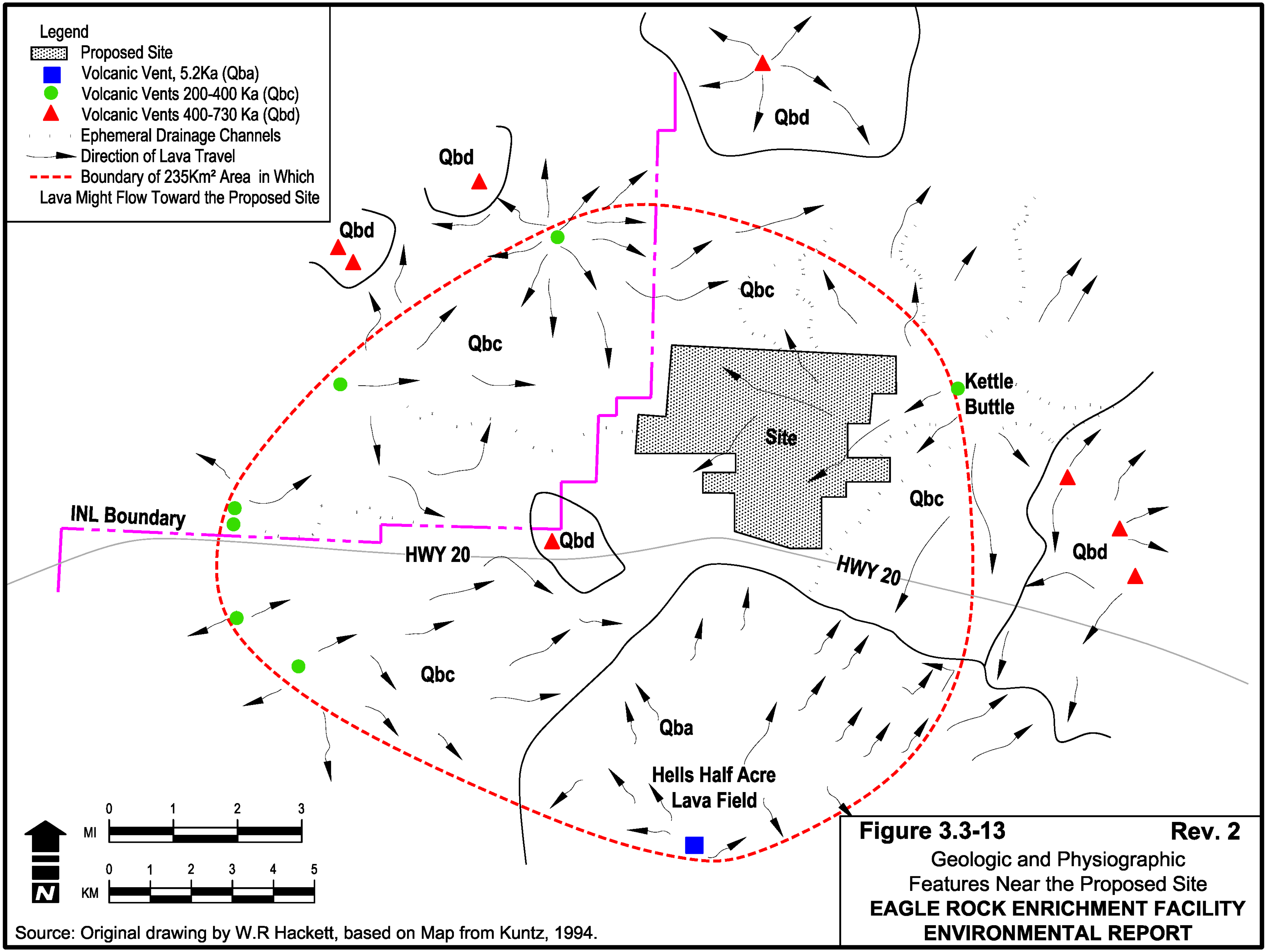
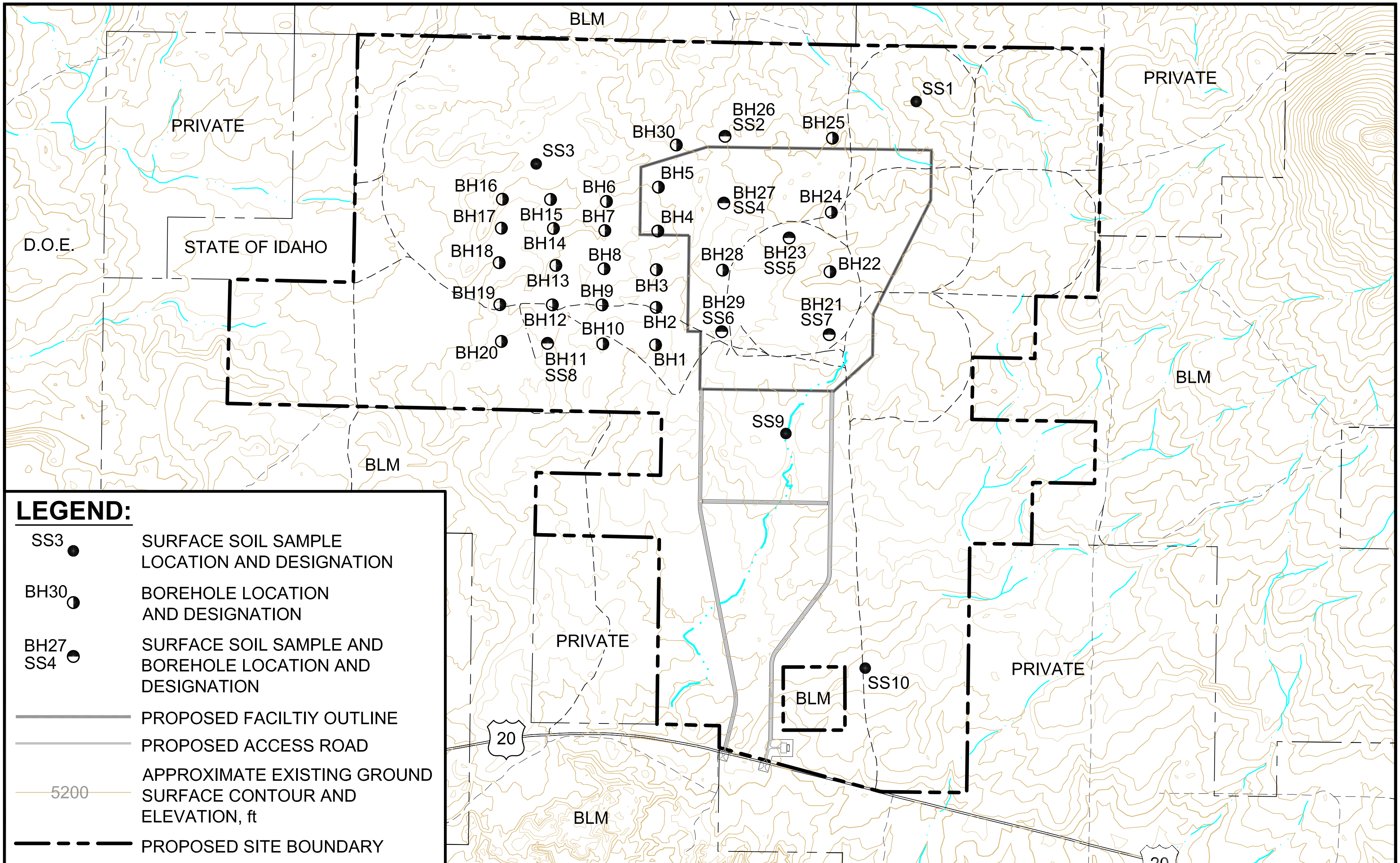


Figure 3.3-13 Rev. 2

Geologic and Physiographic Features Near the Proposed Site

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



LEGEND:

SS3	SURFACE SOIL SAMPLE LOCATION AND DESIGNATION
BH30	BOREHOLE LOCATION AND DESIGNATION
BH27 SS4	SURFACE SOIL SAMPLE AND BOREHOLE LOCATION AND DESIGNATION
	PROPOSED FACILTIY OUTLINE
	PROPOSED ACCESS ROAD
5200	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEVATION, ft
	PROPOSED SITE BOUNDARY
	EXISTING ROAD

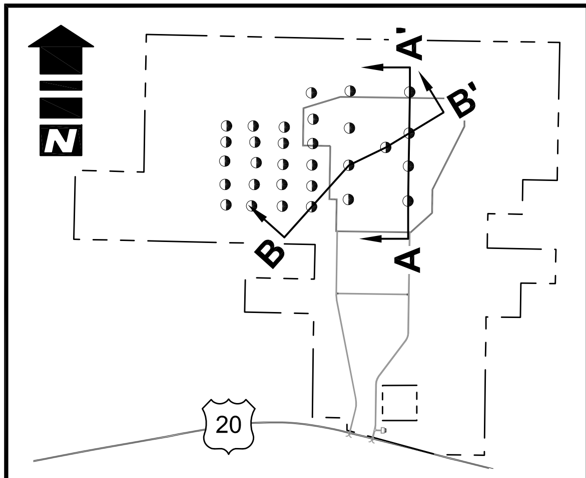
NOTES:

1. GROUND SURFACE CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft.

Figure 3.3-14A **Rev. 2**

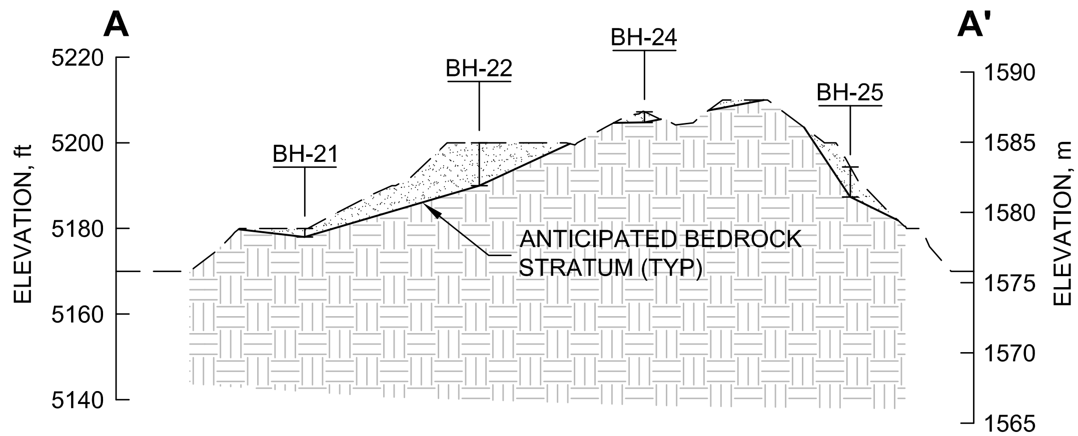
Borehole and Soil Sample Locations

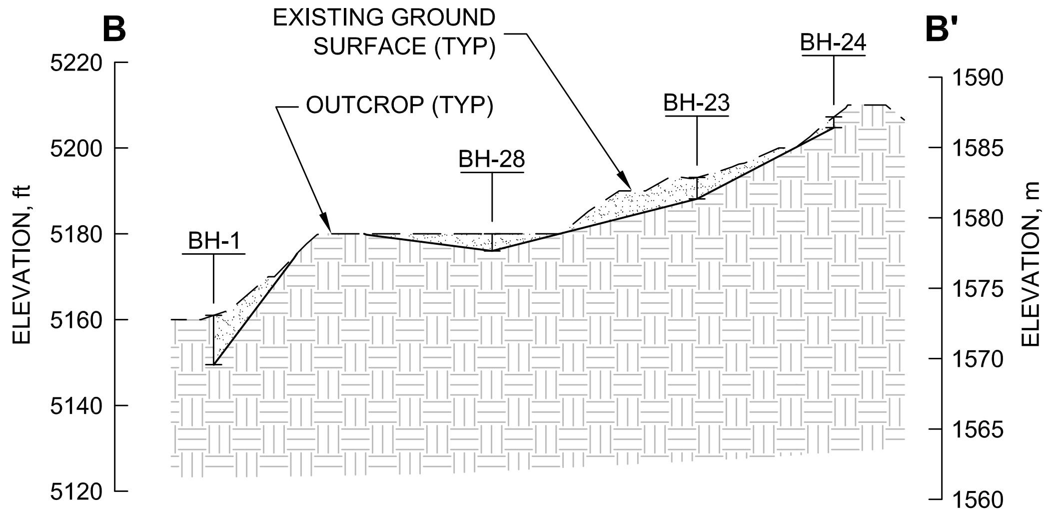
EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



SITE MAP

NTS





LEGEND:

◑ BOREHOLE LOCATION

BH-1 — BOREHOLE IDENTIFICATION

BOREHOLE COLLAR

BOTTOM OF BOREHOLE

NOTE:

