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OCT 2 1 2002

Mr. Daniel M. Gillen, Chief
U.S. Nuclear Regulatory Commission
Fuel Cycle Facilities Branch, NMSS
MS: T8A33
Washington, D.C. 20555-0001

Subject: Transmittal of the *Draft Ground Water Compliance Action Plan for the Lakeview, Oregon, UMTRA Project Site*

Dear Mr. Gillen:

Enclosed are two copies of the *Draft Ground Water Compliance Action Plan (GCAP) for the Lakeview, Oregon, UMTRA Project Site* for your review. I believe we have addressed concerns that Melvyn Leach mentioned in his letter, dated February 1, 2002. I would be glad to discuss the contents of this GCAP with you, Bill Von Till, or others of your staff at their convenience.

If you have questions or need additional copies, please contact me at 970/248-7612.

Sincerely,

Donald R. Metzler,
Program Manager

Enclosures

cc w/enclosures:
W. Von Till, NRC

cc w/o enclosures:
R.D. Dayvault, Stoller
Project File GWLKV 1.9 (Thru K. Sutton)

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GJO–GWLKV 1.9

UMTRA Ground Water Project

Ground Water Compliance Action Plan for the Lakeview, Oregon, UMTRA Project Site

October 2002

Prepared by the
U.S. Department of Energy
Grand Junction Office

Work Performed Under DOE Contract No DE–AC13–02GJ79491 for the U.S. Department of Energy

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October 2002

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Grand Junction Office
Grand Junction, Colorado

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UMTRA Ground Water Project Document Compilation for Lakeview, Oregon

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Acronyms and Abbreviations

ACL	alternate concentration limit
BLRA	baseline risk assessment
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
GCAP	Ground Water Compliance Action Plan
IC	institutional control(s)
MCLs	maximum concentration limits
mg/L	milligrams per liter
NEPA	National Environmental Policy Act
NRC	U.S. Nuclear Regulatory Commission
PEIS	Programmatic Environmental Impact Statement
RAP	Remedial Action Plan
ROD	Record of Decision
TDS	total dissolved solids
Surface EA	surface environmental assessment
UMTRA	Uranium Mill Tailings Remedial Action

1.0 Introduction

This Ground Water Compliance Action Plan (GCAP) presents the proposed compliance strategy for ground water cleanup at the Lakeview, Oregon, uranium processing site. It is based on U.S. Department of Energy (DOE) evaluation of information included in the engineering assessment for the site (DOE 1981), the surface environmental assessment (Surface EA) (DOE 1985), the *Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Lakeview, Oregon* (RAP) (DOE 1992), the baseline risk assessment (BLRA) (DOE 1996b), and information gathered from 1999 to 2002. This GCAP will serve as a stand-alone modification to the RAP, to address ground water restoration and compliance with the U.S. Environmental Protection Agency (EPA) ground water protection standards for the Uranium Mill Tailings Remedial Action (UMTRA) Project Title I sites. The GCAP will be the U.S. Nuclear Regulatory Commission (NRC) concurrence document for compliance with Subpart B of Title 40 *Code of Federal Regulations* Part 192 (40 CFR 192) for the Lakeview processing site.

The proposed compliance strategy for the Lakeview site is based on the compliance strategy selection framework presented in the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE 1996a). National Environmental Policy Act (NEPA) issues and environmental concerns are addressed in the Environmental Checklist for the site and are discussed in Section 5.0 of this document. The public has been actively involved in the decision-making process as discussed in Section 4.0 of this document.

To achieve compliance with Subpart B of 40 CFR 192 at the former Lakeview processing site, DOE proposes no remediation based on limited use ground water and application of supplemental standards. The criterion of 40 CFR 192.11(e)(2), "Widespread, ambient contamination not due to activities involving residual radioactive materials from a designated processing site exists that cannot be cleaned up using treatment methods reasonably employed in public water systems..." is cited. As a best management practice, DOE will also implement institutional controls (ICs) and monitoring to ensure the effectiveness of this compliance strategy. The discussion of site information in Section 2.0 provides justification for the compliance strategy. Details of the compliance strategy are discussed in Section 3.0.

End of current text

2.0 Site Information

2.1 Location

The Lakeview site is approximately 1.5 miles north-northwest of the town of Lakeview in Lake County, Oregon (Figure 2–1). The former millsite is located on private land east of County Road 2–18 and north of Missouri Avenue in Sections 3, 4, 9, and 10, Township 39S, Range 20E, Washington Meridian at 42 degrees 12 minutes 43 seconds north latitude and 120 degrees 22 minutes 09 seconds west longitude (Plate 1). The Lakeview site sits at the base of the Warner Mountains to the east, and is located within one of several fault-block basins in south-central Oregon, which are characterized by the presence of closed-basin lakes (Phillips and Van Denburgh 1971).

2.2 Remedial Action History and Current Land Status

The 258-acre site includes areas formerly occupied by seven raffinate or evaporation ponds and a tailings pile and mill buildings. From 1986 to 1988, 926,000 cubic yards of uranium mill tailings and other process-related solid waste were removed from the site and moved to a disposal cell located on the Collins Ranch property about 7 miles northwest of Lakeview. In some areas of the former raffinate or evaporation ponds, contaminated materials were removed from depths of more than 50 feet (ft) below ground surface (David Steward-Smith, personal communication 2002).

Pacific Pine Products, a lumber company, now uses the former mill buildings. Barbwire fences enclose the former evaporation pond and tailings pile areas in open fields. The entire site is zoned for commercial–light industrial use. The southern portion of the area is part of Lake County's urban growth boundary where commercial businesses could be developed.

2.3 Site Characteristics

2.3.1 Climate

The Lakeview area has low humidity, frequent sunny days, and moderate seasonal temperature ranges. The average annual temperature is 46 °F and ranges from an average of 27 °F in January to 67 °F in July (DOE 1996b). The average annual precipitation is 14 inches (DOE 1996b). The area is semidesert.

2.3.2 Geologic Setting and Hydrogeology

The regional geology is dominated by fault block structures, as evidenced by the normal fault along the west side of the Warner Mountains and the Goose Lake graben. Tertiary volcanic rocks occur in the upthrown fault blocks east and north of Lakeview, nearest the former millsite. Alluvial and lacustrine sediments within the graben may reach a thickness of 2,000 ft in the Lakeview area (DOE 1992).

Generally, individual pulses of sediment are coarser grained near the boundaries of the basin and become finer grained toward the center. The relative rate of basin subsidence and long-term climatic variations control the rates and types of deposition in various parts of the basin.

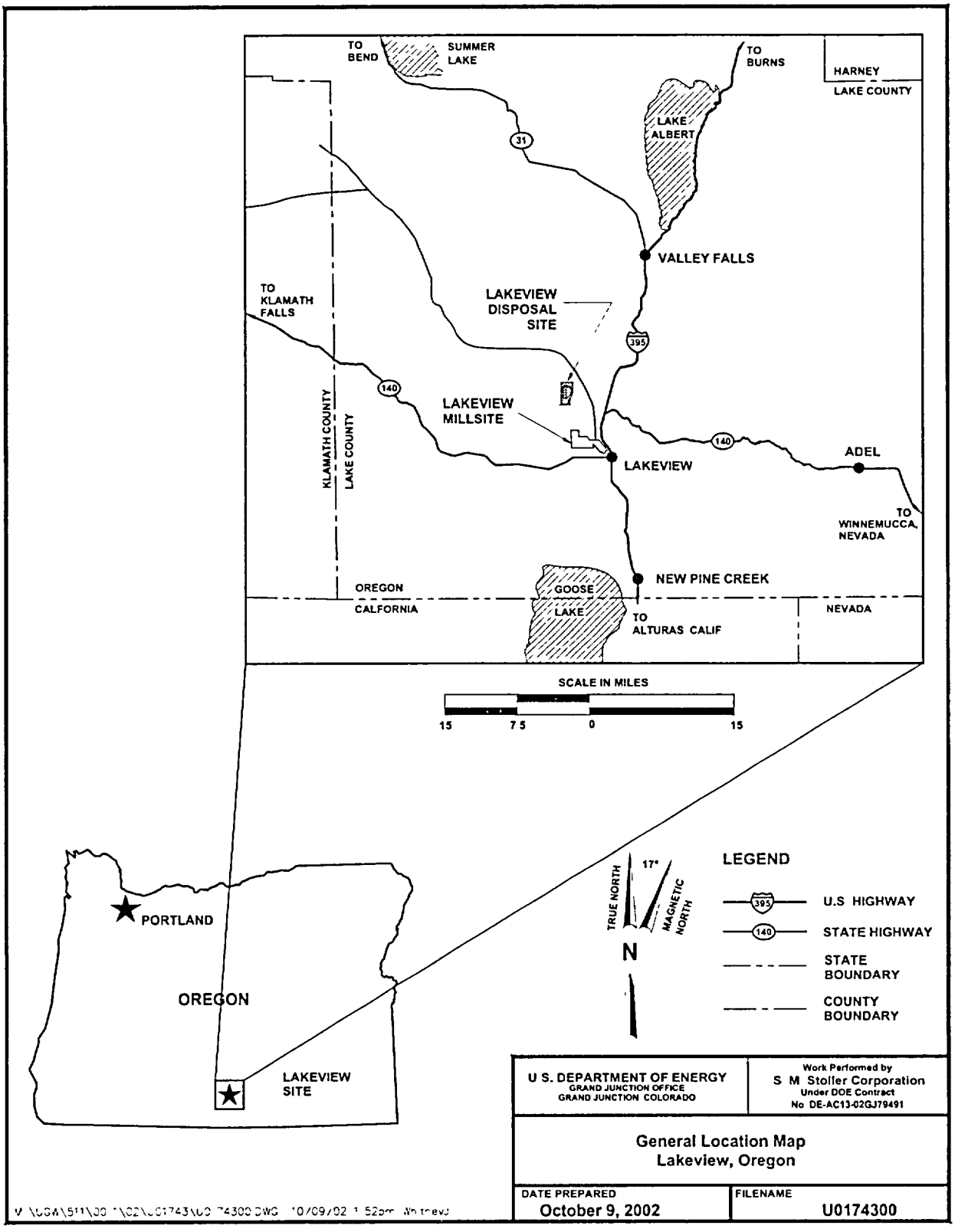

Figure 2–1. Location of the Lakeview, Oregon, Site

Differential subsidence is common in grabens as large as the Goose Lake basin and can also contribute to contemporaneous deposition of coarser- and finer-grained sediments in various areas. Wetter climatic periods producing long-lived lakes can produce finer-grained and more laterally continuous deposits. This combination of tectonics and climatic factors produces the heterogeneous and discontinuous clays, sands, and gravels seen in cross section in Figure 2–2 and Figure 2–3, which are based on borehole lithologic logs.

The BLRA identified two main water-bearing zones in the uppermost aquifer. The aquifer consists of a shallow water-bearing zone (30 ft or less below ground surface) and a deeper zone (60 to 75 ft below ground surface) that are partially separated by interfingering layers of clayey sediments. Aquifer testing has demonstrated that the two zones are hydraulically connected, though this connection is restricted (DOE 1996b). Further study of lithologic logs from wells installed by DOE during the surface cleanup program suggests that the proposed upper and lower intervals may be laterally continuous over limited areas but lack widespread lateral continuity. In the predominantly east-west cross section A–A' (Figure 2–2), sands and gravels are separated intermittently by clays and silts. Upper and lower zones may be distinguishable in several well pairs, but the zones are indistinguishable in other areas. Similarly, the predominantly north-south cross section B–B' (Figure 2–3) located farther out in the basin, does not consistently demonstrate separation of zones. However, the continued interfingering of finer- and coarser-grained sediments with depth can act as an effective hydrologic barrier.

Mr. Loren Lucore of Lucore Drilling Company, who has drilled shallow water wells in the Lakeview area for 30 years, was interviewed about the locations of water-bearing zones and the general quality of water. Mr. Lucore states that generally, fine sand and clay make up the uppermost 30 ft of the sediments, which can yield water of poor quality. An unctuous blue clay is present from about 30 ft to 45 ft in many locations, and a black sand to gravel that extends from 45 to 60 ft usually yields sufficient water for well production. Below 60 feet are various sands, gravels, and clays. Water quality is generally better at this depth, though it is poor enough in many locations that private well users install some type of treatment units before water can be consumed. Wells several hundred feet deep have much better quality water. This interpretation of sedimentary units and water quality generally agrees with lithologic logs and ground water analytical data.

