Outside diameter
CMP	Corrugated metal pipe	NFWE	No free water encountered
HDPE	High density polyethylene		
PVC	Polyvinyl Chloride	Nom.	Nominal
CPT	Corrugated polyethylene tubing	SDR	Standard dimensional ratio
NTS	Not to Scale		
Typ.	Typical		
El.	Elevation		
Req'd	Required		
Dia.	Diameter		
Sch.	Schedule		
$\mathcal{L}$	Center line		
Perf.	Perforated		

Lost Creek ISR, LLC
Englewood, Colorado, USA

Engineered By:

WESTERN STATES MINING CONSULTANTS, P.C.

6911 Casper Mountain Road · Casper, Wyoming 82601 · (307) 266-9117

Index, Legend and General Notes

SIZE	FSCM NO.	DWG NO.	REV
B		0802.100	
SCALE	DATE April 24, 2008	SHEET	

741,500 E.

741,600 E.

741,700 E.

741,800 E.

741,800 E.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	Modified Location and added Coord Grid	1/27/2010	

537,500 N.

537,400 N.

537,300 N.

N

Pond 2

6970

Leak Detection System
(See Dwg. 0802.104
for details)

Pond 1

R50.0

Lost Creek ISR, LLC
Casper, Wyoming, USA

Engineered By:

WESTERN STATES MINING CONSULTANTS, P.C.

6911 Casper Mountain Road · Casper, Wyoming 82601 · (307) 266-9117

Overall Site Plan

SIZE	FSCM NO.	DWG NO.	REV
B		0802.101	1

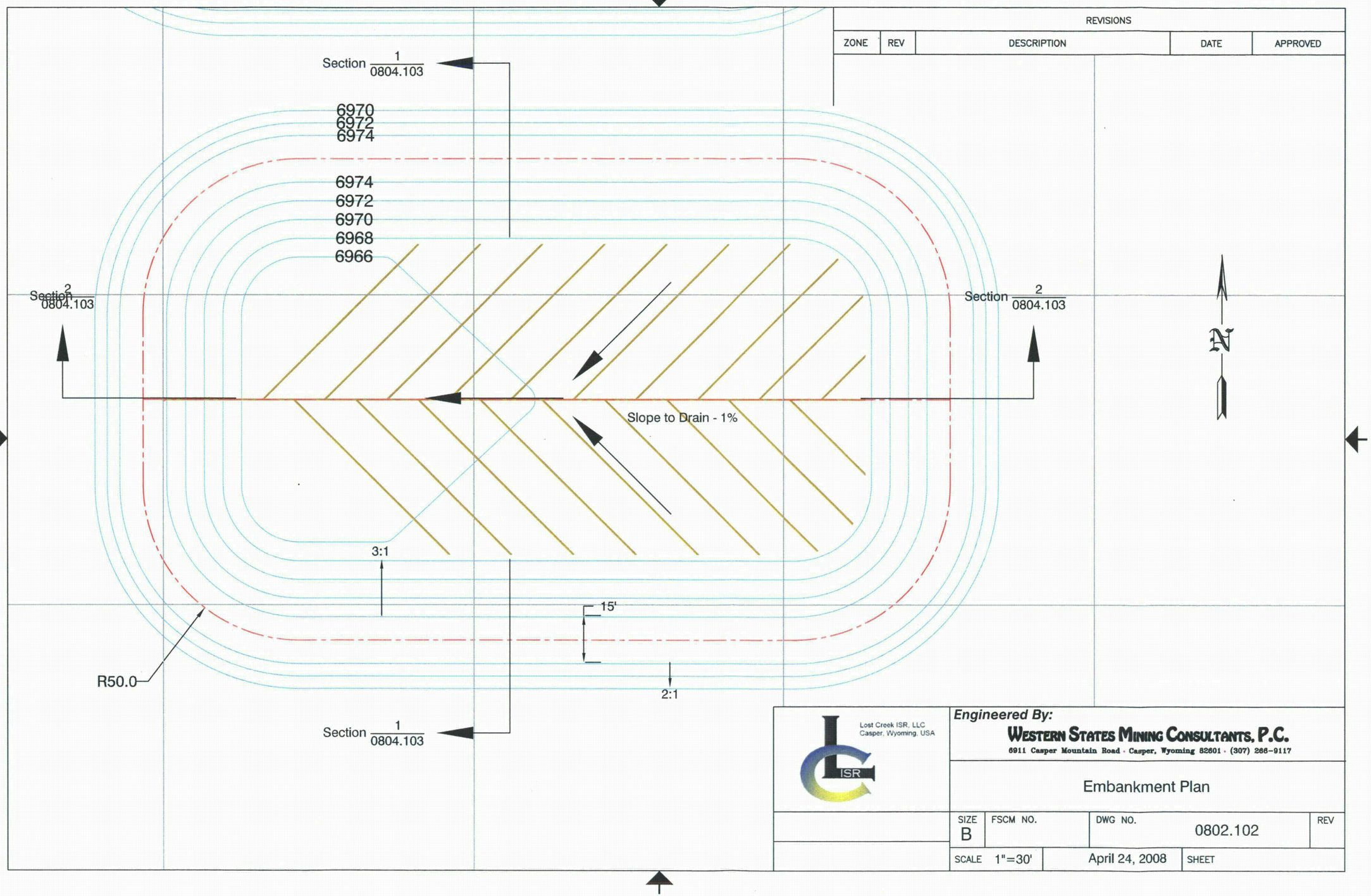
SCALE	DATE	SHEET
1"=50'	April 24, 2008	

NAME

REVDATE

USER

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



Lost Creek ISR, LLC
Casper, Wyoming, USA

Engineered By:

WESTERN STATES MINING CONSULTANTS, P.C.

6911 Casper Mountain Road · Casper, Wyoming 82601 · (307) 266-9117

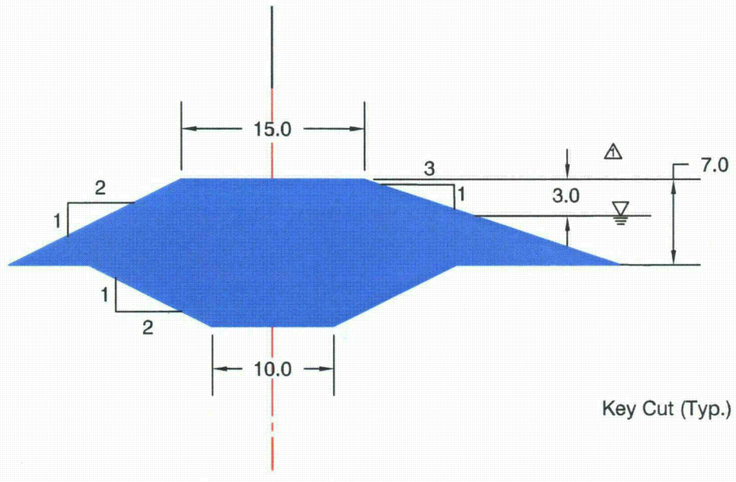
Embankment Plan

SIZE	FSCM NO.	DWG NO.	REV
B		0802.102	

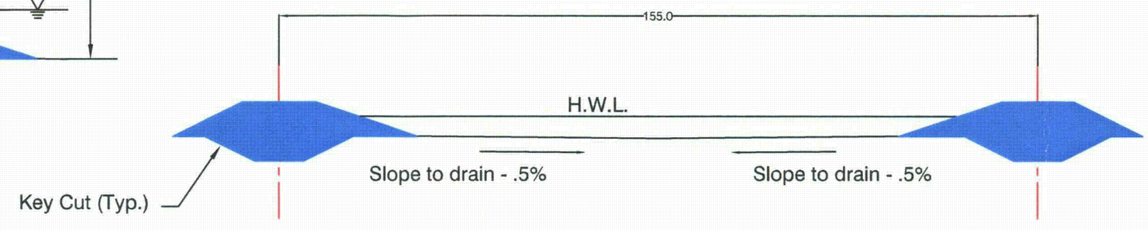
SCALE		SHEET
1"=30'	April 24, 2008	

NAME
REVDATE
USER

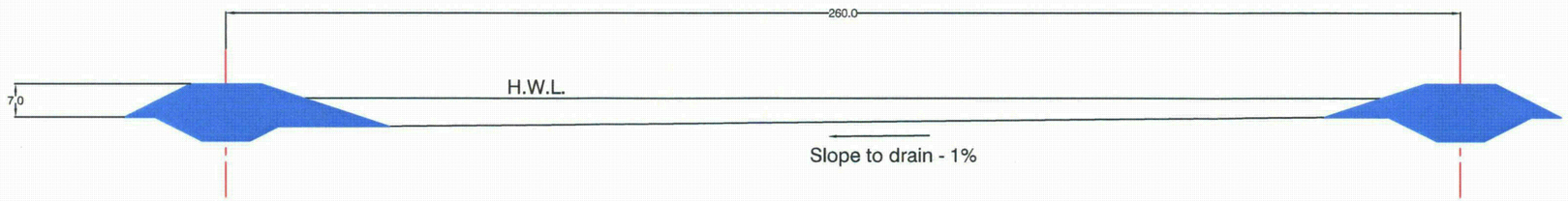
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	Changed dim font for freeboard and added dim for depth	7/17/09	DHS



Embankment Detail
(Typ.)
NTS



Section $\frac{1}{0804.102}$



Section $\frac{2}{0804.102}$

Lost Creek ISR, LLC
Casper, Wyoming, USA

Engineered By:
WESTERN STATES MINING CONSULTANTS, P.C.
6911 Casper Mountain Road · Casper, Wyoming 82601 · (307) 266-9117

Embankment Details

SIZE	FSCM NO.	DWG NO.	REV
B		0802.103	1
SCALE 1"=30'	April 24, 2008	SHEET	

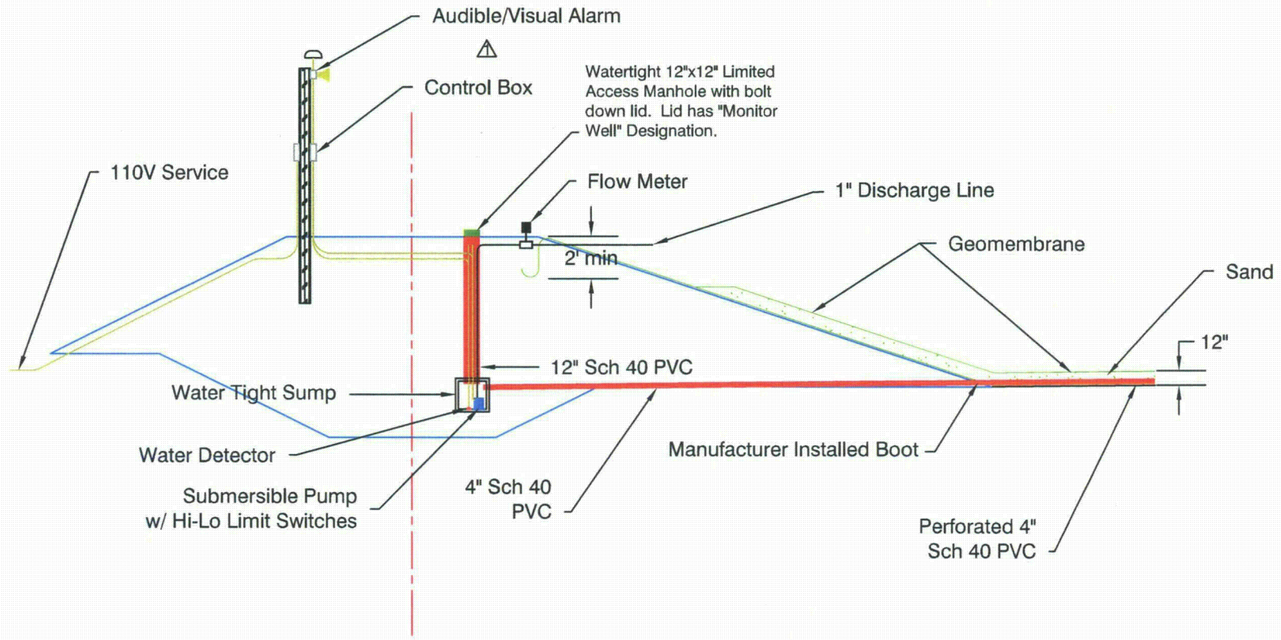
FNAME
REVDATE
USER

FNAME

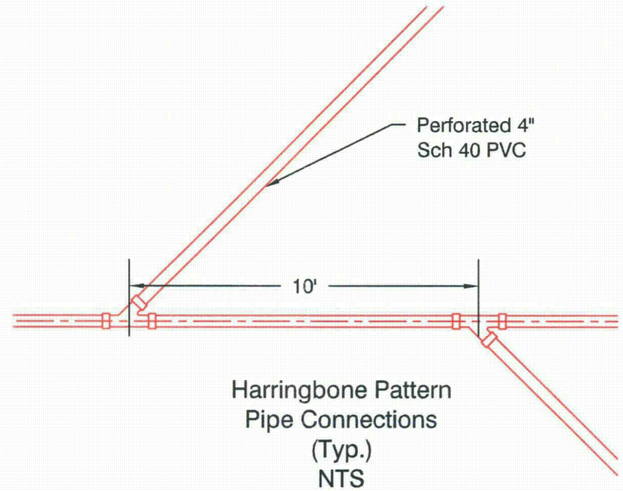
REVDATE

USER

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	⚠	Leak Detection, Alarm System & Pump Back	12/23/2009	DHS



Double Geomembrane Liner
w/ Leak Detection
NTS



Harringbone Pattern
Pipe Connections
(Typ.)
NTS

Lost Creek ISR, LLC
Casper, Wyoming, USA

Engineered By:

WESTERN STATES MINING CONSULTANTS, P.C.

6911 Casper Mountain Road · Casper, Wyoming 82601 · (307) 266-9117

Leak Detection Details

SIZE	FSCM NO.	DWG NO.	REV
B		0802.104	1
SCALE NTS	April 24, 2008	SHEET	

Design Report

Ponds 1 &2

Submitted to:

Lost Creek ISR, LLC
5880 Enterprise Dr., Suite 200
Casper, WY 82609

Prepared by:

Western States Mining Consultants, P.C
6911 Casper Mountain Road
Casper, WY 82601

January, 2009
Project Number: 00802

TABLE OF CONTENTS

Design Report
Ponds 1 & 2

1.0 Introduction

Western States Mining Consultants, P.C. (WSMC) has complete the design of a two holding ponds at the Lost Creek ISR project in Carbon County, Wyoming. Both ponds are identical and are adjacent to one another

Both ponds are approximately 155 feet wide and 260 feet long and have a capacity of approximately 2.3 acre-ft each.

Included in this design report are the following:

- Stability analyses of the embankment,
- Freeboard calculations,
- Slope protection recommendations, and the
- Geotechnical Report.

2.0 Stability Analysis and Settlement

Stability Analysis

Slope stability analyses were performed on embankment cross-section determined to be the most critical. Embankment slopes are 3:1 (h:v) for the upstream slope and 2:1 (h:v) for the downstream slope.

The material properties for the slope stability analyses were obtained from historical values used in similar projects and compared to drilling logs. They are presented in Table 1, Material Properties.

Table 1
Material Properties

Material Type	Cohesion (pcf)	Friction Angle	Unit Weight (pcf)
Fill Material	300	15	115
Native Soils	300	15	110
Bedrock	600	30	150

The computer program STABR was used to generate the slope stability analyses. The program uses the Modified Bishop Method developed by LeFebvre in 1971 to determine minimum factors of safety. Specific input requirements of the program include material properties (listed above), . surface profiles and phreatic surface profiles. Analyses were performed for both the upstream slope and downstream slope at Station 25+00 of the Phase 2 modification. The analyses included both the static and psuedostatic cases. A static safety factor of 1.5 and a psuedostatic safety factor of 1.0 is considered stable for earth filled dams. Results of the analyses are shown in Table 2, Stability Analyses.

Table 2
Stability Analyses - Station 25+00

Slope	Static	Psuedostatic
Downstream	2.128	2.575

All input data and output results of these analyses are included as Appendix A to this report.

Settlement Analysis

The foundations of the ponds will be a very dense clayey sandstone. The bearing strength of this material is about 10 kips (20,000 lbs/ft^2). The ponds are designed to have a maximum water depth of approximately 6 feet. This will apply approximately 374.4 lbs/ft^2. Therefore settlement of the pond is not anticipated with these water volumes.

3.0 Freeboard

The design freeboard must be of sufficient height above the maximum design water level to impound water when it rises above the design water level under the combined action of:

- waves,
- run-up, and
- wind-tide.

Wave height and wind-tide depend on the reservoir configuration; run-up is a function of the steepness and roughness of the design dike slope, the wave length and wave period (Linsley and Franzini, 1964)

The following assumptions were made in calculating the wind-tide, wave height, and run-up for Pond 1 Reservoir:

- Wind Velocity, Vw = 80 mph
- Fetch (length of water surface in miles), F = 0.05 miles
- Average depth of pond, d = 6 feet

The following calculations were based on the above assumptions:

Wind Tide (Zs)

$Zs = Vw^2F/1400d = 80^2 \times 0.05/(1400 \times 6) = 0.038\,feet$

Wave Height (Zw)

Significant wave height (13% exceeding) , Zw

$Zw = 0.034\,Vw^{1.06}F^{0.47} = 0.034 \times 80^{1.06} \times 0.038^{0.41} = 0.932\,feet$

Design

Design wave height (4% exceeding) , Z'

$Z' = 1.67\,Zw = 1.67 \times 0.932 = 1.55\,feet$

Run-up

Assume 3:1 slope (moderately smooth slope)

Wave Period (tw)

$tw = 0.46\ Vw^{0.44} F^{0.28} = 0.46 \times 80^{0.44} \times .05^{0.28} = 1.37$

Wave length (lw)

$lw = 5.12\ tw^2 = 9.57$

$Zw = 0.07$ *(from Linsley and Franzini, pg 167)*

Run-up, $Zr/Zw = 1.2$ *(Interpolated)*

$Zr = 1.2 \times 0.932 = 1.12$ *feet*

Freeboard

Freeboard = Wind-tide + wave height (<4%) + run-up

$= Zs + Z' + Zr = 0.04 + 1.55 + 1.12 = 2.71$

Use 3 feet

4.0 Slope Protection

Upstream Slope Protection - The upstream slopes of earth filled dams must be protected against destructive wave action. The liner will provide all the required slope protection. No other measures are anticipated for these facilities.

Downstream Slope Protection - The downstream slope of the embankment will covered with topsoil and vegetation.

5.0 Geotechnical Report

The geotechnical report prepared by Inberg-Miller Engineers. The report in its entirety is shown as Appendix B of this report. Inberg-Miller drilled 12 borings. Boring B2 is the closest to the proposed pond location and that is the one used for the aforementioned analyses.

Liquefaction Potential

The liquefaction potential appears to be low for the soils surrounding the ponds. Soil used for pond construction and the foundation of the ponds have a low potential for the following reasons:

- The fines in the soils are greater than 15 percent, typically in the 25 - 30% range.
- The soils in the area are typically very dry. Usually less then 10%.
- The soil penetration resistance is high with typical blowcounts of greater than 50 blows per foot.

Permeability of Foundation

Sample were taken from the foundation material to determine the permeability of the foundation. The samples were re-compacted to 95% of their maximum density as determined by the Modified Proctor Analysis (ASTM D1557). Falling head permeability testing methods were used.

The results of the testing are as shown is Table 3, Permeability Testing, is as follows:

Table 3
Permeability Testing

Sample ID	Sample Depth, (ft)	gd max (pcf)	target remolded gd (pcf), M%	Permeability (cm/sec)
Pond 1	4 to 5	125	118.8,11	3.85 E-7
Pond 1	6 to 7	121.5	115.4,11.5	5.46 E-7
Pond 1	7 to 8	125	118.8,9.5	8.52 E-8
Pond 2	4 to 5	123	116.9,11	4.26 E-6
Pond 2	6 to 7	115	109.3,16	9.57 E-7
Pond 2	7 to 8	125	118.8,11	3.42 E-5

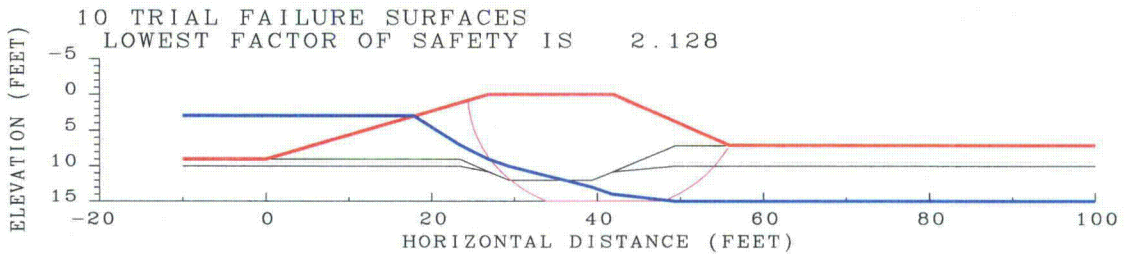
The results show that three to four feet of material will need to be removed from the pond, blended and replaced in six inch layers compacted to 95% of the Modified Proctor to result in an acceptable permeability of 10^{-7} cm/sec.