VERTICAL EXAGGERATION = 10X

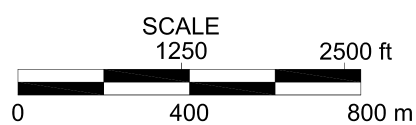


Figure 3.3-14B **Rev. 2**

Cross Sections A-A' and B-B'
On the Proposed EREF Footprint

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

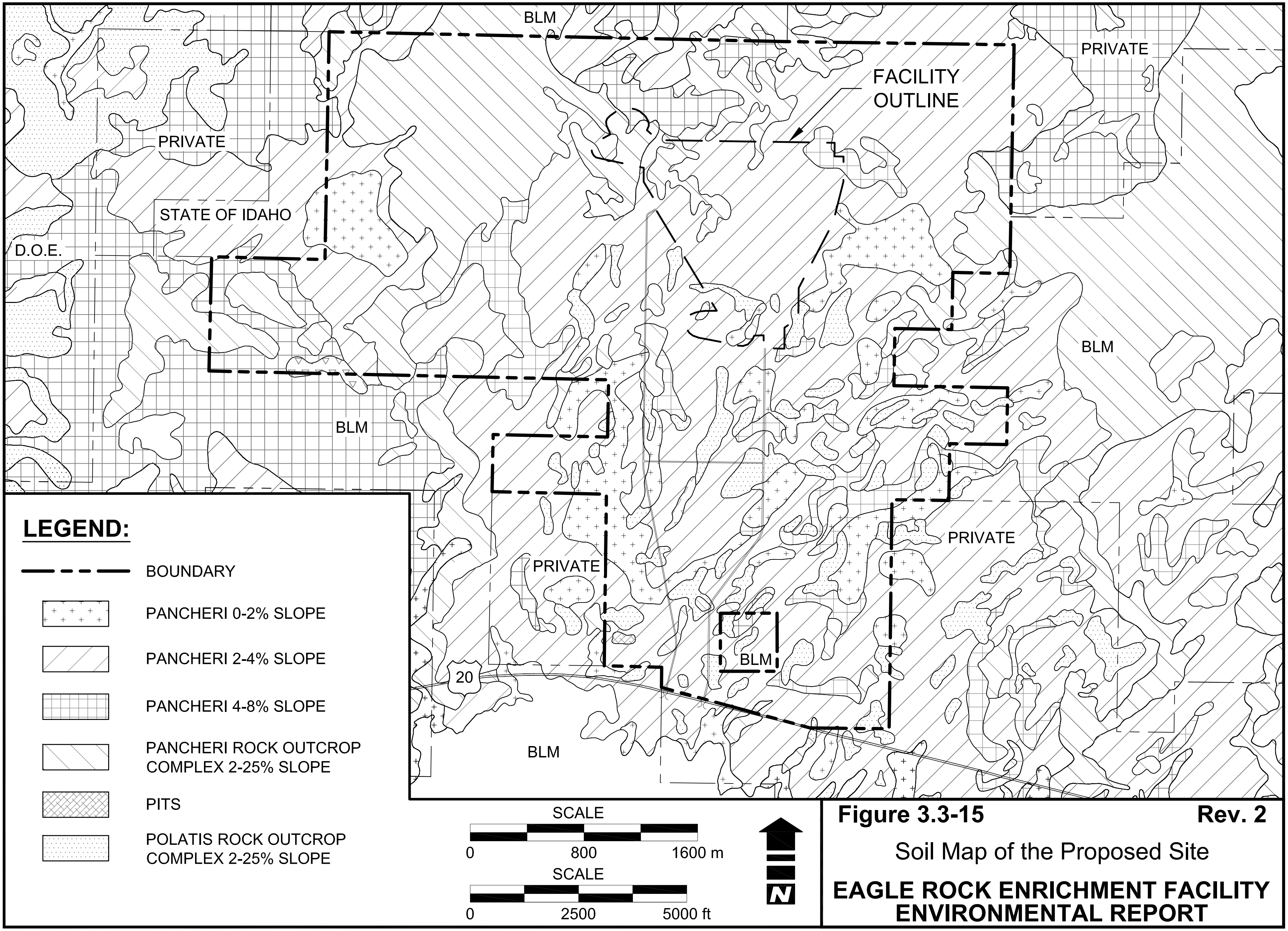
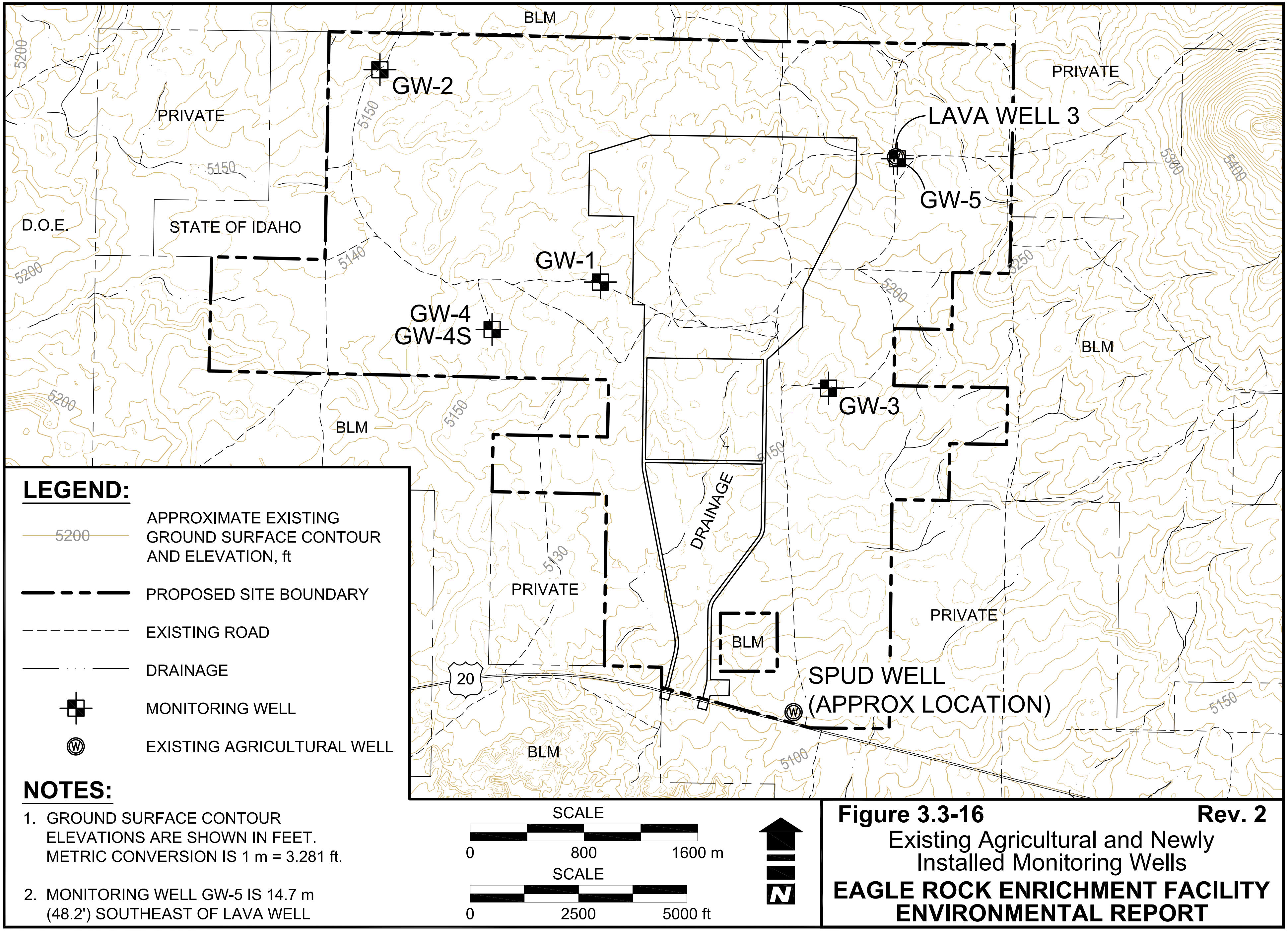


Figure 3.3-15 **Rev. 2**

Soil Map of the Proposed Site

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT



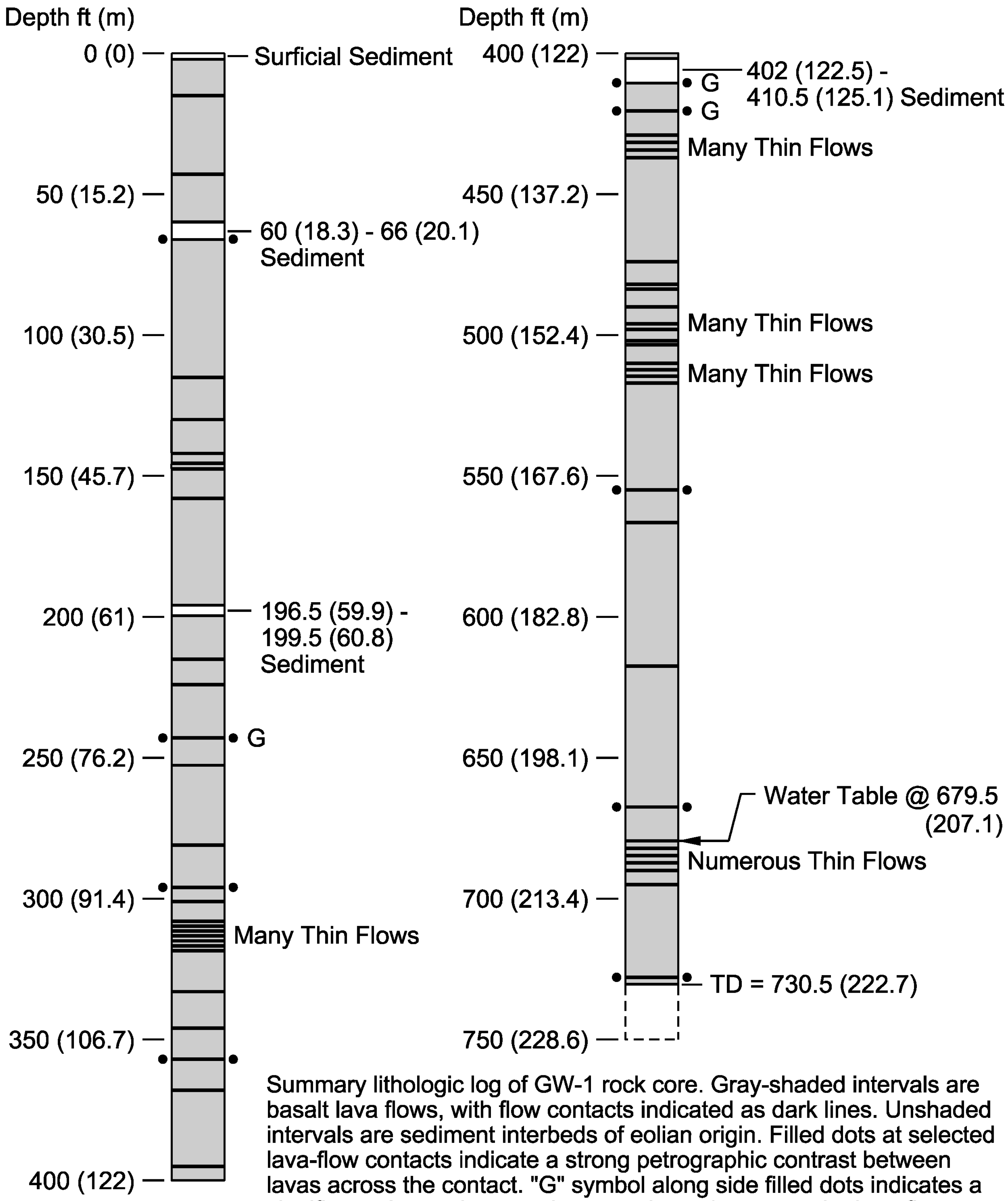
NOTES:

1. GROUND SURFACE CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft.
2. MONITORING WELL GW-5 IS 14.7 m (48.2') SOUTHEAST OF LAVA WELL

Figure 3.3-16 **Rev. 2**

Existing Agricultural and Newly Installed Monitoring Wells

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



Summary lithologic log of GW-1 rock core. Gray-shaded intervals are basalt lava flows, with flow contacts indicated as dark lines. Unshaded intervals are sediment interbeds of eolian origin. Filled dots at selected lava-flow contacts indicate a strong petrographic contrast between lavas across the contact. "G" symbol along side filled dots indicates a significant change in natural-gamma intensity across the lava-flow contact.

Figure 3.3-17 **Rev. 2**

GW-1 Lithologic Log - Summary

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

3.4 WATER RESOURCES

This section describes the surface water and groundwater resources for the site of the proposed Eagle Rock Enrichment Facility (EREF). It provides data for the site and surrounding area and describes the regional setting of the natural water systems. This information establishes the basis for evaluation of potential facility impacts on surface water, groundwater, aquifers, water use, and water quality. Subsections address surface hydrology, water quality characteristics, pre-existing environmental conditions, water rights and resources, water use, contamination sources, and groundwater characteristics.

Much of the water resources information was obtained from prior studies, including extensive subsurface investigations for the Department of Energy's Idaho National Laboratory (INL), which is located immediately west of the proposed site, as well as regional studies conducted by the U.S. Geologic Survey and the State of Idaho. This information is supplemented by a site specific groundwater monitoring and sampling program initiated in March 2008.