In the area of the former millsite and in areas south of the site, the ground water in both the upper and lower zones flows from northeast to southwest at rates ranging from 50 to 160 ft per year (DOE 1996b). Figure 2–4 shows the recent potentiometric surface after three additional wells were installed to obtain water levels in the area south of the former millsite. It also shows a general west to southwest flow direction for the shallow ground water, away from the nearby Warner Mountains.

Ground water from a geothermal artesian source northeast of the site flows southwest through the subsurface beneath the western side of the site and feeds springs that surface north of the site at Hunters Hot Springs. Water from the hot springs feeds Hunters Creek, which flows to the southwest and enters into Warner Creek, located west of the site. Ground water quality at the Lakeview site is influenced by the geothermal waters, as discussed in Section 2.3.3. However, the influence of the geothermal waters on the site's ground water appears more important near the northern and western portions and becomes less important along the eastern and southern portions of the site.

2.3.3 Ground Water and Surface Water Quality

Water quality varies in the vicinity of the Lakeview site. This variation is probably the result of numerous influences, which may include milling processes at the Lakeview site. The BLRA compared ground water beneath the site with ground water assumed to be background and concluded that ground water beneath the Lakeview site was contaminated by former uranium-ore processing operations (DOE 1996b). The BLRA also concluded that constituents of potential concern in the alluvial aquifer were arsenic, boron, chloride, iron, manganese, molybdenum, nickel, sodium, sulfate, uranium, and polonium-210. A problem with this previous evaluation is that only a single well or well pair was used to represent nongeothermal background; this well pair was located near the base of the mountains along Hammersley Creek. Because that area receives recharge essentially directly from the mountains, the water quality may not be indicative of background water quality in the main portion of the valley.

A review of historical data from the Lakeview site creates some doubt that the site is the major source of ground water contamination in the area. The mill was operational less than 3 years over 40 years ago. Monitoring at the site has occurred for about the last 20 years. At other UMTRA Project sites with contaminants similar to those at Lakeview, concentrations of mill-related contaminants generally decrease over time. At Lakeview, no decreasing concentration trends have been observed. Uranium, the main constituent of the milling operation, is virtually absent in the ground water. It is possible that uranium and other mill-related constituents have been flushed from the site and replaced by ambient ground water. Other potential influences on ground water quality are discussed below.

Sediments comprising the alluvial aquifer were deposited in a closed lake setting and contain considerable natural salt. The soluble salts can only be removed by overflow into another basin, by incorporation into the lake bottom as interstitial brines, or by wind transport of desiccated evaporite minerals (Phillips and Van Denburgh 1971). Goose Lake has dried up several times in recent history and undoubtedly has contributed large amounts of salts into the sediments. An analysis of natural ground water from an aquifer containing marine sediments in an arid environment (from Dunne and Leopold 1978) contained total dissolved solids (TDS), sodium, chloride, and sulfate at concentrations of 9,135 milligrams per liter (mg/L), 3,150 mg/L, 3,900 mg/L, and 965 mg/L, respectively. It would be expected that natural ground water from a closed lake setting in the arid western U.S. would have some similarities to that derived from a saline marine sediment setting and would also have naturally high concentrations of those constituents. Other graben-controlled lakes in this semiarid area have high salt contents (Phillips and Van Denburgh 1971).

As noted in the BLRA (DOE 1996b), soils in the vicinity of the site are described by the U.S. Department of Agriculture Soil Conservation Service as "sodic and saline" and unfit for lawns, topsoil, and embankments, due to excess salt. Water quality is generally better to the east of the site where it is closer to the source of fresh surface-water recharge in the mountains. Farther west, where water has been in more prolonged contact with the salty lake sediments, water quality is generally poorer. It is possible that over time, as ground water flows through the salty lake deposits, some of the salt dissolves and becomes ground water TDS. Figure 2–5, from EPA's Ground Water Protection Strategy (EPA 1988), depicts a geologic and hydrologic setting much like that at Lakeview. The intertonguing of fine-grained sediments in the main basin may also retard ground water motion, which would further promote reaction of the ground water with the sediments.

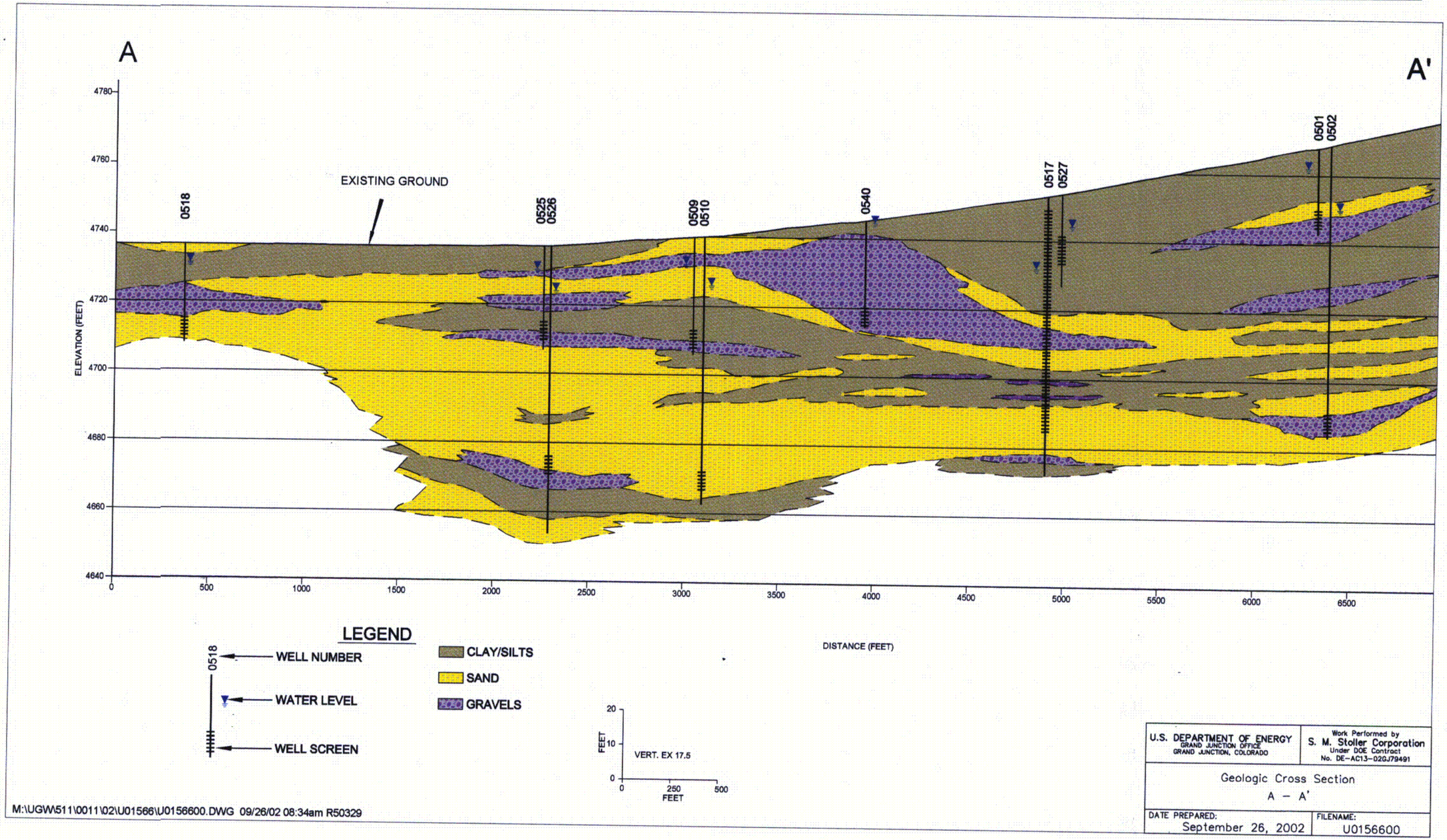

Figure 2–2. Geologic Cross Section A–A'

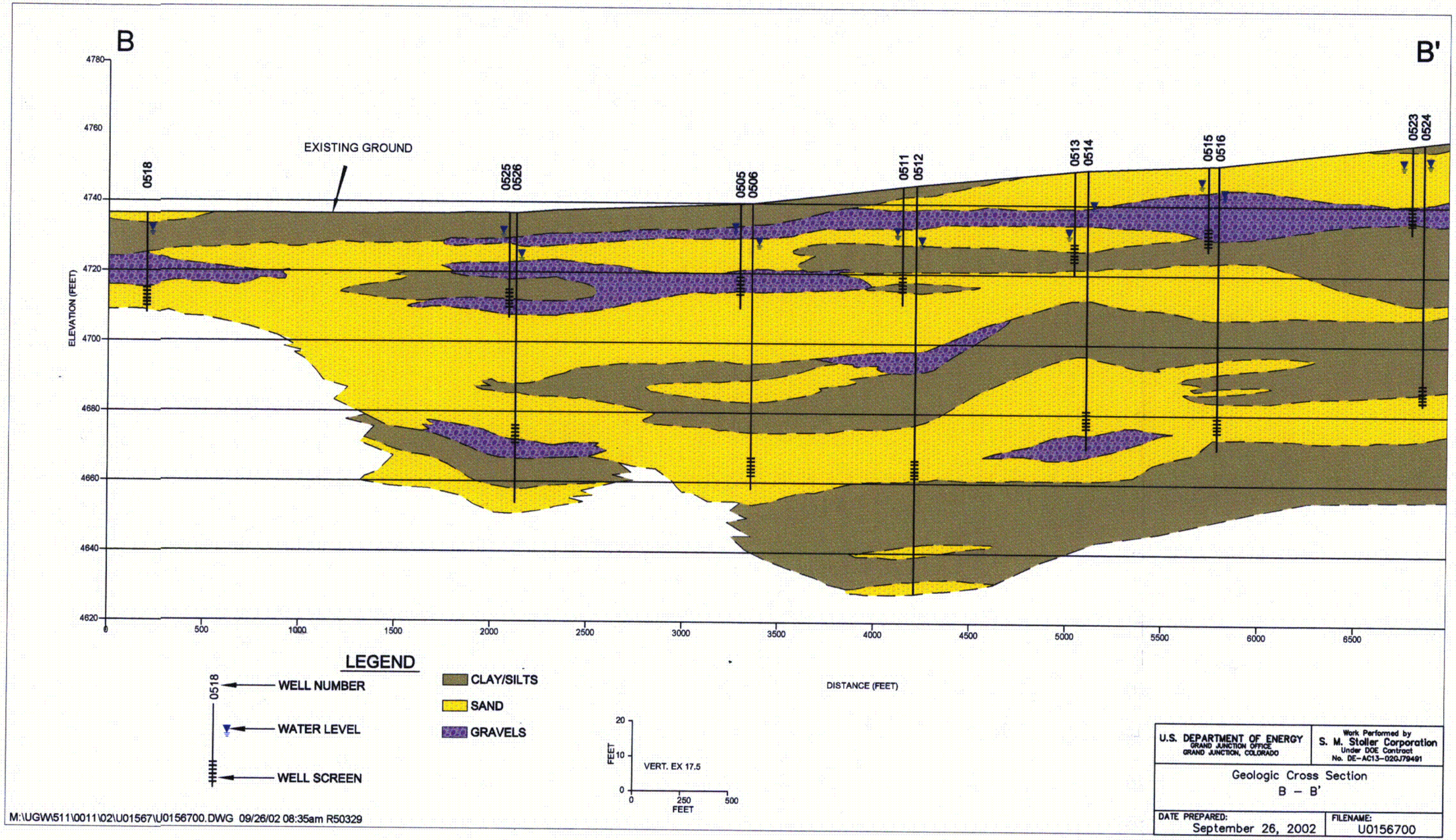

Figure 2–3. Geologic Cross Section B–B'