Appendix A

Input file - Typical Cross-section Downstream - Static Case

Typ XS DS s 2:1

```
0 0 11 4 1 0  0.0 0.0
55.9    0       5
55.9    7
-10     9       9       9       9       9       10      40
0       9       9       9       9       9       10      40
17.9    3       3       3       3       9       10      40
23.4    1.19    1.19    1.19    1.19    9       10      40
26.9    0       0       0       0       10.8    10.8    40
29.4    0       0       0       0       12      12      40
39.4    0       0       0       0       12      12      40
41.9    0       0       0       0       10.8    10.8    40
49.4    3.8     3.8     3.8     3.8     7.1     10      40
55.9    7.1     7.1     7.1     7.1     7.1     10      40
100     7.1     7.1     7.1     7.1     7.1     10      40
 1   300   15   115
 2   300  15   110
 3   600   30   150
-10     3
0       3
17.9    3
23.4    7
26.9    9
29.4    10
39.4    13
41.9    14
49.4    15
55.9    15
100     15
 0
```



Typ XS DS s 2:1

Output file - Typical Cross-section Downstream - Static Case

Typ XS DS s 2:1

CONTROL DATA

NUMBER OF SPECIFIED CENTERS 0
NUMBER OF DEPTH LIMITING TANGENTS 0
NUMBER OF VERTICAL SECTIONS 11
NUMBER OF SOIL LAYER BOUNDARIES 4
NUMBER OF PORE PRESSURE LINES 1
NUMBER OF POINTS DEFINING COHESION PROFILE 0

SEISMIC COEFFICIENT S1,S2 = .00 .00

SEARCH STARTS AT CENTER (55.9, .0),WITH FINAL GRID OF 5.0

ALL CIRCLES PASS THROUGH THE POINT (55.9, 7.0)

GEOMETRY

SECTIONS -10.0 .0 17.9 23.4 26.9 29.4 39.4 41.9 49.4 55.9 100.0

T. CRACKS	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
W IN CRACK	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
BOUNDARY 1	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
BOUNDARY 2	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
BOUNDARY 3	9.0	9.0	9.0	9.0	10.8	12.0	12.0	10.8	7.1	7.1	7.1
BOUNDARY 4	10.0	10.0	10.0	10.0	10.8	12.0	12.0	10.8	10.0	10.0	10.0

SOIL PROPERTIES

LAYER	COHESION	FRICTI0H ANGLE	DENSITY
1	300.0	15.0	115.0
2	300.0	15.0	110.0
3	600.0	30.0	150.0

PORE PRESSURE DATA

COORDINATES OF EQUI-PRESSURE LINES

SECTIONS	-10.0	.0	17.9	23.4	26.9	29.4	39.4	41.9	49.4	55.9	100.0
LINE 1	3.0	3.0	3.0	7.0	9.0	10.0	13.0	14.0	15.0	15.0	15.0

VALUES OF PRESSURE ON EQUI-PRESSURE LINES

LINE	PRESSURE
1	.0

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	FS(BISHOP)	FS(OMS)
1	7.0	7.0	55.9	.0	15.215	15.199
2	12.2	12.2	65.9	.0	**********	
				BISHOPS SOLU. DID NOT CONVERGE IN 21 ITERATIONS		
3	12.2	12.2	45.9	.0	2.582	
				BISHOPS SOLU. DID NOT CONVERGE IN 21 ITERATIONS		
4	21.2	21.2	35.9	.0	3.046	2.103
5	9.7	19.7	45.9	-10.0	6.012	5.764
6	8.6	8.6	50.9	.0	6.506	6.276
7	16.6	16.6	40.9	.0	2.128	1.491
8	21.2	21.2	35.9	.0	3.046	2.103
9	14.2	19.2	40.9	-5.0	2.577	2.128
10	18.3	23.3	35.9	-5.0	3.126	2.467
11	10.6	15.6	45.9	-5.0	4.459	4.115

F.S. MINIMUM= 2.128 FOR THE CIRCLE OF CENTER (40.9, .0)