The proposed facility will use groundwater for both process and potable water requirements. No surface water will be used. The collection and storage of runoff from specific site areas will be controlled. As described below, no significant adverse changes are expected for the hydrologic environment as a result of construction and operation of the facility. ER Section 4.4.7, Control of Impacts to Water Quality, addresses the potential impacts to water resources as a result of activities at the proposed facility, including runoff and infiltration changes due to plant construction and fill placement.

3.4.1 Surface Hydrology

The National Oceanic and Atmospheric Administration's (NOAA) Western Regional Climate Center maintains historical climate data for weather stations throughout the western United States. NOAA classifies the climate of the proposed site as semi-arid climate. A detailed description of the local climate is presented in ER Section 3.6, Meteorology, Climatology, and Air Quality. The combination of low annual precipitation, high evaporation and site topography has created a low potential for surface water run-on or run-off for this site.

The proposed EREF site contains no surface water bodies. There are a few small drainage features in the northeastern corner, and the southeastern and southwestern areas of the proposed site. However, the drainages in the northeastern corner are no longer evident in the field because they are within irrigated crop circles when the natural topography has been smoothed to accommodate crop production. The southeastern and southwestern drainage features likely originated from natural erosional processes during spring snowmelt or heavy rains but now primarily conduct minor amounts of water from irrigated agriculture areas. The southeastern drainages terminate as seepage loss into the ground or by evapotranspiration. In the southwestern area, a single natural drainage was identified during field reconnaissance and this ephemeral drainage can convey water off site during episodic melt water and precipitation events or agricultural flooding. The drainage is located in the southwestern corner of the proposed site and runs from the south-central area of the proposed site southward toward Highway 20. The source of the water within the site boundary is likely the westernmost center pivot agricultural irrigation system. The drainage also potentially conveys surface water during large rainfall events. Just to the north of Highway 20, a series of small ponds were used historically to collect and store water from this drainage for agricultural uses, but these ponds are no longer in use and are dry. Highway 20 has a culvert to convey water from this drainage to the south away from the roadway. Based on field observations, this drainage has an incised channel into the soil exposing bedrock in some areas. Figure 3.4-1, Drainage Feature and Location, shows this drainage feature.

Regional and local hydrologic features are shown in Figure 3.4-2, Regional Hydrologic Features Within 80 km (50 mi), and Figure 3.4-3, Local Hydrologic Features Within 8 km (5 mi). An example of typical site drainage morphology is shown in Figure 3.4-4, Photo of Small Drainage Feature.

Most precipitation is contained on site due to infiltration and evapotranspiration. The vegetation on the site is primarily big sagebrush and perennial grasses or crops on approximately 389 ha (962 acres) of the proposed facility. The surface soils are predominantly of an eolian origin having low permeability and high storage, which tends to hold moisture rather than allow rapid infiltration. Water held in storage in the soil is subsequently subject to evapotranspiration by the well rooted xerophyte type and drought resistant plants of this locale.

Twenty subsurface borings were drilled at the site during November 2007. An additional 10 borings were drilled in May 2008. Moisture content by weight of the initial 20 samples ranged from 9.6% to 15.5%. Moisture content by weight of the May 2008 samples ranged from 10.6% to 19.0%. The winter and spring of 2008 were exceptionally moist in terms of snow and rainfall, explaining the higher moisture contents measured in May 2008 compared to those for November 2007.

The groundwater system underlying the Snake River Plain (SRP) in the vicinity of the proposed facility is referred to as the Eastern Snake River Plain (ESRP) Aquifer (Whitehead, 1992). Recharge rates from precipitation can vary significantly from one part of the ESRP to another due to variations in rainfall, timing, surface cover, evaporation rates, vegetation, etc. In the central part of the ESRP recharge rates are reported to range from 0.6 cm/yr (0.2 in/yr) near the EREF site to 9.1 cm/yr (3.6 in/yr) near Craters of the Moon to the west. The higher recharge rates at Craters of the Moon is attributed to higher precipitation, freshly exposed basaltic lava with high permeability, and because soils and vegetation are largely absent (Ackerman, 2006). At INL, recharge rates range from 0.30 cm/yr (0.12 in/yr) to 1.2 cm/yr (0.48 in/yr) or 2% to 5% of mean annual precipitation of 21.3 cm/yr (8.4 in/yr) (Ackerman, 2006). Given the proximity of INL and similarity in terrain, recharge rates to the ESRP Aquifer at the proposed site are also expected to be in the range of 2% to 5% of mean annual precipitation.

3.4.1.1 Facility Withdrawals and/or Discharges to Hydrologic Systems

A summary of annual liquid waste volumes anticipated to accumulate at the EREF is provided in Table 3.4-1, Summary of Potentially Contaminated Liquid Wastes for the Eagle Rock Enrichment Facility. EREF water consumption is provided in Table 3.4-2, Anticipated Normal Facility Water Consumption and Table 3.4-3, Anticipated Peak Facility Water Consumption. Domestic and process water will be withdrawn from one or more on-site wells. The EREF is expected to require approximately 24,900 m^3/yr (6,570,000 gal/yr) in support of plant operations. Of this approximately 2,100 m^3/yr (554,800 gal/yr) will be consumed by plant processes and 22,800 m^3/yr (6,023,000 gal/yr) will be used for potable water.

The EREF design precludes operational process discharges from the plant to surface or groundwater. Liquid wastes are treated and discharged to atmosphere by evaporation via the Liquid Effluent Collection and Treatment System Evaporator. Total effluent discharge to atmosphere by evaporation from the liquid effluent system evaporator are approximately 59,100 L (15,625 gal) annually. The slurry from the evaporator process is expected to be approximately 720 L (190 gal) annually. This waste will be collected and transferred offsite to a low-level waste facility. Two engineered basins, the Cylinder Storage Pads Stormwater

Retention Basins, will be utilized for the collection and containment of water from stormwater runoff from the Cylinder Storage Pads and daily treated domestic sanitary effluent discharges. The annual treated domestic sanitary effluent discharge to the basin will be approximately 18,700 m^3/yr (4,927,500 gal/yr). The annual stormwater runoff discharge from the Cylinder Storage Pads to the Cylinder Storage Pads Stormwater Retention Basins will be approximately 65,240 m^3/yr (17,234,700 gal/yr). Therefore, the total potential annual discharge to the two Cylinder Storage Pads Stormwater Retention Basins will be approximately 83,940 m^3 (22,162,300 gal). The locations of the Cylinder Storage Pads Stormwater Retention Basins are shown on Figure 4.4-1, Facility Layout with Stormwater Detention/Retention Basins. Evaporation will provide the only means of liquid disposal from the Cylinder Storage Pads Stormwater Retention Basins. The Cylinder Storage Pads Stormwater Retention Basins will include a single membrane liner, to eliminate infiltration into the ground. Residual dry solids, if any, after evaporation of water, will be impounded within the basin.

Each of the two Cylinder Storage Pads Stormwater Retention Basins is designed to contain a volume of approximately 83,019 m^3 (67.3 acre-ft) maintaining a freeboard of 0.9 m (3.0 ft). Under highly unlikely events, the volume of each basin will contain approximately 113,700 m^3 (92.2 acre-ft), maintaining a freeboard of 0.3 m (1.0 ft). The area served by the basin includes 25.6 ha (63.3 acres), the total area of the Cylinder Storage Pads. The retention basins are designed to contain runoff for a volume equal to twice that for the 24-hour, 100-year return frequency rain storm, a 5.70-cm (2.24-in) rainfall plus allowances for daily treated sanitary effluent discharges.

A packaged treatment plant is planned to dispose of domestic sanitary wastes at the site. The solid wastes generated by the Domestic Sanitary Sewage Treatment Plant will be temporarily stored in a holding tank for periodic disposal at an off-site location, as described in ER Section 4.1.2, Utilities Impacts. As indicated above, daily treated domestic sanitary effluent from the sewage system will be directed to two lined Cylinder Storage Pads Stormwater Retention Basins.

Residual solids, after evaporation of water from the Cylinder Storage Pads Stormwater Retention Basins, will be removed off site by a licensed contractor. The wastes will be disposed based on their characterization and in accordance with the U.S. EPA and State of Idaho regulatory requirements. The State of Idaho has adopted the U.S. EPA hazardous waste regulations governing the generation, handling, storage, transportation, and disposal of hazardous materials (IDAPA, 2008f). These regulations are found in ER Section 1.3, Applicable Regulatory Requirements, Permits and Required Consultations.

Stormwater runoff from the central, southern, and surrounding runoff diversions will be collected in the Site Stormwater Detention Basin. The Site Stormwater Detention Basin is located at the south side of the proposed site and will collect runoff from various developed parts of the site, including roads, parking areas, and building roofs (see Figure 4.4-1, Facility Layout with Stormwater Detention/Retention Basins). The detention basin will be unlined and will have an outlet structure to control discharges above the design level. Normal discharge will be through evaporation and infiltration into the ground. The detention basin will be designed to contain runoff for a volume equal to the 24-hour, 100-year return frequency rain storm of 5.70 cm (2.24 inch) rainfall. The storage capacity available for maintaining a freeboard of 0.6 m (2.0 ft) is approximately 32,835 m^3 (27 acre-ft). For a highly unlikely storm scenario maintaining a freeboard of 0.3 m (1.0 ft), the basin will have approximately 49,600 m^3 (40 acre-ft) of storage capacity. The area served by the detention basin is about 139.3 ha (344.2 acres). It will also be designed to detain post-construction peak flow runoff rates from the outfall that are equal to or less than the pre-construction runoff rates from the site area.

Water balances for the Cylinder Storage Pads Stormwater Retention Basins are presented in Tables 3.4-4 and 3.4-5, Water Balance for the Cylinder Storage Pads Stormwater Retention Basins (minimum and maximum scenarios, respectively). Similarly, water balances for the Site Stormwater Detention Basin are found in Tables 3.4-6 and 3.4-7, Water Balance for the Site Stormwater Detention Basin (minimum and maximum scenarios, respectively). The water balance tables consider the following components:

- Precipitation runoff
- Direct precipitation
- Treated domestic sanitary effluent to the retention basins
- Infiltration from the detention basin, and
- Evaporation.

The water balances include the following inputs and assumptions in addition to those cited in the table notes:

- The annual minimum and maximum precipitation amounts were distributed by month using the recorded direct and wettest distribution by month. Use of the minimum precipitation amounts provides a minimum discharge scenario. Use of the maximum precipitation amounts provides a maximum discharge scenario. The information conservatively represents what could possibly occur (although highly unlikely) over a very dry or very wet calendar year based on the 53 year period of record.
- No credit is taken for outflows from the Site Stormwater Detention Basin through the discharge outlet. Any such flows will eventually infiltrate, evaporate or evapotranspirate.
- Precipitation inflow to the retention basin is based on 100% impervious surface contribution from the Cylinder Storage Pads.
- Precipitation inflow to the detention basin is based on the proposed developed surface characteristics of impervious areas, gravel areas, lawn and natural areas contributing to the basin. Inflows were calculated using the HydroCAD Stormwater Modeling System computer software. Urban Hydrology for Small Watersheds, TR-55 was used to calculate runoff curve numbers, taking into account the frozen ground conditions during the winter season.

The tables provide the monthly balance (inflow minus outflow). A positive value indicates that the inflow components exceed the outflow components for the respective basin. A negative value indicates that outflow components will dispose of a portion of or the entire monthly inflow for the respective basin. The tables also provide the monthly net in the basin. A non-zero value indicates that the basin will contain standing water.

The results for the Cylinder Storage Pads Stormwater Retention Basins show that basin outflow due to evaporation will exceed inflows for the months of May through October under the minimum discharge scenario. Cumulative basin outflow due to evaporation does not exceed the monthly inflows for this unlikely chain of events during the maximum discharge scenario. However, the storage volume provided is never exceeded even under the cumulative effect of back to back record wettest months. Under this highly unlikely event, freeboard has been reduced to 0.3 m (1.0 ft) for calculating available basin volume. For the more likely scenario, if the monthly mean precipitation is used in this basin model, a freeboard of 2.15 m (7.05 ft) is provided.

The results for the Site Stormwater Detention Basin show that basin outflow due to evaporation and infiltration will exceed all inflows on a monthly basis under both discharge scenarios. Of the amount that infiltrates into the ground, a portion is expected to eventually return to the atmosphere via evapotranspiration by vegetation growing within and in the vicinity of the basin. As shown in Tables 3.4-6 and 3.4-7, the combination of both potential infiltration and potential evaporation are more than sufficient to dispose of basin inflows on a monthly basis.

In summary, the results demonstrate that even under the maximum scenarios, the capacities of the basins are not exceeded. As stated above, the evaporation rates used in calculating the water balances for the retention and detention basins are based on historic ambient evaporation rates for the site area. Should ambient seasonal air temperatures increase due to global warming and climate change, the evaporation rates would be expected to increase, further reducing infiltration from the detention basin and/or the potential to exceed basin capacities. As a result, the water balance tables are considered conservative.

3.4.2 Water Quality Characteristics

As discussed in ER Section 3.4.1, Surface Hydrology, there are no surface water bodies at the proposed facility and no surface water was present in the drainages during the site field investigations and site visits between November 2007 and July 2008 and in October 2008. The vast majority of runoff from precipitation at the site is effectively contained on site by the natural topography where it infiltrates into the shallow soils. There are small linked drainages that likely convey limited seasonal drainage. The heads of these drainages are near the boundary of the facility footprint.