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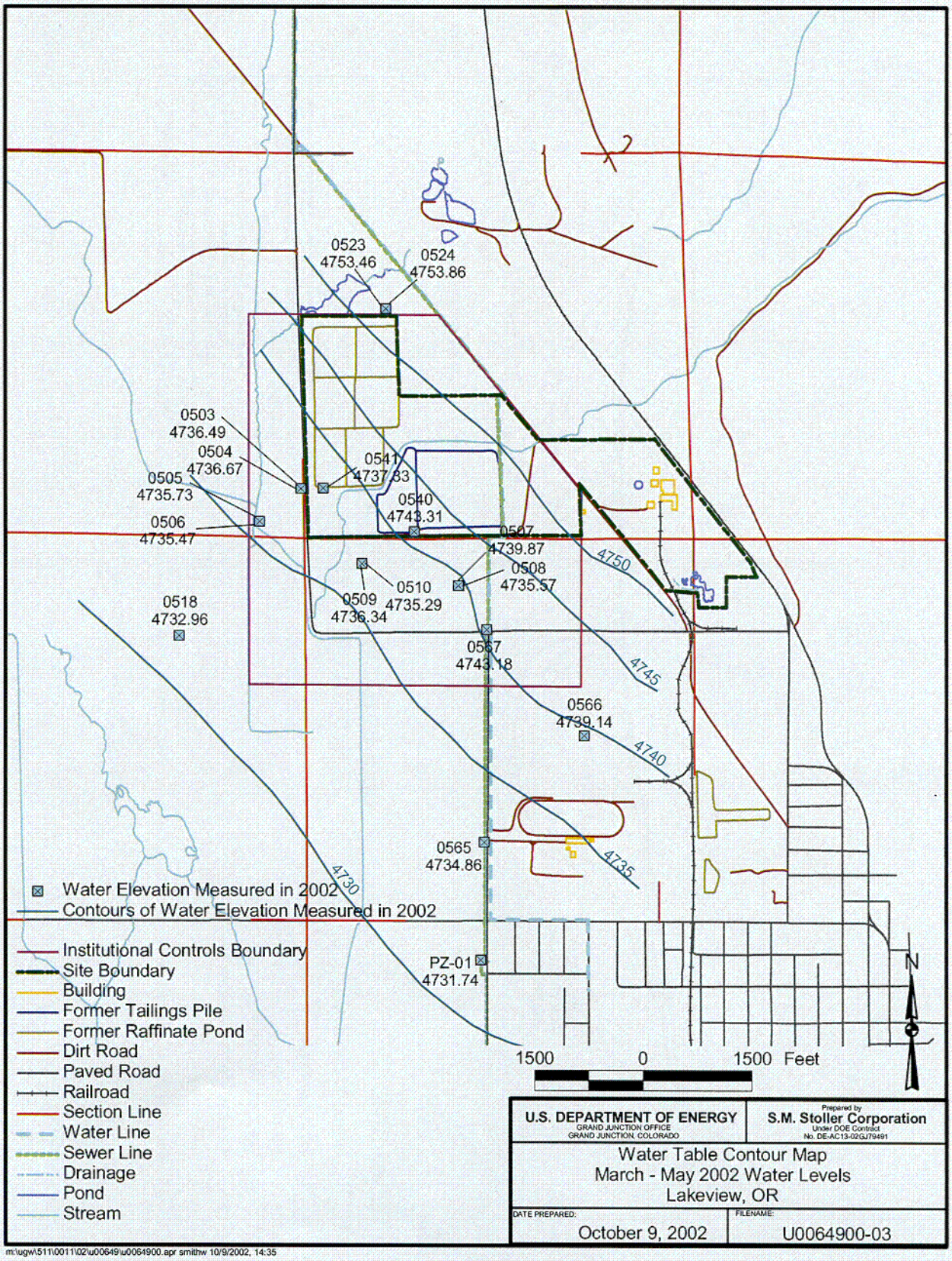

Figure 2–4. Water Table Contour Map, March–May 2002 Water Levels, Lakeview, Oregon

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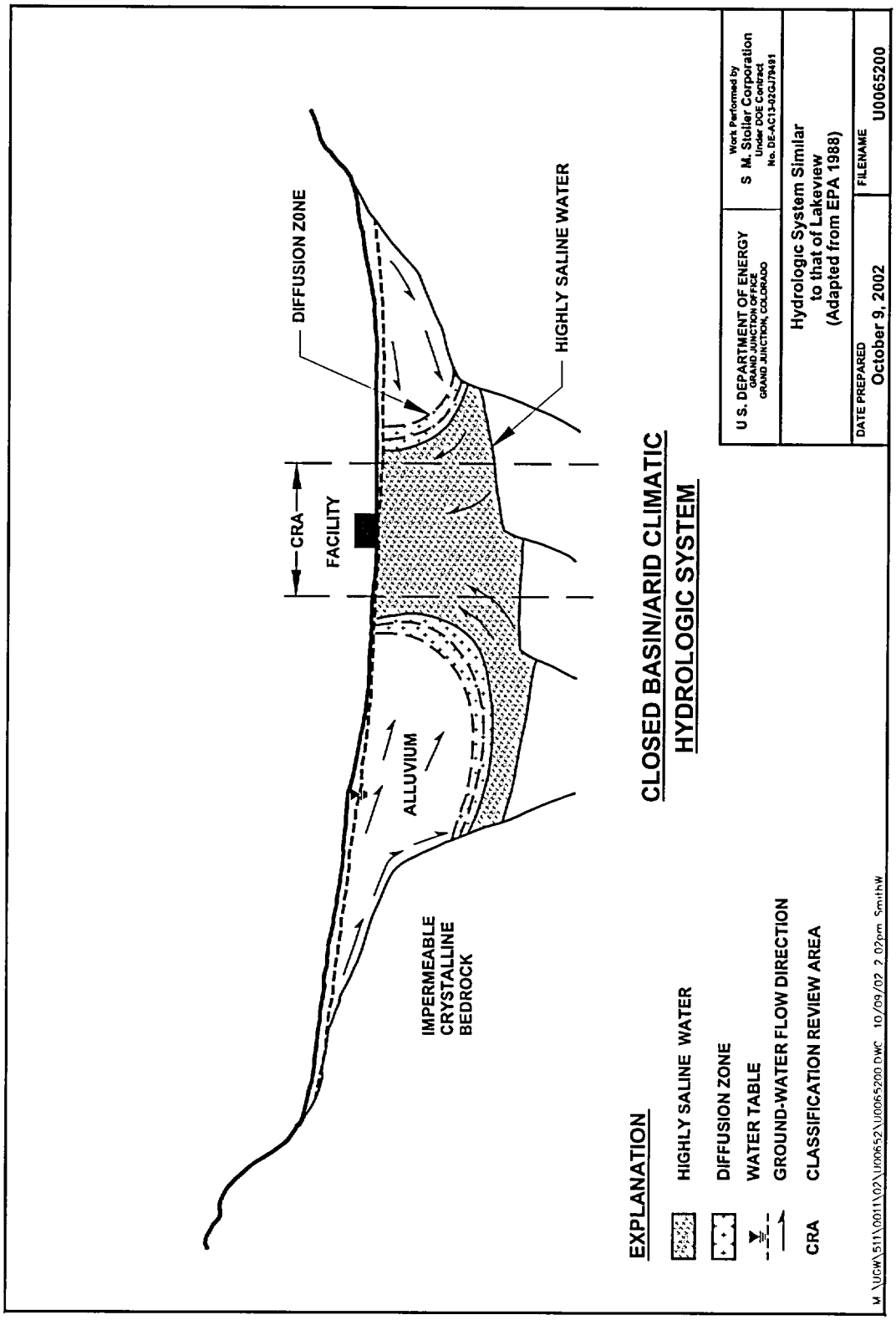

Figure 2–5. Hydrologic System Similar to That of Lakeview

Irrigation can also release salts from the lacustrine sediments. A large portion of the Goose Lake valley floor receives irrigation water; surface water from Thomas and Warner Creeks is diverted to a system of unlined irrigation ditches that serve the area west, southwest, and south of the site (DOE 1996b). Studies in other irrigated areas in the arid to semiarid west have shown that irrigation can lead to dissolution of salts in saline subsurface materials; subsequent discharge of salty ground water to area rivers can have a significant deleterious effect on surface water quality (DOI 1999).

As noted in Section 2.3.2, a geothermal area is present northeast of the Lakeview millsite. Arsenic and boron concentrations in ground water are elevated in the geothermal area and are most likely a product of that geothermal activity. Arsenic is known to be associated with geothermal systems in the western United States (Wedepohl 1974). Boron may also be present in subsurface geothermal fluids, or it may result from the dissolution of subsurface salts by those fluids. It is known that boron is a significant trace component in the subsurface salts in the Lakeview area (Phillips and Van Denburgh 1971). Likewise, chloride, sodium, and sulfate are significant components of those salts and could result from geothermal activity as well.

An isolated area of high sulfate concentrations in ground water is located south of the site along Roberta Avenue, about 2,500 ft east of the maximum extent of the sulfate plume. Ground water in this area also has elevated concentrations of chloride, sodium, calcium, manganese, and iron. The BLRA indicates that these constituents may not be related to uranium milling activities but instead may be related to the presence of fill from former logging ponds including fly ash upgradient from those wells. The porous fill may have trapped rain water and allowed increased leaching of naturally occurring salts in the soils. This could increase chloride, sodium, and sulfate in the ground water. Anecdotal evidence from residents downgradient of the logging facility suggests that operations at the facility adversely affected water quality in some private wells. A logging company also used the former raffinate ponds on the Lakeview site for similar purposes as the off-site operation and may have affected ground water quality in the vicinity of the site as well, further complicating interpretation of ground water quality. The BLRA also indicated that additional data should be gathered to determine the source of contamination in this southern area.

To address this issue, three shallow wells were drilled in May 2002 to measure the piezometric surface in the area south of the site. Figure 2–4 shows the piezometric surface contoured in this area using these new data. It shows the water table sloping off to the west, away from the Warner Mountains. According to this figure, ground water would not flow from the millsite to this southern area, and therefore, contamination along Roberta Avenue could not be derived from the former millsite.

Of the constituents that have UMTRA Project maximum concentration limits (MCLs) in 40 CFR 192, recent ground water and surface water analyses indicate that only three—arsenic, molybdenum, and uranium—have concentrations that exceed the standards. Most of the elevated arsenic concentrations can be attributed to the geothermal water, in which arsenic levels have routinely exceeded the standard by 2 to 4 times and have also exceeded health-based values. Only two on-site wells have arsenic concentrations that exceed the MCL; these concentrations may or may not be site related. The elevated values for molybdenum may be site related, but molybdenum has also been identified as a common trace constituent of surface water in Goose Lake (Phillips and Van Denburgh 1971). Also, concentrations exceed the molybdenum standard only slightly and at only two locations. Concentrations are below the risk-based concentration at

all locations and below detection at most locations. Uranium concentration has been slowly increasing in well 0540 since 1990 but did not exceed the UMTRA Project MCL (0.044 mg/L) until the March 2002 sample, which was 0.057 mg/L. The well is located downgradient of the former tailings pile, and uranium in the ground water was probably leached from the tailings. This is the only well that contains uranium in excess of 0.044 mg/L. Because it is located within the site boundary and the IC boundary, no one will have access to the ground water for unauthorized use. Well 0509, the nearest downgradient well from 0540, shows decreasing concentrations of uranium since monitoring began in 1985. Well 0540 will be monitored to track changes in uranium levels, and well 0509 will be sampled to ensure that uranium is not migrating.

Of the remaining constituents analyzed, boron, chloride, iron, manganese, sodium, sulfate, and TDS are the most highly elevated when compared to water quality standards or other benchmarks. Chloride, iron, manganese, sulfate, and TDS concentrations exceed federal secondary drinking water standards. These values are not enforceable and are based on considerations such as taste and smell. Only boron, manganese, sodium, and sulfate are a concern when ground water concentrations are compared to health-based benchmarks such as health advisories and risk-based concentrations. No toxicity data exist for chloride. Section 2.5 discusses human health and environmental risk.

Figure 2–6 through Figure 2–11 are spot plots that show the distributions of arsenic, chloride, sodium, manganese, sulfate, and TDS in samples from wells and surface water locations. Circles indicate results of the comprehensive March 2002 sample round; squares indicate where samples were collected in 1999 but could not be collected in 2002.

2.4 Applicability of Supplemental Standards

As the discussion of ground water quality in Section 2.3.3 indicates, there is sufficient evidence that some ground water contamination in the site area is not mill related. Although no single source seems to account for all the contaminants and their distribution, multiple processes result in an overall degradation of the aquifer. Ground water in the Lakeview area should qualify for supplemental standards on the basis of widespread ambient contamination not related to the milling process. The UMTRA ground water regulations in 40 CFR 192 note that the use of supplemental standards for limited use ground water applies the ground water classification system in EPA's Ground Water Protection Strategy (EPA 1988). Based on this strategy, limited use ground water would be considered to be Class III.

Ground water in the unconfined surface (uppermost) aquifer is of limited use because of widespread, elevated concentrations of naturally occurring chloride, manganese, sodium, and sulfate that have probably leached from the closed-basin lacustrine deposits making up the shallow aquifer system. Arsenic levels are also more locally elevated due to the presence of a geothermal area north of the site. The influence of this geothermal area on water chemistry decreases to the south and west of the site. Contaminants in the alluvial aquifer cannot be treated to acceptable levels by methods reasonably employed in public water systems.