Input file - Typical Cross-section Downstream - Psuedostatic Case

Typ XS DS p 2:1

```
0 0 11 4 1 0 0.1 0.1
55.9    0       5
55.9    7
-10     9       9       9       9       9       10      40
0       9       9       9       9       9       10      40
17.9    3       3       3       3       9       10      40
23.4    1.19    1.19    1.19    1.19    9       10      40
26.9    0       0       0       0       10.8    10.8    40
29.4    0       0       0       0       12      12      40
39.4    0       0       0       0       12      12      40
41.9    0       0       0       0       10.8    10.8    40
49.4    3.8     3.8     3.8     3.8     7.1     10      40
55.9    7.1     7.1     7.1     7.1     7.1     10      40
100     7.1     7.1     7.1     7.1     7.1     10      40
 1   300   15   115
 2   300  15   110
 3   600   30   150
-10     3
0       3
17.9    3
23.4    7
26.9    9
29.4    10
39.4    13
41.9    14
49.4    15
55.9    15
100     15
 0
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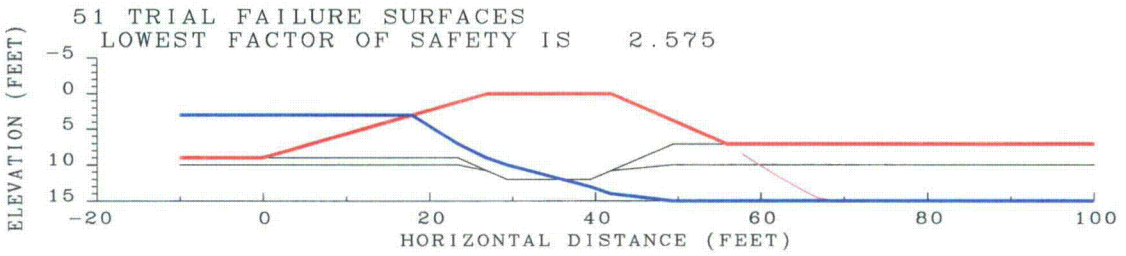

Typ XS DS p 2:1

Output file - Typical Cross-section Downstream - Psuedostatic Case

BISHOP MODIFIED,LEFEBVRE 1971

Typ XS DS p 2:1

CONTROL DATA

NUMBER OF SPECIFIED CENTERS 0
NUMBER OF DEPTH LIMITING TANGENTS 0
NUMBER OF VERTICAL SECTIONS 11
NUMBER OF SOIL LAYER BOUNDARIES 4
NUMBER OF PORE PRESSURE LINES 1
NUMBER OF POINTS DEFINING COHESION PROFILE 0

SEISMIC COEFFICIENT S1,S2 = .10 .10

SEARCH STARTS AT CENTER (55.9, .0),WITH FINAL GRID OF 5.0

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GEOMETRY

SECTIONS -10.0 .0 17.9 23.4 26.9 29.4 39.4 41.9 49.4 55.9 100.0

T. CRACKS	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
W IN CRACK	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
BOUNDARY 1	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
BOUNDARY 2	9.0	9.0	3.0	1.2	.0	.0	.0	.0	3.8	7.1	7.1
BOUNDARY 3	9.0	9.0	9.0	9.0	10.8	12.0	12.0	10.8	7.1	7.1	7.1
BOUNDARY 4	10.0	10.0	10.0	10.0	10.8	12.0	12.0	10.8	10.0	10.0	10.0

SOIL PROPERTIES

LAYER	COHESION	FRICTI0H ANGLE	DENSITY
1	300.0	15.0	115.0
2	300.0	15.0	110.0
3	600.0	30.0	150.0

PORE PRESSURE DATA

COORDINATES OF EQUI-PRESSURE LINES

SECTIONS	-10.0	.0	17.9	23.4	26.9	29.4	39.4	41.9	49.4	55.9	100.0
LINE 1	3.0	3.0	3.0	7.0	9.0	10.0	13.0	14.0	15.0	15.0	15.0

VALUES OF PRESSURE ON EQUI-PRESSURE LINES

LINE	PRESSURE
1	.0

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	FS(BISHOP)	FS(OMS)
1	7.0	7.0	55.9	.0	12.687	12.698
2	12.2	12.2	65.9	.0	10.898	9.991
3	21.2	21.2	75.9	.0	5.028	4.003
4	30.8	30.8	85.9	.0	4.820	3.434
5	35.7	35.7	90.9	.0	6.443	4.733
6	35.1	30.1	85.9	5.0	7.458	4.513
7	26.0	26.0	80.9	.0	4.413	3.240
8	30.1	25.1	80.9	5.0	6.795	3.780
9	21.2	21.2	75.9	.0	5.028	4.003
10	22.7	27.7	80.9	-5.0	3.741	3.020
11	27.3	32.3	85.9	-5.0	3.794	2.912
12	18.3	23.3	75.9	-5.0	4.667	4.014
13	20.2	30.2	80.9	-10.0	3.545	3.043
14	24.5	34.5	85.9	-10.0	3.330	2.708
15	28.9	38.9	90.9	-10.0	3.649	2.871
16	27.3	32.3	85.9	-5.0	3.794	2.912
17	22.2	37.2	85.9	-15.0	3.141	2.678
18	26.3	41.3	90.9	-15.0	3.213	2.629
19	18.3	33.3	80.9	-15.0	3.590	3.218
20	20.4	40.4	85.9	-20.0	3.111	2.752
21	24.2	44.2	90.9	-20.0	2.998	2.543
22	28.3	48.3	95.9	-20.0	3.224	2.650
23	26.3	41.3	90.9	-15.0	3.213	2.629
24	22.4	47.4	90.9	-25.0	2.913	2.549
25	26.2	51.2	95.9	-25.0	2.968	2.509
26	18.9	43.9	85.9	-25.0	3.180	2.894
27	20.9	50.9	90.9	-30.0	2.910	2.613
28	24.5	54.5	95.9	-30.0	2.836	2.460
29	28.3	58.3	100.9	-30.0	3.004	2.533
30	26.2	51.2	95.9	-25.0	2.968	2.509
31	23.0	58.0	95.9	-35.0	2.782	2.469
32	26.6	61.6	100.9	-35.0	2.827	2.435
33	19.7	54.7	90.9	-35.0	2.964	2.717
34	21.7	61.7	95.9	-40.0	2.780	2.515
35	25.1	65.1	100.9	-40.0	2.730	2.398
36	28.6	68.6	105.9	-40.0	2.863	2.452
37	26.6	61.6	100.9	-35.0	2.827	2.435
38	23.8	68.8	100.9	-45.0	2.686	2.402
39	27.1	72.1	105.9	-45.0	2.726	2.375
40	20.6	65.6	95.9	-45.0	2.816	2.591
41	22.6	72.6	100.9	-50.0	2.679	2.434
42	25.8	75.8	105.9	-50.0	2.647	2.343
43	29.2	79.2	110.9	-50.0	2.757	2.386

44	27.1	72.1	105.9	-45.0	2.726	2.375
45	24.6	79.6	105.9	-55.0	2.606	2.341
46	27.9	82.9	110.9	-55.0	2.645	2.321
47	21.6	76.6	100.9	-55.0	2.701	2.488
48	23.6	83.6	105.9	-60.0	2.594	2.362
49	26.7	86.7	110.9	-60.0	2.575	2.290
50	29.9	89.9	115.9	-60.0	2.672	2.327
51	27.9	82.9	110.9	-55.0	2.645	2.321

Appendix B

ATTACHMENT OP-8

Groundwater Monitoring Program

Water Well Sampling Procedure

Contents

I. Purpose

This procedure outlines the approved groundwater sampling protocol for the Lost Creek Project. All individuals involved with the groundwater sampling program; including affected policy makers and supervisors, water samplers, and on-site laboratory personnel, will be familiar with this procedure. When adhered to, this procedure will result in the timely collection, analysis, documentation, and reporting of required groundwater samples.

II. Applicable Regulations and Guidance

The following regulations, guidelines and technical papers were consulted during the writing of this procedure. Any changes made to this document must be consistent with at least the relevant regulations.

A. Wyoming Department of Environmental Quality

- Wyoming Statutes §35-11-428 thru 430
- Land Quality Division Rules and Regulations Chapter 11 "Non-coal In Situ Mining"
- Land Quality Division Guideline No. 4 "In-Situ Mining"
- Land Quality Division Guideline No. 8 "Hydrology Coal and Non-Coal"

B. Nuclear Regulatory Commission

- 10 CFR 40.65
- 10 CFR 40 Appendix A Criterion 5(B)5
- Regulatory Guide 3.46
- Regulatory Guide 4.14
- NUREG 1569 "Standard Review Plan for In Situ Uranium Extraction License Applications"

C. Other

- ASTM Designation D6051-96 (Reapproved 2006) "Standard Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities.

III. Well Types

A. Storage Pond Wells

A series of monitor wells will be installed around the storage ponds to detect the presence of leakage. The wells are completed just above the uppermost aquitard where the water will tend to accumulate. These wells will generally be dry unless they are affected by significant precipitation events or by leakage from one of the ponds.

B. Regional Wells

A total of 27 regional monitor wells were installed to collect pre-operational water quality and hydrologic data. Generally, it is not necessary to collect water quality data from these wells during operations unless there is a reason to believe they have been impacted by operations. Quarterly water level readings will be taken during the life of the mine to document the impact of operations on water levels. Well numbers are:

LC29M, LC30M, LC31M, LC15M, LC18M, LC21M, LC25M, LC16M, LC19M, LC22M, LC26M, LC27M, LC28M, LC17M, LC20M, LC23M, LC24M, and MB-01 through MB-10.

Regional wells completed in the DE Sand that are also within the monitor ring of an unrestored wellfield, will have water levels taken and samples collected once per quarter. The water sample will be analyzed for pH, chloride, and conductivity in an effort to detect any migration of mining solution.

C. Wellfield Monitor Wells

i. Pre-Operational

As a part of the baseline assessment, all the mine unit monitor wells will be sampled at least four times at intervals at least 14 days apart. Water levels will be measured at the same frequency as the monitor well sampling. The Pre-Operational Baseline Table in Section V.A. outlines the constituent list for each type of monitor well.

ii. Operational

Excursion detection will consist of sampling the perimeter, overlying and underlying monitor wells at least twice per month, and no less than ten days apart, and analyzing the samples for the upper concentration limit (UCL) parameters. The monitor wells will be sampled as per the schedule outlined in the Operational Table in Section V.B. except in the event of inclement weather, mechanical failure, holiday scheduling, or other factors that may result in placing an employee at risk or potentially damaging the surrounding environment. In these situations, the EHSO/RSO, or his designee, will document the cause and the duration of any delays. In no event shall a delay be greater than five days.

Water levels will be measured at the same frequency as the monitor well sampling. Sudden changes in water levels may indicate that the mine unit flow is out of balance.

During routine sampling, if two of the three UCL values are exceeded in a monitor well, or if one UCL value is exceeded by 20 percent, the well will be re-sampled within 24 hours of receipt of the results from the routine sampling and analyzed for the excursion indicators. If the second sample does not exceed the UCLs, a third sample will be taken within 24 hours of receipt of the second sample results. If neither the second or third sample results exceed the UCLs, the first sample will be considered in error. If the second or third sample verifies an exceedance, the well in question is placed on excursion status.

In the event of an excursion, the sampling frequency of the monitor well on excursion status will be increased to weekly. If an excursion is not corrected within 30 days, a sample will be collected and analyzed for parameters listed in WDEQ-LQD Guideline 8 Appendix I Sections IV and VA(1) and the applicable EPA MCLs. Once parameters no longer exceed the UCLs, a final sampling and analysis of the WDEQ-LQD Guideline 8 parameters will be performed. An excursion is when the UCLs of two parameters are exceeded for an individual well or when a single parameter exceeds the UCL by more than 20%. An excursion is corrected when two consecutive weekly sample rounds confirm the definition of an excursion is no longer met.

iii. Restoration & Stabilization

During restoration the perimeter and underlying and overlying monitor wells will continue to be sampled at least twice per month, and no less than ten days apart, for UCL parameters. The production monitor wells will be sampled, at a minimum, at the beginning of restoration and the end. The final restoration sample may also serve as the initial stabilization sample.

Upon completion of restoration and notification of WDEQ-LQD, a groundwater stabilization monitoring program will begin in which the production monitor wells used to evaluate restoration success will be sampled. Each production monitor well will be sampled at the beginning of stabilization and once per quarter for a period of 12 months and analyzed for Guideline 8 parameters. This will yield a total of 5 sample rounds. The monitor ring, overlying, and underlying monitor wells will be sampled for the UCL parameters once every two months throughout stabilization. If an excursion occurs during stabilization, then the sampling will revert to weekly for the affected monitor well until the excursion is resolved.

D. Public Wells

Before beginning operations, public wells (wells that may be used for irrigation, watering livestock, or human consumption and are within 2 kilometers (1.24 miles)) will be sampled quarterly for at least one year if the owner consents and the pumping system is in working order. During operations and until groundwater restoration and stabilization are complete; all public wells within two kilometers of active wellfields will be sampled on a quarterly basis if the owner consents and the pumping system is in working order. At a minimum, the samples will be analyzed for natural uranium and radium-226.

Results of the analysis will be included in the NRC semi-annual report and the WDEQ Annual Report. If analysis show that the water quality has deteriorated, an investigation will be initiated by EHS Department to determine the cause and any necessary corrective action. The only well within 2 kilometers of the first mine unit is the Battle Spring Draw Well No. 4451 NE, NW of S21, T25N, R92W.

IV. Sampling Schedule

A. Pre-operational Baseline

Monitor Well Type	Frequency	Analytes[1]	Comments
Storage Pond	Quarterly for one year unless dry	If retrievable water is present analyze for pH, U_{nat}, chloride, bicarbonate, sulfate, and conductivity	
Regional	Quarterly for one year	Guideline 8[2]	
Wellfield	Production Zone 4 total samples at least 14 days apart each	2 rounds of Guideline 8 and 2 rounds of short list[3]	
	Perimeter, Overlying, Underlying 4 total samples at least 14 days apart each	1 round of Guideline 8 and 3 rounds of UCL s	
Public	Quarterly for one year	Ra-226 and U_{nat}	

1 – The listed analytes are in addition to the field parameters pH, water level and temperature which should be collected for all well samples.
2 – Guideline 8 refers to those parameters listed in the WDEQ-LQD Guideline 8, Appendix 1, Section IV and V(A)(1).
3 - Short list consists of those parameters that were detectable during the first and/or second rounds

B. Operational

Monitor Well Type	Frequency	Analytes[1]	Comments
Storage Pond	Monthly	If retrievable water is present analyze for pH, U_{nat}, chloride, bicarbonate, sulfate, and conductivity	Notify EHS/RSO if water level increases or water quality is similar to pond water quality
Regional	Quarterly	Water levels only outside unrestored wellfields, also pH, chloride, and conductivity for wells completed in the DE Horizon and within monitor ring of unrestored wellfields.	Notify EHS/RSO if water level increases or decreases significantly
Wellfield	Production Zone None	None	
	Perimeter, Overlying, Underlying Semi-monthly at least ten days apart[2]	Chloride, bicarbonate, conductivity	Notify EHS/RSO if water level changes significantly or if UCLs are approached or exceeded
Public	Quarterly	Ra-226 and U_{nat}	Notify EHS/RSO if water level changes significantly or if UCLs are approached or exceeded

1 – The listed analytes are in addition to the field parameters pH, water level and temperature which should be collected for all well samples.
2 – In the event of an excursion, affected monitor wells will be sampled weekly for the UCL parameters. If the excursion is not corrected within 30 days a Guideline 8 analysis will also be performed.

C. Restoration & Stabilization

Monitor Well Type	Frequency	Analytes[1]	Comments
Storage Pond	Monthly	If retrievable water is present analyze for pH, U_{nat}, chloride, bicarbonate, and conductivity	Notify Supervisor EHS/RSO if water level increases or water quality is similar to pond water quality
Regional	Quarterly	Water levels only	Notify Supervisor EHS/RSO if water level increases or decreases significantly
Wellfield	<u>Production Zone</u> During restoration a minimum of 1 round at the beginning of restoration and 1 round before beginning stabilization. During stabilization 1 round at the beginning and once each quarter for 12 months	Guideline 8	Notify Supervisor EHS/RSO if water level changes significantly or if analysis indicates an upward trend
	<u>Perimeter, Overlying, Underlying</u> Semi-monthly at least ten days apart during restoration and once every two months during stabilization	Chloride, bicarbonate, conductivity	Notify Supervisor EHS/RSO if water level changes significantly or if analysis indicates an upward trend
Public	Quarterly	Ra-226 and U_{nat}	

1 – The listed analytes are in addition to the field parameters pH, water level and temperature which should be collected for all well samples.

V. Field Sampling Procedure

A. Water Level Measurement

A water level reading should be taken and documented on the well sampling form before sampling any well with an accessible wellhead. Some private or BLM wells may not have the necessary ports at the wellhead to allow a measurement to be taken. In such cases it is not necessary to take a water level reading. Water levels readings must be accurate to within 0.1 feet. Acceptable tools for taking water level readings are an electronic line (e-line) or a sounder. When possible the reading should be taken down the stand pipe to avoid entanglement with the power cable. On the rare occasion that the check valve has not been removed from the pump, the reading will have to be taken in the annulus between the stand pipe and the casing. The presence of a check valve prevents the water in the stand pipe from equalizing with the natural pieziometric head.

An e-line used in a contaminated production or injection well may not be used in any non-contaminated well until it has been cleaned and a successful release survey has been performed and documented by the EHS Department.

B. Wellhead Setup

LC ISR, LLC wellheads will be constructed in such a manner that a meter run can be attached to the outlet of the standpipe. The meter run will have a built in flow meter and a port for collecting a water sample. The discharge pipe coming off of the meter run will be designed to spread the water out to prevent soil erosion. Data from the flow meter will be entered on the Well Sampling form as appropriate.

Public wells may not have a wellhead that allows the use of a meter run. In such cases, the sampler will estimate the flow rate so the Well Sampling Form can be completed.

C. Well Purge

The water within the wellbore may become stagnant over time causing the water chemistry to differ from that in the formation. Therefore, it is important to purge the wellbore so formation water can be sampled. A purge volume, also known as a casing volume, is equal to the volume of water within the well bore including the screened interval. A purge volume can be significantly reduced by installing a packer to isolate the water column above the pump. When a packer is used the purge volume will be equal to the volume of water below the packer; including the volume of water within the screened interval.

If a monitor well should be placed on excursion status, then the well water will be pumped directly to a water truck or tank. The purged well water will be transferred to the holding ponds and disposed of in a deep disposal well. This practice will continue until the affected well is removed from excursion status.

There are two acceptable methods for ensuring a successful well purge.

i. Two Casing Volume Method

A minimum of two submerged casing volumes must be pumped out before the final sample is collected. No stabilization samples are collected but the field parameters pH in standard units, temperature in degrees Celsius, and conductivity in µmos/cm must be measured and recorded on the well sampling form immediately before collecting the final sample. This method should not be used for new wells that may not be completely developed or for wells that have not been recently pumped. For wells that are routinely sampled, such as wells on a semi-monthly sampling schedule, this is an acceptable method.

ii. Stabilization Method

This method requires at least three purge samples to be collected to confirm the water quality is stable and is therefore representative of the formation. These samples are commonly referred to as stabilization samples. Each of the stabilization samples must be collected at least 0.5 casing volumes apart. The field parameters of pH in standard units, temperature in degrees Celsius, and conductivity in µmos/cm will be taken and recorded on the well sampling form for each stabilization sample. When three consecutive stabilization samples show less than 10% variation between any of the readings for each field parameter, the final water sample may be collected.

If a well pumps dry during purging then it is clear that all potentially stagnant water has been removed from the wellbore. Simply turn off the pump so the well can recharge then turn the pump on again and make the necessary field measurements and collect the final sample with no additional purge.

D. Field Analysis and Documentation

Field measurements must be taken using an instrument calibrated pursuant to the manufacturer's recommendations and the QA/QC program. The EHS/RSO, or his designee, shall ensure that only instruments capable of meeting the QA/QC guidelines are purchased for use. The well sampler must be familiar with the instruments capabilities and limitations.

Readings will be documented on the Well Sampling Form which is to be generated and maintained by the EHS Department. All Well Sampling Forms will be maintained for the life of the project.

E. Sample Collection and Preservation

Samples will be collected in a clean plastic or glass container. To ensure the container is clean, the sampler must rinse the container with the sample fluid before collecting the final sample. The cap should be placed on the container immediately after sample collection to prevent contamination by foreign matter. Containers may be used multiple times as long as they are cleaned between uses.

Due to the large number of possible preservation requirements, this SOP will only address basic preservation issues, however all sampling will follow the preservation and holding time procedures as outlined in Methods for Chemical Analysis of Water and Wastes, USEPA, 1983. The Supervisor EHS/RSO or site Chemist will provide additional guidance to the sampling crew as needed. Samples must be kept cool (around 4° C) and in the dark until analysis. Water samples should not be allowed to freeze since this will cause dissolved material to precipitate. The sample should be analyzed as soon as possible. When a sample cannot be analyzed within one day, it may be necessary to acidify the sample to ensure preservation. Consult with the site Chemist or Supervisor EHS/RSO for the proper acidification procedures

VI. QA/QC

The well sampling program will adhere to the following QA/QC requirements to ensure the veracity of resulting data:

- The instrument for analyzing field parameters shall be able to report pH to within 0.2 standard units; temperature to within 0.2° C; and conductivity to within 20 µmhos/cm corrected to 25° C. The instrument will be calibrated in accordance with the manufacturer's specifications with the results documented. The calibration documentation will be maintained for the life of the project.
- A duplicate sample will be collected at least every 20 samples or once every sample round, whichever is less.
- A blank sample consisting of distilled water will be collected at least every 20 samples or once every sample round, whichever is less, for semi-monthly wellfield samples.
- When major ions are analyzed the results will be compared against the TDS (determined at 180° C) to ensure all major ions were analyzed for and the results are otherwise reasonable.
- Samples will be analyzed using EPA approved methods.
- The Supervisor EHS/RSO, or his trained designee, will review the results of all well sampling to ensure the results are reasonable and that there are no issues of environmental concern. Part of the review will include comparing the results with previous analysis to ensure there are no trends of concern.
- A Chain of Custody (COC) form will be used for each sampling event to provide documentation of the transfer of samples from LC ISR, LLC personnel to the laboratory. LC ISR, LLC will use a standard COC document provided by the laboratory performing the analytical services. The COC at a minimum will contain the following items:
    - Company name;
    - Company address;
    - Project Name;
    - Company Contact information;
    - Requested analysis;
    - Sample identification, date sampled and time sampled;
    - Custody record detailing the transfer of the samples.

VII. Employee Training

All individuals supervising or performing well sampling and those working in the on-site laboratory must be familiar with the contents of this procedure. Training shall be performed by an experienced technician or supervisor. A simple letter to file is sufficient documentation that training has been completed. Retraining shall occur every two years for employees routinely engaged in well sampling Retraining shall occur for individuals who have not performed sampling within the past year.

VIII. Occupational and Environmental Safety

Well sampling is generally a very safe activity. However, samplers need to be aware of the following hazards so they can work safely.

- Before starting the pump power supply, inspect the electrical outlet and power cable to ensure they are in good repair. If the insulation or wiring appears to be damaged, perform the appropriate Lock Out/Tag Out procedure and notify your supervisor. Never drive over electrical cords;
- The field instrument calibration fluids may present hazards. Read and comply with the requirements in the MSDS for each chemical. The same is true for sample preservation chemicals;
- Always wear a hard hat, steel toe boots and safety glasses or goggles when sampling;
- If a well will not produce water, turn off the power supply and notify your supervisor. Any blockage in the discharge line, such as ice, will cause the stand pipe to rupture or the pump to overheat;
- Keep wellheads and standpipes covered to prevent entry by animals or debris;
- When purging a well ensure the energy of the water is dispersed to prevent soil erosion.

Attachment OP-9

Derivation of Transmissivity and Storativity of the HJ Horizon Unimpacted by the Lost Creek Fault

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Attachment OP-9

Derivation of Transmissivity and Storativity of the HJ Horizon Unimpacted by the Lost Creek Fault

1.0 INTRODUCTION

The parameters necessary to provide an estimate of drawdown during the life of the Lost Creek Project include transmissivity, storativity, net extraction rate, and duration of operation. Transmissivity of the HJ Horizon has been determined from pumping tests, conducted on either side of the Lost Creek Fault. Because of the influence of the fault, the transmissivity determined from this pumping test is viewed as an 'effective" transmissivity.

2.0 IMAGE WELL THEORY

A value of transmissivity that is not influenced by the fault can be estimated using the principle of superposition and image well theory (Stallman, 1952). The principle of superposition simply states that the total effect resulting from pumping multiple wells simultaneously is equal to the sum of the individual effect caused by each of the wells acting separately. The principle of superposition is commonly used to evaluate well interference problems by summing the drawdown determined using the Theis equation for a homogeneous, isotropic, infinite extent aquifer. Image well theory is used to address hydraulic impacts of a bounded (non infinite extent) aquifer for either no flow or recharge boundaries (Domenico and Schwartz, 1990).

In the application of image well theory for a no flow barrier, an imaginary well is placed directly across the no flow boundary at an equal distance from the boundary as the pumping well. The image well is assigned a pumping rate equal to that of the real pumping well. Then the drawdown can be calculated at any point within the aquifer (on the side with the real well) by summing the impacts from both the real and image well, using a modification of the Theis equation:

$$s = s_p + s_i = (Q/(4\pi T))[W(u)_p + W(u)_t]$$

where:

s = the observed drawdown at any point;
s_p = drawdown resulting from pumping the real well;
s_i = drawdown resulting from pumping the image well;
Q = the pumping rate;
T = aquifer transmissivity;
$W(u)_p$ = well function for the real well;
$W(u)_t$ = well function for the image well;

and:

$$(u)_p = r_p^2 S/4Tt$$
$$(u)_t = r_t^2 S/4Tt$$

where:

r_p = the distance from the pumping well to the observation point;
r_i = the distance from the image well to the observation point; and
S = aquifer storativity.

3.0 APPLICATION TO THE LOST CREEK PROJECT

In the case of the Lost Creek Project, image well theory was applied using the drawdown resulting from the LC19M pump test. The pumping well LC19M is located 482 feet from the Lost Creek Fault, based on mapped data. An image well was assumed at a distance of 964 from the pumping well, on the other side of the Fault. The drawdowns at the end of the pump test at three wells were used to back calculate the transmissivity and storativity of the aquifer. Figure OP-A9-1 shows the location of the wells used to calculate transmissivity with the image well method.

The LC19M pump test was run for a period of 8,252 minutes at an average rate of 42.9 gpm. The wells and respective drawdown (at the end of the test) used to solve the Theis equation for transmissivity and drawdown were: LC19M (93.32 ft); HJMP111 (35.56 ft); and HJMP104 (36.44 ft). The distance from LC19M to HJMP-111 is 473 ft and from LC19M to HJMP104 is 637 ft. The distances from the image well to HJMP-111 and HJMP-104 are 1,043 and 847 feet, respectively.

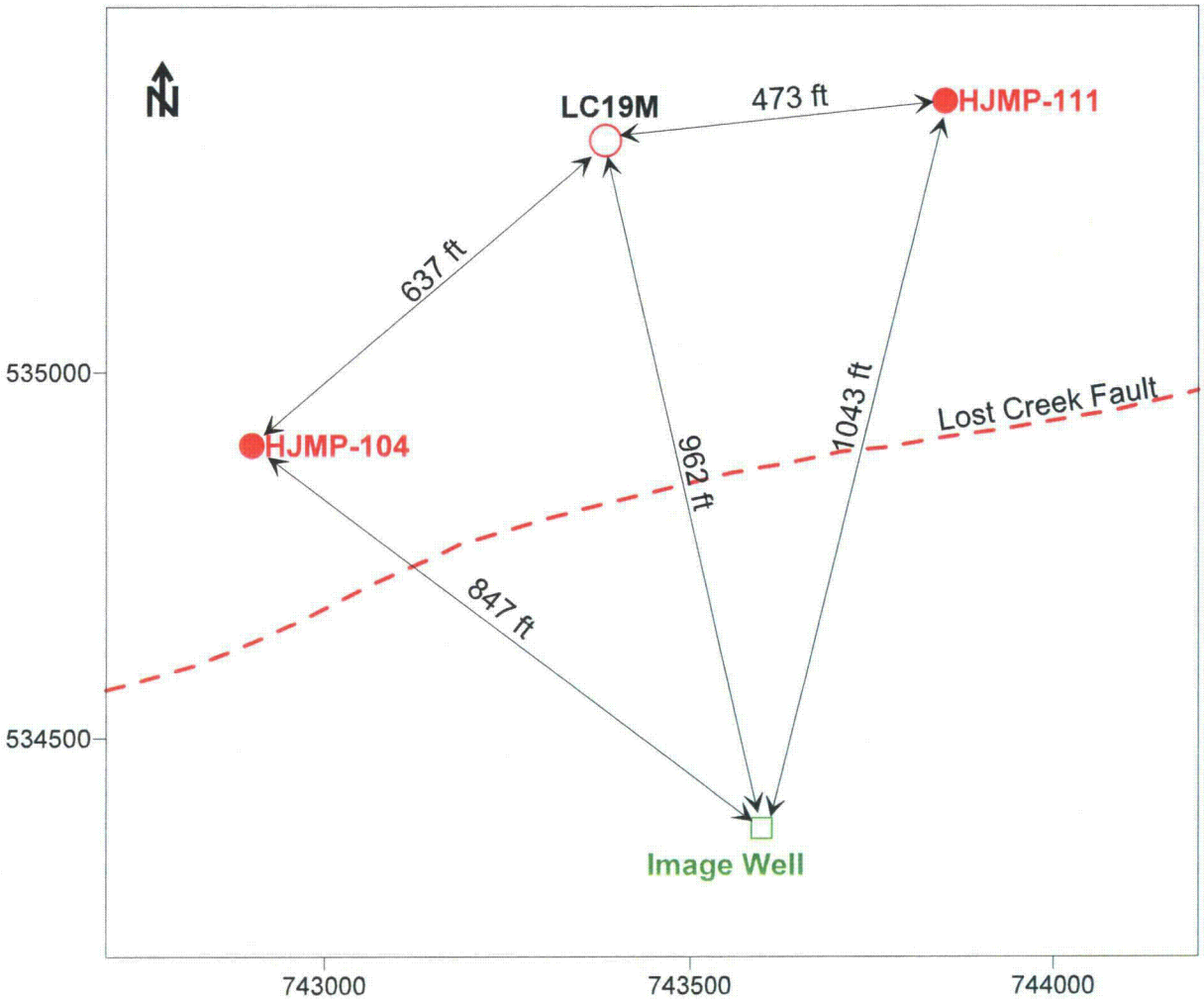
A series of calculations were performed varying the transmissivity and storativity to find the best fit to the observed drawdown at the end of the test. Results of the effort indicate that a transmissivity of 144 ft^2/d and a storativity of 7E-05 provide a very good fit to the data with residuals (difference between the observed and calculated drawdown) of: 0.06 ft at LC19M; -1.04 ft at HJMP-111; and 1.00 ft at HJMP-104. Although this calculation does not account for the partial penetration effects of the pumping and observation wells or the minor leakage from overlying and underlying aquifers (as evidenced by the slight

drawdown response in overlying and underlying observation wells during the test), it does provide a reasonable estimate of the aquifer properties within the vicinity of Mine Unit 1 (unaffected by the fault). Table OP-3b.1 shows the best fit drawdown calculations.

REFERENCES

Domenico, PA and FW Schwartz. 1990. Physical and Chemical Hydrogeology, John Wiley & Sons, New York.

Stallman, RW, 1952, Nonequilibrium Type Curves Modified for Two-Well Systems, U.S. Geological Survey, Groundwater Note 3.



Pumping Test Wells

- Pumping Well
- Image Well
- Production Zone Monitor Well

Lost Creek ISR, LLC
Littleton, Colorado, USA

Petrotek
www.petrotek.com
Littleton, CO, USA

FIGURE OP-A9-1
Location of Pumping Well, Image Well and Observation Wells
Lost Creek Permit Area

Issued For: WDEQ LQD	Drawn By: EPL
Issued /Revised: 09.10.09	
Drawing No.: Figure WDEQCR105a	

0 250 500 Feet

Table OP-A9-1 Best Fit Drawdown Calculations for Estimating Aquifer Transmissivity and Storativity Using Image Well Theory

			Observation Well Distance (feet)					
		LCM19-HJMP111	Image - HJMP111	LCM19-HJMP104	Image - HJMP104	LCM19 - Image	LCM19	
		473	1024	637	867	964	1	
Pump Time	Pump Time							
(hours)	(days)	Drawdown (ft)	Drawdown (ft)	Drawdown (ft)	Drawdown (ft)	Drawdown (ft)	Drawdown (ft)	
137.5	5.73	21.78	14.82	19.08	16.31	15.36	77.91	
Combined ddn from pumped well and image well			36.60	feet				
		Observed ddn	35.56	feet				
		Residual	1.04	feet				
	Combined ddn from pumped well and image well				35.39	feet		
				Observed ddn	36.44	feet		
				Residual	-1.05	feet		
			Combined ddn from pumped well and image well				93.26	feet
						Observed ddn	93.32	feet
						Residual	-0.06	feet
w(u) = s*4*pi*T/(Q)								
u = (0.25*r^2*S)/(Tt) s = ft, Q = gpm, T = ft^2/d, r = ft, t = days								
s = (drawdown) = 15.3*Q*W(u)/T								
K =(hydraulic conductivity)=			1.2	ft/d				
h = (saturated thickness) =			120	ft				
S = (storativity) =			0.00007					
T = (transmissivity) =			144	ft^2/d				
Q =(pump rate) =			42.9	gpm				
t = (time) =								
r = (radius)		1	ft	Pred.				
LCM 19	t(hours)	u	W(u)	s(ft)	t (days)			
	137.5	2.12121E-08	17.0914771	77.91	5.73			
HJMP-111	r =	473	ft					
	t(hours)	u	W(u)	s(ft)	t (days)			
	137.5	0.004745767	4.77802643	21.78	5.73			
HJMP104	r =	637	ft					
	t(hours)	u	W(u)	s(ft)	t (days)			
	137.5	0.008607221	4.18652649	19.08	5.73			
Image - HJMP104	r =	867	ft					
	t(hours)	u	W(u)	s(ft)	t (days)			
	137.5	0.015944918	3.57728069	16.31	5.73			
Image - HJMP111	r =	1024	ft					
	t(hours)	u	W(u)	s(ft)	t (days)			
	137.5	0.022242521	3.2506529	14.82	5.73			
LCM19 - Image	r =	964	ft					
	t(hours)	u	W(u)	s(ft)	t (days)			
	137.5	0.019712339	3.36891009	15.36	5.73			

Attachment OP-10

Septic System Permits

To be provided after approval.

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µmhos/cm	micromhos per centimeter
BLM	Bureau of Land Management
BPT	Best Practicable Technology
Eh	oxidation-reduction potential
EPA	Environmental Protection Agency
ft bgs	feet below ground surface
H_2S	hydrogen sulfide
ISR	In Situ Recovery
LC ISR, LLC	Lost Creek ISR, LLC
LQD	Land Quality Division
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
Na_2S	sodium sulfide
NH_3	ammonia
NRC	Nuclear Regulatory Commission
pCi/L	picoCuries per liter
Permit Area	Lost Creek Permit Area
Project	Lost Creek Project
PV	pore volume
RO	reverse osmosis
SOP	standard operating procedure
su	standard units
SWPPP	Storm Water Pollution Prevention Plan
TDS	total dissolved solids
UIC	Underground Injection Control
US	United States
WDEQ	Wyoming Department of Environmental Quality
WQD	Water Quality Division
WSEO	Wyoming State Engineer's Office

GROUNDWATER QUALITY RESTORATION AND SURFACE RECLAMATION

A variety of restoration and reclamation activities will be phased in throughout the Lost Creek Project (Project) life as mine units are depleted of uranium. Final facility decommissioning and reclamation will occur once the Plant is no longer in use. **Figure RP-1** includes a schedule of activities for the Project, including the restoration and reclamation activities. Lost Creek ISR, LLC (LC ISR, LLC) will include in the Annual Report to the Wyoming Department of Environmental Quality (WDEQ) and the United States (US) Nuclear Regulatory Commission (NRC) a map of the Lost Creek Permit Area (Permit Area) showing: the mine units that are being developed, in production, and in restoration; and areas where restoration has been completed. The schedule will be compared with that in **Figure RP-1**, and if it becomes evident that LC ISR, LLC cannot comply with the approved schedule, a request for revision of the schedule will be made, including explanation of the reason(s) for the changes from the approved schedule.

Reclamation of each mine unit and associated header houses involves:

- groundwater restoration,
- radiological decontamination,
- equipment removal/decommissioning (e.g., well abandonment), and
- surface reclamation (e.g., well site reseeding).

Groundwater restoration may start once uranium recovery is complete at that header house, and restoration of a header house may occur contemporaneously with the operation of another header house in the same mine unit. To ensure maximum ore recovery and avoid interference between header houses, contemporaneous production and restoration of adjacent or overlying header houses and/or mine units will be carefully evaluated and implemented. Once groundwater restoration is complete, decontamination and other reclamation activities will start. Because some ore-bearing sands may overlie others in a mine unit, decontamination of equipment and other surface reclamation activities will start when all of the "stacked" sands are restored.

Reclamation of the Plant and support facilities involves similar activities, including:

- radiological decontamination,
- equipment removal/decommissioning (e.g., building demolition), and
- surface reclamation (e.g., road removal, topsoil replacement, and reseeding).

The following sections describe the criteria used to determine when production is complete, the status of the mine unit at the end of operations, the subsequent restoration and reclamation activities, and the criteria used to determine when restoration and reclamation have been successful. The restoration and reclamation success criteria are summarized in **Table RP-1a**.

RP 1.0 COMPLETION OF PRODUCTION OPERATIONS

Technical, economic, and operational criteria can be reviewed to determine if uranium recovery is complete in a given header house and/or mine unit. The technical criteria comprise the percentage recovery of the estimated resources, the uranium concentration in the production fluid, and the header house flow rates. Typically, the technical criteria for considering production operations complete are:

- a uranium recovery of at least 80 percent;
- a production fluid uranium concentration reduced to a level not significantly greater than the injection fluid; and,
- in some instances, a reduced groundwater flow rate.

The economic criteria comprise the corporate financial objectives, the price of uranium, and the annual production targets. When production targets are no longer being met, and operational changes will not improve the possibility of meeting those targets, then ISR operations may be considered complete.

The ion exchange and processing capacity of the Plant may also factor into determining if ISR operations have been completed in a given header house or mine unit. If there is unused ion-exchange-recovery and waste-management capacity that can be filled by continued operation of an area, which is essentially depleted but will continue to supply a low-concentration production fluid, it may be economic to continue operation of that header house. Such an extension allows for the recovery of uranium for a period of a few months after the header house operations might normally be considered complete. In addition, such an extension allows for higher percent recovery of uranium, which may facilitate subsequent groundwater restoration. This extension will end when there is no longer sufficient capacity for low-concentration production fluid or the quantity of uranium recovered is insufficient to cover operating costs.

RP 2.0 PLANS AND SCHEDULE FOR GROUNDWATER QUALITY RESTORATION

The objective of restoration and reclamation is to return the affected groundwater and land surface to the uses for which they were suitable before commencement of the Project operations. The methods to achieve this objective for groundwater are described in this section.

The schedule for the Project activities, including groundwater restoration, is shown in **Figure RP-1** and is discussed in detail in **Section OP 2.1**. **Figure RP-2** shows the location of the mine units and includes a schedule of mining and restoration for each mine unit. **Figures OP-5a through OP-5f** illustrate the water balance for the Project, and include several variations of production and restoration scenarios. **Section OP 3.6.3** discusses the water balance during different phases of the Project. During the groundwater sweep restoration phase of the first mine unit, the waste water will be sent to disposal since there will be no need for make-up water in other mine units. However, during groundwater sweep of subsequent mine units, at least a portion of the waste water may be used as make-up water for reverse osmosis (RO) treatment or other purposes. **Figure OP-5b** represents the water balance during groundwater sweep in the first mine unit.

LC ISR, LLC has designed its processing plant to perform restoration concurrent with commercial production. Restoration shall be carried to completion with all reasonable diligence and shall be conducted concurrently with production operations to the extent practicable.

RP 2.1 Conditions in the Mineralized Zone Before and After Operations

The uranium deposits underlying the Permit Area are similar to those found at other ISR operations in the United States (US). They are primarily roll front deposits in fluvial sandstones, and the uranium was deposited when oxidized groundwater containing the uranium entered reducing conditions in the subsurface aquifers. The reducing agents were probably organic matter and pyrite and, to a lesser degree, hydrogen sulfide.

ISR operations essentially reverse the natural processes that deposited the uranium. Injection wells introduce lixiviant into the mineralized zone to oxidize the reduced

uranium and to complex it with bicarbonates. Pumping from production wells draws the lixiviant through the mineralized zone, oxidizing additional ore between the injection and production wells.

In turn, groundwater restoration essentially reverses the effects of the oxidation during ISR operations and re-establishes the reducing conditions that were present prior to production, to the extent possible. Groundwater sweep removes much of the groundwater oxidized during operations. During the RO phase, salts, residual uranium and other metals mobilized under the oxidized conditions are removed, and the treated water is re-injected. As necessary to accomplish restoration, specific reductants such as sodium sulfide may be added. Bioremediation may also be applied, if site conditions are suitable for this restoration technology.

RP 2.2 Restoration Requirements

LC ISR, LLC commits to return the groundwater to the pre-operational class-of-use in accordance with WDEQ statutes and regulations. Restoration will demonstrate that Best Practicable Technology (BPT), as defined in the Wyoming Statutes, has been applied. Current technologies which are considered BPT are discussed in the following section. If possible, restoration will be conducted to achieve water quality that approximates baseline levels.

Prior to operation of each mine unit, groundwater class-of-use will be determined by the WDEQ-Water Quality Division (WQD) on the basis of baseline water quality data collected in accordance with WDEQ requirements and submitted to WDEQ by LC ISR, LLC. The WDEQ Class-of-Use Standards are listed in **Table RP-1b**. For the wells in the perimeter monitor ring and for wells in overlying and underlying aquifers, the class-of-use will be determined on a well-by-well basis. For the pattern area, baseline water quality data from monitor wells in the pattern area will be averaged to determine the class-of-use for that mine unit (WDEQ, 1977).

Baseline water quality data will be collected from the monitor wells in the perimeter ring, in the pattern area, and in the overlying and underlying aquifers before initiating ISR operations in each mine unit, in accordance with the Testing Proposal which will be submitted to WDEQ-Land Quality Division (LQD) for review and approval. A minimum of four samples will be collected from each well, with each sampling event separated by at least 14 days. At least one of the four samples will be analyzed for the parameters required per WDEQ-LQD Guidelines 4 and 8, as listed in **Table RP-1b**. The other samples may be analyzed for a reduced parameter list with agency approval.

RP 2.3 Groundwater Restoration Methods

The following sections discuss the treatment phases and methodology that will be employed during the groundwater restoration program at the Lost Creek Project. LC ISR, LLC believes that the groundwater restoration methodology set out in this section represents Best Practicable Technology (BPT) as evidenced and demonstrated by accepted and approved industrial practices over the last decade in the State of Wyoming and at other locations where ISR operations are licensed and authorized. Further evidence that the methodology described herein is accepted as BPT is the inclusion of the same methodology in NRC NUREG-1910, 'Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities', published in May 2009. As stated in the abstract of the document:

> *"NRC developed this GEIS using (1) knowledge gained during the past 30 years licensing and regulating ISL facilities, (2) the active participation of the State of Wyoming Department of Environmental Quality Land Quality Division as a cooperating agency and (3) public comments received during the preparation of the GEIS."*

In order to demonstrate that BPT has been correctly applied, LC ISR, LLC will be required to review: (1) the type of technology used; (2) the application of the technology; and (3) the economics and benefits of further processing, upon completion of the restoration activities within each mine unit. While the restoration activities described herein are designed to optimize restoration equipment used in treating groundwater, minimize the number of pore volumes circulated during the restoration stage, and minimize net consumptive use of groundwater resources: LC ISR, LLC will consider new technologies as they develop and apply them to groundwater restoration as appropriate and as approved by WDEQ-LQD. A conclusion that the proper technology was economically applied can only be drawn at the completion of the activity.

The aquifer restoration program will use a combination of the following phases including:

- groundwater transfer
- groundwater sweep
- reverse osmosis treatment with permeate injection; and
- recirculation.

LC ISR, LLC may evaluate the use of reductants on a case by case basis. If it is determined that use of a reductant would be beneficial and consistent with BPT, LC ISR,

LLC will seek WDEQ-LQD approval via a minor permit revision application that details the proposed chemical or biological reductant addition techniques, anticipated chemical or biological responses and compliance with the applicable terms and conditions of the UIC permit requirements. With permit approval, reductants could be added during any of the restoration phases to lower the oxidation potential of the groundwater within the production zone. Reductants have been used successfully in some mine units in Wyoming, but have been relatively ineffective in others. Further, the additives and addition techniques have not been standardized within the industry. Some operators have added sulfide or sulfite compounds to the injection stream in concentrations theoretically sufficient to reduce the oxidized species. Biological reductant methods have also been proposed and applied as experimental technology. Because of the lack of consensus on the techniques and results, reductant addition is not presently considered in the discussion of BPT.

The progress of groundwater restoration is often measured on the basis of the number of "pore volumes" treated in each phase. Pore volume is a term used by the industry to define an indirect measurement of a unit volume of aquifer water affected by ISR operations. It represents the volume of water that fills the void space in a certain volume of rock or sediment. Pore volume provides a unit reference that an operator can use to describe the amount of treated water circulations needed to flow through a depleted ore body to achieve restoration standards.

One pore volume (PV) is equivalent to:

- the volume of water within the pattern area (thickness of the completion interval times the surficial pattern area times the effective porosity of the sand); plus
- the volume of water outside of the pattern area affected by the "horizontal flare" of the lixiviant along the outer edge of the pattern area; plus
- the volume of water above and below the completion interval affected by the "vertical flare" of lixiviant.

The thickness (T) of the average well completion interval and the size of the pattern area (A_p) are readily measurable, and the effective porosity is determined from hydrogeologic data. The extent of the horizontal and vertical flare can also be estimated from hydrogeologic data for each mine unit. For preliminary purposes, LC ISR, LLC has estimated the horizontal flare and vertical flare are both twenty percent of the volume in the pattern area. The calculation of the pore volume will take the form of the following equation:

PV = Area x Thickness x Horizontal Flare x Vertical Flare x Porosity x Conversion

$$PV = A_p\ (ft^2) \times T\ (ft) \times 1.2 \times 1.2 \times 0.25 \times 7.48\ (gallons/ft^3) = PV\ (gallons)$$

The number of pore volumes planned for each stage of groundwater restoration to meet the restoration objective and to demonstrate the application of BPT is as follows:

- Groundwater transfer - zero to two pore volumes (optional);
- Groundwater sweep – three tenths of a pore volume;
- RO permeate injection - six pore volumes; and
- Groundwater recirculation – one pore volume.

LC ISR, LLC will conduct an in-house water quality monitoring program throughout the progression of the groundwater restoration activities. Upon the expectation that the restoration requirements have been met, LC ISR, LLC will collect appropriate groundwater samples (as outlined in this application) to determine the results. If confirmed, LC ISR, LLC will initiate the stabilization monitoring phase and submit supporting documentation that the restoration parameters are at or below the restoration standards. If at the end of restoration activities the parameters are not at or below the primary standards, LC ISR will either re-initiate certain of the restoration phases or submit documentation to the agencies that BPT has been used in restoration and the aquifer has been restored to its original class of use. The documentation will include an evaluation of the water quality data and a narrative of the application of BPT as applied.

Additional details, descriptions and discussion of the pore volume requirement determination of the various phases of groundwater restoration are presented in the following sub-sections.

RP 2.3.1 Groundwater Transfer

Groundwater transfer (or exchange) involves moving groundwater between a mine unit in restoration and another mine unit where uranium production is beginning. (Alternately, it may be desirable to transfer water between different portions of the same mine unit, depending on the water quality and operational state of the different portions.) Both mine units will first have received approval for UIC Class III injection. The transferred groundwater may undergo treatment using one or more of the permit-approved processes (such as ion exchange, chemical pH adjustment, and/or reverse osmosis) prior to injection within the destination mine unit. This technique is generally used to replace operationally-affected waters in the restoration mine unit with baseline quality water from the production mine unit. The operationally-affected waters from the restoration mine unit are then used as the basis for the lixiviant in the production mine unit.

Because water is transferred (or exchanged) between mine units at equal rates, the transfer typically does not generate liquid effluents.

The operations plan and project schedule for the Lost Creek Project do not represent the use of groundwater transfer techniques. However, should the opportunity arise and BPT dictates the use of the method, LC ISR, LLC will beneficially utilize groundwater transfer to enhance the project restoration effort. In such an event, it is projected that the transfer will involve between zero and two pore volumes. As two discreet mine units of differing volume are involved, the actual pore volume transferred will vary depending on the mine units involved. For the restoration mine unit, groundwater transfer has much of the benefit of groundwater sweep without the large consumptive use of water. This technique has been used successfully at ISR operations in Nebraska.

RP 2.3.2 Groundwater Sweep

During groundwater sweep, water is pumped from the mine unit without offsetting with water injection. This pumping creates an influx of baseline quality native groundwater into the unit, thereby flushing contaminants from areas affected by the horizontal and vertical spreading (flare) of the lixiviant during mining. The affected water in the edge patterns of the mine unit is also drawn back into more central portions of the pattern area, making the later restoration phases more efficient.

Groundwater produced during the sweep phase will contain uranium and other constituents mobilized during production. The initial concentrations of the constituents would be similar to those during the later stages of production. With enough pumping, the constituent concentrations would decline gradually, reflecting the influx of baseline quality water. The water produced during groundwater sweep is treated through the restoration plant ion exchange circuit to capture uranium and then either treated with reverse osmosis or pumped directly to disposal.

Groundwater sweep alone is typically insufficient and uneconomical for complete groundwater restoration. Because of the heterogeneities commonly observed in the production aquifers, the native groundwater that is brought into the ore zone does not completely displace the residual lixiviant. With increasing volumes produced, a greater proportion of the produced water will be native groundwater. Many pore volumes of groundwater would need to be produced in order to reach original baseline conditions, if baseline conditions could be achieved by this method alone. Application of groundwater sweep alone to Wyoming ISR projects has not been demonstrated to be successful and therefore is not proposed for the Lost Creek Project.

Native groundwater quality and regional climate may impact the extent to which groundwater sweep is considered for use under BPT. The native groundwater quality is relatively poor at many of the South Texas ISL facilities that could be considered as analogs to a modern ISR facility in Wyoming. In addition, because the regional climate in South Texas is characterized by considerable precipitation, pumping out the groundwater by sweep does not significantly impact the area and is therefore considered an acceptable method. In the arid basins of Wyoming, the use of substantial volumes of native groundwater to replace the affected groundwater may not be considered beneficial. Experience at other Wyoming ISR facilities also demonstrates that long-term groundwater sweep operations do not lead to water quality that approaches baseline conditions within the impacted production zones.