Two agricultural wells (Lava Well-3 and Spud Well) were previously installed at the proposed site. In addition, five deep aquifer monitoring wells (GW-1 through GW-5) and one shallow perched water well (GW-4S) were drilled and installed on the proposed site (see Figure 3.4-5). Standard protocols were followed during all phases of well drilling, installation, completion, development, and sample collection.

Groundwater samples were collected from all of the aquifer monitoring wells; however, a groundwater sample could not be obtained from the shallow perched water well (GW-4S) due to lack of water. GW-4S was installed to determine if a perched groundwater system existed at the site; however, this well has remained dry since completion. The existing agricultural wells were sampled in March 2008, June 2008, and September 2008. The deep monitoring wells GW-1 through GW-5 were sampled as they were completed between May 2008 and July 2008, and sampled a second time in September/October 2008. Additional groundwater sampling was performed in January, 2009 and April, 2009. The regional and local groundwater chemistry is described in detail in ER Section 3.4.15.

3.4.3 Pre-Existing Environmental Conditions

Historically, the site has been used for farming and grazing. There is no documentation of manufacturing, storage, or significant use of hazardous chemicals on the subject property. The closest area of large industrial operations is the INL. The eastern boundary of the INL is about 0.8 km (0.5 mi) west of the proposed site. The INL property near the proposed site is undeveloped rangeland. The closest facility on the INL property is the Materials and Fuels Complex located approximately 16 km (10 mi) west of the proposed property boundary. There are no other commercial or industrial facilities within 8 km (5 mi) of the site.

The primary anthropogenic effects on water quality reported for the ESRP Aquifer in the vicinity to the EREF are due to:

- Agricultural practices

- Industrial operations at INL

The major effects of agricultural practices on the ESRP water quality are elevated concentrations of nitrate and other anions and the occasional presence of pesticides. Wells near the eastern boundary of the INL show elevated nitrate and other anion concentrations probably due to agricultural impacts (DOE-ID, 2007a). The elevated nitrate concentrations are indicative of leaching of fertilizers in agricultural areas and transport into the aquifer. The transport to the aquifer reflects irrigation water migrating back to the aquifer with an increase in anions, chloride and sulfate due to evaporation. Agricultural areas upgradient of the EREF site could impact water quality beneath the EREF site.

INL is the closest area of large industrial operations to the proposed EREF site. However, regional groundwater flow directions indicate that INL is cross gradient to the proposed EREF (DOE-ID, 2007a; DOE-ID, 2007b; Ackerman, 2006). Groundwater flow paths determined by delineation of groundwater plumes at the INL indicate that these plumes will not impact the proposed EREF site (DOE-ID, 2007b).

3.4.4 Historical and Current Hydrological Data

The proposed facility is located in an area with no surface water bodies. The predominant regional direction of groundwater flow is from the northeast to southwest (Smith, 2004) (Whitehead, 1992). The closest surface water bodies are the Snake River and the Market Lake Wildlife Management Area (WMA). These two surface water bodies are located about 32 km (20 mi) to the east and northeast of the site, respectively. Each of these features is located within the Idaho Falls watershed (Hydrologic Unit Code [HUC] 17040201) (IDEQ, 2004). Due to the distance of these surface waters bodies from the proposed site, it is unlikely that they will be impacted by the facility from surface water flow. Flow data for the Snake River are presented in ER Section 3.4.13, Freshwater Streams for the Watershed Containing the Site.

3.4.5 Statistical Inferences

With the exception of the calculation and presentation of simple arithmetic means, no statistical parameters are used to provide or interpret surface hydrologic data for the proposed facility.

3.4.6 Water Rights and Resources

The proposed facility will obtain water for operational purposes from groundwater using wells within the property boundary. Water rights and transfers associated with the acquisition of this water are described in the following subsections.

3.4.6.1 Public Water Supply and Water Rights

The ESRP Aquifer has been a designated “sole source aquifer” since 1991. A sole source aquifer is defined by the EPA as an aquifer that supplies at least 50% of the drinking water in the area overlying the aquifer. The EPA definition also requires that the area dependent on the sole source aquifer must have no alternative drinking water sources that could satisfy all of the drinking water in an economical and legal manner (EPA, 2008a). At the current time, the ESRP Aquifer is the sole source of drinking water for the entire population residing in southeast and south-central Idaho.

The largest municipalities located in the ESRP include Idaho Falls in Bonneville County and Pocatello in Bannock County. The City of Idaho Falls operates a system of 19 groundwater wells that produce an average daily usage of about 76,000 m^3/d (20,000,000 gal/d) and maximum usage of 220,000 m^3/d (58,000,000 gal/d). The City of Pocatello obtains drinking water from the ESRP and the tributary Portneuf Aquifer through a system of 21 water supply wells. These wells provide an average of 57,160 m^3/d (15,000,000 gal/d) (IDC, 2008a).

The use of groundwater by the EREF will be covered by a 1961 water right appropriation that will be transferred to the property for use as industrial water. The water transfer will occur concurrently with the purchase of the property by AES and will change the original water use from agriculture to industrial use. The primary point of diversion will be from the existing agricultural well, Lava Well 3, near the center of Section 13, or a replacement well. The water will be assigned to other points of diversion to allow for the use of water from another well if the primary well should happen to fail. The original 1961 appropriation will decrease to approximately 1,713 m^3/d (452,500 gal/d) for industrial use and 147 m^3/d (38,800 gal/d) for seasonal irrigation use.

The annual water usage during the construction years will increase to a maximum estimate of 98,458,000 L/yr (26,010,000 gal/yr) in the second year and decrease to 84,374,000 L/hr (22,289,000 gal/yr) during the seventh year of construction. The maximum annual water usage rate during construction is about 16% of the water appropriation value of 625,000,000 L/yr (165,000,000 gal/yr) for industrial use. It is assumed that construction water usage during construction years 8 through 11 will diminish markedly as most of the remaining construction activities are for assembly of systems and components and not concrete mixing, dust control or soil compaction. The heavy construction period includes the years when both construction and operation of cascades overlap. Section 3.4.7 provides the details of the water use values for construction and operation.

The predicted daily water consumption during operations of the EREF is anticipated to be approximately 68.2 m^3/d (18,000 gal/d) and the peak water consumption rate is anticipated to be 42 L/s (664 gpm). The normal annual water usage rate for the EREF will be 24,870,000 L/yr (6,570,000 gal/yr), which is a very small fraction (i.e., about 4%) of the water appropriation value of 625,000,000 L/yr (165,000,000 gal/yr) for industrial use. The peak water usage is developed based on the assumption that all water users are operating simultaneously. Furthermore, the peak water usage assumes that each water user is operating at maximum demand. This combination of assumptions is very unlikely to occur during the lifetime of the EREF. Nevertheless, the peak water usage is used to size the piping system and pumps. Given that the normal annual water usage rate for the EREF is a very small fraction of the appropriation value, momentary usages of water beyond the expected normal water usage rate are expected to be well within the water appropriation value for the EREF.

3.4.6.2 Regional Groundwater Use

The SRP Aquifer is relied upon for drinking water and irrigation throughout southeastern Idaho (Garabedian, 1992)(Lindholm, 1996). A breakdown of the water withdrawals by use from the SRP Aquifer is provided in Table 3.4-8, Total Groundwater Withdrawals from the SRP Aquifer for Irrigation, Public-Supply, and Self-Supplied Industrial Water Uses in 2000. The data in this table indicate that irrigation is the primary use, accounting for 97% of the total withdrawals in 2000 (Maupin, 2005). Public water supply accounts for 3% of the total withdrawals, and industrial uses amount to a fraction of 1% (Maupin, 2005).

At the current time, about 1.2 million ha (3 million ac) of the SRP are irrigated farmlands. About one third of the irrigation water is pumped from the SRP Aquifer and two thirds from surface water diversions (DGI, 2008). Irrigation with groundwater is possible because of high rates of water yield from the basaltic units of the SRP Aquifer.

3.4.6.3 Idaho National Laboratory

The INL is a significant user of groundwater in the general area of the proposed site. The ESRP Aquifer is the source of all the water used at INL. In 2007, the INL pumped 3.97E+06 m^3 (1.05E+09 gal) from a total of 29 production wells at 8 facilities (INL, 2008). The water uses at the INL include drinking water for employees and water for use in chemical processing, facilities operations, wastewater treatment, and environmental remediation (ATSDR, 2004).

3.4.6.4 Site Groundwater Management

The proposed site location is within the Bonneville-Jefferson groundwater management district. According to the Idaho Department of Water Resources (IDWR, 2008a), groundwater districts were defined by the Idaho State Legislature in the "Ground Water District Act" of 1995. This Act allows groundwater users to organize their own Districts that have broader authorities than water measurement districts. The groundwater districts can perform the measurement and reporting functions required by law and levy assessments similar to water measurement districts. Additionally, groundwater districts may represent their members in various water use issues and related legal matters, develop and operate mitigation and recharge plans, and perform other duties. It is unlikely that stipulations of the Bonneville-Jefferson Groundwater Management District will have any impact on the proposed EREF use of ground water.

The proposed site location is not within the service areas of any irrigation companies. It also is not located in established groundwater critical groundwater areas, contamination areas, or groundwater vulnerability areas (IDWR, 2008a).

3.4.7 Quantitative Description of Water Use

The source of water for the proposed facility would come from on-site groundwater wells. Anticipated water use by the facility is shown in Table 3.4-2, Anticipated Normal Plant Water Consumption, and Table 3.4-3, Anticipated Peak Facility Water Consumption. Anticipated water use to construct the facility is shown in Table 3.4-15, Construction Water Use (2011-2022). The construction period includes the years when both construction and operation of cascades overlap. Anticipated water use to operate the facility during this period of construction and operations overlap is shown in Table 3.4-16, Operations Water Use (2011-2022). Irrigation water usage will start in the year 2013 and continue to increase until the completion of construction in 2022. The irrigation water usage will not exceed 24,669,000 L (6,517,020 gal) per growing season and will not be applied outside the period defined by the Idaho Department of Water Resources (IDWR) as the growing season – April 1 through October 31. Irrigation water usage is within the IDWR irrigation water use limitation specified in the IDWR Water Rights for the EREF site. The water supply will be adequate for construction, operation and maintenance of the proposed site.

3.4.8 Non-Consumptive Water Use

The EREF will have a water appropriation of approximately 1,713 m^3/d (452,500 gal/d) for industrial use and 147 m^3/day (38,800 gal/day) for seasonal irrigation use from an existing water right associated with the property. This water right will transfer to AES with the purchase of the property. Non-consumptive use of water is not planned.

3.4.9 Contaminant Sources

There will be no direct discharges to native groundwater or surface waters from the operations at the proposed facility, other than potential infiltration from the Site Stormwater Detention Basin. There is no history of industrial use at the site. With the exception of agricultural products (fertilizers, pesticides, etc.) used at or near the site, the closest source of known hazardous releases and contaminants to the groundwater system is the INL. However, the INL is hydrologically cross gradient to the proposed site based on predominant flow directions in the ESRP Aquifer (DOE-ID, 2007a; DOE-ID, 2007b; Ackerman, 2006). Agricultural influences are the only potential upgradient impacts. Additional industrial development could occur in the vicinity, but no plans for such operations are known at this time.

Stormwater runoff from the proposed site will be controlled during construction and operation. Appropriate stormwater construction runoff permits for construction activities will be obtained before construction begins. Designs for stormwater runoff controls for the operating plant are described in Section 4.4, Water Resources Impacts. Appropriate routine erosion control measures and best management practices (BMPs) will be implemented as is normally required by such permits.

During operation, stormwater will be collected from appropriate site areas and routed to detention/retention basins. The stormwater plan is described in ER Section 4.4.1, Receiving Waters and shown in Figure 4.4-1, Facility Layout with Stormwater Detention/Retention Basins.

3.4.10 Description of Wetlands

An evaluation of wetlands mapped by the Fish and Wildlife Service determined that the site does not contain jurisdictional wetlands (USFWS, 1980) (USFWS, 2008c).

3.4.11 Federal and State Regulations

ER Section 1.3, Applicable Regulatory Requirements, Permits, and Required Consultations, describes the applicable regulatory requirements and permits for this project. ER Section 4.4, Water Resources Impacts, describes potential site impacts as they relate to environmental permits regarding water use by the proposed EREF (refer to ER Section 1.3.1, Federal Agencies and ER Section 1.3.2, State Agencies).