Some private wells screened in the uppermost aquifer are used for drinking water without any form of treatment. Most of the wells with high quality water are close to the base of the mountains and tap into ground water that is more directly affected by recharge than the wells farther west. EPA's Ground Water Protection Strategy (EPA 1988) notes that an entire aquifer

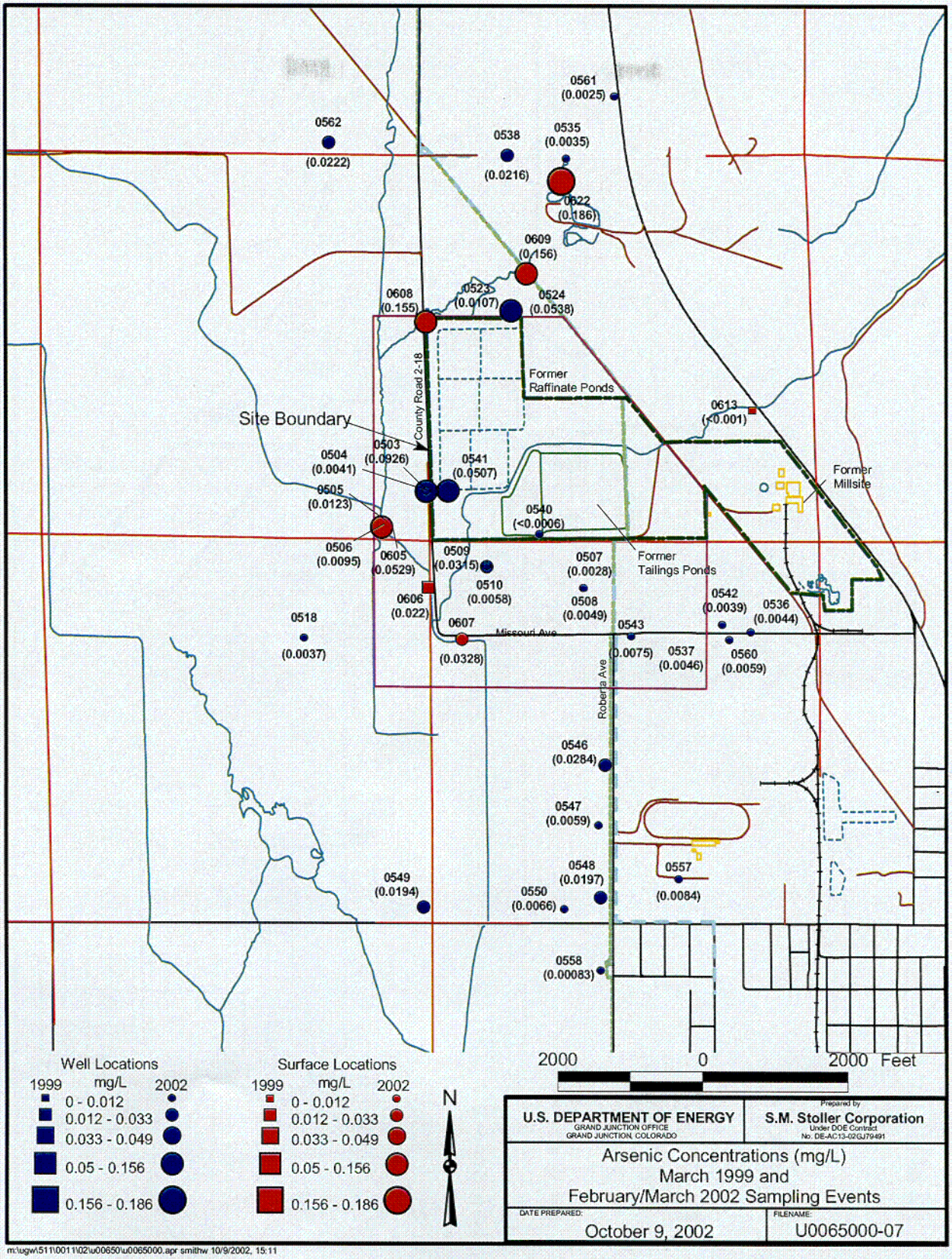

Figure 2–6. Arsenic Concentrations, March 1999 and February/March 2002 Sampling Events

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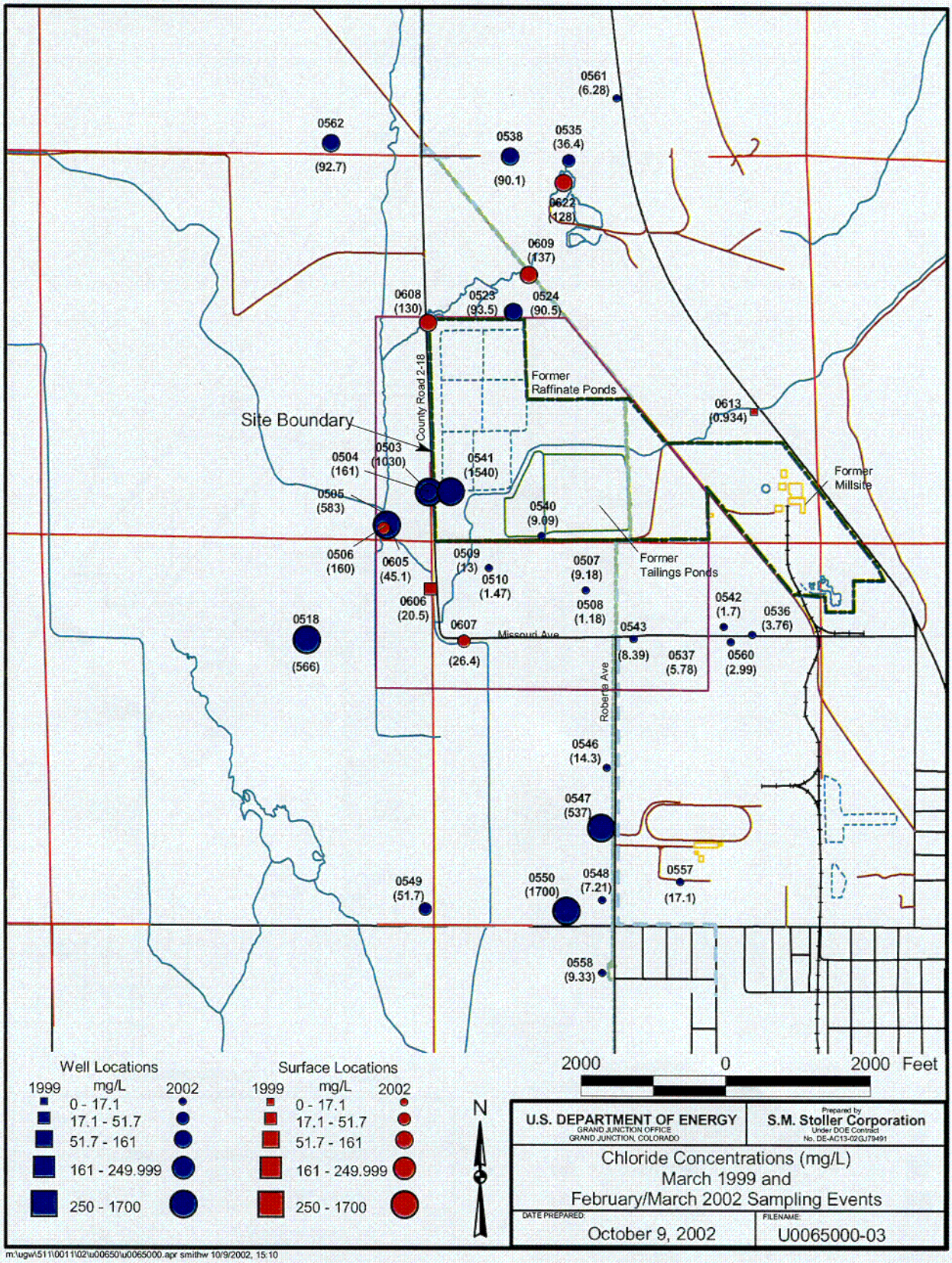

Figure 2–7. Chloride Concentrations, March 1999 and February/March 2002 Sampling Events

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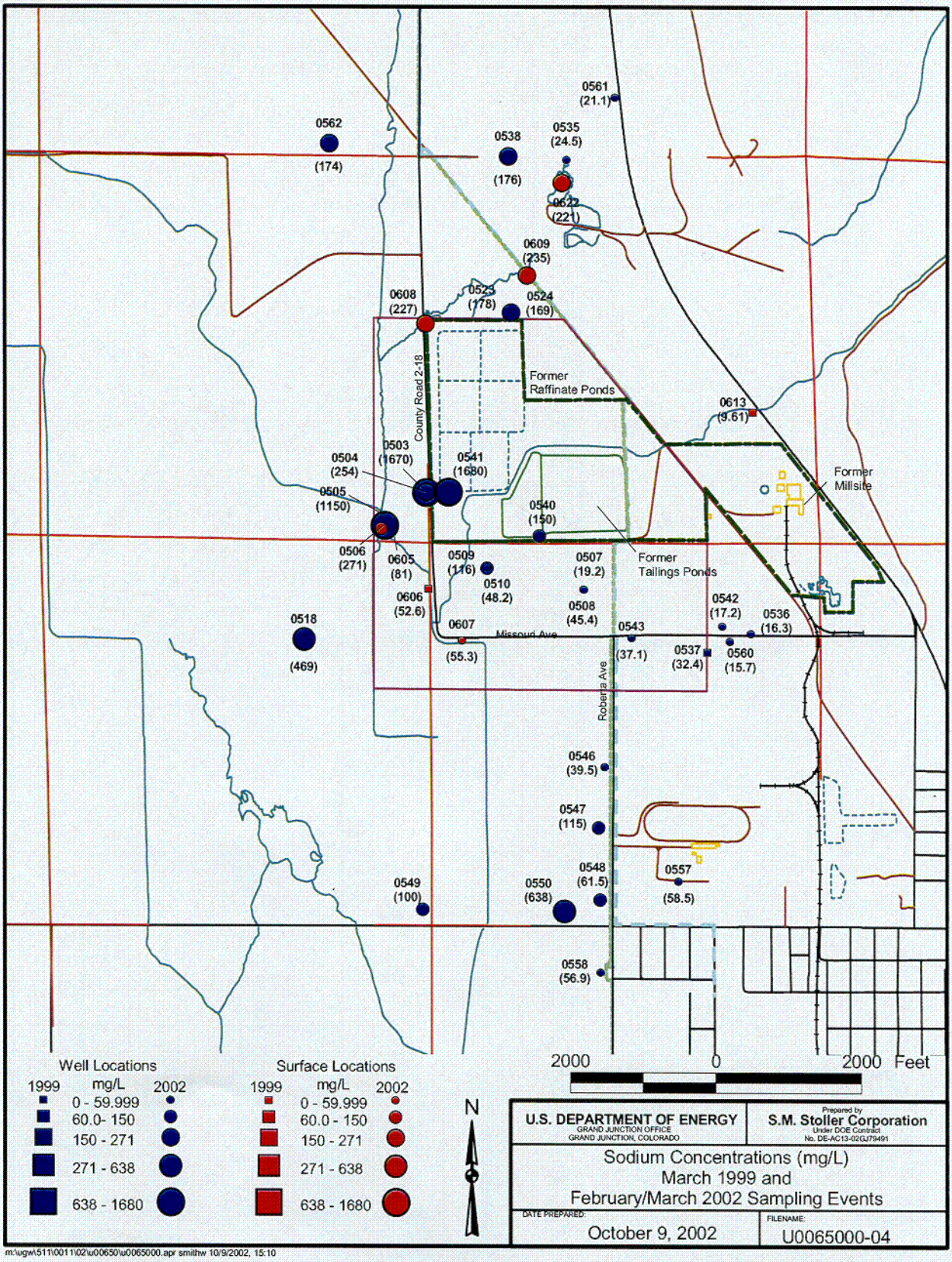

Figure 2–8. Sodium Concentrations, March 1999 and February/March 2002 Sampling Events