As part of its commitment to environmental stewardship and BPT, LC ISR, LLC will minimize the volume of groundwater removed during sweep operations. The operational requirement of this phase will be condensed to the basic need to draw water into the pattern area of unit from the edges. The benefits from groundwater sweep will be realized in a fraction of one pore volume since the groundwater within the production pattern area will not require displacement by this operation. Groundwater within the production pattern area can be more effectively remediated by reverse osmosis permeate injection operations.

LC ISR, LLC has determined that groundwater sweep removal of 0.3 PV, in conjunction with the groundwater removal associated with the bleed requirements of normal production and RO, will result in an adequate flushing and removal of water from the affected areas at the edges of the mine unit. This determination is supported by the underlying calculation of a pore volume. A pore volume (PV) includes the volume of water within the pattern area (V_{PA}) plus the volume of water outside of the pattern area affected by the horizontal flare (V_{HF}) of the lixiviant along the outer edge of the pattern area plus the volume of water above and below the completion interval affected by the "vertical flare" (V_{VF}) of lixiviant. Using the preliminary estimate of vertical and horizontal flare factors of 0.2, the portion of a pore volume attributable to the vertical and horizontal flare combined approximately equals 30% (0.30). The following calculations apply:

$$V_{HF} = V_{VF} = 0.2\ V_{PA}$$

$$PV = V_{PA} + V_{HF} + V_{VF} = V_{PA} + 0.2\ V_{PA} + 0.2V_{PA} = 1.4V_{PA}$$

$$\text{therefore; } (V_{HF} + V_{VF}) / PV = (V_{HF} + V_{VF}) / 1.4\ V_{PA} = (0.2\ V_{PA} + 0.2V_{PA}) / 1.4V_{PA}$$

$$\text{and; } (V_{HF} + V_{VF}) / PV = 0.4V_{PA} / 1.4V_{PA} = 0.29PV$$

The Lost Creek project schedule (**Figure RP-1**), water balances (**Figures OP-5b, OP-5c,** and **OP-5e**) and bond calculations incorporate a groundwater sweep phase operation of 0.30 PV in each mine unit.

RP 2.3.3 Reverse Osmosis Treatment with Permeate Injection

Reverse osmosis with permeate injection (RO) is used following the groundwater sweep phase. This treatment is most beneficial in returning the concentrations of total dissolved solids and trace metals and the aquifer pH to baseline values. The water balances in this restoration phase are shown in **Figures OP-5c through OP-5f.**

During this restoration phase, uranium in the groundwater is removed by passing the water through an ion exchange circuit. The ion exchange resins remove the majority of the soluble uranium in recovered solutions and yield chloride, sulfate or bicarbonate ions in the place of the uranium compounds. The chemistry of the ion exchange circuit used in the restoration is identical to the chemistry of the ion exchange circuit used in the production circuit. Ion exchange resins preferentially remove the uranyl dicarbonate and/or uranyl tricarbonate compounds from the solution. Chloride, sulfate and/or bicarbonate compounds are displaced from the resin and set into the solution.

After ion exchange, other chemical constituents in the groundwater are removed by passing the water through an RO system. The RO process yields two fluids: clean water (permeate) that can be reinjected into the aquifer; and concentrated water (brine) that cannot be reinjected directly. Water sent to the RO system usually requires some form of pre-treatment to prevent fouling of the membranes. Commonly, the pH is lowered with the addition of sulfuric or hydrochloric acid and antiscalant additives may be used. These additives (along with the sulfate and/or chloride ions of the acid) are rejected in the RO unit and become part of the brine. Therefore, the additives do not become part of the permeate which will be injected into the restoration aquifer. After reverse osmosis, the permeate may be depressurized to release entrained gasses. This process commonly results in a pH increase since carbon dioxide is typically present in the permeate and is readily released at atmospheric pressure. Sodium hydroxide may also be added to increase the pH of the permeate stream prior to injection.

If reductant is added to the injection stream during the treatment stage, it will scavenge oxygen and reduce the oxidation-reduction potential (Eh) of the aquifer. During ISR operations, certain trace elements are oxidized. By adding a reductant, the Eh of the aquifer is theoretically lowered, thereby decreasing the solubility of these elements. As warranted, hydrogen sulfide, sodium sulfide, or a similar compound may be added as a reductant. LC ISR, LLC is more likely to use sodium sulfide as a reductant due to the

chemical safety issues associated with proper handling of hydrogen sulfide. A comprehensive safety plan regarding reductant use will be prepared for WDEQ-LQD review prior to implementation.

Table RP-2 shows typical RO manufacturers' specification data for removal of ion constituents. The clean permeate water will be re-injected or sent to storage for use in the ISR process. The 25% of water that is rejected, called "brine," contains the majority of dissolved salts and other ions recovered from the mine unit water and will be sent for disposal in the waste system. The amount of brine can be reduced by making additional passes through an RO system. Permeate produced from secondary RO units may be added to the injection stream to reduce the amount of "bleed" in the restoration areas.

The number of pore volumes treated and re-injected during the groundwater treatment phase will depend on the efficiency of the RO in removing TDS and the effectiveness of the reductant, if used, in lowering the uranium and trace element concentrations. LC ISR, LLC will monitor the quality of selected wells throughout restoration to determine the effectiveness of the treatment/re-injection phase of groundwater restoration and to determine if additional or alternate techniques are necessary. Restoration at other ISR facilities within Wyoming has typically shown that the groundwater class-of-use can be attained in approximately six pore volumes of RO treatment.

The prescribed restoration process and number of pore volumes of RO treatment has been proven successful at analogous mine units restored at the Christensen Ranch ISR Project in the Powder River Basin of Wyoming. The process is justifiable in terms of performance and achievability in relation to health, safety and the minimization of adverse impacts to the environment. The restoration efforts and results from the restored Christensen Ranch Mine Units 5 and 6 (Wellfield Restoration Report, Christensen Ranch Project, March 2008) are reviewed and compared to the process proposed for the Lost Creek Project. Although located in a distinctly separate geographic basin, the two mine units were selected as analogs for the following reasons;

1) Restoration began soon after production operations ended;
2) RO treatment of lixiviant was employed throughout the production life;
3) Average flow rates on a per well basis for these fields most nearly approach the average flow rate per well predicted for Lost Creek (low flow rate per well is not analogous);
4) The pore volume calculation method was comparable;
5) There were mixed pattern types addressing multiple ore horizons within the sand unit; and
6) Hydro-geologic properties are similar (see table below).

Project & Mine Unit	Confined?	Sand Unit Thickness (ft)	Transmissivity (ft^2/d)	Hydraulic Conductivity (ft/d)
Christensen MU5	Yes	190	87	0.46
Christensen MU6	Yes	50 - 60	84	1.58
Lost Creek	Yes	120 - 140	60 – 80	0.50 - 1.50

The groundwater restoration process employed at the Christensen Ranch Project was similar in that it employed the staged approach of groundwater sweep followed by RO and then recirculation. The following table presents the actual number of pore volumes processed in each restoration stage at the Christensen Ranch Project as compared to the Lost Creek restoration plan.

Project & Mine Unit	Pore Volumes			
	Groundwater Sweep	Reverse Osmosis	Recirculation	Total
Christensen MU5	1.1	8.0	1.0	10.1
Christensen MU6	1.5	3.5	1.0	6.0
Lost Creek (projection)	0.3	6.0	1.0	7.3

Ground water within the Christensen Mine Unit 5 production zone was restored to the pre-mining class of use, using BPT, as required by the WDEQ-LQD. In Mine Unit 5, 25 of the 35 constituents were restored to at or below their target restoration values. Concentrations of most constituents were reduced by more than seventy five percent of the post mining values.

There are reasons to expect that restoration of Mine Unit 5 could have been achieved with fewer pore volumes of treatment. Plots of uranium concentration and total dissolved solids for each module (header house) during RO clearly indicate that the effort extended well beyond the point where beneficial gains were being obtained. The Mine Unit 5 restoration report data (COGEMA, March 2008) supports a conclusion that the completion of the restoration operations in Mine Unit 5 could have been achieved with six or less pore volumes of RO operations instead of the 8 PV that were completed.

Ground water within the Christensen Mine Unit 6 production zone was also restored to the pre-mining class of use, using BPT, as required by the WDEQ-LQD. In Mine Unit 6,

27 of the 35 constituents were restored to at or below their target restoration values. Concentrations of most constituents were reduced by more than seventy five percent of the post mining values.

The Mine Unit 6 Restoration Report (COGEMA, March 2008) demonstrates that six PV of active restoration is sufficient to successfully complete restoration operations in mine units using the BPT practices proposed for the Lost Creek Project. LC ISR, LLC has included seven and one-third PV of active restoration in its restoration plan. The proposed process is justifiable in terms of performance and achievability in relation to health, safety and the minimization of adverse impacts to the environment.

RP 2.3.4 Recirculation

At the completion of the reverse osmosis treatment phase in a mine unit, recirculation will be initiated. Recirculation consists of pumping from the mine unit and re-injecting the commingled solution (untreated) into the aquifer it came from. Recirculating solution is intended to homogenize the overall groundwater conditions. It is anticipated that one pore volume of groundwater will be recirculated.

RP 2.4 Stabilization Phase

Upon completion of restoration and notification of WDEQ, a groundwater stabilization monitoring program will begin in which the pattern monitor wells used to evaluate restoration success will be sampled. Each pattern monitor well will be sampled at the beginning of stabilization and once every three months for a period of twelve months, for a total of five samples, and analyzed for the parameters in Table RP-1b.

The stability period will be a minimum of 12 months. (Pursuant to discussions with WDEQ-LQD, the bond and timeline show a stability period of 9 months. The additional three months of time is accounted for in the regulatory approval period.) Following the end of the 12-month stability period, LC ISR, LLC will perform a linear regression analysis on each monitored constituent within the pattern monitor wells. This statistical method will assist in determining if the concentration of a given constituent exhibits a significantly increasing trend during the stability period. The regression analysis will be performed in accordance with Chapter 17 on trend analyses in the EPA guidance document, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance" (EPA, 2009).

If a constituent exhibits a strongly increasing trend (or in the case of pH a strongly increasing or decreasing trend), the action that LC ISR, LLC will take to resolve this situation will depend on the constituent and the status of the restored groundwater

system. As stated in the EPA guidance document, statistical analysis provides a "workable decision framework". However, due to the complexity of the aqueous geochemical groundwater systems involved, these statistical techniques should not be relied on as the sole determinant when evaluating the effectiveness of groundwater restoration. Therefore LC ISR, LLC will consider which constituent(s) is showing an increasing trend in concentration and base its decision on further action on the status of the mining zone groundwater geochemistry. These actions may include extending the stability period or LC ISR, LLC may return to a previous phase of active restoration to resolve the issue. The phase of active restoration that will used will be determined by the constituent and the process required to decrease its concentration.

During stability monitoring, all overlying, underlying and perimeter monitor wells will be analyzed for all UCL parameters once every two months. If groundwater restoration has not been successful and an excursion occurs during stabilization, then the sampling will revert to weekly for affected monitor wells until the excursion is resolved.

If the analytical results continue to meet the appropriate standards for the mine unit and do not exhibit significant increasing trends, LC ISR, LLC will submit supporting documentation to the regulatory agencies that the restoration parameters have remained at or below the restoration standards and request that the mine unit be declared restored.

RP 2.5 Reporting

During the restoration process LC ISR, LLC will perform daily, weekly, and monthly analyses as needed to track restoration progress. These analyses will be summarized, along with the restoration methods, and discussed in the Annual Report submitted to WDEQ-LQD. This information will also be included in the final report on restoration.

Upon completion of restoration activities and before stabilization, the monitor wells in the pattern area, plus any perimeter, overlying, or underlying monitor wells affected by excursions, will be sampled for the parameters required per WDEQ-LQD Guidelines 4 and 8, as listed in **Table RP-1b**. The water quality data from each well in the monitor ring and from each overlying and underlying well will be compared with the baseline water quality data for that well. The average of the water quality data from the monitor wells in the pattern area will be compared with the baseline average from the pattern area. These comparisons will help ensure that the water quality criteria have been met and that the oxidation/reduction conditions in the pattern area are such that any residual uranium or other metals are not readily mobile. In addition, the water quality data for monitor wells completed outside the uranium recovery zone that have experienced an excursion will be compared with the US Environmental Protection Agency (EPA) maximum contaminant levels (MCLs), if greater than baseline concentrations, to help ensure the

groundwater outside the area exempted for ISR operations will be protective of human health. If the concentrations are at or below those approved by WDEQ and NRC, LC ISR, LLC will submit supporting documentation that the restoration parameters are at or below the restoration standards.

RP 3.0 MINE UNIT RECLAMATION

Mine unit reclamation will be followed by any radiation surveys and/or soil or equipment remediation required by NRC within the mine unit.

RP 3.1 Well Abandonment

Once NRC and WDEQ review and approve LC ISR, LLC's assessment that the groundwater restoration is complete in a given mine unit, all of the wells will be abandoned in accordance with applicable regulations, unless a well is needed for continued monitoring of another mine unit or retention of the well for future use has been requested and approved. Currently, the applicable well abandonment statutes and rules include:

- Wyoming Statute 35-11-404;
- WDEQ-LQD Rules and Regulations Chapter 11, Section 8;
- WDEQ-WQD Rules and Regulations Chapter XI, Section G; and
- Wyoming State Engineer's Office (WSEO) Rules and Regulations Part III, Chapter VI, Section 5.

The regulations will be reviewed prior to well abandonment to ensure that the following procedures are still appropriate.

1) A drill rig, tremie pipe, or similar equipment will be used to ensure proper grouting through the entire length of the well.
2) The grout properties will be: a ten-minute gel strength of at least 20 pounds per 100 square feet and a filtrate volume not to exceed 0.824 cubic inches (13.5 cubic centimeters).
3) The volume of fluid necessary to grout the entire length of the well will be calculated and recorded.
4) A mud and/or water retention pit will be constructed by removing topsoil and subsoil from the pit area near the well. The depth of topsoil removed will be based on the soil characteristics of the area; and the removed material will be stockpiled and protected from wind and water erosion.

5) The grout will be mixed in a manner to ensure the appropriate fluid properties are obtained and will be introduced into the well through the drill pipe or tremie to the bottom of the well. The grout will be pumped until the grout rises to the well collar. The water displaced from the well will be directed to the water retention pit. The amount of grout pumped into the well will be compared with the calculated volume to ensure there are no major discrepancies, which could indicate bridging or another problem with the abandonment procedure.
6) The well will be left open for at least 24 hours to allow the grout to set.
7) If the grout has settled no more than 40 feet below ground surface (ft bgs) the top of the well will be sealed with bentonite chips, pellets, or additional grouting material will be used. If the grout has settled more than 40 ft bgs, additional grout will be introduced on top of the settled grout through a tremie pipe. Step 8 will not commence unless the last application of abandonment material remains less than three feet below ground surface after at least a 24-hour period.
8) Once the grout is set, the soil around the well collar will be excavated so the final plug depth is at least three ft bgs. The well casing above that depth will be removed.
9) A concrete plug will be set in place above the top of the casing, along with a steel plate with the permit number, well identification number, and date of plugging.
10) The excavated soil will be replaced into the hole around the abandoned well and into the mud/water retention pit and leveled with the surrounding surface or mounded slightly above it to ensure depressions are not created.
11) The disturbed area will be reseeded with the seed mixture listed in **Table RP-3**.
12) A written well abandonment report will be completed and sent to WSEO and WDEQ-LQD.

RP 3.2 Facility and Road Reclamation

With the exception of any facilities, access roads, or utility corridors required for continued operation all of the facilities associated with a specific header house or mine unit will be removed once stabilization in that header house or mine unit has been deemed complete. The header houses and pump stations will be moved to new locations in other mine units of the Permit Area or dismantled and disposed of in accordance with applicable regulations. Soil will be replaced at each header house or pump station in accordance with the depths and acreages salvaged during construction, as described in more detail in the Hydrologic Testing Proposal and subsequent Test Report submitted to WDEQ-LQD for review and approval prior to development of each mine unit. Soil replacement and reseeding will be performed in accordance with the methods described below in **Section RP 4.5**.

Topsoil will be windrowed along pipeline routes; and buried piping will be excavated. Any contaminated piping will be disposed of at an NRC-licensed facility, and non-contaminated piping will be removed for salvage or for disposal in accordance with applicable regulations. Topsoil along the pipeline route will be re-spread and the disturbed area reseeded with the seed mixture listed in **Table RP-3**.

Unless approval for leaving a specific road is obtained for post-mine use, all roads will be reclaimed. Improved or constructed roads will be reclaimed by removal of culverts, removal of road surfacing materials, recontouring, as necessary, preparation of the seed bed, and reseeding in accordance with the procedures outlined below in **Section RP 4.5**.

Erosion control will be an important factor in protecting the topsoil resource. When soil is disturbed in such a manner that wind or water erosion may result, one or more of the following practices will be followed to mitigate the potential risk:

- mulching;
- terracing;
- wind breaks;
- dust suppression with water; and/or
- sediment trapping structures

RP 4.0 RECLAMATION AND DECOMMISSIONING OF PROCESSING AND SUPPORT FACILITIES

The facilities that require reclamation and decommissioning include:

- processing and water treatment equipment, which includes tanks, filters, ion-exchange columns, pipes, pumps, and related equipment;
- buildings and structures, parking areas, processing facilities, shipping areas, laydown areas, and offices;
- waste storage, treatment, and disposal facilities, including the Underground Injection Control (UIC) Class I wells and the Storage Ponds;
- buried pipes;
- topsoil and subsoil stockpile locations;
- engineering control structures, such as dams and culverts; and
- roads.

Final reclamation and decommissioning will begin following any radiation surveys and or soil or equipment remediation required by NRC.

With the exception of any facilities, including roads, approved for post-operational use, all of the facilities associated with the Project will be removed once uranium processing and groundwater restoration have been completed. Approval for post-operational use must be supported by the landowners and/or lessees request, and approval from the US Bureau of Land Management (BLM), which is the surface management agency of the Permit Area, and WDEQ-LQD. If any facility, including a road, is left post-operations, the responsibility for long-term maintenance and ultimate reclamation of the facility or road will be transferred to the accepting party.

RP 4.1 Removal and Disposal of Equipment and Structures

Prior to demolition of the buildings and structures, all equipment will be decontaminated, if necessary, based on preliminary radiological surveys and release limits. Particular attention will be given to equipment and structures in which radiological materials could accumulate, including piping, traps, junctions, and access points. Radiological materials will either be decontaminated to NRC unrestricted release standards or removed for disposal at an NRC-licensed facility. Processing and water treatment equipment, including tanks, filters, ion exchange columns, pipes, and pumps, will be prepared, including decontamination if necessary, for use at another location or dismantled and disposed of in accordance with applicable regulations. Radiologically contaminated materials will be disposed of at an NRC-licensed facility; and materials contaminated with other industrial constituents will be disposed of at an appropriately licensed facility. Decontaminated and non-contaminated materials will be removed for salvage or disposed of at an appropriately licensed solid waste facility.

Structures will be decontaminated, if necessary, and moved to a new location, salvaged, or dismantled and disposed at an appropriately licensed solid waste facility. Concrete flooring, foundations, and foundation materials will be decontaminated, if necessary, broken up, and disposed of at an appropriately licensed facility. The contours of the disposal area shall blend with those of the surrounding area.

Soil will be replaced at sites from which structures are removed in accordance with the depths and acreages salvaged prior to installation of the structures as described in **Section OP 2.5**. Storm water control, soil replacement, and reseeding will be done in accordance with the methods described below in **Section RP 4.5**.

RP 4.2 Waste Storage, Treatment, and Disposal Facilities

Those facilities for which a separate license has been obtained, e.g., a UIC Class I Well for process water injection, will be transferred to another owner or operator in accordance with applicable requirements or reclaimed and decommissioned in accordance with the separate license requirements.

Any contaminated sludge accumulation in the Storage Ponds, the pond liner, and, if necessary, the leak detection equipment will be removed, in accordance with the standard operating procedure (SOP) for handling of contaminated materials, and disposed of at an NRC-licensed facility. The soil underneath the pond will be surveyed for radiological contamination, and any areas in which concentrations exceed limits for unrestricted use will be excavated and the contaminated material disposed of at an NRC-licensed facility. Confirmation surveying and sampling will be conducted in accordance with applicable requirements to ensure all contaminated material has been removed. The area will then be reclaimed in accordance with the procedures outlined below in **Section RP 4.5**.

All other waste facilities will be reclaimed in accordance with the procedures outlined above in **Section RP 4.1**.

RP 4.3 Buried Piping and Engineering Control Structures

Buried piping and engineering control structures will be decontaminated and removed. All the reclamation will be done in accordance with the procedures outlined above in **Section RP 4.1**.

RP 4.4 Roads

Improved or constructed roads will be reclaimed by removal of culverts, removal of road surfacing and road bed materials, and recontouring, as necessary. Unimproved roads will be recontoured, if necessary, and scarified, ripped, or disced to reduce compaction. The roads will then be reclaimed through preparation of the seed bed and reseeding, in accordance with the procedures outlined below in **Section RP 4.5**.

RP 4.5 Soil Replacement and Revegetation

Areas in which reclamation will be required within the Permit Area include the mine units, in particular where the header houses and roads have been removed, and the Plant area. Disturbed areas will be reclaimed to the approved post-operations land use by regrading the surface to the approximate pre-operations contour, re-establishing drainages, replacing salvaged soil, and revegetating the areas, in accordance with the procedures outlined below.