Applicable regulations for water resources for this proposed site include:

- The Safe Drinking Water Act (SDWA) requirements on a state level: The Idaho Environmental Protection and Health Act (Idaho Code Chapter 1, Title 39) gives the Idaho Department of Environmental Quality (IDEQ) the authority to promulgate rules governing quality and safety of drinking water. The Water Quality Division (WQD) is delegated responsibility to implement the SDWA. Rules governing quality and safety of drinking water in Idaho have been promulgated in IDAPA 58.01.08. Although a permit is not required for a drinking water system serving fewer than 10,000 persons (IDAPA, 2008b), the IDEQ requires a comprehensive treatment plan and licensed plant operator. The drinking water plan for the proposed EREF will include sufficient detail to demonstrate that the proposed project meets applicable criteria. The facility plan generally addresses the overall system-wide plan.
- National Pollution Discharge Elimination System (NPDES): The NPDES permit program includes an industrial stormwater permitting component adopted under Section 402 of the CWA. The NPDES Stormwater Program regulates discharges of stormwater from industrial

and commercial facilities to waters of the United States. Since the construction of the proposed EREF would be greater than 0.4 ha (1.0 ac), AES will obtain a NPDES Construction General Permit to establish the provisions for meeting stormwater regulations at the EREF. For operations, AES will obtain a NPDES Multi-Sector General Permit for stormwater discharges. Design, construction, and operational details of facility groundwater systems and stormwater pollution prevention plans will be provided to EPA and IDEQ as part of the Notice of Intent to obtain each permit. Water Well Permit: A permit application to drill a well must be approved by staff of the IDWR. The information required on the application includes the well location, proposed use, and well construction methods. Wells must be drilled by persons holding a driller's license from the IDWR. Wells must also comply with Idaho's well construction standards found at IDAPA 37.03.09 (IDAPA, 2008h). A drilling permit must be obtained before the construction of any well greater than 5.5 m (18.0 ft) in depth. The drilling permit is valid for two months from the approval date for the start of construction.

3.4.12 Surface Water Characteristics for Relevant Water Bodies

No off-site surface water runoff will occur from the proposed facility. One minor, natural erosional drainage exists within the proposed site boundary (described in ER Section 3.4.1, Surface Hydrology). It is located in the southwestern corner of the proposed site and runs from the south-central area of the proposed site southward toward Highway 20. Highway 20 has a culvert to convey water from this drainage to the south, away from the roadway. Precipitation that will fall on the developed areas of the proposed site will be collected in stormwater retention and detention basins where it will be allowed to evaporate or infiltrate into the subsurface in the case of the detention basin.

3.4.12.1 Freshwater Streams, Lakes, Impoundments

The proposed site does not include any freshwater streams or lakes. Retention and detention basins designed to contain stormwater runoff and treated effluent from the Domestic Sanitary Sewage Treatment Plant from the EREF will be constructed as part of the facility. These components are described in ER Section 3.4.1.1, Facility Withdrawals and/or Discharges to Hydrologic Systems.

3.4.12.2 Flood Frequency Distributions, Including Levee Failures

The proposed facility elevation is above the 100-year and the 500-year flood elevation (FEMA, 1981).

3.4.12.3 Flood Control Measures (Reservoirs, Levees, Flood Forecasting)

The proposed facility is not located near any reservoirs, levees or surface waters that could cause flooding of the plant site. In addition, because the proposed facility elevation will be above the 100-year and the 500-year flood elevation - as designated by FEMA (FEMA, 1981), no flood control measures are proposed.

3.4.12.4 Location, Size and Elevation of Outfall

Operations at the proposed facility will not include an outfall to any surface water bodies.

3.4.12.5 Outfall Water Body

The operations at the proposed facility will not include a surface water body outfall.

3.4.12.6 Bathymetry Near Any Outfall

The operations at the proposed facility will not include an outfall to any surface water bodies and, as a result, bathymetry is not necessary.

3.4.12.7 Erosion Characteristics and Sediment Transport

The EREF is designed as a non-discharge facility; therefore erosion and sediment transport are not expected to occur. The operations at the proposed facility will not include an outfall or discharge to any surface water bodies.

3.4.12.8 Floodplain Description

The proposed EREF site elevation is above the 100-year and the 500-year flood elevation (FEMA, 1981). There are no detailed floodplain maps available for the site since it is not located near any floodplains.

3.4.12.9 Design-Basis Flood Elevation

Since the proposed site is not within the 100-year or 500-year floodplain (FEMA, 1981), flooding at the proposed facility is unlikely. The proposed site is contained within the Idaho Falls watershed, HUC 17040201, with gradual average slopes of about 1.4%. The Natural Resources Conservation Service soil survey data summary indicates that soils typically have no potential for ponding (NRCS, 2008a). Any on-site precipitation will be subject to evapotranspiration or infiltration. Minor intermittent drainages originating within the site boundary do not connect to off-site resources or larger drainages. The largest surface water body southwest of the proposed site (along the topographical grade) is Lake Wolcott, approximately 120 km (75 mi) from the proposed site and the Snake River about 32 km (20 mi) east of the site. No special design considerations for local intense precipitation are necessary to prevent flooding at the proposed site other than the stormwater runoff controls described in ER Sections 4.4.1, Receiving Waters, and 4.4.7.1, Mitigations.

3.4.13 Freshwater Streams for the Watershed Containing the Site

The Snake River and some minor tributaries are located in the Idaho Falls watershed, HUC 17040201, where the proposed facility will be located (IDEQ, 2004). No streams on the proposed site flow directly to any tributaries or the Snake River.

3.4.13.1 Drainage Areas

The proposed facility is located in the Idaho Falls watershed, HUC 17040201. The slopes and surface waters generally flow from northeast to southwest. The closest surface water bodies are the Snake River and the Market Lake Wildlife Management Area (WMA), about 32 km (20 mi) to the east and northeast of the site, respectively. Each of these features is located within the Idaho Falls watershed, HUC 17040201 (IDEQ, 2004). As described in ER Section 3.4.1, Surface Hydrology, there are a few small drainage areas within the proposed site boundary.

3.4.13.2 Historical Maximum and Minimum River Flows

There are three USGS streamflow gauging stations for the Snake River located within the Idaho Falls watershed that have historical daily records of streamflow (USGS, 2008b). These are the Snake River near Lewisville, Snake River above Eagle Rock near Idaho Falls, and Snake River near Idaho Falls. Table 3.4-9, Average Flows by Month for the Snake River, shows the average flows by month at these gauge locations along the Snake River. Table 3.4-10, Snake River Gauge Statistics, shows the average annual flow, average daily minimum and maximum flows, and daily minimum and maximum flows for each of these gauges.

A hydrograph depicting the mean daily streamflow over the period of record for the Snake River gauge with the longest historical record is shown in Figure 3.4-6, Snake River above Eagle Rock near Idaho Falls Hydrograph.

3.4.13.3 Historical Drought River Flows

The Palmer Drought Severity Index shows that south-central Idaho has been in a drought since water year 2000 (Skinner, 2007). Average annual flows recorded at USGS gauge 13057155, Snake River above Eagle Rock near Idaho Falls, have been reduced to about 200 m^3/s (7,060 ft^3/s) since this time. Refer to Figure 3.4-7, Annual Flows in the Snake River.

The State of Idaho has published a drought plan to respond to water supply issues during dry periods and has identified critical groundwater management areas, most located in southwestern Idaho, where groundwater has been “overdrafted” to supplement water needs (IDWR, 2001). However, the proposed EREF is located within the Idaho Falls watershed and has enough available water in times of drought to provide for regional needs.

3.4.13.4 Important Short Duration Flows

Annual peak flows for the Snake River above Eagle Rock near Idaho Falls tend to be between two and three times the average flows (Figure 3.4-7, Annual Flows in the Snake River). The greatest flow occurred during a storm in 1997 where the short duration flow reached 1,376 m^3/s (48,600 ft^3/s) (USGS, 2008b).

3.4.14 Water Impoundments

Impoundments to contain stormwater runoff and treated domestic sanitary effluent will be constructed as part of the facility. These features are described in ER Section 3.4.1.1, Facility Withdrawals and/or Discharges to Hydrologic Systems.

3.4.14.1 Elevation-Area-Capacity Curves

Impoundments to contain stormwater runoff and treated domestic sanitary effluent will be constructed as part of the proposed EREF. These features are described in ER Section 3.4.1.1, Facility Withdrawals and/or Discharges to Hydrologic Systems.

The Site Stormwater Detention Basin which will be located at the south side of the site will be designed to contain runoff for a volume equal to a 24-hour, 100-year return frequency rain storm of 5.70 cm (2.24 inch) rainfall. The storage capacity available for maintaining a freeboard of 0.6 m (2.0 ft) is approximately 32,835 m^3 (27 acre-ft). For a highly unlikely storm scenario maintaining a freeboard of 0.3 m (1.0 ft), the basin will have approximately 49,600 m^3 (40 acre-ft) of storage capacity. The area served by the detention basin is 139.3 ha (344.2 acres).

Each of the two Cylinder Storage Pads Stormwater Retention Basins which will be located northwest of the developed footprint will be designed to contain a volume of approximately 83,019 m^3 (67.3 acre-ft) maintaining a freeboard of 0.9 m (3.0 ft). Under highly unlikely events, the volume of each basin will contain approximately 113,700 m^3 (92.2 acre-ft), maintaining a freeboard of 0.3 m (1.0 ft). The area served by the retention basins will be 25.6 ha (63.3 acres). The retention basins are designed to contain runoff for a volume equal to twice that for the 24-hour, 100-year return frequency rain storm, a 5.70-cm (2.24-in) rainfall plus allowances for treated effluent from the Domestic Sanitary Sewage Treatment Plant.

3.4.14.2 Reservoir Operating Rules

The proposed facility will not make use of any reservoir.

3.4.14.3 Annual Yield and Dependability

The proposed facility will not take or discharge process water to any local water body; thus, it will not affect water storage in any water body.

3.4.14.4 Inflow/Outflow/Storage Variations

The proposed facility will not take or discharge process water to any local water body; thus, it will not affect water storage in any water body.

3.4.14.5 Net Loss, Including Evaporation and Seepage

The proposed facility will not take or discharge process water to any local water body; thus, it will not affect water storage in any water body. Discharge of treated effluent from the Domestic Sanitary Sewage Treatment Plant will be to the Cylinder Storage Pads Stormwater Retention Basins, which will be lined. The retention basins will be designed so that evaporation is the sole discharge route. The annual evaporation potential is 117.73 cm (46.35 in).

3.4.14.6 Current Patterns

The proposed facility will not take or discharge process water to local water bodies or the ground surface; thus, there will be no change in current patterns.

3.4.14.7 Temperature Distribution

The proposed facility will not take or discharge process wastewater or non-contact cooling water to any local water body; thus, it will not affect water temperature in any water body.

3.4.15 Groundwater Characteristics

The groundwater characteristics for the area of the proposed EREF site are discussed in the following sections.

3.4.15.1 Regional Hydrology

The groundwater system underlying the SRP in the vicinity of the proposed facility is referred to as the Eastern Snake River Plain (ESRP) aquifer (Whitehead, 1992). The ESRP Aquifer consists predominantly of flood basalt lava flows with intermittent interbeds of unconsolidated sediments (Whitehead, 1992) (Whitehead, 1994b) as discussed in ER Section 3.3, Geology and Soils. The geologic units comprising the aquifer are primarily lava flows of the Snake River Group basalts (Qb) and the upper part of the Idaho Group (Bruneau Formation) (Ackerman, 2006) (Smith, 2004). The basalt units are variable in thickness and generally discontinuous in lateral extent. Sedimentary interbeds exist between some of the basalts and are of variable thickness and lateral extent (Ackerman, 2006) (Smith, 2004). At the site, the groundwater surface is encountered at depths between 199.5 m (654.4 ft) and 219.4 m (719.9 ft) below ground surface (bgs). The saturated thickness of the ESRP Aquifer is shown on Figure 3.4-8, Saturated Thickness of Pliocene and Younger Basaltic Rocks in the ESRP Aquifer (Whitehead, 1994b).

The ESRP Aquifer covers about 26,000 km^2 (10,039 mi^2) with a thickness up to 400 m (1,312 ft) thick and the water volume in the aquifer is estimated at 100 billion m^3 (3.5E+12 ft^3) (Smith, 2004). The ESRP Aquifer is a major economic resource in southeastern Idaho that is relied upon for both drinking water and irrigation (Garabedian, 1992) (Lindholm, 1996). Wells completed in the top hundred meters or so (few hundred feet) of the Quaternary basaltic units are reported to have specific-capacity values that range from 0.103 m^3/s (3.6 ft^3/s) to 0.207 m^3/s (7.3 ft^3/s) per meter (3.3 ft) of drawdown (Whitehead, 1994b). Based on an analysis of 176 wells in the ESRP Aquifer, Garabedian (Garabedian, 1992) reported median specific yields that range from 0.0008 m^3/s (0.03 ft^3/s) to 0.197 m^3/s (7.0 ft^3/s) per meter (3.3 ft) of drawdown with higher values were the Quaternary basalts are thickest.

The ESRP Aquifer is unconfined over nearly all of its area through locally confined conditions may exist (Garabedian, 1992). The overlying unsaturated zone or vadose zone is spatially heterogeneous and ranges in thickness from 60 m (200 ft) to greater than 300 m (984 ft) (Smith, 2004) and consists of unconsolidated alluvium and Snake River Group basalts (Qb) (Ackerman, 2006). The saturated thickness of the aquifer is greatest in the central part of the ESRP and thins substantially to the west (Whitehead, 1994b). Within the basalts, permeable zones are located mainly in the tops and bottoms of lava flows, which are typically fractured and porous, leading to high horizontal hydraulic conductivity. Vertical joint densities and presence of lower permeability sediment interbeds act to control vertical hydraulic conductivity (Smith, 2004). The interbeds may also act to locally confine limited portions of the aquifer (Whitehead, 1992). Overall, the fractured, porous, and complexly interconnected nature of the basaltic lava flows has resulted in high but heterogeneous and anisotropic horizontal conductivity and much lower vertical conductivity (Nimmo, 2004).