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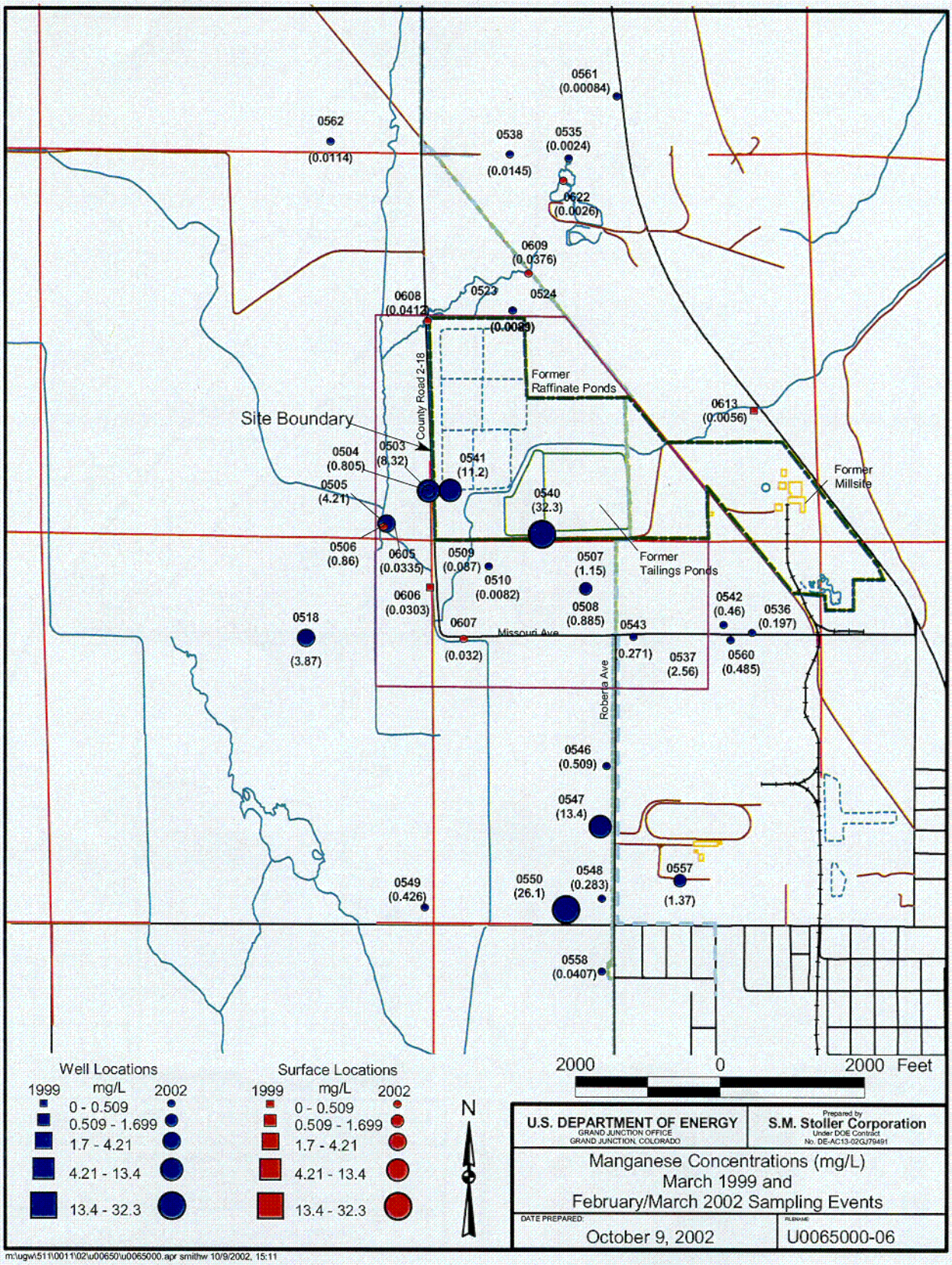

Figure 2–9. Manganese Concentrations, March 1999 and February/March 2002 Sampling Events

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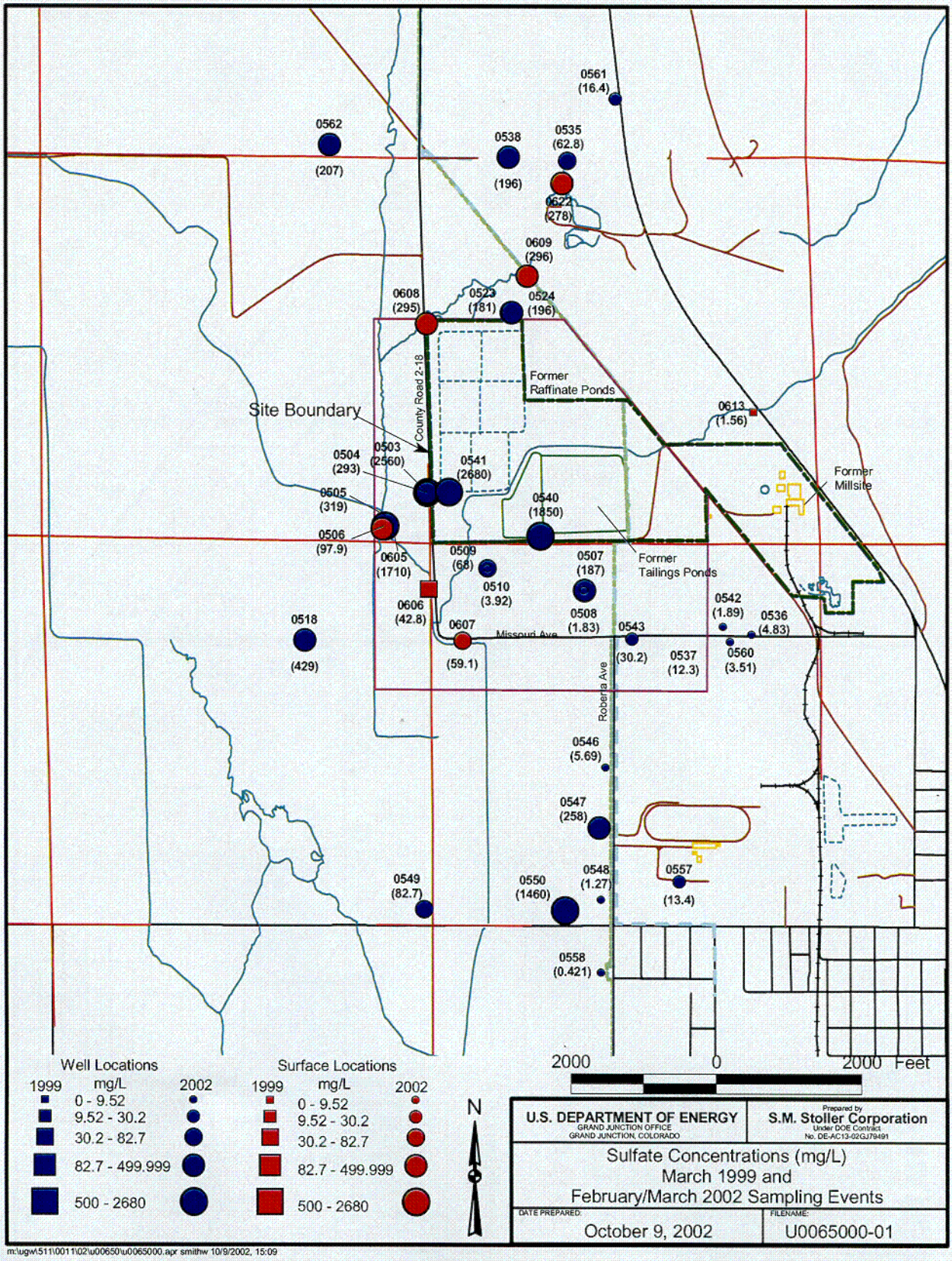

Figure 2–10. Sulfate Concentrations, March 1999 and February/March 2002 Sampling Events

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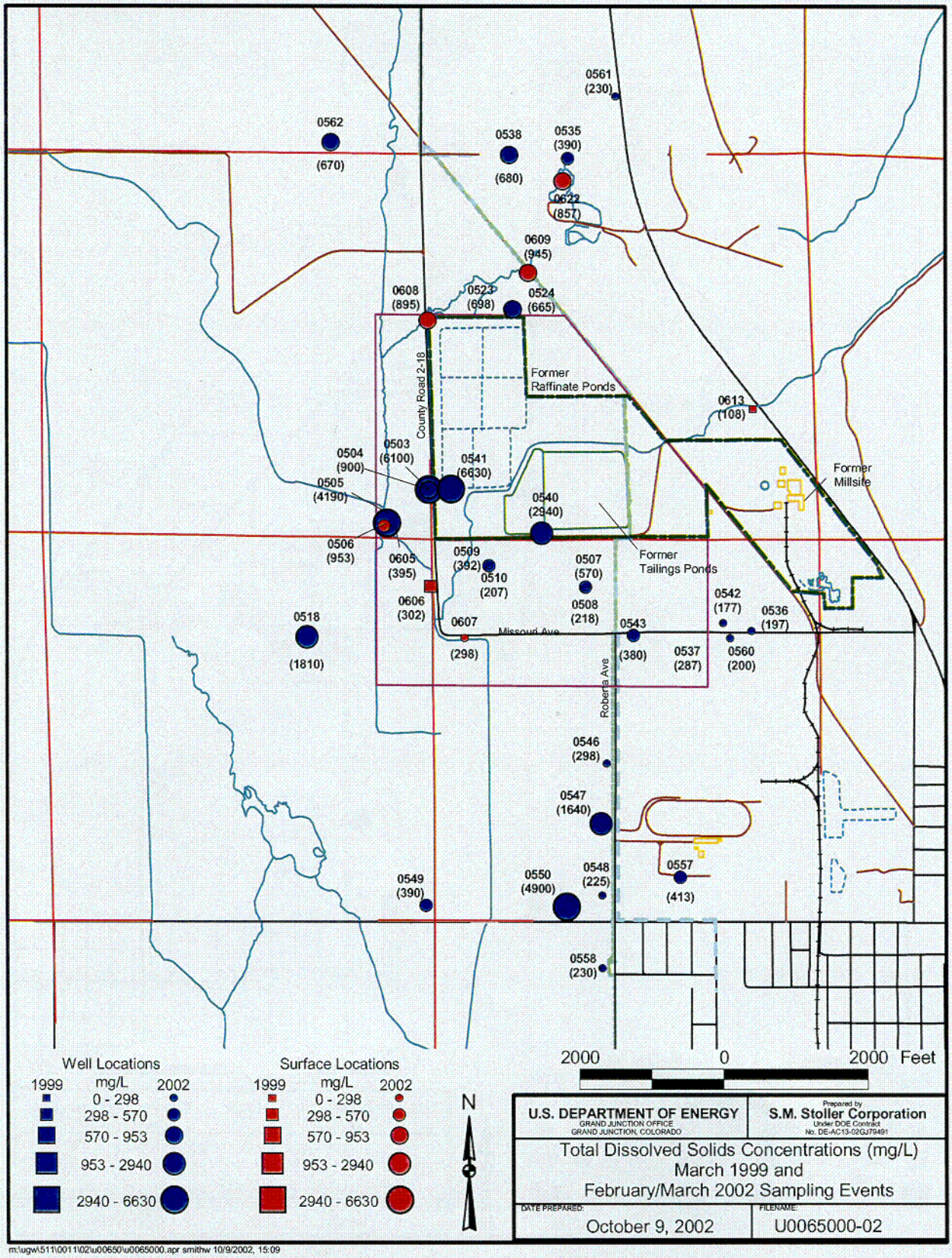

Figure 2–11. TDS, March 1999 and February/March 2002 Sampling Events

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need not meet the Class III criteria to qualify for that designation; if a substantial portion meets the criteria the Class III designation can be justified. Figure 2–5 demonstrates a likely scenario for the general geochemical setting at Lakeview.

2.4.1 Reasonableness of Ground Water Treatment

If the high salt content ground water and geothermal ground water were treated for municipal use, high concentrations of arsenic, chloride, sodium, sulfate, and TDS would need to be removed. No rigorous feasibility study was performed on Lakeview area water. However, a previous study at another UMTRA Project millsite (DOE 1999a, Appendix J) indicated that the only reasonable method of treating these constituents would be some type of desalination. Reverse osmosis would be the least expensive process. Chloride, sodium, sulfate, and TDS concentrations in alluvial ground water were elevated at another UMTRA Project site where a detailed study was conducted in 1998 (DOE 1999a). Data from that study is used as an analogue to treatment of Lakeview ground water. In the 1998 study, arsenic was not among the primary constituents, but selenium and uranium were. Treatment methods for removal of arsenic are similar to those for uranium. The average annual cost to treat the water for a household was estimated to be $400. Water for Lakeview residents is produced from rain collectors located in mountains east of the town and, when necessary, from deep wells located near the town. The annual cost per household for domestic water in Lakeview is $150 (personal communication 1999); thus, the cost to treat the shallow ground water could be considered unreasonable.