During site reclamation, the storm water discharge permits applicable per the Wyoming Pollution Discharge Elimination System (WYPDES) will be maintained (**Table ADJ-1**).

The associated Storm Water Pollution Prevention Plan (SWPPP) will be designed and implemented as part of LC ISR, LLC's compliance with applicable WDEQ-Water Quality Division (WQD) rules and will be kept in an accessible area of the Project. The SWPPP will focus on protecting waters of the state through prevention and mitigation of chemical spills and topsoil erosion and will contain provisions for routine inspections and audits to ensure the plan is being properly implemented and all employees, and contractors as necessary, are familiar with applicable portions of the plan.

RP 4.5.1 Post-Operational Land Use

The post-operations land use will be livestock grazing and wildlife habitat, which is the same as the pre-operations land use. Buildings, roads, wells, or other facilities constructed as part of the Project will be removed and the disturbance reclaimed, unless prior approval is obtained from the landowner and WDEQ to leave the facilities in place to improve post-operational access or land use.

RP 4.5.2 Surface Preparation

Due to the nature of ISR, topography or drainage patterns will not be significantly altered during operations. Therefore, post-reclamation contours are not shown on a separate map (see Plate OP-2 for pre-operational contours). The small areas of disturbance that may be necessary (e.g., due to culvert removal) will be graded to approximate pre-operational contours and drainage patterns.

No permanent impacts to the surface water system are anticipated. All of the surface facilities are scheduled for removal and reclamation. The landowner (BLM) could request that a road (and associated culverts) be left in place, which may mean a permanent change to the drainage pattern. However, by that time, any potential problems with the

function of the culvert(s) should have been detected and repaired. As noted above, any spill-related impacts will be addressed at the time of the spill.

To avoid creating ruts or other surface damage, loss of soil resources, and/or equipment damage, seed bed preparation will be performed under appropriate soil (e.g., not when the ground is wet, frozen, or exceptionally dry) and climatic conditions (e.g., not during significant precipitation events or if the wind is excessive).

In areas where soil was not removed but was compacted due to site operations, e.g., two-track roads used to access monitor wells, soils will be scarified, ripped, or disced as necessary to aid in revegetation. In areas where soil was removed, the disturbed areas will be scarified, ripped, or disced as necessary to a depth of 12 inches to ensure soil stability after replacement. Areas with viable sage brush will not be ripped and seed will be broadcast and worked in by appropriate means such as a harrow, drag, or rake.

RP 4.5.3 Soil Replacement

Excavated soils will be replaced at the location from which they were excavated; unless, the area from which the soils were excavated is approved for a different post-mine land use (e.g., the landowner requests that a road or building remain in place and that request is approved by WDEQ-LQD). In such a case, the excavated soil from the road or building area will be used in another area where the original topsoil depth was thin or non-existent (e.g., it was disturbed by historic exploration activities), if such replacement is approved by WDEQ-LQD.

The replaced soil thickness will be in accordance with the depths and acreages salvaged during construction (**Section OP 2.5**). The replacement will be along the contour, where necessary to prevent soil erosion. To avoid clods, soils will not be replaced when the ground is wet or frozen. The replaced topsoil will be disced to create a proper seed bed.

RP 4.5.4 Seed Mix, Reseeding Methods, and Fencing

The permanent seed mix and seeding rates for revegetation of the Permit Area are provided in **Table RP-3**. This seed mix will adequately support the post-operational land uses, livestock grazing and wildlife habitat, and was approved by Mark Newman of the BLM Rawlins Office on November 17, 2006 and by Melissa Bautz of the WDEQ-LQD Lander Field Office on November 3, 2006 (e-mail communications). If any of the approved seed is unavailable or prohibitive in cost at the time of seeding, other locally adapted and certified seed may be substituted with prior approval of BLM and WDEQ-LQD. On occasion it may be beneficial to stabilize soil by planting a vigorous annual

cover crop of rhizomatous species as directed in WDEQ-LQD Guideline 2. LC ISR, LLC will seek and receive approval from BLM and WDEQ-LQD before planting such species.

Three methods of seeding, drill, pit and broadcast, will be used. Seeding will be performed as a continuous operation when conditions allow. In general, seeding will be completed during the spring or fall, whichever is the first normal period for favorable planting after the seed bed preparation.

Drill seeding will be the primary method. Areas with little gradient will be seeded with the rows perpendicular to the direction of the prevailing wind. Where necessary to prevent erosion, seeding will be done along the contour. Broadcast seeding will be performed on any steep slopes and drainage areas that may be disturbed in the Permit Area. The seed will be distributed uniformly over the area using a mechanical seed spreader. Immediately after broadcast seeding, the areas will be raked or dragged along the contour. This will cover the seeds with approximately one-quarter inch of soil. Pit seeding will be used in areas in which vegetation re-establishment is particularly difficult because the method allows for sheltering seeds from eolian erosion and capturing moisture in the area of the seed.

When reseeding areas outside fenced mine units or the Plant, vehicular access to reseeded areas will be restricted until vegetation is successfully re-established. Because of the potential for excessive grazing pressure on these areas, revegetation success will be evaluated in each growing season to determine if additional weed control, a cover crop, or other protective measures are necessary. If such measures are considered necessary, LC ISR, LLC will submit a plan to WDEQ-LQD.

RP 4.5.5 Revegetation Success Criteria

Revegetation shall be deemed complete no earlier than the fifth full growing season after seeding and when:

- the revegetation is self-renewing under the site conditions;
- the total vegetation cover of perennial species (excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of perennial species (excluding noxious weed species) of the undisturbed portions of the Permit Area;
- the species diversity and composition are suitable for the post-operational land use; and

- the total vegetation cover and species diversity and composition are quantitatively assessed in accordance with procedures approved by WDEQ-LQD.

Because many of the reclaimed areas are relatively small in comparison with the Permit Area and because of the similarity of the vegetation communities at the site, LC ISR,

LLC will delineate a comparison area in an undisturbed portion of the site at least six months prior to evaluation of revegetation success. In addition, LC ISR, LLC will describe the quantitative methods to be used for comparing the total vegetation cover in the reclaimed and undisturbed areas and for evaluating species diversity and composition. These methods, as well as the size and location of the comparison area, will be submitted to WDEQ-LQD for review and approval at least six months prior to the fifth full growing season.

RP 4.6 Recovery of Groundwater Levels

Once ISR operations cease, water levels will begin to recover to pre-ISR levels. A calculation of the time required for water levels to recover following completion of the Lost Creek Project was performed using a modified version of the Theis solution.

The analysis of recovery is based on the principle of superposition, which was described in **Section OP 3.6.3.3**. It is assumed that after the pump has been shut down (at the centroid of production), the well continues to be pumped at the same discharge as before and that an imaginary recharge equal to the discharge is injected into the well. The recharge and discharge thus cancel each other resulting in a well that is effectively no longer being pumped. The recovery of the well is measured as 'residual' drawdown. Applying the Theis equation to this problem the residual drawdown is

$s' = (Q/4\pi T)\{W(u)-W(u')$

where:

$u = (r^2S)/(4Tt)$ and $u' = (r^2S')/(4Tt')$

where:

s' = residual drawdown in ft
r = distance from well to observation point in ft
T = transmissivity of the aquifer in ft2/d
S' = storativity of the aquifer during recovery, unitless
S = storativity of the aquifer during pumping, unitless
t = time in days since start of pumping in days
t' = time in days since the cessation of pumping in days
Q = rate of recharge = rate of discharge in ft^3/d

The calculated residual drawdown (in feet) using the equation above for various times at 2 miles and 5 miles from the centroid is shown below. Recovery to within 5 feet of the original, pre-ISR potentiometric surface is estimated to take between 10 to 12 years. As previously noted, because of regional recharge to the aquifer, the actual drawdown will be significantly lower than predicted with the Theis solution (Section OP 3.6.3.3). Therefore, the recovery time to reach a residual drawdown of 5 feet will be less than that shown below.

Residual Drawdown (in feet) After End of ISR Operation

	Time Since End of ISR Operation					
Distance	1 yr	2 yr	4 yr	8 yr	10 yr	12 yr
2 Miles	20.5	15.1	10.3	6.5	5.5	4.8
5 Miles	18.9	14.4	10.0	6.4	5.5	4.8

RP 5.0 FINANCIAL ASSURANCE

LC ISR, LLC will establish and maintain appropriate surety arrangements with NRC and WDEQ to cover the costs of groundwater restoration, radiological decontamination, facility decommissioning, and surface reclamation. The surety will be reviewed annually and adjusted to reflect changes in cost and in the Project.

The surety estimate for the Project, including surface reclamation of all the facilities, including the Plant, and groundwater restoration and reclamation of Mine Unit One, is $7,532,329 Restoration costs for additional mine units will be added to the surety as the mine units are brought online. The anticipated schedule and approximate amounts for the bond increases associated with the additional mine units are shown on **Figure RP-3**.

A detailed description of this surety estimate is provided in **Table RP-4**, and the schedule on which the estimate is based is detailed in **Figure RP-4**. The table includes a summary page and a series of worksheets with itemized costs for the reclamation and restoration activities. Each worksheet covers a particular task or associated tasks, such as Building Demolition. Worksheets are provided for:

- groundwater restoration,
- building demolition (including disposal),
- pond reclamation (including disposal of pond materials),
- well abandonment,
- mine unit equipment, and
- topsoil and revegetation.

Table RP-5 provides information on quantities and weights of equipment for the demolition calculations.

The Bond Estimate (**Table RP-4**) is divided into the following categories:

Category 1) Groundwater Restoration (Worksheet 1),
Category 2) Decommissioning and Surface Reclamation (Worksheets 2 – 8), and
Category 3) Miscellaneous Costs Associated with Third Party Contractors and Contingency (summary [first] page of **Table RP-4**).

Category 1) Groundwater Restoration

Worksheet 1 in **Table RP-4** supports the bonding requirement for Mine Unit 1 in 2007 dollars. The assumptions are broken down into Technical, Operating and Cost categories and are shown in the left hand columns. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information). The capital investment for equipment is included in initial plant construction. All required restoration equipment will be installed prior to initiating production operations (as shown in **Figure OP-4a**). Additional mine units are estimated for future bonding to be of similar size and character to Mine Unit 1.

Category 2) Decommissioning and Surface Reclamation

Worksheet 2 supports the bonding requirement for Plant Equipment Removal and Disposal in 2007 dollars. The quantity of materials to be removed is summarized in **Table RP-5**. The assumptions are based on current labor and trucking costs. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information).

Worksheet 3 supports the bonding requirement for Facility Buildings Demolition and Disposal in 2007 dollars. The quantity of materials to be removed is based on the plant design as shown in **Plate OP-2** as well as the header house and drill shed designs. The assumptions are based on current labor, equipment and trucking costs. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information).

Worksheet 4 supports the bonding requirement for Storage Pond Reclamation in 2007 dollars. The quantity of materials to be removed is based on the preliminary pond design including liner and leak detection materials. The assumptions are based on experience, current labor, equipment and trucking costs. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information).

Worksheet 5 supports the bonding requirement for Well Abandonment and for Mine Unit Equipment Removal and Disposal for Mine Unit 1 in 2007 dollars. The quantity of materials for abandonment is based on use of Class G Cement to plug the wells from total depth to surface. The assumptions are based on experience, current labor and equipment costs. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information). Additional mine units are estimated for future bonding to be of similar size and character to Mine Unit 1.

Worksheet 6 supports the bonding requirement for Mine Unit Equipment Removal and Disposal for Mine Unit 1 in 2007 dollars. The quantity of materials is based on the current anticipated design for production systems for Mine Unit 1. The assumptions are based on experience, current labor, equipment and trucking costs. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information). Additional mine units are estimated for future bonding to be of similar size and character to Mine Unit 1.

Worksheet 7 supports the bonding requirement for Topsoil Replacement and Revegetation for Mine Unit 1 and the Storage Ponds in 2007 dollars. The affected area is a conservative estimate (5 of 40 total acres) that will require topsoil handling and grading. **Figure OP-7b** details the area of disturbance on a header house basis. The assumptions are based on experience, and current labor, equipment and material costs. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information). Additional mine units are estimated for future bonding to be of similar size and character to Mine Unit 1.

Worksheet 8 supports the bonding requirement for Miscellaneous Reclamation in 2007 dollars. The areas of bonding are for removal of fencing, powerline, pumping stations, culverts, other utilities, and disposal well pipelines. The assumptions are based on experience, current labor, equipment and trucking costs. The quantities are based on initial engineering designs for Mine Unit 1 and associated systems. The right hand columns provide an explanation as to the line item and the source (data, calculated, rate, and similar information). Additional mine units are estimated for future bonding to be of similar size and character to Mine Unit 1.

Category 3) Miscellaneous Associated with Third Party Contractors and Contingency

The Summary of Reclamation/Reclamation Bond Estimate supports the bonding requirement for Miscellaneous Third Party Contractors and Contingency in 2007 dollars. The costs are a percentage of the total restoration and reclamation costs detailed in Worksheets 1 through 8 and are as follows (as shown on the summary [first] page of **Table RP-4**):

Project Design	2%
Contractor Profit and Mobilization	8%
Pre-Construction Investigation	1%
Project Management	5%
On-site Monitoring	0.5%
Site Security and Liability Assurance	1%
Longterm Administration	2%
Contingency	15%
TOTAL	34.5%

REFERENCES

Environmental Protection Agency. 2009b. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance. EPA 530-F-09-020 Available from http://www.epa.gov/osw/hazard/correctiveaction/resources/guidance/sitechar/gwstats/unified-guid-3.pdf. Access on 9th December 2009.

The Cogema Report, Wellfield Restoration Report Christensen Ranch Project, March 5, 2008.

Wyoming Department of Environmental Quality. 1977. Letter from G. Beach (WQD) and R. Chancellor (LQD) to M.Loomis (WMA). Use of average wellfield concentrations and individual monitor well concentrations for groundwater classification at in situ operations.

Table RP-1a Summary of Criteria for Successful Groundwater Restoration and Surface Reclamation (Page 1 of 2)

The evaluation of groundwater restoration success within the production zone will be based on the average water quality over the production unit as measured in the baseline production zone monitor wells or their approved replacements. The baseline water quality data will be collected and submitted as part of each respective mine unit package (**Section OP 3.2.2.3** and **Attachment OP-8**). The post-mining data will be collected during stabilization as outlined in Section RP 2.4. Assessment of the success of groundwater restoration and surface reclamation will be conducted as follows:
1) Determination of Stability The groundwater chemistry data will be analyzed on the basis of production zone averages and on a parameter-by-parameter basis. Standard statistical techniques such as trend regression analysis will be used to determine stability. The data will be compared against baseline variability to determine if the water quality is stable. For example, the degree of water quality variability during stabilization sampling must be similar to or less than the variability of baseline water quality before the mine unit can be declared stable. If the water quality is determined to be stable, then the success of returning the water quality to the primary goal can be assessed. If not, then additional stability monitoring or restoration may be required.
2) Primary Goal Assessment The primary goal of groundwater restoration is to return the groundwater quality to a level consistent with the baseline quality (while considering the statistical confidence of baseline and stability water quality). If the results of stability monitoring confirm that all measured parameters have been returned to a quality consistent with baseline conditions, then restoration will be deemed successful and complete. Abandonment of wells and surface reclamation may commence. However, if the primary goal of reaching baseline water quality has not been reached then the secondary goal of WDEQ-WQD Class of Use may be pursued.
3) Class of Use Assessment The secondary groundwater restoration goal of class is deemed successful if the implementation of Best Practicable Technology, discussed in Section RP 2.3, has been implemented, and the water quality has been returned to class of use for all parameters. Upon a determination by WDEQ that the secondary goal of class of use has been reached, abandonment of wells and surface reclamation may commence. However, if all parameters have not been successfully returned to class of use then additional restoration may be required or, LC ISR, LLC may request that the WDEQ Director recommend to the Environmental Quality Council that the water quality criteria for groundwater restoration be modified in accordance with W.S. 35-11-429(iii)(2003).

Table RP-1a Summary of Criteria for Successful Groundwater Restoration and Surface Reclamation (Page 2 of 2)

4) Restoration Outside the Production Zone Regardless of the restored groundwater quality in the production zone, the adjacent aquifers and other waters within the same aquifers must be fully protected to their class of use and, outside the aquifer exemption boundary, to applicable Maximum Contaminant Levels from the U.S. Environmental Protection Agency Rules (40 CFR 141 as amended July 1, 2001). If the restored groundwater in the production zone poses a threat to groundwater outside the production zone, then flow and/or fate and transport models may be used to assist in determining what action, including monitoring sufficient to verify the model, needs to be taken.
5) Well Abandonment and Surface Reclamation Upon approval by WDEQ and the NRC that groundwater restoration is complete, well abandonment and surface reclamation will be initiated pursuant to **Sections RP 3.0** and **4.0** and completed within two years as required
6) Bond Release At the conclusion of successful groundwater restoration the following reclamation activities will occur prior to complete bond release: **a.** Proper abandonment of all wells pursuant to WDEQ-LQD NonCoal Rules and Regulations, Chapter 11 Section. 8 and as described in **Section RP 3.1**; **b.** Removal of all piping conveyances, power lines, roads, culverts, header houses and other infrastructure pursuant to **Sections RP 3.2** and **4.0**; **c.** Contamination surveys and any necessary mitigation required to return soil to unrestricted use; **d.** Contouring and reapplication of topsoil pursuant to **Section RP 4.5**; and **e.** Re-vegetation with successful growth pursuant to **Sections RP 4.5.4** and **4.5.5**. LC ISR may seek partial bond release from the agencies (WDEQ, NRC and BLM) at any stage of reclamation.

Table RP-1b Restoration Groundwater Quality Parameters (Page 1 of 2)

Parameter	WDEQ/LQD Guidelines 4 & 8 [1,2]	WDEQ/WQD Groundwater Classification Standards [3]			EPA MCL [4]
		Class I Domestic	Class II Agriculture	Class III Livestock	
GENERAL CHEMISTRY					
Total Dissolved Solids (mg/L)	R	500	2,000	5,000	-
Conductivity - field measured (µmhos)	R	-	-	-	
pH-field measured (su)	R	6.5 to 8.5	4.5 to 9.0	6.5 to 8.5	-
Temperature – field measured	R	-	-	-	-
Alkalinity	R	-	-	-	-
MAJOR IONS (mg/L)					
Calcium-dissolved	R	-	-	-	-
Potassium-dissolved	R	-	-	-	-
Magnesium-dissolved	R	-	-	-	-
Sodium-dissolved	R	-	-	-	-
Bicarbonate	R	-	-	-	-
Carbonate	R	-	-	-	-
Chloride-dissolved	R	250	100	2,000	-
Silica - dissolved	-	-	-	-	-
Sulfate	R	250	200	3,000	-
Ammonia Nitrogen as Nitrogen (as NH_3)	R	0.50	-	-	-
Nitrate + Nitrite as Nitrogen	R	-	-	100.0	10.0
Fluoride	R	4.0	-	-	4.0
TRACE METALS (mg/L)					
Aluminum-dissolved	R	-	5.0	5.0	-
Arsenic-dissolved	R	0.05	0.1	0.2	0.01
Barium-dissolved	R	2.0	-	-	2.0
Boron	R	0.75	0.75	5.0	-
Cadmium-dissolved	R	0.005	0.01	0.05	0.005

Table RP-1b Restoration Groundwater Quality Parameters (Page 2 of 2)

Parameter	WDEQ/LQD Guidelines 4 & 8 [1,2]	WDEQ/WQD Groundwater Classification Standards [3]			EPA MCL [4]
		Class I Domestic	Class II Agriculture	Class III Livestock	
Chromium-dissolved	R	0.10	0.1	0.05	0.1
Copper-dissolved	R	1.0	0.2	0.5	1.3
Iron-total and dissolved	R	0.3	5.0	-	-
Lead-dissolved	R	0.015	5.0	0.1	0.015
Manganese-total	R	0.05	0.2	-	-
Mercury-dissolved	R	0.002	-	0.00005	0.002
Molybdenum-dissolved	R	-	-	-	-
Nickel-dissolved	R	-	0.2	-	-
Selenium-dissolved	R	0.05	0.02	0.05	0.05
Vanadium	R	-	0.1	0.1	-
Zinc-dissolved	R	5.0	2.0	25.0	-
RADIONUCLIDES (pCi/L)					
Gross Alpha [5]	R	15.0	15.0	15.0	15.0
Gross Beta	R	-	-	-	- [6]
Radium-226 + 228	R	5.0	5.0	5.0	5.0
Uranium - dissolved	R	-	-	-	0.03

[1] http://deq.state.wy.us/lqd/guidelines.asp.
[2] R = Recommended in WDEQ Guidelines 4 or 8.
[3] http://deq.state.wy.us/wqd/WQDrules/Chapter_08.pdf. The above list is from Table 1 in Chapter 8 of the WDEQ/WQD Rules. There are broad narrative standards as well in Chapter 8, Section 4(d)), and the Table 1 in Chapter 8 also lists other parameters such as Sodium Adsorption Ratio (SAR). However, the parameters listed above are the ones of most concern for ISR operations.
[4] MCL = Maximum Contaminant Level, http://www.epa.gov/safewater/contaminants/index.html.
[5] The gross alpha standard for WDEQ/WQD includes Ra-226 but excludes radon and uranium.
[6] The MCL for gross beta is given as an exposure rate (4 mrem/year), which is addressed through the radiological monitoring for the site decommissioning.

Table RP-3 Permanent Seed Mixture

Common Name [1]	Scientific Name	Application (pounds per acre)
Thickspike wheatgrass	*Agropyron dasystacum*	4.0
Slender wheatgrass	*Agropyron trachycaulum*	2.5
Western wheatgrass	*Agropyron smithii*	2.0
Indian ricegrass	*Achnatherum hymenoides*	2.0
Great Basin wildrye	*Leymus cinereus*	2.0
Winterfat	*Ceratoides lanata*	1.5
Sandberg bluegrass	*Poa secunda*	1.5
Big Sagebrush	*Artemesia tridentata*	1.0
TOTAL		**16.5**

[1] Alternative selections if one or two of primary selections (other than Big Sagebrush) are not available: Needle-and-thread (*Stipa comata*); and Bottlebrush squirreltail (*Elymus elymoides*).

LOST CREEK ISR, LLC SUMMARY OF RECLAMATION/RESTORATION BOND ESTIMATE

I	GROUNDWATER RESTORATION - Worksheet 1	$3,942,720
II	DECOMMISSIONING AND SURFACE RECLAMATION	$1,657,524
	A. Plant Equipment Removal and Disposal - Worksheet 2	$73,724
	B. Plant Building Demolition and Disposal - Worksheet 3	$335,818
	C. Storage Pond Sludge and Liner Handling - Worksheet 4	$405,997
	D. Well Abandonment - Worksheet 5	$380,143
	E. Wellfield Equipment Removal and Disposal - Worksheet 6	$224,708
	F. Topsoil Replacement and Revegetation - Worksheet 7	$72,944
	G. Miscellaneous Reclamation Activities - Worksheet 8	$164,189
	SUBTOTAL RESTORATION AND RECLAMATION	**$5,600,244**
III	TOTAL CONTINGENCY	$1,932,084
	Miscellaneous Costs Associated with Third Party Contractors	
	Project Design 2% =	$112,005
	Contractor Profit & Mobilization 8% =	$448,020
	Pre-Construction Investigation 1% =	$56,002
	Project Management 5% =	$280,012
	On-Site Monitoring 0.5% =	$28,001
	Site Security & Liability Assurance 1% =	$56,002
	Longterm Administration 2% =	$112,005
	Contingency 15% =	$840,037
	TOTAL RESTORATION AND RECLAMATION	**$7,532,329**

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
Technical Assumptions:			
Wellfield Area (Square Feet)	1,611,720	Proposed area	Data
Wellfield Area (Acres)	37.00		Calculated
Affected Ore Zone Area (Square Feet)	1,611,720	Proposed area affected	Data
Average Completed Thickness (Feet)	12.0	Proposed thickness	Data
Affected Volume:			
Factor For Vertical Flare	20%	Vertical flare estimate	Estimated
Factor For Horizontal Flare	20%	Horizontal flare estimate	Estimated
Total Volume (Cubic Feet)	27,850,522	= Area * Thickness * Vertical flare * Horizontal flare	Calculated
Porosity	25.0%	Typical value for host sand	Data