Natural recharge to the aquifer occurs primarily in the Yellowstone Plateau in southeastern Idaho and in the Bitterroot, Lemhi, Lost River, White Knob, and Pioneer mountain ranges adjacent to the northern side of the aquifer (Smith, 2004). A water budget developed in 1980 for the ESRP Aquifer indicated that 60% of the recharge to the aquifer occurs from infiltration of irrigation water. Recharge from groundwater underflow derived from upland areas of the Yellowstone Plateau and mountainous areas on the north side of the ESRP accounts for another 18%. Infiltration of direct precipitation falling on the ESRP provides another 9% of the recharge budget. Contributions from losing stretches of Snake River tributaries and canals accounted for the remaining 13% of the recharge budget (Garabedian, 1992).

The primary discharge area for the aquifer is the Snake River (Ackerman, 2006) (Garabedian, 1992) (Smith, 2004) (Whitehead, 1992). Much of the discharge occurs in a series of springs known as the “Thousand Springs Area”, near the City of Twin Falls, Idaho and another area of springs near American Falls Reservoir located about 145 km (90 mi) upstream from Twin Falls, Idaho (Wood, 1988). The rate of discharge to the Snake River and the American Falls Reservoir is approximately 69.4 m^3/s (2,450.8 ft^3/s)(Whitehead, 1994b). Discharge rates at specific springs vary seasonally by up to 34% as a result of seasonal precipitation and irrigation practices (Johnson, 2002). However the total discharge rates to the Snake River are relatively constant on a seasonal basis, although there have been long-term trends in discharge attributable to changes in irrigation practices and climatic fluctuations (Garabedian, 1992) (Lindholm, 1996) (Whitehead, 1994b).

3.4.15.1.1 **Groundwater Elevations and Flow Direction**

Groundwater elevations in the ESRP Aquifer vary from approximately 1,830 m (6,004 ft) at the northeastern edge to less than approximately 792 m (2,600 ft) at the southwestern edge. The elevation of groundwater drops about 610 m (2,001 ft) over a 320-km (200-mi) flowpath for an average gradient of 1.9 m/km (10.0 ft/mi) (Smith, 2004) (Wood, 1988). Groundwater flowpaths run in a southwestern direction, generally parallel to the Snake River for much of the central portion of ESRP. The Snake River turns northwestward and the groundwater flowpaths discharge to the Snake River (see Figure 3.4-9, Groundwater Elevations and General Direction of Groundwater Movement in the SRP Aquifer) (Ackerman, 2006) (Whitehead, 1994b).

3.4.15.1.2 Groundwater Aquifier Interactions

The ESRP Aquifer is located within a topographic basin formed by geological subsidence relative to surrounding mountain ranges and uplands (Garabedian, 1992). The ESRP Aquifer receives inflows of groundwater as underflow from tributary basins located along its margins, especially along the northern and northwestern boundaries where a series of northwest-trending mountain ranges and valleys terminate on their southern ends in the ESRP (Ackerman, 2006) (Garabedian, 1992) (Lindholm, 1996).

In the “Thousand Springs”, area, the Snake River has incised a deep west-northwest trending channel in the basalt matrix making up the aquifer. In addition, a significant amount of water is withdrawn from the aquifer for irrigation purposes.

Due to the aquifers physical configuration, and the nature of the inflows and outflows, the ESRP Aquifer does not interact with or convey water into other regional aquifer systems.

3.4.15.1.2 Groundwater Velocities

The transmissivities of the basalts comprising the ESRP are very high on average throughout much of the ESRP Aquifer (Ackerman, 2006) (Wood, 1988). As a result, groundwater velocities in the aquifer are relatively fast (Table 3.4-11, Ranges of Hydrologic Properties for the SRP). The average time for water to travel from the recharge areas in the northeast to discharge areas at the Snake River, which is a distance of approximately 320 km (199 mi), is estimated to be about 300 years, yielding an average velocity of 3 m/d (10 ft/d) (Smith, 2004). Determinations of groundwater velocities at the nearby INL, based on chloride-36 and tritium data, range from 0.6 m/d (2.0 ft/d) to 5.5 m/d (18.0 ft/d) (Figure 3.4-10, Groundwater Velocities in the ESRP) (Ackerman, 2006)). Reported velocities on the INL near the border of the proposed site are at the high end of this range at 4.6 m/d (15.1 ft/d) to 5.5 m/d (18.0 ft/d) with flow in a southwesterly direction (Figure 3.4-11, Water Elevations and Flow Directions in the ESRP Aquifer). These rapid flow rates are consistent with studies of stable isotope and tritium levels that have indicated that the water in the ESRP Aquifer is derived from modern meteorological sources in the basin and that recharge from these sources is rapid (Schramke, 1996) (Wood, 1988).

3.4.15.1.3 Regional Soil Properties

Soil cover across the ESRP is generally variable, ranging from non-existent in areas of recent volcanism to tens of meters (feet) to thickest in areas of wind-blown loess accumulation (Hughes, 1999) (Lindholm 1996) (Whitehead, 1994b). Thin soils and basalt outcrops are common in many areas along ridge lines and wind-swept areas. Natural soil development due to vegetation growth and degradation is minimal due to the cold, semi-arid climate.

Soil types in the ESRP fall into six orders of lightly weathered soils characteristic of arid conditions: alfisols, aridisols, entisols, inceptisols, mollisols, and vertisols (Cook, 2007). The textures of most of these soil types are described as falling in the silt-loam textural class with 0% to 27% clay, 55% to 80% silt, and 10% to 35% sand (Nimmo, 2004). The mineralogical composition of the soils reported for INL and likely representative of much of the ESRP include quartz, plagioclase feldspar, potassium feldspar, pyroxene, olivine, calcite, dolomite, and clay minerals (Nimmo, 2004).

Data summarized by Nimmo (Nimmo, 2004) for INL indicate that saturated hydraulic conductivities measured on soil cores range from about 5.0E-04 cm/s (1.6E-05 ft/s) to 1.0E-02 cm/s (3.3E-04 ft/s) although reported ranges in the literature span over six orders of magnitude from 1.1E-08 cm/s (3.6E-10 ft/s) to 1.2E-02 cm/s (3.9E-04 ft/s). The Nimmo (Nimmo, 2004) data show porosities from 0.42 to 0.55 and moisture contents from about 5% to 30%. Measurements of unsaturated properties for surficial soils are also summarized by Nimmo (Nimmo, 2004). These data show drying retention curves with air entry pressures near zero, an abrupt decrease in water content at -10 and -30 kPa (-1.4 and -4.3 psi) and then a nearly flat response in water content to higher pressures.

3.4.15.2 Regional Water Quality

The chemical composition of groundwater in the ESRP has been examined in detail (DOE-ID 2007a; DOE-ID 2007b; Wood, 1988). The geochemical and physical parameter data indicate that there are two major water types in the aquifer (Wood, 1988):

- An upper zone located in predominantly Quaternary basalts and sediment interbeds of the Snake River Group. This upper zone is also called the active portion of the aquifer because it is the fastest moving aquifer water and is the primary portion of the aquifer exploited for irrigation and public water supplies. The upper zone may be potentially impacted by EREF activities.
- A deeper zone of the aquifer often exhibits secondary mineralization and contains low temperature geothermal water located primarily in Tertiary basalts, rhyolites and tuffs. Geothermal water in the ESRP Aquifer is defined as water with a temperature greater than 26.0ºC (78.8ºF). The geothermal groundwater is not a major source for irrigation and public supply. This water would not be expected to be impacted by migration from a surface source located at the EREF.

The shallow part of the Snake River Plain Aquifer is characterized as a calcium-bicarbonate chemical type relatively enriched in silica (DOE-ID, 2007a; DOE-ID, 2007b; Wood, 1988). Solute mass balance calculations indicate that about 80% of the solute load leaving the ESRP is derived from subsurface inflows from surrounding drainage basins (Wood, 1988). The remaining 20% of the solute load is derived from mineral dissolution reactions occurring as groundwater flows through the ESRP and reacts with the bedrock. The major dissolving minerals are magnesium-iron-calcium silicates, pyrite, and anhydrite present in the basalt. Calcium, bicarbonate, and silica are removed from solution by the precipitation of calcite and amorphous silica (Wood, 1988). Detectable but low concentrations of minor elements and trace metals are found throughout the aquifer (Table 3.4-12, Mean Concentrations of Analytes in SRP

Shallow Zone Groundwater). The concentrations of minor elements and metals are generally low due to the neutral to slightly alkaline pH and moderately reducing conditions.

3.4.15.3 Site Hydrogeology

3.4.15.3.1 Site Groundwater Investigations

Site-specific hydrogeologic investigations occurred at the proposed EREF site between May and July 2008. Additional groundwater sampling was performed in September/October 2008, January 2009 and April 2009. The proposed site is located east of the INL site, which has had numerous subsurface investigations performed for the purpose of delineating and monitoring the subsurface hydrologic conditions. Much of this information is directly pertinent to the proposed site and provides the basis for the regional groundwater information summarized in this ER. In addition, the INL hydrogeologic information was used in planning the site-specific investigations.

The objective of the groundwater field studies was to collect data that can be used to describe the following characteristics for the site:

- Stratigraphy of the bedrock units
- Structure and hydrogeological properties of unsaturated and water saturated geological units
- Depth to saturated groundwater conditions within the site boundaries
- Groundwater elevation trends and flow directions
- Prevalence of perched groundwater systems
- Water quality for groundwater
- Potential for interaction between different aquifers

Field activities included:

- Collection of a continuous core between the ground surface and approximately 12.2 m (40.0 ft) below the static water table,
- Installation of five deep monitoring wells to intercept the regional groundwater,
- Installation of one shallow monitoring well to intercept potentially perched groundwater,
- Down hole geophysical testing in two locations,
- Hydrologic testing in both the saturated and unsaturated zones, and
- Groundwater collection and analyses.

Five deep monitoring wells installed at the proposed site were designated as GW-1, GW-2, GW-3, GW-4, and GW-5. One shallow well (GW-4S) was also completed. The locations of these monitoring wells on the proposed site are shown in Figure 3.4-5, Existing Agricultural and Newly Installed Monitoring Wells, and are distributed to allow monitoring of the ground water elevations, evaluation of regional groundwater flow direction, and water quality at the EREF site. The wells are located in areas that are hydrologically upgradient (GW-5), cross gradient (GW-2 and GW-3), downgradient of the plant footprint (GW-4), and within the downgradient edge of the facility footprint (GW-1). The five deep wells provide adequate site-specific data to define the potentiometric surface of the groundwater, thereby providing data indicative of groundwater flow direction and gradient.

At location GW-1, a 7.6-cm (3.0-in) core was collected from the ground surface to the total depth of the boring prior to installation of a monitoring well. The core was collected using a diamond drill bit designed to produce intact core samples. The recovered core revealed a succession of basalt flows with occasional interlayers of silts and clays ranging in thickness between 1.2 to 2.4 m (4.0 to 8.0 ft). The basalt flows typically were highly fractured and highly vesicular, although there were also intervals up to 3.0 m (9.8 ft) thick or more of competent basalt without fractures or vesicles.

Boreholes GW-1 and GW-4 were geophysically logged prior to their completion as monitoring wells. GW-1 was logged to a depth of 223 m (730 ft), which included approximately 208.6 m (684.3 ft) of unsaturated conditions and approximately 9 m (30 ft) of saturated conditions, below the static water level. Partially completed Well GW-4S was logged to a depth of 168 m (550 ft) bgs in unsaturated conditions. Downhole geophysics included caliper, natural gamma, normal electrical resistivity, point resistance, induction resistivity, and optical tools. Following the geophysical logging of GW-1, eight hydrologic packer tests were conducted that covered the range of observed geologic character (e.g., dense to fractured) observed in the core and geophysical tests. The depth to groundwater in the on-site wells ranges between 199.5 m (654.4 ft) and 219.4 m (719.9 ft) below ground surface (bgs), depending on location.

There are four primary features of the sediments and bedrock underlying the proposed site that can dramatically affect the flow of fluids in the vadose zone and groundwater in the saturated zone (Cecil, 1991):

1. Low permeability sedimentary interbeds
2. Alteration in the baked zones at flow tops
3. Dense, unfractured massive basalt
4. Sedimentary and chemical infilling of fractures

A minimum of three well-developed sedimentary interbeds from 1.2 to 2.4 m (4.0 to 8.0 ft) thick were clearly observed in the core collected from GW-1. Similar sedimentary interbeds in GW-4 were inferred from the geophysical logging of that hole. The drilling log for Lava Well-3 suggested the presence of at least two or possibly three sedimentary interbeds. Sedimentary layers were encountered in the core of GW-1 at 18.3, 59.4, and 122.5 m (60.0, 195.0, and 402.0 ft) bgs, and, in GW-4 the sedimentary interbeds were inferred from the geophysical logs at 19.7, 61.9, and 102.2 m (64.6, 203.0, and 334.4 ft) bgs. The geophysical logging conducted with the acoustic televiewer (OPTV) and natural gamma measurements in GW-1 and GW-4 also revealed the presence of sedimentary interbeds. In addition, these interbeds also were qualitatively identified in the conductivity logs. A cross section of the subsurface stratigraphy is shown in Figure 3.3-17, GW-1 Lithologic Log - Summary.