2.5 Human Health and Environmental Risks

Assessment of site conditions indicates that supplemental standards would be protective of human health under current conditions. Future risks to human health would be unacceptable if ground water with high salt content or geothermal water were used as a primary source of drinking water. This use is not expected because other sources of drinking water are available, and ICs would be in place to prohibit access to contaminated ground water.

A limited ecological evaluation was performed for this site in the BLRA. That evaluation concluded that there is a low potential to threaten the food chain (through bioaccumulation and biomagnification) of terrestrial and aquatic wildlife. However, the BLRA identified two potential areas of concern: (1) phytotoxicity of plants that have roots in direct contact with the aquifer and (2) use of ground water as a long-term source of drinking water for livestock. Recent visual reconnaissance of the former millsite indicated that no phytotoxicity is occurring as a result of COPCs in the ground water. Therefore, this does not appear to be a significant issue.

Potential effects on livestock have been studied at other DOE uranium mill tailings sites. Lampham and others (1989) and Henningsen (1997) evaluated this issue at two millsites by comparing COPC concentrations in ground water to tissue concentrations in affected livestock. The 1989 study, conducted near the Ambrosia Lake site in New Mexico, concluded that some concentrations of radionuclides were elevated in livestock tissues, but not to the levels predicted from bioaccumulation models. Radionuclides are not an issue at the Lakeview site.

Henningsen conducted the 1997 study downgradient of the former millsite at Monticello, Utah. That study is more relevant to the Lakeview situation because it included the evaluation of arsenic and manganese. Concentrations of arsenic and manganese in ground water at Monticello were lower than those at Lakeview; however, for the study, contributions from soil, sediment,

and vegetation resulted in an analogous contaminant loading. The study concluded that the edible portions of livestock were not affected by site contamination. The only effect observed was in bone tissue, which accumulated contaminants with chemical properties similar to those of calcium. One shortcoming of comparing this study to Lakeview is that sulfate was not a COPC. Sulfate concentrations in ground water at the Lakeview site may cause diarrhea in livestock, but long-term negative effects are unlikely.

These studies and the qualitative screening evaluation done for the Lakeview BLRA indicate that ground water contaminants are unlikely to significantly affect livestock exposed to the ground water at or downgradient of the site. Overall, the application of supplemental standards would be protective of human health and the environment.

3.0 Ground Water Compliance

3.1 Compliance Strategy Framework

The framework defined in the PEIS (DOE 1996a) governs selection of the strategy to achieve compliance with EPA ground water standards. Stakeholder review of the final PEIS is documented and supported by the Record of Decision (Federal Register [FR] v. 62, No. 81, 1997). Figure 3–1 and Table 3–1 present summaries of the framework used to determine the appropriate ground water compliance strategies for the Lakeview site. The framework considers human health and environmental risk, stakeholder input, and cost. A step-by-step approach in the PEIS results in the selection of one of three general compliance strategies:

- ***No remediation***—Compliance with the EPA ground water protection standards would be met without altering the ground water or cleaning it up in any way. This strategy could be applied for those constituents at or below MCLs or background levels or for those constituents above MCLs or background levels that qualify for supplemental standards or alternate concentration limits (ACLs).

- ***Natural flushing***—This strategy would allow natural ground water movement and geochemical processes to decrease contaminant concentrations to regulatory limits. The natural flushing strategy can be applied where ground water compliance could be achieved within 100 years, where effective monitoring and ICs can be maintained, and where the ground water is not currently and is not projected to be a source for a public water system.

- ***Active ground water remediation***—This strategy would require engineered ground water remediation methods such as gradient manipulation, ground water extraction and treatment, land application, phytoremediation, and in situ ground water treatment to achieve compliance with EPA standards.

3.2 Implementation

The UMTRA Project regulations provide several ways to comply with ground water protection standards in Subpart B of 40 CFR 192.12(c). These include meeting the provisions of 40 CFR 192.02(c)(3) or a supplemental standard established under 40 CFR 192.22. The provisions of 40 CFR 192.02(c)(3) include (1) the background level of the constituent in ground water, (2) the MCL for any constituents listed in Table 1 to Subpart A, or (3) an ACL established pursuant to paragraph (c)(3)(ii) of that section.

The compliance strategy proposed for the Lakeview site is no remediation with the application of supplemental standards based on widespread ambient contamination that is not milling related. ICs and monitoring will continue as a best management practice. These components of the compliance strategy are described separately.

3.2.1 Institutional Controls

Because of aquifer heterogeneity and the fact that the contaminants have various sources, ambient contamination is not uniformly distributed throughout the surficial aquifer. There are some pockets where water quality is relatively good, particularly close to the mountains, or

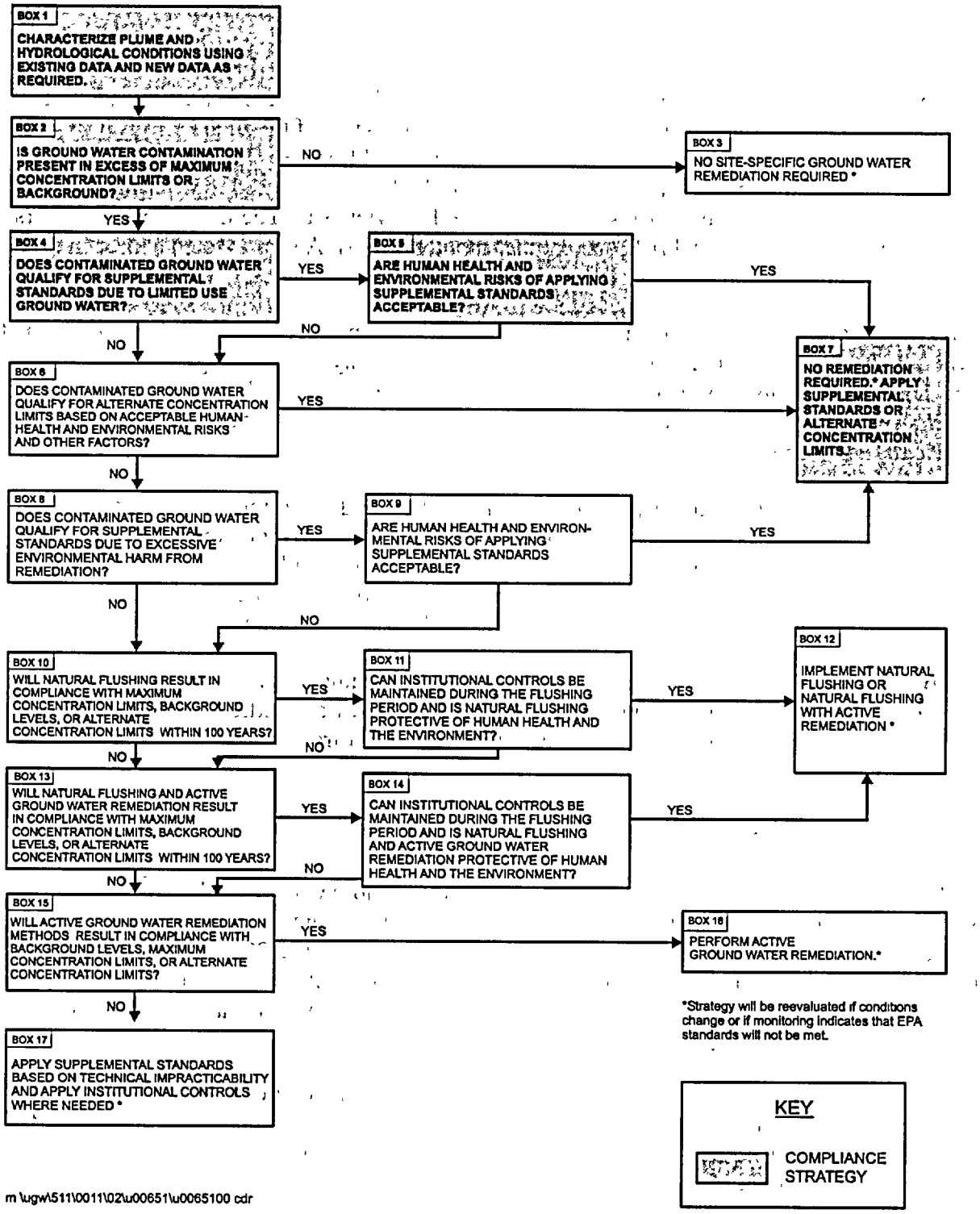

Figure 3–1. Ground Water Compliance Strategy Selection Process

Table 3–1. Explanation of the Compliance Strategy Selection Process

Box (Figure 3–1)	Action or Question	Result or Decision
1	Characterize plume and hydrologic conditions.	Use of the Surface EA, RAP, BLRA, and March 1999 through March 2002 sample analyses Go to Box 2
2	Is ground water contamination present in excess of UMTRA MCLs or background?	Arsenic concentrations exceed the UMTRA MCL Sulfate, manganese, chloride, and TDS exceed secondary standards established in the Safe Drinking Water Act. Sodium and boron are elevated above some health advisory levels. Go to Box 4.
4	Does contaminated ground water qualify for supplemental standards due to limited use ground water?	Ground water qualifies for limited use on the basis of widespread ambient contamination from mobilization of sulfate, manganese, chloride, sodium, and TDS from naturally occurring salts in lake sediments. A more localized area is also affected by elevated arsenic and boron from a geothermal area Go to Box 5
5	Are human health and environmental risks of applying supplemental standards acceptable?	No one is currently drinking water contaminated from uranium milling activities ICs will prevent any future use of water from the former millsite. The environment is not being adversely affected by contaminated water. Go to Box 7.
7	No remediation required. Apply supplemental standards or alternate concentration limits	Supplemental standards are applied. As a best management practice, ICs will be adopted and limited monitoring will continue

MCL = UMTRA Project maximum concentration Limit in 40 CFR 192

intermittent streams draining the mountains, where higher quality water recharges the aquifer. Private wells are located in the area; some tap into water suitable for drinking without treatment, and other homeowners equip their in-house spigots with some type of treatment unit. Direct ingestion presents the only risk to human health from using the contaminated ground water. The proposed IC would limit access to contaminated ground water by providing city water to the area that may be affected by milling contamination. This is being accomplished in a two-part effort. An IC boundary was established around the western part of the former millsite that included land containing and extending beyond probable millsite contamination as defined by the extent of the sulfate plume (Plate 1).

DOE negotiated with the town of Lakeview and Lake County officials to increase the diameter of a domestic water line in the IC area that was being constructed from the town of Lakeview to a new state prison located north of town. This construction was performed in spring through fall of 2002. The corridor for the water line to the prison intersects the southern and eastern sides of the IC area and will provide municipal water to residents inside the zone. DOE paid $200,000 to fund this difference in cost for the waterline. In exchange, Lake County and the City of Lakeview both passed ordinances requiring future land users inside an IC area to obtain hookups from the new domestic water line or to drill a well to a depth that ensures water quality is satisfactory. The second part of this IC is the depth to which a well must be drilled before water is used for drinking purposes. This will be codified by the Oregon Water Resources Department in Salem, Oregon, the state agency responsible for ensuring that domestic well applications are reviewed and approved before drilling permits are issued. The Oregon Water Resources Department Commission will make their ruling based on information from DOE.

DOE has reviewed well pair chemistry that suggests no site-related contamination is present at depths greater than 100 ft. This depth is comparable to anecdotal information from an experienced well driller, indicating that good water throughout the area is usually found at depths

greater than 60 ft. To investigate this question further, DOE sampled and analyzed water from several current municipal or multi-use domestic wells in the millsite area during the 2002 sampling event. Wells 0557, 0558, and 0562 are 300 to 400 ft deep and all produce large volumes of potable water. Results showed good quality water with relatively low TDS. Therefore, DOE will propose to the Oregon Water Resources Commission that domestic wells in the IC area can safely be drilled and screened to depths exceeding 300 ft. This is considered to be a conservative estimate. Currently, no one is drinking contaminated water from private domestic wells downgradient of the site and inside the IC boundary. One residence within the IC boundary does have a private drinking water well that is less than 300 ft in depth; this well produces high quality water. DOE will continue to monitor this well to ensure adequate water quality is maintained.

3.2.2 Ground Water Monitoring Plan

As a best management practice, a limited ground water monitoring program will continue at the locations shown in Figure 3–2. Samples will be collected from monitoring locations at a frequency of every other year for 10 years and will be analyzed for sulfate and manganese. The private well along Missouri Avenue (0543) will be monitored to ensure that this well, though located within the IC boundary, continues to have high quality drinking water.