Gallons Per Cubic Foot	7.48	Conversion factor	Constant
Gallons Per Pore Volume	52,080,475	= Volume * Porosity * gal/ft^3	Calculated
Number of Wells in Unit(s)			
Production Wells	241	Proposed well count	Data
Injection Wells	417	Proposed well count	Data
Monitor Wells	69	Proposed well count	Data
Average Well Spacing (Feet)	95	Proposed well spacing	Data
Average Well Depth (Feet)	410	Proposed well depth	Data

Table RP-4 Reclamation/Restoration Bond Estimate (Page 3 of 37)

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
I GROUNDWATER SWEEP			
A. PLANT & OFFICE			
Operating Assumptions:			
Flow Rate (Gallons per Minute)	40	Planned flow	Data
Pore Volumes Required	0.3	Required value	Data
Total Gallons For Treatment	15,624,143	= Gallons per Pore Volume * Number of Pore Volumes	Calculated
Total Kilogallons for Treatment	15,624		Calculated
Cost Assumptions:			
Power			
Average Connected Horsepower	20	Proposed pump horsepower	Data
Kilowatt-hours per Horsepower	0.746		Conversion Factor
Cost per Kilowatt-hour	$0.060	Estimate based on supplier	Unit Rate
Gallons per Minute	40	Planned rate	Data
Gallons per Hour	2400		Calculated
Cost per Hour	$0.90		Calculated
Cost per Gallon	$0.00037		Calculated
Cost per Kilogallon	$0.373		Calculated
Chemicals			
Antiscalent (Cost per Kilogallon)	$0.120	Based on required dosage/estimated cost	Unit Rate
Repair & Maintenance (Cost per Kilogallon)	$0.035	Estimate	Unit Rate
Analysis (Cost per Kilogallon)	$0.030	On-site laboratory analysis	Unit Rate

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
I GROUNDWATER SWEEP (continued)			
A. PLANT & OFFICE (continued)			
Total Cost per Kilogallon	$0.558		Calculated
Total Treatment Cost	$8,718		Calculated
Utilities			
Power (Cost per Month)	$225	Estimate	Unit Rate
Propane (Cost per Month)	$225	Estimate	Unit Rate
Time for Treatment			
Minutes for Treatment	390,604	=Total Gallons for Treatment Divided by Flow Rate (gpm)	Calculated
Hours for Treatment	6,510		Calculated
Days for Treatment	271		Calculated
Average Days per Month	30.4		Calculated
Months for Treatment	8.9		Calculated
Utilities Cost	$4,013		Calculated
TOTAL PLANT & OFFICE COST	$12,731		

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
I GROUNDWATER SWEEP (continued)			
B. WELLFIELD			
Cost Assumptions:			
Power			
Average Flow per Pump (Gallons per Minute	32	Estimate from pumping	Data
Average Horsepower per Pump	7.50	Estimate from pumping	Data
Average Number of Pumps Required	1.3	Estimate from pumping	Data
Average Connected Horsepower	14.4	Pumps plus 5 horsepower for HH	Data
Kilowatt-hours per Horsepower	0.746		Conversion Factor
Cost per Kilowatt-hour	$0.060	Estimate based on supplier	Unit Rate
Gallons per Minute	40	Planned flow	Data
Gallons per Hour	2400		Calculated
Cost per Hour	$0.64		Calculated
Cost per Gallon	$0.0003		Calculated
Cost per Kilogallon	0.268		Calculated
Repair & Maintenance (Cost per Kilogallon)	$0.115	Estimate	Unit Rate
Total Cost per Kilogallon	$0.383		Calculated
TOTAL WELLFIELD COST	$5,986		Calculated
TOTAL GROUNDWATER SWEEP COST	$18,717		Calculated

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
II REVERSE OSMOSIS			
A. PLANT & OFFICE			
Operating Assumptions:			
Flow Rate (Gallons per Minute)	760	Estimate from pumping	Data
Pore Volumes Required	6.0	Required value	Data
Total Gallons for Treatment	312,482,852	= Gallons per Pore Volume * Number of Pore Volumes	Calculated
Total Kilogallons for Treatment	312,483		Calculated
Feed to Reverse Osmosis Unit (Gallons per Minute)	760	Planned flow	Data
Permeate Flow (Gallons per Minute)	570	= Planned Flow * Average Reverse Osmosis Recovery	Calculated
Brine Flow (Gallons per Minute)	190	= Planned Flow - Permeate Flow	Calculated
Average Reverse Osmosis Recovery	75.0%	Reverse Osmosis Design	Data
Cost Assumptions:			
Power			
Average Connected Horsepower	300.00	Average value for each area	Data
Kilowatt-hours per Horsepower	0.746		*Conversion Factor*
Cost per Kilowatt-hour	$0.060	Estimate based on supplier	Unit Rate
Gallons per Minute	760	Planned flow	Data
Gallons per Hour	45600		Calculated
Cost per Hour	$13.43		Calculated
Cost per Gallon	$0.00029		Calculated
Cost per Kilogallon	$0.294		Calculated
Chemicals			
Sulfuric Acid (Cost per Kilogallon)	$0.090	Estimate	Unit Rate
Caustic Soda (Cost per Kilogallon)	$0.023	Estimate	Unit Rate
Reductant (Cost per Kilogallon)	$0.113	Estimate	Unit Rate
Antiscalent (Cost per Kilogallon)	$0.124	Based on required dosage/estimated cost	Unit Rate
Repair & Maintenance (Cost per Kilogallon)	$0.068	Estimate	Unit Rate
Sampling & Analysis (Cost per Kilogallon)	$0.030	Estimate	Unit Rate

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
II REVERSE OSMOSIS (continued)			
A. PLANT & OFFICE (continued)			
Total Cost per Kilogallon	$0.742		Calculated
Total Pumping Cost	$231,854		Calculated
Utilities			
Power (Cost per Month)	$560	Estimate	Unit Rate
Propane (Cost per Month)	$225	Estimate	Unit Rate
Time for Treatment			
Minutes for Treatment	411,162		Calculated
Hours for Treatment	6,853		Calculated
Days for Treatment	286		Calculated
Average Days per Month	30.4		Calculated
Months for Treatment	9.4		Calculated
Utilities Cost	$7,379		Calculated
TOTAL PLANT & OFFICE COST	$239,233		Calculated

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
II REVERSE OSMOSIS (continued)			
B. WELLFIELD			
Cost Assumptions:			
Power			
Average Flow per Pump (Gallons per Minute	32.00	Average value for each area	Data
Average Horsepower per Pump	7.50	Average value for each area	Data
Average Number of Pumps Required	23.8	Average value for each area	Data
Average Connected Horsepower	188.1	Pump horsepower plus 10 horsepower	Calculated
Kilowatt-hours per Horsepower	0.746		Conversion Factor
Cost per Kilowatt-hour	$0.060	Estimate based on supplier	Unit Rate
Gallons per Minute	760	Planned flow	Data
Gallons per Hour	45,600		Calculated
Cost per Hour	$8.42		Calculated
Cost per Gallon	$0.0002		Calculated
Cost per Kilogallon	$0.185		Calculated
Repair & Maintenance (Cost per Kilogallon)	$0.115	Estimate	Unit Rate
Total Cost per Kilogallon	$0.300		Calculated
TOTAL WELLFIELD COST	$93,638		Calculated
TOTAL REVERSE OSMOSIS COST	$332,872		Calculated

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
III RECIRCULATION			
A. WELLFIELD			
Cost Assumptions:			
Power			
Average Flow per Pump (Gallons per Minute	32	Estimate from pumping	Data
Average Horsepower per Pump	7.50	Estimate from pumping	Data
Average Number of Pumps Required	241.0	Estimate from pumping	Data
Average Connected Horsepower	1,812.5	Pumps plus 5 horsepower for HH	Data
Kilowatt-hours per Horsepower	0.746		Conversion Factor
Cost per Kilowatt-hour	0.060	Estimate based on supplier	Unit Rate
Gallons per Minute	7712	Planned flow	Data
Gallons per Hour	462720		Calculated
Cost per Hour	$81.13		Calculated
Cost per Gallon	$0.0002		Calculated
Cost per Kilogallon	0.175		Calculated
Repair & Maintenance (Cost per Kilogallon)	$0.115	Estimate	Unit Rate
Total Cost per Kilogallon	$0.290		Calculated
TOTAL WELLFIELD RECIRCULATION COST	$15,120		Calculated

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
IV WASTE DISPOSAL WELL			
Operating Assumptions:			
Annual Evaporation Capacity (Gallons)	0		Data
Average Monthly Evaporation Capacity (Gallons)	0		Calculated
Total Disposal Requirement			
Reverse Osmosis Brine (Total Gallons)	78,120,713	=Treatment Gallons * (1- Reverse Osmosis Recovery)	Calculated
Reverse Osmosis Brine (Total Kilogallons)	78,121		Calculated
Brine Concentration Factor	50%	Reverse Osmosis Design	Data
Total Concentrated Brine (Gallons)	39,060,357	= Reverse Osmosis Brine Gallons * Brine Concentration Factor	Calculated
Months of RO Operation	9.4		Calculated
Average Monthly Requirement (Gallons)	4,155,357	=Total Concentrated Brine / Months of Reverse Osmosis Operation	Calculated
Monthly Balance for DDW (Gallons)	4,155,357	=Average Monthly Requirement - Average Monthly Evaporation	Calculated
Total WDW Disposal (Gallons)	39,060,357		Calculated
Total WDW Disposal (Kilogallons)	39,060		Calculated
Cost Assumptions:			
Power			
Average Connected Horsepower	100.0	Estimate	Data
WDW Average Connected Horsepower	300.0	Estimate	Data
Kilowatt-hours per Horsepower	0.746		Conversion Factor
Cost per Kilowatt-hour	$0.060	Estimate based on supplier	Unit Rate
Gallons per Minute	115.0	Planned flow	Data
Gallons per Hour	6900		Calculated
Cost per Hour	$17.90		Calculated
Cost per Gallon	$0.0026		Calculated
Cost per Kilogallon	$2.595		Calculated

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
IV WASTE DISPOSAL WELL (continued)			
Chemicals			
Reverse Osmosis Antiscalent (Cost per Kilogallon)	$0.225	Based on required dosage and cost	Unit Rate
WDW Antiscalent (Cost per Kilogallon)	$0.254	Based on required dosage and cost	Unit Rate
Sulfuric Acid (Cost per Kilogallon)	$0.315	Estimate	Unit Rate
Corrosion Inhibitor	$0.244	Estimate	Unit Rate
Repair & Maintenance (Cost per Kilogallon)	$0.130	Estimate	Unit Rate
Total Cost per Kilogallon	$3.762		Calculated
TOTAL WASTE DISPOSAL WELL COST	$146,956		Calculated
V STABILIZATION MONITORING			
Operating Assumptions:			
Time of Stabilization (Months)	9	Time frame required	Data
Frequency of Analysis (Months)	3	Required sampling	Data
Total Sets of Analysis	4	Required sampling	Data
Cost Assumptions:			
Power (Cost per Month)	$1,125	Estimate	Unit Rate
Total Power Cost	$10,125		Calculated
Sampling & Analysis (Cost per Set)	$4,050	Estimate	Unit Rate
Total Sampling & Analysis Cost	$16,200		Calculated
Utilities (Cost per Month)	$2,250	Estimate	Unit Rate
Total Utilities Cost	$20,250		Calculated
TOTAL STABILIZATION COST	$46,575		Calculated

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
VI LABOR			
Cost Assumptions			

	Crew Numbers	Cost per Hour	Hours per Year	Crew	Cost		
	1	$50.00	7280	Project Manager	$364,000	Anticipated operations crew	Data
	1	$40.00	7280	Supervisor/RSO	$291,200	Anticipated operations crew	Data
	1	$30.00	7280	EHS Tech	$218,400	Anticipated operations crew	Data
	1	$30.00	4160	Sampler	$124,800	Anticipated operations crew	Data
	8	$30.00	2600	Plant and Field Operators	$624,000	Anticipated operations crew	Data
	1	$30.00	4160	Chemist	$124,800	Anticipated operations crew	Data
	1	$30.00	7280	Maintenance	$218,400	Anticipated operations crew	Data
	1	$30.00	7280	Office Support	$218,400	Anticipated operations crew	Data
	1	$30.00	7280	Equipment Operator	$218,400	Anticipated operations crew	Data
	4	$30.00	2773	Reclamation Laborer	$332,760	Anticipated operations crew	Data
	1	$35.00	5200	Foreman	$182,000	Anticipated operations crew	Data
	4	$13.50	2080	Vehicles	$112,320	Anticipated operations crew	Data
TOTAL RESTORATION LABOR COST					$3,029,480		

VII RESTORATION CAPITAL REQUIREMENTS				
I	Plug and Abandon DDW (3)	$353,000	$117,560 per well estimate	Data
TOTAL		$353,000		

Table RP-4 Reclamation/Restoration Bond Estimate (Page 13 of 37)

LOST CREEK ISR, LLC GROUNDWATER RESTORATION - WORKSHEET 1

Assumptions/Items	Mine Unit No. 1	Explanation	Source
SUMMARY:			
I GROUNDWATER SWEEP	$18,717		
II REVERSE OSMOSIS	$332,872		
III RECIRCULATION	$15,120		
IV WASTE DISPOSAL WELL	$146,956		
V STABILIZATION	$46,575		
VI LABOR	$3,029,480		
VII CAPITAL	$353,000		
TOTAL GROUNDWATER RESTORATION COST	**$3,942,720**		

Table RP-4 Reclamation/Restoration Bond Estimate (Page 14 of 37)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: A. Plant Equipment Removal and Disposal - WORKSHEET 2

Assumptions/Items	Shop / Lab / Office	Precipitation Section	Chemical Section	Ion Exchange Section	Restoration Section	Total	Explanation	Source
Volume (Cubic Yards)	68	46	17	111	96	338	Estimate of equipment to be removed	Data
Volume per Truck Load (Cubic Yards)	20	20	20	20	20		Typical load for shipping	Data
Number of Truck Loads	3.4	2.3	0.8	5.6	4.8	16.9		Calculated
I DECONTAMINATION								
Decontamination Cost per Truck Load	$620	$620	$620	$620	$620		Estimated average decontaminate	Unit Rate
Percent Requiring Decontamination	50.0%	100.0%	0.0%	100.0%	100.0%		Percent expected	Data
TOTAL DECONTAMINATION COST	$1,060	$1,428	$0	$3,443	$2,963	$8,894		Calculated
II DISMANTLING & LOADING								
Cost per Truck Load	$805	$805	$805	$805	$805		Estimated average dismantle cost	Unit Rate
TOTAL DISMANTLING & LOADING COST	$2,753	$1,854	$676	$4,470	$3,847	$13,600		Calculated
III OVERSIZE								
Percent Requiring Permits	0.0%	10.0%	10.0%	10.0%	10.0%			Data
Cost per Truck Load	$367	$367	$367	$367	$367			Unit Rate
TOTAL OVERSIZE COST	$0	$85	$31	$204	$175	$495		Calculated
IV TRANSPORTATION & DISPOSAL								
A. Landfill								
Percent to be Shipped	90.0%	50.0%	100.0%	50.0%	50.0%		Percent acceptable at landfill	Data
Distance (Miles)	48	48	48	48	48		Distance to landfill	Data
Cost per Mile	$2.90	$2.90	$2.90	$2.90	$2.90		Current transport rate	Unit Rate
Transportation Cost	$429	$160	$117	$386	$333			Calculated
Disposal Fee per Cubic Yard	$13.50	$13.50	$13.50	$13.50	$13.50		Landfill fee	Unit Rate
Disposal Cost	$831	$311	$227	$750	$645			Calculated
Total Cost	$1,260	$471	$344	$1,136	$978			Calculated
B. Licensed Site								
Percent to be Shipped	10.0%	50.0%	0.0%	50.0%	50.0%		Percent requiring disposal at licensed site	Calculated
Distance (Miles)	105	105	105	105	105		Distance to Shirley Basin	Data
Cost per Mile	$2.90	$2.90	$2.90	$2.90	$2.90		Current transport rate	Unit Rate
Transportation Cost	$104	$351	$0	$845	$728			Calculated
Disposal Cost per Cubic Foot	$12.38	$12.38	$12.38	$12.38	$12.38		Licensed site fee	Unit Rate
Volume per Truck Load (Cubic Yards)	20.0	20.0	20.0	20.0	20.0		Typical load for shipping	Data
Volume per Truck Load (Cubic Feet)	540	540	540	540	540			Calculated
Disposal Cost	$2,287	$7,697	$0	$18,562	$15,975			Calculated
Total Cost Licensed Site	$2,391	$8,047	$0	$19,407	$16,702			Calculated
TOTAL TRANSPORTATION & DISPOSAL COST	$3,650	$8,518	$344	$20,544	$17,680	$50,736		Calculated
TOTAL PLANT EQUIPMENT REMOVAL AND DISPOSAL COST	**$7,464**	**$11,884**	**$1,050**	**$28,661**	**$24,666**	**$73,724**		Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: B. Plant Building Demolition and Disposal - WORKSHEET 3

Assumptions/Items	Plant	Header Houses	Drill Shed	Total	Explanation	Source
I STRUCTURE DEMOLITION & DISPOSAL						
Structural Character	2-Story Steel Frame	1-Story Pre Fab. (12)	1-Story Pole Barn			
Demolition Volume (Cubic Feet)	1,248,000	39,240	22,400		Estimated volume of structures	Data
Demolition Cost per Cubic Foot	$0.1474	$0.1474	$0.0737			Unit Rate
Demolition Cost	$183,955	$5,784	$1,651	$191,390		Calculation
Factor For Gutting	20.0%	10.0%	10.0%			Data
Gutting Cost	$36,791	$578	$165	$37,535		Calculation
Weight (Pounds)	196,750	99,000	15,000		Estimated weight of building components	Data

	Quantity	Height (Feet)	Length (Feet)	Area (Square Feet)	Density (Pounds per Square Foot)	Building Weight (Pounds)
Ends	2	1	4800	9600	2.5	24000
Roof	2	82.5	260	42900	2.5	107250
Sidewall	2	20	260	10400	2.5	26000
Internal Wall	1	20	460	9200	2.5	23000
Internal Wall	1	30	220	6600	2.5	16500
Total 2-Story Steel Frame Weight						**196750**

Weight per Truck Load	40,000	40,000	40,000		Typical load for shipping	Data
Number of Truck Loads	4.9	2.5	0.4			Calculation
Distance to Landfill	48	48	48		Distance to landfill	Data
Cost per Mile	$2.90	$2.90	$2.90		Current transport rate	Unit Rate
Transportation Cost	$685	$345	$52	$1,081		
Disposal Cost per Ton	$40.20	$40.20	$40.20		Landfill fee	Unit Rate
Disposal Cost	$3,955	$1,990	$302	$6,246		Calculation
TOTAL STRUCTURE DEMOLITION & DISPOSAL COST	$225,386	$8,697	$2,170	$236,252		Calculation

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: B. Plant Building Demolition and Disposal - WORKSHEET 3

Assumptions/Items	Plant	Header Houses	Drill Shed	Total	Explanation	Source
II CONCRETE DECONTAMINATION, DEMOLITION & DISPOSAL						
Area (Square Feet)	30,050	565	565		Building concrete area	Data
Average Thickness (Feet)	1	1.0	0.3			Data
Volume (Cubic Feet)	30,050	565	141			Calculation
Percent Requiring Decontamination	75.0%	50.0%	0.0%			Data
Percent Decontaminated	75.0%	75.0%	0.0%			Data
Decontamination (Cost per Square Foot)	$0.191	$0.191	$0.191			Unit Rate
Decontamination Cost	$4,305	$81	$0	$4,386		Calculation
Demolition (Cost per Square Foot)	$2.124	$2.124	$0.100			Unit Rate
Demolition Cost	$63,826	$1,200	$57	$65,083		Calculation
Transportation & Disposal						
A. On-Site Disposal						
Percent to be Disposed On-Site	90%	90%	100%			Data
Transportation Cost	$0	$0	$0			Data
Disposal Cost per Cubic Foot	$0.055	$0.055	$0.055			Unit Rate
Disposal Cost	$1,487	$28	$8	$1,523		Calculation
B. Licensed Site						
Percent to be Shipped	10%	10%	0%			Calculation
Distance (Miles)	105	105	105			Data
Cost per Mile	$2.90	$2.90	$2.90		Current transport rate	Unit Rate
Transportation Cost	$1,694	$32	$0	$1,726		Calculation
Disposal Cost per Cubic Foot	$4.16	$4.16	$4.16			Unit Rate
Volume per Truck Load (Cubic Yards)	20	20	20			Data
Volume per Truck Load (Cubic Feet)	540	540	540			Calculation
Disposal Cost	$12,501	$235	$0	$12,736		Calculation
TOTAL CONCRETE DECONTAMINATION, DEMOLITION & DISPOSAL COST	$83,814	$1,576	$64	$85,454		Calculation

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: B. Plant Building Demolition and Disposal - WORKSHEET 3

Assumptions/Items	Plant	Header Houses	Drill Shed	Total	Explanation	Source
III SOIL REMOVAL & DISPOSAL						
Front End Loader Cost per Hour	$50	$50	$50	$50		
Time with Front End Loader (Hours)	16	6	1	23		
Cost of Front End Loader	$800	$300	$50	$1,150	Assume removal of 3" of Contaminated	Data
Volume to be Shipped (Cubic Feet)	2504	141	0		Soil Under Headers, 1" under Plant,	Data
Distance (Miles)	105	105	105		Disposal at a Licensed Facility	Data
Cost per Mile	$2.90	$2.90	$2.90			Unit Rate
Transportation Cost	$1,412	$80	$0	$1,492		*Calculation*
Disposal Fee per Cubic Foot	$4.16	$4.16	$4.16			Unit Rate
Quantity per Truck Load (Cubic Feet)	540	540	540			Data
Disposal Cost	$10,417	$588	$0	$11,005		Calculation
TOTAL SOIL REMOVAL & DISPOSAL COST	$12,629	$967	$50	$13,647		Calculation
IV RADIATION SURVEY						
Area Required (Acres)	0.69	0.01	0.01			Data
Survey Cost per Acre	$653.00	$653.00	$653.00			Unit Rate
TOTAL RADIATION SURVEY COST	$450	$8	$8	$466		Calculation
TOTAL PLANT BUILDING DEMOLITION AND DISPOSAL COST	**$322,279**	**$11,248**	**$2,292**	**$335,818**		Calculation

Table RP-4 Reclamation/Restoration Bond Estimate (Page 18 of 37)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: C. Storage Pond Sludge and Liner Handling - WORKSHEET 4

Assumptions/Items	Pond 1 Storage	Pond 2 Storage	Total	Explanation	Source
I POND SLUDGE					
Average Sludge Depth (Feet)	0.250	0.250			Data
Average Sludge Area (Square Feet)	40,300	40,300			Data
Sludge Volume (Cubic Feet)	10,075	10,075			Calculated
Sludge Volume (Cubic Yards)	373	373			Calculated
Sludge Volume per Truck Load (Cubic Yards)	20.0	20.0			Data
Number of Sludge Truck Loads	18.7	18.7			Calculated
Sludge Handling Cost Per Load	$268.00	$268.00			Unit Rate
Total Sludge Handling Cost	$5,012	$5,012	$10,023		Calculated
Transportation & Disposal					
Percent to be Shipped	100.0%	100.0%			Data
Distance (Miles)	105	105			Data
Cost per Mile	$2.90	$2.90			Unit Rate
Transportation Cost	$5,694	$5,694			Calculated
Disposal Cost per Cubic Foot	$12.38	$12.38			Unit Rate
Volume per Truck Load (Cubic Yards)	20.0	20.0			Data
Volume per Truck Load (Cubic Feet)	540	540			Calculated
Disposal Cost	$125,013	$125,013			Calculated
Total Transportation & Disposal Cost	$130,707	$130,707	$261,414		Calculated
TOTAL POND SLUDGE COST	$135,719	$135,719	$271,438		Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: C. Storage Pond Sludge and Liner Handling - WORKSHEET 4

Assumptions/Items	Pond 1 Storage	Pond 2 Storage	Total	Explanation	Source
II POND LINER					
Total Pond Area (Acres)	0.93	0.93			Data
Total Pond Area (Square Feet)	40,300	40,300			Calculated
Factor For Sloping Sides	20.0%	20.0%			Data
Total Liner Area (Square Feet)	48360	48360			Calculated
Liner Thickness (Mils)	30	30			Data
Liner Thickness (Inches)	0.0300	0.0300			Calculated
Liner Thickness (Feet)	0.0025	0.0025			Calculated
"Swell" Factor	25.0%	25.0%			Data
Liner Volume (Cubic Feet)	151	151			Calculated
Truck Loads of Liner	0.3	0.3			Calculated
Liner Handling Cost					
Labor Crew Cost per Hour	$135	$135			Unit Rate
Hours per Load	2.0	2.0			Unit Rate
Liner Handling Cost per Load	$270.00	$270.00			Calculated
Total Liner Handling Cost	$81	$81	$162		Calculated
Transportation & Disposal					
Percent to be Shipped	100.0%	100.0%			Data
Distance (Miles)	105	105			Data
Cost per Mile	$2.90	$2.90			Unit Rate
Transportation Cost	$91	$91			Calculated
Disposal Cost per Cubic Foot	$12.38	$12.38			Unit Rate
Volume per Truck Load (Cubic Feet)	540	540			Data
Disposal Cost	$2,006	$2,006			Calculated
Total Transportation & Disposal	$2,097	$2,097	$4,194		Calculated
TOTAL POND LINER COST	$2,178	$2,178	$4,356		Calculated

Table RP-4 Reclamation/Restoration Bond Estimate (Page 20 of 37)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: C. Storage Pond Sludge and Liner Handling - WORKSHEET 4

Assumptions/Items	Pond 1 Storage	Pond 2 Storage	Total	Explanation	Source
III POND BACKFILL					
Backfill Required (Cubic Yards)	10,448	10,448			Data
Backfill Cost per Cubic Yard	$1.13	$1.13			Unit Rate
TOTAL POND BACKFILL COST	$11,806	$11,806	$23,612		Calculated
IV RADIATION SURVEY					
Areal required (Acres)	1.02	1.02			Data
Survey Cost per Acre	$653.00	$653.00			Unit Rate
TOTAL RADIATION SURVEY COST	$665	$665	$1,330		Calculated
V LEAK DETECTION SYSTEM REMOVAL					
Gravel and Piping Volume (Cubic Feet)	10075	10075		Assume 3 inches	Data
Volume per Truck Load (Cubic Feet)	540	540			Data
Loads to be Shipped	18.7	18.7			Calculated
Distance (Miles)	105	105			Data
Cost per Mile	$2.90	$2.90			Unit Rate
Transportation Cost	$5,681	$5,681			Calculated
Handling Cost	$5,038	$5,038			Unit Rate (Imbedded)
Disposal Fee per Cubic Foot	$4.16	$4.16			Unit Rate
Disposal Cost	$41,912	$41,912			Calculated
TOTAL LEAK DETECTION SYSTEM REMOVAL COST	$52,631	$52,631	$105,261		Calculated
TOTAL POND RECLAMATION COST	**$202,998**	**$202,998**	**$405,997**		Calculated

Table RP-4 Reclamation/Restoration Bond Estimate (Page 21 of 37)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: D. Well Abandonment - WORKSHEET 5

Assumptions/Items	Mine Unit No. 1	Explanation	Source
Number of Wells	727		Data
Average Depth (Feet)	410		Data
Average Diameter (Inches)	4.328		Data
I MATERIALS			
Class G Neat Cement Required (Cubic Feet per Well)	41.9		Data
Cement Sacks Required per Well	32.7	15 ppg Class G cement requires 6 gallons water per sack cement and 1-1/2% bentonite by weight	Data
Cement Sack Cost	$14.43		Unit Rate
Cement Cost per Well	$472.22		Calculated
Bentonite Sacks Required per Well	0.9		Data
Bentonite Bag Cost	$2.90		Unit Rate
Bentonite Cost per Well	$2.68		Calculated
TOTAL MATERIALS COST PER WELL	$474.89		Calculated
II LABOR (INCLUDED IN WORKSHEET 1)			
Hours Required per Well	0.0		Data
Labor Cost per Hour	$0.00		Unit Rate
TOTAL LABOR COST PER WELL	$0.00		Calculated
III EQUIPMENT RENTAL			
Hours Required per Well	1.0		Data
Backhoe with Operator Cost per Hour	$48.00		Unit Rate
Total Equipment Cost per Well	$48.00		Calculated
TOTAL EQUIPMENT COST PER WELL	$522.89		Calculated
TOTAL WELL ABANDONMENT COST	**$380,143**		Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
I WELLFIELD PIPING		
A. Removal		
Surface Length per Well (Feet)	250	
Downhole Length per Well (Feet)	350	
Total Number of Wells	658	
Total Length (Feet)	394,800	Calculated
Cost of Removal per Foot	$0.109	Unit Rate
Cost of Removal	$42,836	Calculated
Average OD (Inches)	1.6	
Chipped Volume Reduction (Cubic Feet per Foot)	0.008	Unit Rate
Chipped Volume (Cubic Feet)	3,158	Calculated
Volume per Truck Load (Cubic Feet)	540	
Total Number of Truck Loads	5.8	Calculated
B. Survey & Decontamination		
Percent Requiring Decontamination	0%	
Number of Decontamination Loads	0.0	Calculated
Decontamination Cost per Load	$620.00	Unit Rate
Decontamination Cost	$0	Calculated
C. Transport & Disposal		
Landfill		
Transportation		
Percent to be Shipped	0.0%	
Loads to be Shipped	0.0	Calculated
Distance (Miles)	48	
Transportation Cost per Mile	$2.90	Unit Rate
Transportation Cost	$0	Calculated
Disposal		
Disposal Fee per Cubic Yard	$13.50	Unit Rate
Load Volume (Cubic Yards)	20	
Disposal Cost	$0	Calculated
Total Landfill Cost	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
I WELLFIELD PIPING (continued)		
C. Transport & Disposal (continued)		
Licensed Site		
Transportation		
Percent to be Shipped	100.0%	Calculated
Loads to be Shipped	5.8	Calculated
Distance (Miles)	105	
Transportation Cost per Mile	$2.90	Unit Rate
Transportation Cost	$1,766	Calculated
Disposal		
Disposal Fee per Cubic Foot	$12.38	Unit Rate
Disposal Fee per Cubic Yard	$334.26	Calculated
Load Volume (Cubic Yards)	20	
Disposal Cost	$38,774	Calculated
Total Licensed Site Cost	$40,540	Calculated
Total Transport & Disposal Cost	$40,540	Calculated
TOTAL WELLFIELD PIPING REMOVAL & DISPOSAL COST	$83,376	Calculated
II PRODUCTION WELL PUMPS		
A. Pump and Tubing Removal		
Number of Production Wells	241	
Removal Cost per Well	$12.07	Unit Rate
Removal Cost	$2,908	Calculated
Number of Pumps per Truck Load	180	
Number of Truck Loads (Pumps)	1.3	Calculated
B. Survey & Decontamination (Pumps)		
Percent Requiring Decontamination	0.0%	
Number of Decontamination Truck Loads	0.0	Calculated
Decontamination Cost per Load	$0.00	Unit Rate
Decontamination Cost	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
II PRODUCTION WELL PUMPS (continued)		
C. Tubing Volume Reduction & Loading		
Length per Well (Feet)	360	
Total Length (Feet)	86,760	Calculated
Removal Cost per Foot	$0.014	Unit Rate
Removal Cost	$1,171	Calculated
Average OD (Inches)	2.0	
Chipped Volume Reduction (Cubic Feet per Foot)	0.012	
Chipped Volume (Cubic Feet)	1,041	Calculated
Volume per Truck Load (Cubic Feet)	540	
Number of Truck Loads	1.9	Calculated
D. Transport & Disposal		
Landfill		
Transportation		
Percent to be Shipped (Pumps)	100.0%	
Loads to be Shipped	1.3	Calculated
Distance (Miles)	48	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$181	Calculated
Disposal		
Disposal Fee per Cubic Yard	$13.50	Unit Rate
Load Volume (Cubic Yards)	20	
Disposal Cost	$351	Calculated
Total Landfill Cost	$532	Calculated
Licensed Site		
Transportation		
Percent to be Shipped (Pumps)	0.0%	
Percent to be Shipped (Tubing)	100.0%	
Loads to be Shipped	1.9	Calculated
Distance (Miles)	105	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$587	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
II PRODUCTION WELL PUMPS (continued)		
D. Transport & Disposal (continued)		
Licensed Site (continued)		
Disposal		
Disposal Cost per Cubic Foot	$12.38	Unit Rate
Disposal Fee per Cubic Yard	$334.26	Calculated
Load Volume (Cubic Yards)	20	
Disposal Cost	$12,889	Calculated
Total Licensed Site Cost	$13,476	Calculated
Total Transport & Disposal Cost	$14,008	Calculated