The sedimentary interbeds represent periods of volcanic quiescence and are likely to be laterally continuous for at least several hundred meters (hundreds to thousands of feet), but may have thin or absent areas at the topographic highs of the paleo-ground surface, similar to what is presently observed for the surface terrain. No evidence of sediment interbeds was observed below about 121.9 m (400.0 ft) to the total depth of GW-1 at 222.5 m (730.0 ft) bgs. Several zones containing scoria, cinder, red oxidation, increased vesicles, and changes in fracturing indicating flow tops were also observed. In GW-1, the individual lava flows increase in thickness with depth from 15.2 m (50.0 ft) near the top to over 91.4 m (300.0 ft) near the bottom. The individual flows were also marked by the presence of sediment infillings (e.g., clay) in the fractures. The zones beneath the flow tops where baking from the overlying lava flows would have occurred in combination with sediment infillings likely have lower permeability than the base of the overlying flows.

Most of the basalt bedrock is fractured to some degree with Rock Quality Data (RQD) values typically ranging between 50% and 100%. Some intervals are completely fractured with RQDs of 0% to 25%. The flow interiors are evident by thick, massive zones of basalt with few or no fractures (RQD at or near 100%). The flow interiors typically contain narrow vertical fractures, whereas the flow tops and bottoms typically contain both large vertical and horizontal fractures. The massive zones observed in GW-1 and GW-4 ranged up to 3 m (10 ft) or more in thickness.

Data on groundwater elevations measured for the site monitoring wells on July 22, 2008 have been compiled into two maps of the potentiometric groundwater surface. Figure 3.4-12, Regional Groundwater Potentiometric Surface Map, shows the site groundwater data in conjunction with data from observation wells located in the vicinity of the EREF. Figure 3.4-13, Site Groundwater Potentiometric Surface Map, shows a closer view of the site groundwater elevation data. The data shown in these figures indicate that the depth to water occurs between 200.7 and 219.3 m (658.4 and 719.5 ft) bgs at the site. Based on these elevations, the direction of groundwater flow across the site is from the northeast to the southwest. This direction is consistent with the regional groundwater flow direction, which is to the southwest toward Thousand Springs, approximately 322 km (200 mi) southwest of the site. Based on ground surface elevations and the depths to water observed in GW-5 and GW-1, the hydraulic gradient likely is about 1.5 m (4.9 ft) of difference in water levels over 2,260 m (7,420 ft) between the two wells. This difference in water levels is equivalent to a gradient of approximately 0.0007 m/m (0.0007 ft/ft). Additional data on depths to groundwater measured for the site monitoring wells between June 27, 2008 and July 20, 2009 (measured weekly through January 2009, then monthly through July 2009) indicate that the depth to water occurs between 199.5 m (654.4 ft) and 219.4 m (719.9 ft).

Two field testing methods were utilized to estimate the horizontal permeability of the subsurface materials: borehole constant head tests (packer tests) and one multi-well aquifer pumping test. Eight packer tests were conducted in borehole GW-1 over 1.5 to 3.0 m (5.0 to 10.0 ft) intervals from 7.6 to 190.5 m (25.0 to 625.0 ft) bgs within the vadose zone. The testing was conducted on intervals of fractured bedrock, massive bedrock, and sedimentary interbeds to estimate the full range of hydraulic conductivities. The results of the packer tests indicated hydraulic conductivities as follows (the values in parentheses indicate the number of tests performed in that rock or sediment type):

- Fractured bedrock (five): greater than 9.0E-04 cm/s (3.0E-05 ft/s)
- Soil layers (two): 2.0E-06 cm/s (6.6E-08 ft/s)
- Massive (relatively unfractured) bedrock (one): 2.0E-08 cm/s (6.6E-10 ft/s)

The tests that were performed in the fractured bedrock provide a measure of the lower bound for the highest hydraulic conductivities in the formation because no head pressure was developed during those tests. No head pressure conditions occur when the formation accepts more water than the test pump can deliver, which is an indication of high hydraulic conductivities. If more water could have been delivered to the packed off interval, then a higher hydraulic conductivity might have been measured. Data for the sedimentary interbeds and intervals of massive basaltic bedrock are indicative of low hydraulic conductivities. The sedimentary interbeds and massive basalt layers will significantly impede water movement or may cause lateral flow below the water table or may cause perching above the water table.

An aquifer pumping test was conducted using the existing agricultural (irrigation) well, Lava Well-3, as the pump well and nearby monitoring well GW-5 as an observation well. Three phases to the pumping test occurred:

1. Pre-test monitoring – three days
2. Constant rate pumping test – three days
3. Recovery test – one day

The test was conducted by pumping the agricultural well, Lava Well-3, and measuring the resulting drawdown and barometric pressure changes in GW-5. The pumping well (Lava Well-3) is a large diameter irrigation well originally installed in the 1970s. The well is currently fitted with a pump capable of pumping 15.9 m^3/min (4,200.0 gal/min). The observation well GW-5 is a 10.2-cm (4.0-inch) PVC monitoring well screened from 215.2 to 227.4 m (706.0 to 746.0 ft) bgs, partially penetrating the aquifer.

The pumping well was in operation prior to the test but was shutdown before the pumping test so that water levels and barometric pressure could be monitored to evaluate antecedent trends in water levels and the barometric efficiency of the aquifer. This pre-test period lasted for three days. Water levels during this period were relatively stable, varying less than 0.05 m (0.15 ft). The variations in water level that did occur appeared to be directly related to barometric pressure changes, which varied up to 1.00 kPa (0.15 psi) (0.52 m (1.70 ft) equivalent). The Barometric Efficiency (BE) of the aquifer, the relationship between changes in water levels and barometric pressure, was estimated from this pre-test data at 22%. The BE was then used to make corrections to the changes in water levels observed during the pumping test so that only changes due to pumping were analyzed (Freeze, 1979).

The pumping test was conducted for 72 hours at a constant pumping rate of 15.9 m^3/min (4,200 gal/min) in Lava Well-3 during which time barometric pressure changes and water levels were recorded in GW-5. The water level in GW-5 dropped rapidly in response to pumping at first, and then more slowly as the cone of depression developed and expanded outward. Total drawdown was less than 0.3 m (1.0 ft), exhibiting a classic aquifer response to pumping (Fetter, 1994). Due to the apparent confined or semi-confined conditions, the pumping test data was corrected for barometric pressure changes and analyzed with the Theis equation for non-equilibrium radial flow for a semi-confined aquifer (Fetter, 1994). This solution utilizes type curves related to transmissivity and storativity based on a log-log plot of drawdown versus elapsed time. The response to pumping observed in GW-5 during the constant rate test resulted in a curve on the log-log plot that fit exactly to the Theis type curve, and indicated a transmissivity of 7,850.0 cm^2/s (8.5 ft^2/s), which is consistent with transmissivity values observed at INL (Whitehead, 1992). The recovery test was also analyzed with the Theis method (Fetter, 1994), which resulted in a transmissivity of 9,476.0 cm^2/s (10.2 ft^2/s) and the Jacob-Straight-Line method, which resulted in a transmissivity of 8,365.0 cm^2/s (9.0 ft^2/s).

Hydraulic conductivity is calculated by dividing transmissivity by the aquifer thickness. The aquifer thickness is based on an interpretation of the hydrostratigraphy observed during drilling. Based on observations in GW-1, the aquifer is estimated to range in thickness from 45.7 to 91.4 m (150.0 to 300.0 ft). The individual basalt flows appear to increase in thickness with depth in GW-1, and it is estimated that a reasonable maximum aquifer thickness is 106.7 m (350.0 ft). Using these data, the hydraulic conductivity is calculated to be 0.007 m/s (0.023 ft/s)). If the aquifer thickness is closer to 60.9 m (200.0 ft) thick, then the hydraulic conductivity would be 0.015 m/s (0.05 ft/s). It is important to note that this is a measure of the hydraulic conductivity of the aquifer as a whole. Individual fractures or void spaces may have hydraulic conductivity values that are orders of magnitude higher, while the massive zones will have hydraulic conductivities orders of magnitude lower (as low as 1E-10 m/s (3.3E-10 ft/s) as measured in the packer tests).

The results of the pumping test indicated a storativity of 0.03. Confined aquifers typically have storativities in the range of 0.005 to 0.00005, while unconfined aquifers typically have a specific yield (S_y) in the range of 0.1 to 0.3 (Fetter, 1994). The storativity value of 0.03 estimated for the aquifer tested at the site suggests that the aquifer is acting as an unconfined or semi-confined aquifer. Regionally, the SRP aquifer is considered to be unconfined (Whitehead, 1992). However, locally confined conditions can exist due to the lower permeability zones existing at the top of the aquifer as described above. The aquifer test results suggest that the aquifer is locally confined, as suggested by the response to barometric pressure and the shape of the first derivative of the log-log drawdown versus elapsed time curve, but becomes unconfined at some distance away from the pumping well. Early-time drawdown data reflect the confined conditions, while later-time data reflect unconfined conditions and/or delayed recharge. The late-time data on the drawdown versus time plot deviates from the type curve (less drawdown) suggesting an additional source of recharge to the cone of depression was reached toward the end of the test. This is likely due to the confining layer (massive bedrock) either pinching out or developing more fractures and unconfined conditions, thus yielding more water from storage.

3.4.15.3.2 Vadose Zone and Perched Groundwater

The vadose zone in the ESRP is spatially heterogeneous, ranges from 60 m (197 ft) to 300 m (984 ft) (Smith, 2004), and consists of unconsolidated alluvium and Snake River Group basalts (Qb). Perching of water above the regional water table requires two things, first, a large contrast between a higher permeability layer with a lower permeability zone below and second, a significant source of water to maintain the perched water body. Perched water zones are common throughout the ESRP, especially near rivers, canals or other sources of surface water because of the high contrasts in permeability common in the basalts and sediments in the area. The presence of lower permeability zones only indicate that zones of perched groundwater could occur if sufficient recharge was available. The development of perched zones on top of confining layers has been a subject of concern at INL (Cecil, 1991).

The first interval that could develop perched groundwater at the proposed site is the sedimentary interbed at approximately 18.3 to 19.8 m (60.0 to 65.0 ft) bgs observed in GW-1 and GW-4, which is underlain by a layer of massive bedrock from 54.9 to 57.9 m (180.0 to 190.0 ft) bgs. Numerous other confining layers that could develop perched zones are present at greater depths.

Perched water was not directly observed during drilling; however, some limited increase in moisture water during drilling of GW-4 was noted. Moist conditions were occasionally observed downhole when drilling started in the morning, but it was not possible to determine whether the down hole moisture was a result of condensation of warm compressed air overnight, draining of perched water into the well, infiltrating wetting fronts, or overnight drainage of drilling circulation fluids from the previous day. The sediment layers that are interfingered with the basalts (described above) could potentially act as a perching layer for infiltrating precipitation. To determine whether a perched layer exists beneath the site, a shallow monitoring well (designated as GW-4S) was installed directly above the uppermost sediment layer. Groundwater was not observed in this well which suggests that although the sediment layers could act as a perching layer for groundwater, there is either insufficient recharge water to form a perched water body or the sediment layers are not continuous enough or impermeable enough to be an effective perching layer.

At the proposed site, drilling occurred soon after the 2008 spring snow melt. However, no perched water zones were observed during drilling GW-1 and no water accumulated in GW-4S. These observations indicate that any perched water dissipates relatively quickly (i.e., within a matter of days or weeks) or that even in an exceedingly wet year recharge is insufficient to form perched water. It is most likely the former.

The primary sources of recharge to the vadose zone and subsequently to the aquifer beneath the site is precipitation in the form of rainfall, snow melt, and irrigation infiltration. An extensive set of wells located around the proposed site are monitored for groundwater elevation on a monthly to yearly basis by the U.S. Geological Survey and Idaho Department of Water Resources (IDWR, 2008b). Data from wells at nearby locations within 1 to 20 km (0.6 to 12.4 mi) of the proposed site show typical seasonal changes in groundwater elevations of less than 1.5 m (5.0 ft) with the highest levels occurring in spring and early summer and lowest levels in late summer and fall. Long-term fluctuations in water levels range up to 15 m (50 ft) for the entire periods of record of 20 to 50 years (IDWR, 2008b) due to meteorological cycles and changes in irrigation practices in the ESRP (Garabedian, 1992)(Lindholm, 1996). It does not appear that seasonal infiltration events play a significant role in area of the proposed site.

3.4.15.4 Site Groundwater Quality

Groundwater was collected and analyzed from the existing agricultural wells on the site in March 2008 and June 2008, and the deep monitoring wells were sampled during installation between May and July 2008. Groundwater samples were also collected from the existing agricultural wells and the deep monitoring wells in September/October 2008, January 2009, and April 2009. The shallow perched water well (GW-4S) has remained dry since completion.