Wells 0503, 0505, and 0540 are near the leading edge of the proposed sulfate and manganese plumes. Though these constituents are believed to have sources other than the site (as evidenced by similar elevated concentrations in wells along Roberta Avenue), elevated concentrations in the vicinity of the Lakeview site are at least partially attributable to milling operations. Concentrations of sulfate and manganese in these wells have remained relatively constant over the monitoring period (Figure 3–3 and Figure 3–4); continued monitoring will ensure that any unexpected changes can be detected. In addition, uranium concentration in well 0540 has recently increased above the UMTRA standard. Because of the historical lack of elevated uranium concentrations in ground water, the cause of this uranium increase is unclear. However, it was noted in the field sampling report that turbidity requirements were not achieved, and water was a yellowish color. DOE will investigate the integrity of this well. Monitoring for uranium will continue in this well and in well 0509, downgradient of 0540. Though other constituents, such as arsenic, are slightly elevated at some site locations, site concentrations are below ambient concentrations. Therefore, monitoring for these constituents is not proposed.

Table 3–2. Summary of Monitoring Requirements

Location	Monitoring Purpose	Analytes	Frequency
LKV-0503	Well, downgradient of raffinate ponds	Sulfate, Manganese; Uranium for 0540 and 0509 only	Every other year for 10 years; reevaluate requirements at that time
LKV-0505	Well, downgradient of raffinate ponds		
LKV-0540	Well, downgradient of former tailings pile		
LKV-0543	Well, private, along Missouri Ave.		
LKV-0509	Well, downgradient of former tailings pile		

DOE will decommission all site monitor wells that are no longer needed for compliance monitoring in accordance with applicable State of Oregon regulations.

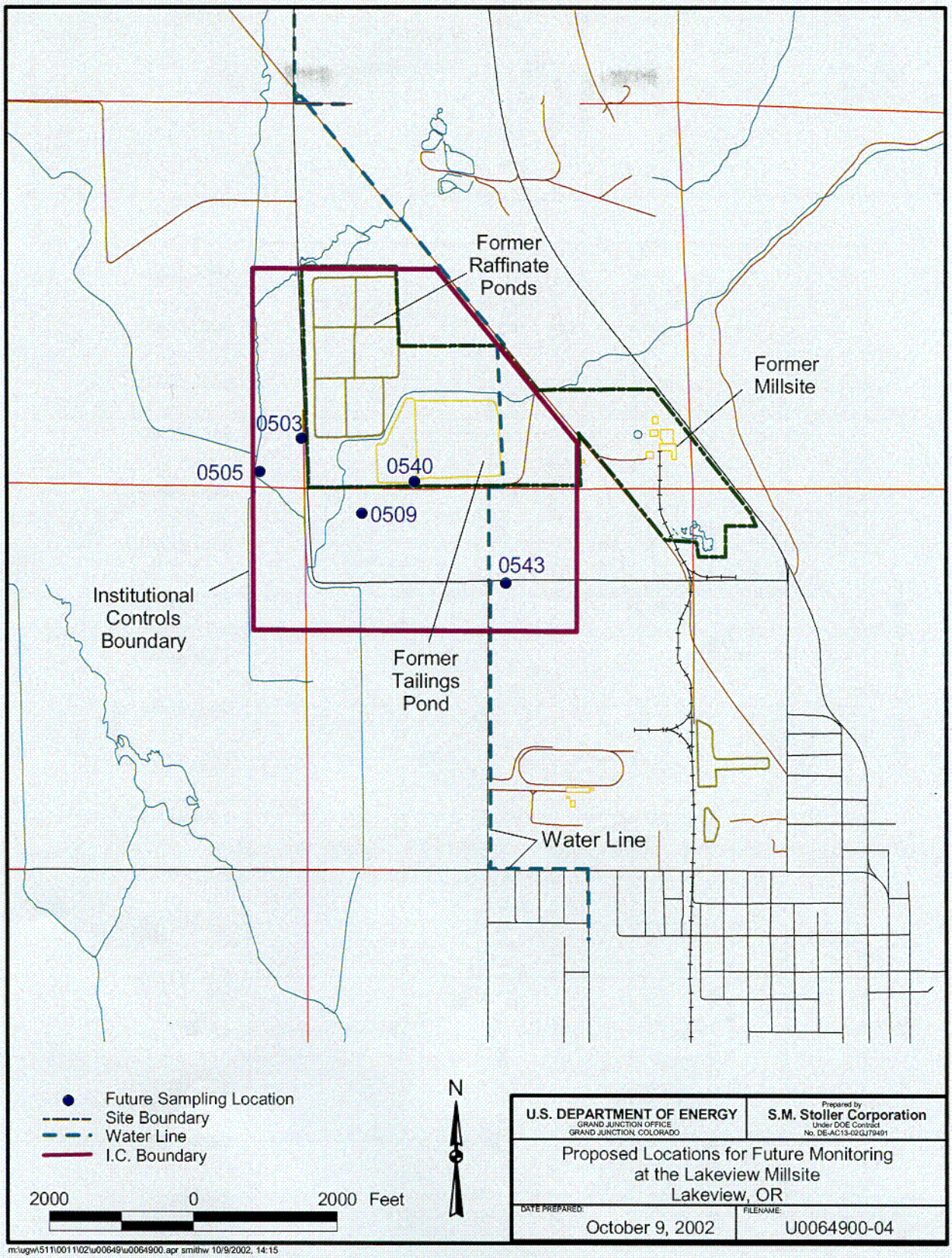

Figure 3–2. Proposed Locations for Future Monitoring at the Lakeview Millsite, Lakeview, Oregon

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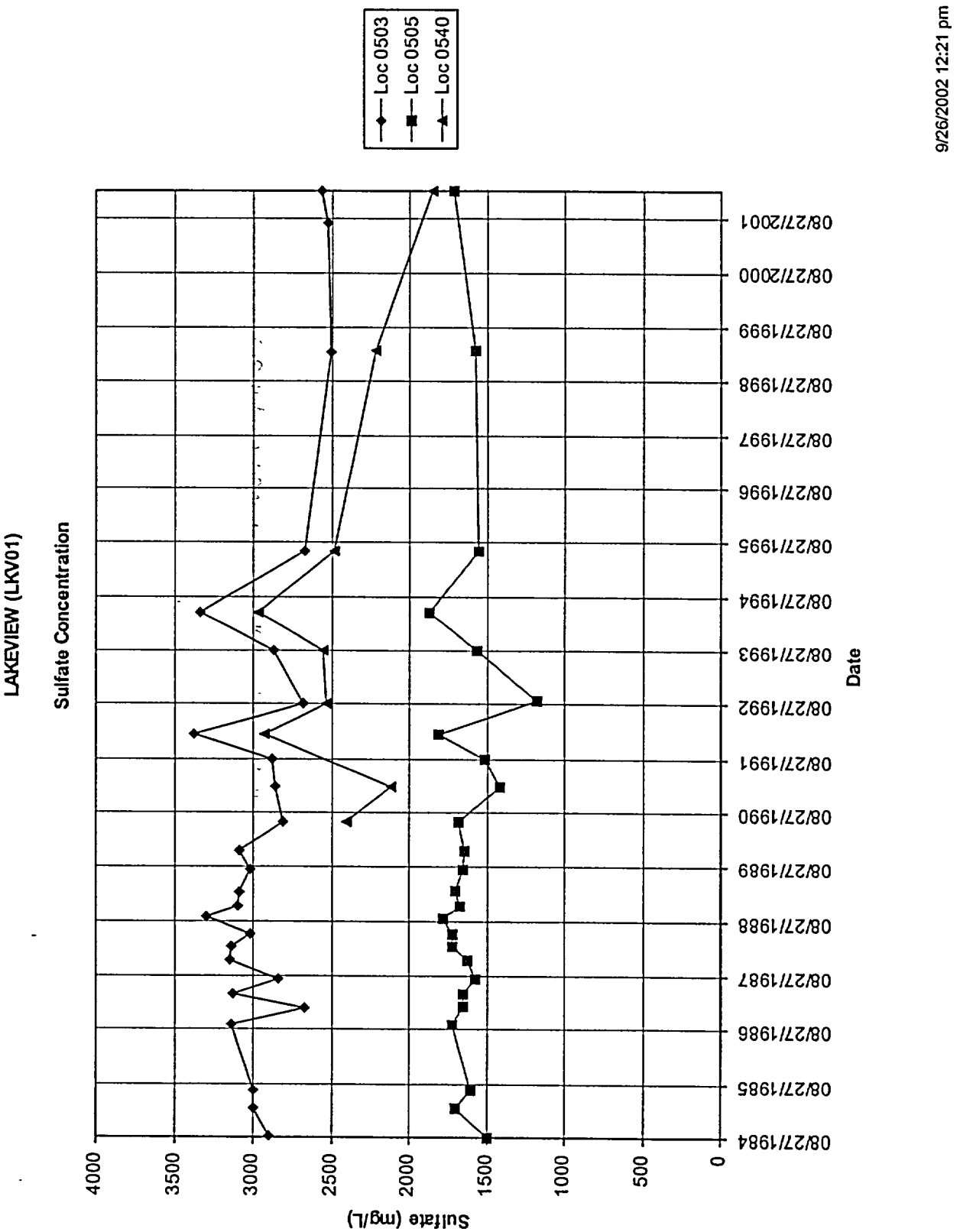

Figure 3–3. Sulfate Concentrations at the Lakeview, Oregon, Site

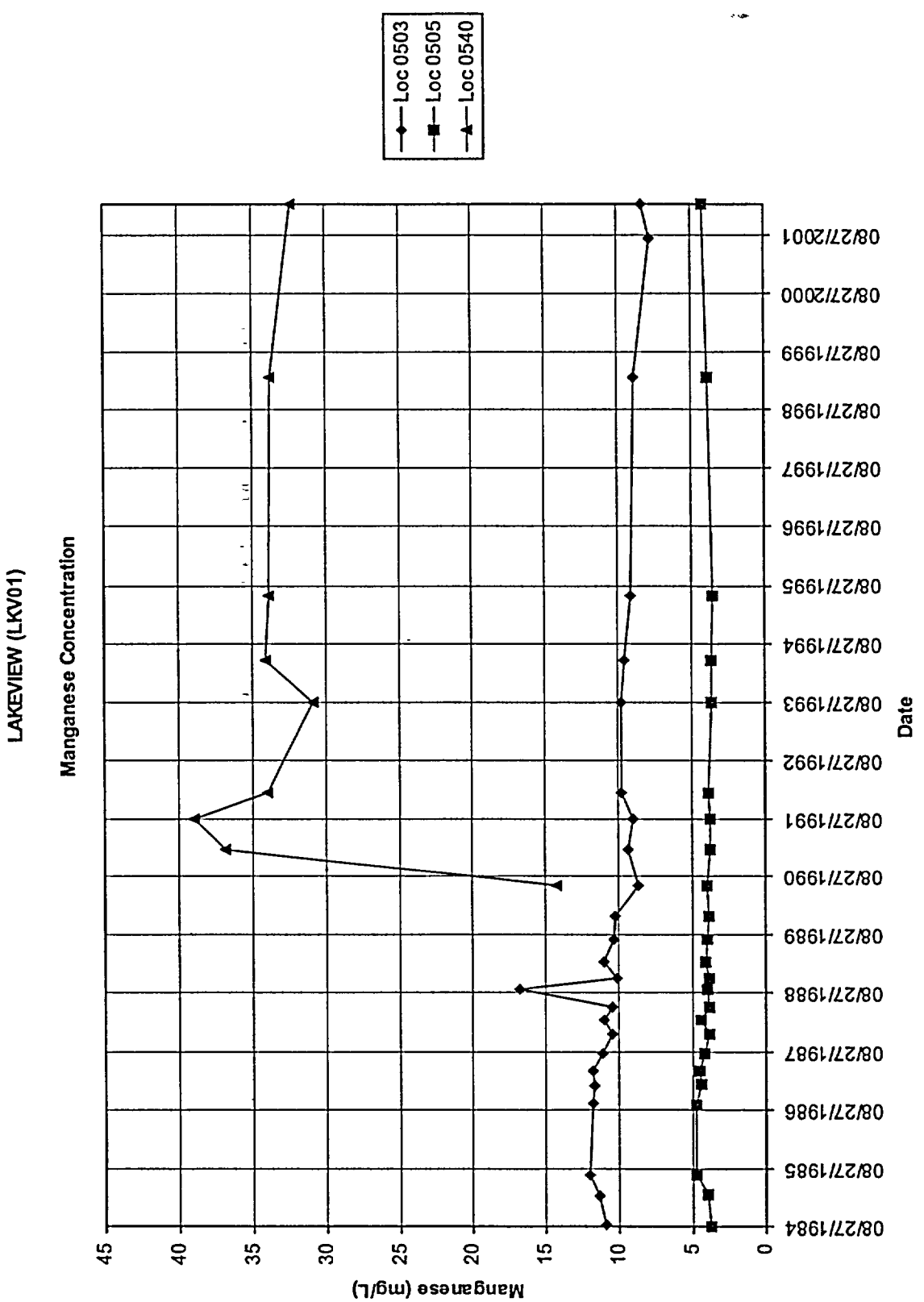

Figure 3–4. Manganese Concentrations at the Lakeview, Oregon, Site

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4.0 Public Participation

To comply with NEPA regulations and guidance in the PEIS, DOE provided relevant environmental information to public officials and citizens by conducting a public meeting with the Lake County Commissioners on July 21, 1999, and by conducting a second public meeting later that day. The meetings were publicized in a news release dated July 8, 1999, and were advertised in the *Lake County Examiner*, a local newspaper, and on KQIK, the local radio station. Letters of invitation were sent to property owners who own land within the boundaries of the former millsite. DOE gave formal presentations and provided a fact sheet at the meetings. The meeting with the county commissioners resulted in the proposed upgrade of the water line from the town of Lakeview to the prison that will be built north of town. County commissioners were pleased with this pledge. One citizen attended the public meeting held at 7:00 p.m. July 21 at the Lake County Senior Community Center. He was one of the landowners and had no problems with the proposed compliance strategy. DOE distributed minutes of the meetings to county commissioners, a reporter for the *Lake County Examiner*, and landowners.