TOTAL PRODUCTION WELL PUMP REMOVAL & DISPOSAL COST	$18,087	Calculated
III SURFACE TRUNKLINE PIPING		
A. Removal		
Total Length (Feet)	0	
Removal Cost per Foot	$0.081	Unit Rate
Removal Cost	$0	Calculated
Average OD (Inches)	8.750	
Chipped Volume Reduction (Cubic Feet per Foot)	0.088	Unit Rate
Chipped Volume (Cubic Feet)	0	Calculated
Volume per Truck Load (Cubic Feet)	540	
Total Number of Truck Loads	0.0	Calculated
B. Survey & Decontamination		
Percent Requiring Decontamination	0.0%	
Number of Decontamination Truck Loads	0.0	Calculated
Decontamination Cost per Load	$0.00	Unit Rate
Decontamination Cost	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
III SURFACE TRUNKLINE PIPING (continued)		
C. Transport & Disposal		
Landfill		
Transportation		
Percent to be Shipped	0.0%	
Loads to be Shipped	0.0	Calculated
Distance (Miles)	48	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$0	Calculated
Disposal		
Disposal Fee per Cubic Yard	$13.50	Unit Rate
Load Volume (Cubic Yards)	20	
Disposal Cost	$0	Calculated
Total Landfill Cost	$0	Calculated
Licensed Site		
Transportation		
Percent to be Shipped	100.0%	Calculated
Loads to be Shipped	0.0	Calculated
Distance (Miles)	105	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$0	Calculated
Disposal		
Disposal Cost per Cubic Foot	$12.38	Unit Rate
Disposal Fee per Cubic Yard	$334.26	Calculated
Load Volume (Cubic Yards)	20	
Disposal Cost	$0	Calculated
Total Licensed Site Cost	$0	Calculated
Total Transport & Disposal Cost	$0	Calculated
TOTAL SURFACE TRUNKLINE PIPING REMOVAL & DISPOSAL COST	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
IV BURIED TRUNKLINE		
A. Removal		
Total Length (Feet)	24,304	
Removal Cost per Buried Foot	$1.58	Unit Rate
Removal Cost	$19,139	Calculated
Average OD (Inches)	9.635	
Chipped Volume Reduction (Cubic Feet per Foot)	0.309	Unit Rate
Chipped Volume (Cubic Feet)	7,510	Calculated
Volume per Truck Load (Cubic Feet)	540	
Number of Truck Loads	13.9	Calculated
B. Survey & Decontamination		
Percent Requiring Decontamination	0.0%	
Number of Decontamination Truck Loads	0.0	Calculated
Decontamination Cost per Load	$0.00	Unit Rate
Decontamination Cost	$0	Calculated
C. Transport & Disposal		
Landfill		
Transportation		
Percent to be Shipped	0.0%	
Loads to be Shipped	0.0	Calculated
Distance (Miles)	48	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$0	Calculated
Disposal		
Disposal Fee per Cubic Yard	$13.50	Unit Rate
Load Volume (Cubic Yards)	20	
Disposal Cost	$0	Calculated
Total Landfill Cost	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
IV BURIED TRUNKLINE (continued)		
C. Transport & Disposal (continued)		
Licensed Site		
Transportation		
Percent to be Shipped	100.0%	Calculated
Loads to be Shipped	13.9	Calculated
Distance (Miles)	105	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$4,233	Calculated
Disposal		
Disposal Cost per Cubic Foot	$12.38	Unit Rate
Disposal Fee per Cubic Yard	$334.26	Calculated
Load Volume (Cubic Yards)	20	
Disposal Cost	$92,924	Calculated
Total Licensed Site Cost	$97,157	Calculated
Total Transport & Disposal Cost	$97,157	Calculated
TOTAL BURIED TRUNKLINE REMOVAL & DISPOSAL COST	$116,296	Calculated
V MANHOLES		
A. Removal		
Total Quantity	9	
Removal Cost per Manhole	$73.16	Unit Rate
Removal Cost	$658	Calculated
Quantity per Truck Load	10	
Number of Truck Loads	0.9	Calculated
B. Survey & Decontamination		
Percent Requiring Decontamination	0.0%	
Number of Decontamination Truck Loads	0.0	Calculated
Decontamination Cost per Load	$0.00	Unit Rate
Decontamination Cost	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: E. Wellfield Equipment Removal and Disposal - WORKSHEET 6

Assumptions/Items	Mine Unit No. 1	Source
V MANHOLES (continued)		
C. Transport & Disposal		
Landfill		
Transportation		
Percent to be Shipped	0.0%	
Loads to be Shipped	0.0	Calculated
Distance (Miles)	48	Unit Rate
Cost per Mile	$2.90	Calculated
Transportation Cost	$0	
Disposal		
Disposal Fee per Cubic Yard	$13.50	Unit Rate
Load Volume (Cubic Yards)	20	
Disposal Cost	$0	Calculated
Total Landfill Cost	$0	Calculated
Licensed Site		
Transportation		
Percent to be Shipped	100.0%	Calculated
Loads to be Shipped	0.9	Calculated
Distance (Miles)	105	
Cost per Mile	$2.90	Unit Rate
Transportation Cost	$274	Calculated
Disposal		
Disposal Cost per Cubic Foot	$12.38	Unit Rate
Disposal Fee per Cubic Yard	$334.26	Calculated
Load Volume (Cubic Yards)	20	
Disposal Cost	$6,017	Calculated
Total Licensed Site Cost	$6,291	Calculated
Total Transport & Disposal Cost	$6,291	Calculated
TOTAL MANHOLE REMOVAL & DISPOSAL COST	$6,949	Calculated
TOTAL WELLFIELD EQUIPMENT REMOVAL AND DISPOSAL COST	**$224,708**	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
I PLANT		
A. Topsoil Handling & Grading		
Affected Area (Acres)	5.0	
Average Affected Thickness (Inches)	12.0	
Topsoil Volume (Cubic Yards)	8,067	Calculated
Hauling/Placement Cost per Cubic Yard	$1.13	Unit Cost
Topsoil Handling Cost	$9,115	Calculated
Grading Cost per Acre	$56.28	Unit Cost
Grading Cost	$281	Calculated
Total Topsoil Handling & Grading Cost	$9,397	Calculated
B. Radiation Survey & Soil Analysis		
Survey & Analysis Cost per Acre	$653.00	Unit Cost
Total Survey & Analysis Cost	$3,265	Calculated
C. Revegetation		
Fertilizer Cost per Acre	$52.33	Unit Cost
Seeding Preparation & Seeding Cost per Acre	$189.85	Unit Cost
Mulching & Crimping Cost per Acre	$311.25	Unit Cost
Total Revegetation Cost per Acre	$553.43	Calculated
Total Revegetation Cost	$2,767	Calculated
TOTAL PLANT COST	$15,429	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
II PONDS		
A. Topsoil Handling & Grading		
Affected Area (Acres)	5.0	
Average Affected Thickness (Inches)	12	
Topsoil Volume (Cubic Yards)	8,067	Calculated
Hauling/Placement Cost per Cubic Yard	$1.13	Unit Cost
Topsoil Handling Cost	$9,115	Calculated
Grading Cost per Acre	$56.28	Unit Cost
Grading Cost	$281	Calculated
Total Topsoil Handling & Grading Cost	$9,397	Calculated
B. Radiation Survey & Soil Analysis		
Survey & Analysis Cost per Acre	$653.00	Unit Cost
Total Survey & Analysis Cost	$3,265	Calculated
C. Revegetation		
Fertilizer Cost per Acre	$52.33	Unit Cost
Seeding Preparation & Seeding Cost per Acre	$189.85	Unit Cost
Mulching & Crimping Cost per Acre	$311.25	Unit Cost
Total Revegetation Cost per Acre	$553.43	Calculated
Total Revegetation Cost	$2,767	Calculated
TOTAL POND COST	$15,429	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
III WELLFIELDS		
A. Topsoil Handling & Grading		
Affected Area (Acres)	0.0	
Average Affected Thickness (Inches)	3.5	
Topsoil Volume (Cubic Yards)	0	Calculated
Hauling/Placement Cost per Cubic Yard	$1.13	Unit Cost
Topsoil Handling Cost	$0	Calculated
Grading Cost per Acre	$56.28	Unit Cost
Grading Cost	$0	Calculated
Total Topsoil Handling & Grading Cost	$0	Calculated
B. Radiation Survey & Soil Analysis		
Survey & Analysis Cost per Acre	$653.00	Unit Cost
Total Survey & Analysis Cost	$0	Calculated
C: Spill Cleanup		
Affected Area (Acres)	-	Calculated
Affected Area (Square Feet)	-	
Average Affected Thickness (Feet)	0.25	
Affected Volume (Cubic Feet)	-	Calculated
Volume per Truck Load (Cubic Feet)	540	
Number of Truck Loads	0.0	Calculated
Distance (Miles)	105	
Cost per Mile	$2.90	Unit Cost
Transportation Cost	$0	Calculated
Handling Cost per Truck Load	$238	Unit Cost
Handling Cost	$0	Calculated
Disposal Fee per Cubic Foot	$4.16	Unit Cost
Disposal Cost	$0	Calculated
Total Spill Cleanup Cost	$0	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
III WELLFIELDS (continued)		
D. Revegetation		
Fertilizer Cost per Acre	$52.33	Unit Cost
Seeding Preparation & Seeding Cost per Acre	$189.85	Unit Cost
Mulching & Crimping Cost per Acre	$311.25	Unit Cost
Total Revegetation Cost per Acre	$553.43	Calculated
Total Revegetation Cost	$0	Calculated
TOTAL WELLFIELDS COST	$0	Calculated
IV ROADS		
A. Topsoil Handling & Grading		
Affected Area (Acres)	11.1	

Main Road Lengths (ft)	Secondary Road Lengths (ft)	
1,556		
594		
228		
356	966	
362	391	
211	276	
2,309	291	
1,260	311	
244	257	
1,029	330	
5,049	323	
13,198	3,145	Total Road Lengths (Feet)
20	12	Road Width (Feet)
12	8	Road Borrow (Feet)
32	20	Road Width and Borrow (Feet)
9.7	1.4	Road Area (Acres)
11.1		**Total Road Area (Acres)**

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
IV ROADS (continued)		
A. Topsoil Handling & Grading (continued)		
Average Affected Thickness (Inches)	12	
Topsoil Volume (Cubic Yards)	17,908	Calculated
Hauling/Placement Cost per Cubic Yard	$1.13	Unit Cost
Topsoil Handling Cost	$20,236	Calculated
Grading Cost per Acre	$56.28	Unit Cost
Grading Cost	$625	Calculated
Total Topsoil Handling & Grading Cost	$20,861	Calculated
B. Radiation Survey & Soil Analysis		
Survey & Analysis Cost per Acre	$653.00	Unit Cost
Total Survey & Analysis Cost	$7,248	Calculated
C. Revegetation		
Fertilizer Cost per Acre	$52.33	Unit Cost
Seeding Preparation & Seeding Cost per Acre	$189.85	Unit Cost
Mulching & Crimping Cost per Acre	$311.25	Unit Cost
Total Revegetation Cost per Acre	$553.43	Calculated
Total Revegetation Cost	$6,143	Calculated
TOTAL ROADS COST	$34,252	Calculated

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
V OTHER		
A. Topsoil Handling & Grading		
Affected Area (Acres)	1.0	
Average Affected Thickness (Inches)	3.0	
Topsoil Volume (Cubic Yards)	403.33	Calculated
Hauling/Placement Cost per Cubic Yard	$1.13	Unit Cost
Topsoil Handling Cost	$456	Calculated
Grading Cost per Acre	$56.28	Unit Cost
Grading Cost	$56	Calculated
Total Topsoil Handling & Grading Cost	$512	Calculated
B. Radiation Survey & Soil Analysis		
Survey & Analysis Cost per Acre	$653.00	Unit Cost
Total Survey & Analysis Cost	$653	Calculated
C. Revegetation		
Fertilizer Cost per Acre	$52.33	Unit Cost
Seeding Preparation & Seeding Cost per Acre	$189.85	Unit Cost
Mulching & Crimping Cost per Acre	$311.25	Unit Cost
Total Revegetation Cost per Acre	$553.43	Calculated
Total Revegetation Cost	$553	Calculated
TOTAL OTHER COST	$1,718	Calculated

Table RP-4 Reclamation/Restoration Bond Estimate (Page 36 of 37)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: F. Topsoil Replacement and Revegetation - WORKSHEET 7

Assumptions/Items	Mine Unit No. 1	Source
VI REMEDIAL ACTION		
A. Topsoil Handling & Grading		
Affected Area (Acres)	11.1	
Average Affected Thickness (Inches)	0.0	
Topsoil Volume (Cubic Yards)	0	Calculated
Hauling/Placement Cost per Cubic Yard	$1.13	Unit Cost
Topsoil Handling Cost	$0	Calculated
Grading Cost per Acre	$0.00	Unit Cost
Grading Cost	$0	Calculated
Total Topsoil Handling & Grading Cost	$0	Calculated
B. Radiation Survey & Soil Analysis		
Survey & Analysis Cost per Acre	$0.00	Unit Cost
Total Survey & Analysis Cost	$0	Calculated
C. Revegetation		
Fertilizer Cost per Acre	$52.33	Unit Cost
Seeding Preparation & Seeding Cost per Acre	$189.85	Unit Cost
Mulching & Crimping Cost per Acre	$311.25	Unit Cost
Total Revegetation Cost per Acre	$553.43	Calculated
Total Revegetation Cost	$6,115	Calculated
TOTAL REMEDIAL ACTION COST	$6,115	Calculated
TOTAL TOPSOIL REPLACEMENT AND REVEGETATION COST	**$72,944**	

Table RP-4 Reclamation/Restoration Bond Estimate (Page 37 of 37)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: G. Miscellaneoues Reclamation Activities - WORKSHEET 8

Assumptions/Items	Quantity	Source
I FENCE REMOVAL & DISPOSAL		
Length (Feet)	9,500	
Removal & Disposal Cost per Foot	$0.34	Unit Cost
TOTAL FENCE REMOVAL AND DISPOSAL COST	$3,230	Calculated
II POWERLINE REMOVAL & DISPOSAL		
Length (Feet)	15,300	
Removal & Disposal Cost per Foot	$1.00	Unit Cost
TOTAL POWERLINE REMOVAL & DISPOSAL COST	$15,300	Calculated
III POWERPOLE REMOVAL & DISPOSAL		
Number of Powerpoles	51	
Removal & Disposal Cost per Powerpole	$100.00	Unit Cost
TOTAL POWERPOLE REMOVAL & DISPOSAL COST	$5,100	Calculated
IV TRANSFORMER REMOVAL & DISPOSAL		
Number of Transformers	12	
Removal & Disposal Cost per Transformer	$2,428	Unit Cost
TOTAL TRANSFORMER REMOVAL & DISPOSAL COST	$29,131	Calculated
V BOOSTER PUMP ASSEMBLY REMOVAL & DISPOSAL		
Number of Booster Pump Assemblies	0	
Removal & Disposal Cost per Booster Pump Assembly	$149	Unit Cost
TOTAL BOOSTER PUMP ASSEMBLY REMOVAL & DISPOSAL COST	$0	Calculated
VI CULVERT REMOVAL & DISPOSAL		
Length (Feet)	200	
Removal & Disposal Cost per Foot	$1.74	Unit Cost
TOTAL CULVERT REMOVAL & DISPOSAL COST	$348	Calculated
VII UTILITIES		
Number of Months	6	
Cost per Month	$2,380	Unit Cost
TOTAL UTILITIES COST	$14,280	Calculated
VIII DDW PIPELINE REMOVAL AND DISPOSAL		
Length (Feet)	21,730	
Removal & Disposal Cost per Foot	$4.45	Unit Cost
TOTAL DDW PIPELINE REMOVAL & DISPOSAL COST	$96,800	Calculated
TOTAL MISCELLANEOUS RECLAMATION ACTIVITIES COST	**$164,189**	Calculated

Table RP-5 Equipment and Tank List for Bond Estimate (Page 1 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank List

	Quantity	Length (Feet)	Width or Area (Feet or Square Feet)	Thickness (Feet)	Volume (Cubic Feet)	Volume (Cubic Yards)	Contamination	Contaminated Volume (Cubic Yards)	Percent Contamination
SHOP / LAB / OFFICE									
Concrete									
Shop Floor	1	180	40	0.5	3600	133.3	N	0.0	0.0%
Lab Floor	1	40	40.5	0.5	810	30.0	Y	30.0	10.2%
Office Floor	1	40	80	0.5	1600	59.3	N	0.0	0.0%
Perimeter Beam	1	340	1	4	1360	50.4	N	0.0	0.0%
Internal Perimeter	1	300	1	2	600	22.2	N	0.0	0.0%
Total Concrete					7970.0	295.2		30.0	10.2%
Equipment									
Lab Tables	1	1	435	3	1305	48.3	Y	48.3	70.7%
Air Compressor	1	3	3	2	18	0.7	N	0.0	0.0%
Water Heater	2	3	3	6	108	4.0	N	0.0	0.0%
Generator	1	6	4	4	96	3.6	N	0.0	0.0%
MCC	1	20	2	8	320	11.9	N	0.0	0.0%
Total Equipment					1847	68.4		48.3	70.7%
TOTAL SHOP / LAB / OFFICE					**9817**	**363.6**		**78.3**	**21.5%**

Table RP-5 Equipment and Tank List for Bond Estimate (Page 2 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank List										
		Quantity	Length (Feet)	Width or Area (Feet or Square Feet)	Thickness (Feet)	Volume (Cubic Feet)	Volume (Cubic Yards)	Contamination	Contaminated Volume (Cubic Yards)	Percent Contamination
PRECIPITATION SECTION										
	Concrete									
	Precip Floor	1	180	40	0.5	3600	133.3	Y	133.3	65.5%
	Perimeter Beam	1	40	1	4	160	5.9	Y	5.9	2.9%
	Internal Perimeter	1	400	1	2	800	29.6	Y	29.6	14.5%
	Tank Base	6	1	140	1	840	31.1	Y	31.1	15.3%
	Pump Base	4	5	5	1	100	3.7	Y	3.7	1.8%
	Total Concrete					5500	203.7		203.7	100.0%
	Equipment									
	Filter Press	2	12	3	4	288	10.7	Y	10.7	23.2%
	YC Slurry Tank	2	1	89.1	1	178.2	6.6	Y	6.6	14.3%
	YC Slurry Trailer	2	1	189	1	378	14.0	Y	14.0	30.4%
	Precip. Tank	4	1	91.8	1	367.2	13.6	Y	13.6	29.5%
	Pumps	8	2	2	1	32	1.2	Y	1.2	2.6%
	Total Equipment					1243	46.1		46.1	100.0%
TOTAL PRECIPITATION SECTION						**6743**	**249.8**		**249.8**	**100.0%**

Table RP-5 Equipment and Tank List for Bond Estimate (Page 3 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank List										
		Quantity	Length (Feet)	Width or Area (Feet or Square Feet)	Thickness (Feet)	Volume (Cubic Feet)	Volume (Cubic Yards)	Contamination	Contaminated Volume (Cubic Yards)	Percent Contamination
CHEMICAL STORAGE										
	Concrete									
	Chem. Floor	1	80	40	0.5	1600	59.3	N	0.0	0.0%
	Perimeter Beam	1	120	1	4	480	17.8	N	0.0	0.0%
	Internal Perimeter	1	120	1	2	240	8.9	N	0.0	0.0%
	Acid Floor	2	16	16	1	512	19.0	N	0.0	0.0%
	Acid Perimeter	2	64	1	2	256	9.5	N	0.0	0.0%
	Tank Base	4	1	140	1	560	20.7	N	0.0	0.0%
	Pump Base	4	5	5	1	100	3.7	N	0.0	0.0%
	Total Concrete					3748	138.8		0.0	0.0%
	Equipment									
	Soda Ash Tank	1	1	81	1	81	3.0	N	0.0	0.0%
	Bicarb Tank	1	1	56.7	1	56.7	2.1	N	0.0	0.0%
	NaOH Tank	1	1	81	1	81	3.0	N	0.0	0.0%
	NaCl Saturator	1	1	75.6	1	75.6	2.8	N	0.0	0.0%
	Peroxide Tank	1	1	18.9	1	18.9	0.7	N	0.0	0.0%
	HCl Tank	1	1	2.7	1	2.7	0.1	N	0.0	0.0%
	Acid Tank	2	1	56.7	1	113.4	4.2	N	0.0	0.0%
	Pumps	6	2	2	1	24	0.9	N	0.0	0.0%
	Total Equipment					453	16.8		0.0	0.0%
TOTAL CHEMICAL STORAGE						**4201**	**155.6**		**0.0**	**0.0%**

Table RP-5 Equipment and Tank List for Bond Estimate (Page 4 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank List

	Quantity	Length (Feet)	Width or Area (Feet or Square Feet)	Thickness (Feet)	Volume (Cubic Feet)	Volume (Cubic Yards)	Contamination	Contaminated Volume (Cubic Yards)	Percent Contamination
ION EXCHANGE SECTION									
Concrete									
IX Floor A	1	180	80	0.5	7200	266.7	Y	266.7	64.3%
IX Floor B	1	40	40	0.5	800	29.6	Y	29.6	7.1%
Perimeter Beam	1	300	1	4	1200	44.4	Y	44.4	10.7%
Tank Base	12	1	140	1	1680	62.2	Y	62.2	15.0%
IX Base	56	1	1	2	112	4.1	Y	4.1	1.0%
Pump Base	8	5	5	1	200	7.4	Y	7.4	1.8%
Total Concrete					11192	414.5		414.5	100.0%
Equipment									
IX Column	10	1	86.4	1	864	32.0	Y	32.0	28.8%
Guard Column	2	1	64.8	1	129.6	4.8	Y	4.8	4.3%
Elution Vessel	2	1	86.4	1	172.8	6.4	Y	6.4	5.8%
Fresh Eluate Tank	2	1	91.8	1	183.6	6.8	Y	6.8	6.1%
Eluate Tank	2	1	91.8	1	183.6	6.8	Y	6.8	6.1%
Rich Eluate Tank	2	1	99.9	1	199.8	7.4	Y	7.4	6.7%
Fresh Water Tank	2	1	91.8	1	183.6	6.8	Y	6.8	6.1%
Resin Water Decant	1	1	35.1	1	35.1	1.3	Y	1.3	1.2%
Resin Water Tank	1	1	91.8	1	91.8	3.4	Y	3.4	3.1%
Waste Water Tank	2	1	91.8	1	183.6	6.8	Y	6.8	6.1%
RW Sand Filter	1	1	13.5	1	13.5	0.5	Y	0.5	0.5%
RW Bag Filter	4	1	0.8	1	3.2	0.1	Y	0.1	0.1%
RW Element Filter	4	1	0.8	1	3.2	0.1	Y	0.1	0.1%
Eluate Sump Filter	4	1	0.8	1	3.2	0.1	Y	0.1	0.1%
Eluate Bag Filter	6	1	0.8	1	4.8	0.2	Y	0.2	0.2%
Eluate Element Filter	4	1	0.8	1	3.2	0.1	Y	0.1	0.1%
Resin Screen	4	8	4	1	128	4.7	Y	4.7	4.3%
RO Unit	1	20	4	6	480	17.8	Y	17.8	16.0%
RO Pump	1	1	3.7	1	3.7	0.1	Y	0.1	0.1%
IC/PC Pump	12	1	3.7	1	44.4	1.6	Y	1.6	1.5%
WDW Pump	1	4	6	2	48	1.8	Y	1.8	1.6%
Sump Pump	4	1	1	3	12	0.4	Y	0.4	0.4%
Pumps	6	2	2	1	24	0.9	Y	0.9	0.8%
Total Equipment					2999	111.1		111.1	100.0%
TOTAL ION EXCHANGE SECTION					**14191**	**525.6**		**525.6**	**100.0%**

Table RP-5 Equipment and Tank List for Bond Estimate (Page 5 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank List

	Quantity	Length (Feet)	Width or Area (Feet or Square Feet)	Thickness (Feet)	Volume (Cubic Feet)	Volume (Cubic Yards)	Contamination	Contaminated Volume (Cubic Yards)	Percent Contamination
RESTORATION SECTION									
Concrete									
Rest. Floor	1	40	80	0.5	1600	59.3	Y	59.3	97.5%
IX Base	8	1	1	2	16	0.6	Y	0.6	1.0%
Pump Base	1	5	5	1	25	0.9	Y	0.9	1.5%
Total Concrete					1641	60.8		60.8	100.0%
Equipment									
Rest. Column	2	1	75.6	1	151.2	5.6	Y	5.6	5.9%
RO Unit	5	20	4	6	2400	88.9	Y	88.9	93.0%
RO Pump	5	1	3.7	1	18.5	0.7	Y	0.7	0.7%
Sump Pump	1	1	1	3	3	0.1	Y	0.1	0.1%
Pumps	2	2	2	1	8	0.3	Y	0.3	0.3%
Total Equipment					2580.7	95.6		95.6	100.0%
TOTAL RESTORATION SECTION					**4221.7**	**156.4**		**156.4**	**100.0%**

Table RP-5 Equipment and Tank Calculations for Bond Estimate (Page 6 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank Calculations

	Quantity	Type	Material	ID (Feet)	Height (Feet)	Unit Volume (Cubic Feet)	Total Volume (Cubic Feet)	Thickness (Inches)	Unit Dry Weight (Pounds)	Total Dry Weight (Pounds)	Unit Crushed Volume (Cubic Yards)	Total Crushed Volume (Cubic Yards)	Vessel Numbers
Pressure Vessels													
Ion Exchange Columns	10	Ellip Hd	CS	11.5	9	3739	37393	0.750	25000	250000	3.2	32.3	IX-1 to 10
Guard Columns	2	Ellip Hd	CS	6.5	9	1195	2389	0.500	9200	18400	2.4	4.8	IX-11, 12
Restoration Columns	2	Ellip Hd	CS	10	8	2513	5027	0.625	13700	27400	2.8	5.6	IX-13, 14
Elution Vessels	2	Ellip Hd	CS	11.5	9	3739	7479	0.750	25000	50000	3.2	6.5	E-1, 2
Tanks													
Fresh Eluate Tanks	2	Flat Btm	FRP	14	18	11084	22167	1.000	10,450	20,900	3.4	6.8	T-210A, B
Eluate Tanks	2	Flat Btm	FRP	14	18	11084	22167	1.000	10,450	20,900	3.4	6.8	T-211A, B
Rich Eluate Tanks	2	Flat Btm	FRP	14	20	12315	24630	1.000	11,286	22,572	3.7	7.3	T-212A, B
Fresh Water Tanks	2	Flat Btm	FRP	14	18	11084	22167	1.000	10,450	20,900	3.4	6.8	T-200A, B
Resin Water Decant	1	Cone Btm	FRP	12	8.5	3845	3845	0.750	3,896	3,896	1.3	1.3	T-201
Resin Water Tank	1	Flat Btm	FRP	14	18	11084	11084	1.000	10,450	10,450	3.4	3.4	T-202
Waste Water Tanks	2	Flat Btm	FRP	14	18	11084	22167	1.000	10,450	20,900	3.4	6.8	T-203A, B
Precipitation Tanks	4	Flat Btm	FRP	14	18	11084	44334	1.000	10,450	41,801	3.4	13.6	T-213A - D
Y/C Slurry Storage	2	Cone Btm	CS - RL	12.5	15	7363	14726	0.500	8,242	16,484	3.3	6.6	T-220A, B
Soda Ash Tank	1	Flat Btm	FRP	12	20	9048	9048	1.000	9,316	9,316	3.0	3.0	T-214
Bicarb Mix Tank	1	Flat Btm	FRP	12	12	5429	5429	1.000	6,449	6,449	2.1	2.1	T-215
NaCl Saturator	1	Flat Btm	FRP	12	18	8143	8143	1.000	8,599	8,599	2.8	2.8	T-216
NaOH Tank	1	Flat Btm	FRP	12	20	9048	9048	1.000	9,316	9,316	3.0	3.0	T-219
H2O2 Tank	1	Hor Tank	Alum	9	16.5	4199	4199	0.375	2,396	2,396	0.7	0.7	T-220
Acid Day Tank	1	Flat Btm	CS	5.5	6	570	570	0.250	773	773	0.1	0.1	T-217
Acid Tanks	2	Flat Btm	FRP	12	12	5429	10857	1.000	6,449	12,899	2.1	4.2	T-218A, B
Filtration													
RW Sand Filter	1	Ellip Hd	CS	6	12.5	1414	1414	0.500	7,450	7,450	0.5	0.5	
RW Bag Filter	2		316ss	2	3	38	75	0.375	175	351	0.03	0.1	
RW Element Filter	2		304ss	2	3	38	75	0.375	175	351	0.03	0.1	
Eluate Sump Filter	2		316ss	2	3	38	75	0.375	175	351	0.03	0.1	
Eluate Bag Filter	6		316ss	2	3	38	226	0.375	175	1,052	0.03	0.2	
Eluate Element Filter	2		304ss	2	3	38	75	0.375	175	351	0.03	0.1	
Slurry Filter Press	2						0			0	0.00	0.0	

Table RP-5 Equipment and Tank Calculations for Bond Estimate (Page 7 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Equipment and Tank Calculations

	Quantity	Type	Material	ID (Feet)	Height (Feet)	Unit Volume (Cubic Feet)	Total Volume (Cubic Feet)	Thickness (Inches)	Unit Dry Weight (Pounds)	Total Dry Weight (Pounds)	Unit Crushed Volume (Cubic Yards)	Total Crushed Volume (Cubic Yards)	Vessel Numbers
Pumps													
IC Pumps (75 hp submersible)	6		SS			3.7	22		560	3,360			P-206A - F
PC Pumps (75 hp submersible)	6		SS			3.7	22		560	3,360			P-207A - F
RO Pumps (75 hp horizontal)	6		CS/SS			3.7	22		560	3,360			
Waste Water Pumps (25 hp centrifugal)	2		SS				0		100	200			P-203A/B
Resin Water Pumps (20 hp centrifugal)	4		SS				0		265	1,060			P-201A/B, 202A/B
Waste Disposal Pump (Plunger)	2		CS/SS			23	46		2,400	4,800			
Sump Pumps (5 hp)	4		SS				0		295	1,180			
Reverse Osmosis													
200 GPM Unit	6						0			0			
Other													
Resin Screens	4		CS/SS				0			0			S-1A, B, S-2A, B
Water Heater							0			0			
Air Compressor							0			0			
Slurry Trailer	2		CS				0	0.375	15,000	30,000	7	14.0	TR-1, 2
Generator	2						0			0			
MCC							0			0			

FRP =	0.06
CS =	0.28
SS =	0.29
Al =	0.097
Accy Fact	1.1

Table RP-5 Deep Disposal Pipeline Calculations for Bond Estimate (Page 8 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Deep Disposal Pipeline Calculations

Assumptions/Items	Deep Disposal Well No. 1	Deep Disposal Well No. 2	Deep Disposal Well No. 3	Total	Source
PIPELINE					
A. Removal					
Total Length (Feet)	11,850	1,230	8,650	21,730	
Removal Cost per Foot	$0.79	$0.79	$0.79		Unit Rate
Removal Cost	$4,681	$486	$3,417		Calculated
Average OD (Inches)	4.500	4.500	4.500		
Chipped Volume Reduction (Cubic Feet per Foot)	0.309	0.309	0.309		Unit Rate
Chipped Volume (Cubic Feet)	3,662	380	2,673	6,715	Calculated
Volume per Truck Load (Cubic Feet)	540	540	540		
Number of Truck Loads	6.8	0.7	4.9	12.4	Calculated
B. Survey & Decontamination					
Percent Requiring Decontamination	0.0%	0.0%	0.0%		
Number of Decontamination Truck Loads	0.0	0.0	0.0	0.0	Calculated
Decontamination Cost per Load	$0.00	$0.00	$0.00		Unit Rate
Decontamination Cost	$0	$0	$0	$0	Calculated
C. Transport & Disposal					
Landfill					
Transportation					
Percent to be Shipped	0.0%	0.0%	0.0%		
Loads to be Shipped	0.0	0.0	0.0	0.0	Calculated
Distance (Miles)	48	48	48		
Cost per Mile	$2.90	$2.90	$2.90		Unit Rate
Transportation Cost	$0	$0	$0	$0	Calculated
Disposal					
Disposal Fee per Cubic Yard	$13.50	$13.50	$13.50		Unit Rate
Load Volume (Cubic Yards)	20	20	20		
Disposal Cost	$0	$0	$0	$0	Calculated
Total Landfill Cost	$0	$0	$0	$0	Calculated

Table RP-5 Deep Disposal Pipeline Calculations for Bond Estimate (Page 9 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Deep Disposal Pipeline Calculations

Assumptions/Items	Deep Disposal Well No. 1	Deep Disposal Well No. 2	Deep Disposal Well No. 3	Total	Source
PIPELINE (continued)					
C. Transport & Disposal (continued)					
Licensed Site					
Transportation					
Percent to be Shipped	100.0%	100.0%	100.0%		Calculated
Loads to be Shipped	6.8	0.7	4.9	12.4	Calculated
Distance (Miles)	105	105	105		
Cost per Mile	$2.90	$2.90	$2.90		Unit Rate
Transportation Cost	$2,071	$213	$1,492	$3,776	Calculated
Disposal					
Disposal Cost per Cubic Foot	$12.38	$12.38	$12.38		Unit Rate
Disposal Fee per Cubic Yard	$334.26	$334.26	$334.26		Calculated
Load Volume (Cubic Yards)	20	20	20		
Disposal Cost	$45,459	$4,680	$32,757	$82,896	Calculated
Total Licensed Site Cost	$47,530	$4,893	$34,250	$86,672	Calculated
Total Transport & Disposal Cost	$47,530	$4,893	$34,250	$86,672	Calculated
TOTAL PIPELINE REMOVAL & DISPOSAL COST	$52,211	$5,379	$37,666	$95,256	Calculated
MANHOLES					
A. Removal					
Total Quantity	1	0	1	2	
Removal Cost per Manhole	$73.16	$73.16	$73.16		Unit Rate
Removal Cost	$73	$0	$73	$146	Calculated
Quantity per Truck Load	10	10	10		
Number of Truck Loads	0.1	0.0	0.1	0.2	Calculated
B. Survey & Decontamination					
Percent Requiring Decontamination	0.0%	0.0%	0.0%		
Number of Decontamination Truck Loads	0.0	0.0	0.0	0.0	Calculated
Decontamination Cost per Load	$0.00	$0.00	$0.00		Unit Rate
Decontamination Cost	$0	$0	$0	$0	Calculated

Table RP-5 Deep Disposal Pipeline Calculations for Bond Estimate (Page 10 of 10)

LOST CREEK ISR, LLC DECOMMISSIONING AND SURFACE RECLAMATION: Deep Disposal Pipeline Calculations

Assumptions/Items	Deep Disposal Well No. 1	Deep Disposal Well No. 2	Deep Disposal Well No. 3	Total	Source
MANHOLES (continued)					
C. Transport & Disposal					
Landfill					
Transportation					
Percent to be Shipped	0.0%	0.0%	0.0%		
Loads to be Shipped	0.0	0.0	0.0	0.0	Calculated
Distance (Miles)	48	48	48		Unit Rate
Cost per Mile	$2.90	$2.90	$2.90		Calculated
Transportation Cost	$0	$0	$0	$0	
Disposal					
Disposal Fee per Cubic Yard	$13.50	$13.50	$13.50		Unit Rate
Load Volume (Cubic Yards)	20	20	20		
Disposal Cost	$0	$0	$0	$0	Calculated
Total Landfill Cost	$0	$0	$0	$0	Calculated
Licensed Site					
Transportation					
Percent to be Shipped	100.0%	100.0%	100.0%		Calculated
Loads to be Shipped	0.1	0.0	0.1	0.2	Calculated
Distance (Miles)	105	105	105		
Cost per Mile	$2.90	$2.90	$2.90		Unit Rate
Transportation Cost	$30	$0	$30	$61	Calculated
Disposal					
Disposal Cost per Cubic Foot	$12.38	$12.38	$12.38		Unit Rate
Disposal Fee per Cubic Yard	$334.26	$334.26	$334.26		Calculated
Load Volume (Cubic Yards)	20	20	20		
Disposal Cost	$669	$0	$669	$1,337	Calculated
Total Licensed Site Cost	$699	$0	$699	$1,398	Calculated
Total Transport & Disposal Cost	$699	$0	$699	$1,398	Calculated
TOTAL MANHOLE REMOVAL & DISPOSAL COST	$772	$0	$772	$1,544	Calculated
TOTAL DEEP DISPOSAL WELL PIPELINE REMOVAL AND DISPOSAL COS	**$52,983**	**$5,379**	**$38,438**	**$96,800**	Calculated
DEEP DISPOSAL WELL PIPELINE REMOVAL AND DISPOSAL COST PER FOOT				**$4.45**	Calculated