End of current text

5.0 Environmental Considerations

NEPA requires DOE to prepare a programmatic environmental impact statement (the PEIS, DOE 1996a), which was issued in October 1996. The PEIS assesses the potential programmatic effects of conducting the UMTRA Ground Water Project, provides a method for determining site-specific ground water compliance strategies, and provides data and information that can be used to prepare site-specific environmental impact analyses more efficiently. In the proposed action (preferred alternative), ground water compliance strategies are tailored to each site to achieve conditions that are protective of human health and the environment. The selection framework for determining an appropriate compliance strategy at each site is presented in Section 2.1 of the PEIS and discussed in Section 3.1 of this document. Environmental impacts from the proposed action on these issues and resources were assessed in several documents (DOE 1981, 1985, 1992, 1996a, and 1996b). The following environmental issues and resources are potentially affected by the proposed action:

- Risks to human health and the environment.
- Ground water use.
- Surface water use.
- Land use.
- Exposure to potentially contaminated ground water.
- Environmental site restoration.

The proposed compliance strategy will not involve any surface-disturbing activities at the Lakeview site. Surface disturbance will occur along a corridor west and south of the site when the water line is constructed. The State of Oregon will construct the trench, and DOE will pay only for an upgrade to the water line. The only other field activities required following implementation of the GCAP would be continued monitoring of the sample locations shown in Figure 3–2 and decommissioning of monitor wells no longer needed for compliance monitoring.

The proposed action will produce no adverse effects to air quality, surface water quality, cultural resources, sensitive plant or wildlife species (including threatened or endangered species), or designated or sensitive natural resource areas (e.g., wetlands, wilderness, parks, and scenic rivers).

On the basis of data evaluated for this report, only four constituents present in the surficial aquifer—arsenic, chloride, manganese, and sulfate—pose a potential risk to human health. The BLRA determined that ingestion of alluvial ground water as a regular source of drinking water would result in the only unacceptable risk to human health. Because this pathway is currently incomplete, no actual human health risk exists. Under the proposed action, an IC would prohibit ground water use for any purpose for the foreseeable future, and no human health risks would exist as long as access to contaminated ground water is prohibited. Arsenic concentrations are currently above the UMTRA standard and are expected to remain at this elevated value indefinitely. Similarly, chloride, manganese, and sulfate concentrations are not expected to decrease substantially. Continued monitoring will track concentrations of manganese and sulfate.

Ground water beneath the site is not considered to present ecological risks because it has not presented problems in the past and because of the lack of exposure pathways. Ground water is not being used to water livestock at the site, except for geothermal ground water. Surface water runoff from Warner Mountain is also available for this purpose. Because near-surface ground water is generally of poor quality in the valley, no future use of this ground water for watering livestock is expected. Water from wells deeper than 300 ft contain potable water, which can also be used for agricultural purposes. Studies at other DOE uranium-ore processing sites with similar contaminants indicate that the contaminants do not present a risk to livestock or to people who consume tissues from the livestock. Plants growing on the former millsite show no signs of stress.

Existing documents and public participation efforts comply with DOE's NEPA regulations, orders, and guidance. Local government is pleased with the proposed IC at the site, and public interest in the site is low. Therefore, an environmental assessment is not recommended. The conditions for evaluating a risk scenario and selecting a compliance strategy at the Lakeview site closely parallel the conditions at the Salt Lake City UMTRA Project site, for which a GCAP was prepared (DOE 1999b) and an environmental assessment was not required.

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Appendix A

UMTRA Ground Water Project

Document Compilation for

Lakeview, Oregon

August 1999

Contents

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- 1.2 Content

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- 2.2 Data Validation Package, Lakeview, Oregon, UMTRA Project Site, March 1999
- 2.3 Uranium Mill Tailings Remedial Action Ground Water Project Record of Decision, April 28, 1997
- 2.4 Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project, October 1996
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1.0 Introduction

This appendix is a compilation of documents and correspondence completed under the Uranium Mill Tailings Remedial Action (UMTRA) Project for the Lakeview, Oregon, uranium mill tailings site. This document contains portions of UMTRA documents relevant to the UMTRA Ground Water Project at the Lakeview site.

1.1 Purpose

This appendix is a quick-reference document. Section 2 presents excerpts of documents relevant to the UMTRA Ground Water Project. The documents are in chronological order, beginning with the most recent.

1.2 Content

Each subsection includes a summary of the document.

Lakeview, Oregon,
Minutes of Public Meetings
July 1999

Two meetings were held on July 21, 1999: one with the Lake County Commissioners and one with the town of Lakeview. A quorum of county commissioners, three DOE representatives, and one State of Oregon representative from the Oregon Department of Energy were present for the first meeting. A DOE representative discussed supplemental standards, limited yield ground water, and widespread ambient contamination based on naturally occurring arsenic from the geothermal springs upgradient of the site. As a best management practice, it was recommended that IC be expanded to prevent domestic use of contaminated ground water from the former millsite. To accomplish this, DOE would fund an upgrade to a water line planned for installation along a downgradient side of the former millsite. In exchange, Lake County would require future land users in this area to obtain a tap to the new water line.

The second meeting was held at a public auditorium in Lakeview the same evening. One person from the community attended the meeting. He asked how long DOE would monitor ground water from the former millsite and was assured that DOE would monitor for at least 10 years or as long as necessary to ensure public health and safety.

Data Validation Package
Lakeview, Oregon, UMTRA Project Site
March 1999

This is a standard data package from the March 1999 sampling at the Lakeview site. It contains

A site hydrologist summary
A data package assessment
A data assessment summary
A report of suspected anomalies
UMTRA database printouts
A sampling and analysis work order and trip report.

Uranium Mill Tailings Remedial Action
Ground Water Project
Record of Decision
April 28, 1997

The final Record of Decision (ROD) was published in the *Federal Register* (Vol. 62, No. 81). DOE prepared this ROD pursuant to the Council on Environmental Quality regulations for implementing DOE's NEPA regulations. The ROD is based on the *Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project* (PEIS) (DOE/EIS-0198), issued October 1996.

The proposed action (preferred alternative) in the PEIS establishes a consistent risk-based framework for implementing the UMTRA Ground Water Project and for determining appropriate strategies to comply with EPA ground water standards. Under the preferred alternative, DOE may use active, passive, and no-remediation strategies to comply with the standards. Before making site-specific decisions to implement the preferred alternative, DOE will prepare appropriate NEPA documentation.

If ground water at an UMTRA Project site is contaminated as a result of uranium-ore processing, and contaminant concentrations exceed background levels or EPA ground water standards, the next step is to determine whether compliance with the standards could be achieved by applying supplemental standards under 40 CFR 192.21(g). If the ground water meets EPA's definition of limited use ground water, and if supplemental standards are shown to be protective of human health and the environment, no remediation is required.

Final Programmatic Environmental Impact Statement for the Uranium Mill Tailings Remedial Action Ground Water Project October 1996

Sections 1 through 7 of the Final Programmatic Environmental Impact Statement (PEIS) are relevant to the proposed compliance strategy for the Lakeview UMTRA site and are included in this subsection. These portions describe the basis for UMTRA Ground Water Project alternatives, comparisons of the alternatives, site prioritization and risk assessment, ground water characterization and remedial actions, and environmental impacts and analysis of these impacts at each UMTRA site. The PEIS also discusses potentially unavoidable adverse environmental impacts of the preferred alternative; the short-term uses of the environment, including the maintenance and enhancement of long-term productivity at each site; and the irreversible and irretrievable commitment of resources.

DOE prepared the PEIS for the UMTRA Ground Water Project to comply with requirements of the National Environmental Policy Act (NEPA). The PEIS provides an analysis of potential effects of the ground water compliance strategies as well as potential cumulative effects. The document is a comprehensive planning and decision-making tool that provides a basis for determining the appropriate ground water compliance strategy at each UMTRA Project site, assesses the potential programmatic effects of the UMTRA Ground Water Project, and provides a tiering document for the site-specific NEPA documents. Preparation of the PEIS is consistent with the concept of tiering, in which broad-scope environmental impact statements analyze general policy or program issues to facilitate subsequent site-specific decision making. The Record of Decision issued for the PEIS further describes the purpose.

Baseline Risk Assessment of Ground Water Contamination at the Uranium Mill Tailings Site Near Lakeview, Oregon (BLRA) March 1996

The Baseline Risk Assessment (BLRA) addresses risks to human health and the environment from exposure to ground water contaminated by uranium-ore processing at the former millsite near Lakeview, Oregon. The assessment describes the source of contamination, the potential exposure pathways, the amount of contamination that could potentially reach people and the environment, and the health and ecological effects of exposure.

The study concluded that because ground water within the contaminant plume is not used for any purpose, there are no complete exposure pathways, and human health is not at risk. However, long-term use of contaminated ground water as a source of drinking water, especially water from the most contaminated portion of the plume, could present a risk to human health. Consequently, the BLRA recommends that site ground water not be used as drinking water in the future. The BLRA also indicates that because the source of contamination has been removed, contaminant concentrations in ground water should eventually decrease, and risk should become less with time.

Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Site at Lakeview, Oregon: Volume 1, Text and Appendices A through D. Final Report: Revision 1 July 1992

The Remedial Action Plan (RAP) assesses the risk for performing surface remedial action and discusses the proposed design for relocating the millsite materials to the Collins Ranch approximately 7 miles north of Lakeview. The RAP provides information to support a ground water compliance strategy at the former millsite but defers defining a specific strategy until after proposed EPA ground water standards are final. However, the report suggests that restoration of the aquifer beneath the site would not be warranted because

- Except for arsenic, contaminants originating at the raffinate ponds and tailings pile are nontoxic. However, arsenic concentrations in the background geothermal ground water are greater than concentrations in the contaminant plume.
- Ground water contamination is limited to a distance of about 800 feet downgradient of the site, as indicated by sulfate in the water.
- Ground water within the contaminant plume is not used for any purpose.
- Concentrations of site-related contaminants are expected to decrease over time because the tailings and other contaminated materials have been relocated.

Environmental Assessment of Remedial Action at the Lakeview Uranium Mill Tailings Site, Lakeview, Oregon Volume I: Text, and Appendix D: Hydrology April 1985

This subsection consists of Volume I of the Environmental Assessment (Surface EA) and the hydrologic data. These sections discuss the quality of ground water and the local hydrologic system at the former millsite and at the two proposed locations for the disposal cell. The Surface EA indicates that the uppermost aquifer is of naturally poor quality and that arsenic concentrations in samples from Hunters Hot Springs exceed all values in ground water samples at the former millsite. The document suggests that additional ground water characterization should be performed at the site before an adequate compliance strategy could be proposed. The Surface EA also discusses the high sulfate concentrations in ground water beneath and downgradient of the site. The high concentrations probably resulted from use of sulfuric acid during the milling operations.

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THAT CAN BE VIEWED AT THE RECORD TITLED: FILENAME: U0064900-01 PLATE 1: LAKEVIEW BASE MAP WITH 1994 PHOTO BASE WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE FILENAME: U0064900-01

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