The two existing agricultural wells and the newly installed five aquifer monitoring wells at the EREF site were sampled for field measured parameters and inorganic analytes, metals (dissolved and total recoverable including major cations and anions), total organic carbon, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, herbicides, and petroleum hydrocarbons (Table 3.4-13, Chemical Analyses for the EREF Site Groundwater). In addition, samples were analyzed for radiological constituents of tritium, gross alpha, gross beta, gamma spectrometry, thorium isotopes, uranium isotopes and radium isotopes (Table 3.4-14, Radiochemical Analyses for the EREF Site Groundwater). Sampling results are compared to EPA maximum contaminant levels (MCLs) and secondary maximum contaminant levels (SMCLs) (Tables 3.4-13, Chemical Analyses for the EREF Site Groundwater, and Table 3.4-14, Radiochemical Analyses for the EREF Site Groundwater). The regulatory limits represent the EPA Safe Drinking Water Act (SDWA) primary and secondary drinking water standards for potable water supplies (EPA, 2008b). In addition, inorganic data are compared to background values (Figure 3.4-14, Piper Diagram Showing Major Elemental Composition of Groundwater in the ESRP Aquifer).

The analytical results show that the groundwater has concentrations of major ions that are consistent with regional groundwater (Table 3.4-12, Mean Concentrations of Analytes in SRP Shallow Zone Groundwater). The regional groundwater has a predominantly calcium-bicarbonate chemical composition and is of high quality when compared to drinking water standards (DOE-ID, 2007a; DOE-ID, 2007b; Wood, 1988).

The concentrations of dissolved analytes are below their corresponding EPA MCL. Concentrations of minor elements and trace metals found in the aquifer at the EREF are similar to regional background groundwater concentrations (Table 3.4-12, Mean Concentrations of Analytes in SRP Shallow Zone Groundwater, and Tables 3.4-13, Chemical Analyses for the EREF Site Groundwater). With the exception of total recoverable aluminum and iron collected from the two agricultural wells (March 25, 2008 samples) (highlighted in Table 3.4-13, Chemical Analyses for the Eagle Rock Enrichment Site Groundwater), total metals concentrations are less than their EPA MCL. The elevated total recoverable aluminum and iron concentrations detected in the unfiltered samples are probably due to suspended particulates because aluminum is not soluble at the neutral to slightly alkaline pH of the SRP Aquifer, and dissolved concentrations of aluminum and iron do not exceed their MCLs. Also, iron shows variability with the total recoverable concentration exceeding the EPA MCL only for the initial March 2008 samples but not in more recent samples. The concentrations of minor elements and metals are generally low due to the neutral to slightly alkaline pH. Total dissolved solids are approximately 170 to 292 mg/L, which is lower than the EPA limits of 500 mg/L.

No volatile or semi-volatile organic compounds, pesticides, herbicides, or PCBs were detected in the March to July 2008 samples. The September/October 2008 samples from GW-1, GW-2, and GW-3 contained low concentrations of bis (2-ethylhexyl) phthalate and a single detection of diethylphthalate occurred for GW-5. These two phthalate compounds are used as plasticizers and it is expected that their occurrence is from contact of the samples with plastics during collection and analyses. Lube oil was detected in the samples from the irrigation well, Lava Well-3, except for the June 19, 2008 sample. Lubricating oil is a known contaminant associated with well drilling and likely explains the occurrence of petroleum in this well. Diesel was detected in the groundwater sample collected on July 9, 2008 from GW-4. This may be due to exhaust from the truck used for sampling. Phenol was detected in the January 6, 2009 and April 7, 2009 samples collected from Lava Well-3. Considering that phenol is a common additive to petroleum lubricants, its presence is attributed to lube oil which was also detected in the January and April 2009 samples collected from this same well. Low concentrations of toluene were also detected in Wells GW-1, GW-2, GW-3, GW-4 and GW-5 during the January and April 2009 sampling events. Considering that gasoline contains toluene, the likely cause for these detections is the exhaust from the portable gasoline powered generator used to operate the groundwater sample collection pump. No other petroleum hydrocarbons were detected in the site groundwater samples.

Most of the radiological analytes were less than their respective minimum detectable concentration (MDC) (Table 3.4-14, Radiochemical Analyses for the EREF Site Groundwater). The gamma spectroscopy analyte, gross alpha, was below its MDC in all samples. Tritium (H-3) was only detected in GW-3 in the May 20, 2008 sample. The radiological analytes that occurred most frequently above their MDCs were gross beta, Uranium-234 and Uranium-238 (MDC exceedances are highlighted in Table 3.4-14, Radiochemical Analyses for the EREF Site Groundwater). These analytes are naturally occurring and are similar in concentration to background values observed at the INL (DOE-ID, 2007b). Radiological analytes detected less frequently above their MDCs in various wells included Potassium-40, Uranium-235, Radium-224, Radium-226, Thorium-228, Thorium-230 and Thorium-232. Where applicable, the radiological analytical results were less than MCLs.

Some of the radionuclide results given in Table 3.4-14, Radiochemical Analyses for the EREF Site Groundwater, are negative. It is possible to calculate radioanalytical results that are less than zero, although negative radioactivity is physically impossible. This result typically occurs when activity is not present in a sample or is present near background levels. Laboratories occasionally choose not to report negative results or results that are near zero. For the groundwater samples, the negative values are left as reported so as not to censor the results.

TABLES

Table 3.4-1 Summary of Potentially Contaminated Liquid Wastes for the Eagle Rock Enrichment Facility

(Page 1 of 1)

Source/System	Annual Volume: L (Gal)
Laboratory waste, floor washings, miscellaneous condensates	46,280 (12,226)
Degreaser Water	7,419(1,960)
Spent Citric Acid	5,440 (1,437)
Total Treated Plant Effluent[1]	59,100 (15,625)

Notes:

1. Liquid wastes are treated and discharged to atmosphere by evaporation via Liquid Effluent Treatment System evaporator. Total annual liquid effluent is approximately 59,100 L (15,625 gal) of distillate; with uranic input approximately 114 kg (251 lb). Liquid wastes are treated by precipitation, filtration, and evaporation prior to discharge. The anticipated atmospheric distillate release is expected to be <0.0356 g/yr (1.26E-03 oz/yr) of total uranium.

Table 3.4-2 Anticipated Normal Facility Water Consumption (Page 1 of 1)

Area/Usage	m^3/Yr	L/d	Gal/d		L/Year	Gal/Year
Potable Water Average Consumption						
All Shifts – up to 550 people	22,795	62,453	16,500		22,795,163	6,022,500
Summation of Liquid Effluents (excluding utilities)						
Laboratory, Floor washing water, and various condensates	46.28	127	33		46,280	12,227
Degreaser washer	7.42	20	5		7,420	1,960
Citric acid	5.44	15	4		5,440	1,437
Laundry	None	None	None		None	None
Hand Wash and Shower Water[1]	Nil	Nil	Nil		Nil	Nil
Total Liquid Effluents	**59.1**	**162**	**43**		**59,100**	**15,625**
DI Water makeup (process, humidification, etc.)	**2,013**	**5,515**	**1,457**		**2,013,148**	**531,875**
Total Water consumption[2]	**24,900**	**68,200**	**18,000**		**24,870,000**	**6,570,000**

Notes:

1. Testing only. No radiological discharge.
2. This sums the potable water, liquid effluents and DI water makeup. Values calculated in English units, converted to SI and rounded off. The "Total Water Consumption" row was rounded off to the nearest 100 except for columns "L/Year" and Gal/Year" that were rounded up to the nearest 10,000.

Table 3.4-3 Anticipated Peak Facility Water Consumption
(Page 1 of 2)

Peak Potable Water Consumption	No. of Fixtures	Basis		Flow Rate	
				GPM	L/s
OSB		**Fixture Units**	**Total Fixtures**		
Sinks	10	3	30		
WC[1]	10	5	50		
Urinals	5	4	20		
Showers	10	2	20		
JC[2]	2	3	6		
Total OSB			**126**	**45**	**2.8**
Admin					
Sinks	8	3	24		
WC	8	5	40		
Urinals	5	4	20		
JC	1	3	3		
Total Admin			**87**	**40**	**2.5**
CAB					
Sinks	5	3	12		
WC	4	5	20		
Urinals	3	4	12		
Showers	3	2	6		
JC	1	3	3		
Total CAB			**53**	**30**	**1.9**
Security Bldgs					
Sinks	3	3	9		
WC	3	5	15		
Urinals	2	4	8		
Showers	2	2	4		
JC	1	3	3		
Total Security Bldgs.			**39**	**25**	**1.6**
Gate Houses (2)					
Sinks	2	3	6		
WC	2	5	10		
Urinals	2	4	8		
JC	2	3	6		
Total Gate Houses			**30**	**20**	**1.3**
Visitor Center					
Sinks	4	3	12		
WC	3	5	15		
Urinals	2	4	8		
JC	1	3	3		
Sinks – Kitchen	1	3	3		
Dishwasher – Kitchen	1	1.5	2		
Handwash – Kitchen	1	2	2		
Total visitor Center			**45**	**27**	**1.7**
Warehouses (2)					
Sinks	4	3	12		
WC	4	5	20		
Urinals	2	4	8		
JC	2	3	6		
Total Warehouses			**46**	**27**	**1.7**

Table 3.4-3 Anticipated Peak Facility Water Consumption
(Page 2 of 2)

Peak Potable Water Consumption	No. of Fixtures	Basis		Flow Rate	
				GPM	L/s
Peak Process Water Consumption					
DI Water Make Up				75	4.7
Fire Protection (Two 680 m^3 (180,000 gal) for water tanks				375	23.7
	Total Peak Flow			**664**	**42**

Notes:

1. WC – Water Closet
2. JC – Janitorial Closet

Table 3.4-4 Water Balance for the Cylinder Storage Pads Stormwater Retention Basins (one of two identical basins) (Minimum Scenario) (Page 1 of 2)

Month	Precipitation cm (in)	Total Precipitation Inflow to Basin m^3 (gal)	Treated Sanitary Effluent Inflow to Basin m^3 (gal)	Total Inflow to Basin m^3 (gal)	Evaporation per Month cm (in)	Potential Evaporation Outflow from Basin m^3 (gal)	Balance Inflow-Outflow m^3 (gal)	Net in Basin m^3 (gal)
JAN	0.08 (0.03)	129 (34,196)	792 (209,250)	922 (243,446)	0.00 (0.00)	0 (0)	922 (243,446)	922 (243,446)
FEB	0.18 (0.07)	302 (79,804)	715 (189,000)	1,018 (268,804)	0.00 (0.00)	0 (0)	1,018 (268,804)	1,939 (512,250)
MAR	0.00 (0.00)	0 (0)	792 (209,250)	792 (209,250)	0.00 (0.00)	0 (0)	792 (209,250)	2,731 (721,500)
APR	0.03 (0.01)	43 (11,403)	767 (202,500)	810 (213,903)	0.00 (0.00)	0 (0)	810 (213,903)	3,541 (935,404)
MAY	0.25 (0.10)	431 (113,972)	792 (209,250)	1,224 (323,222)	13.26 (5.22)	5,546 1,465,070	-4,322 (-1,141,849)	0 (0)
JUN	0.18 (0.07)	302 (79,780)	767 (202,500)	1,069 (282,280)	15.91 (6.27)	6,653 (1,757,692)	-5,585 (-1,475,412)	0 (0)
JUL	0.00 (0.00)	0 (0)	792 (209,250)	792 (209,250)	18.28 (7.20)	7,642 (2,018,891)	-6,850 (-1,809,641)	0 (0)
AUG	0.00 (0.00)	0 (0)	792 (209,250)	792 (209,250)	16.71 (6.58)	6,988 (1,846,067)	-6,196 (-1,636,817)	0 (0)
SEP	0.00 (0.00)	0 (0)	767 (202,500)	767 (202,500)	11.40 (4.49)	4,765 (1,258,861)	-3,999 (-1,056,361)	0 (0)
OCT	0.00 (0.00)	0 (0)	792 (209,250)	792 (209,250)	6.85 (2.70)	2,862 (756,102)	-2,070 (-546,852)	0 (0)
NOV	0.00 (0.00)	0 (0)	767 (202,500)	767 (202,500)	0.00 (0.00)	0 (0)	767 (202,500)	767 (202,500)

Table 3.4-4 Water Balance for the Cylinder Storage Pads Stormwater Retention Basins (one of two identical basins) (Minimum Scenario) (Page 2 of 2)

Month	Precipitation cm (in)	Total Precipitation Inflow to Basin m^3 (gal)	Treated Sanitary Effluent Inflow to Basin m^3 (gal)	Total Inflow to Basin m^3 (gal)	Evaporation per Month cm (in)	Potential Evaporation Outflow from Basin m^3 (gal)	Balance Inflow-Outflow m^3 (gal)	Net in Basin m^3 (gal)
DEC	0.10 (0.04)	173 (45,589)	792 (209,250)	965 (254,839)	0.00 (0.00)	0 (0)	965 (254,839)	1,731 (457,339)
Totals	0.8 (0.3)	1,381 (364,744)	9,326 (2,463,750)	10,707 (2,828,494)	82.41 (32.45)	34,456 (9,102,683)		

Notes:

1. The annual evaporation rate is 117.73 cm (46.35 in). The pan evaporations are from Aberdeen Experimental Station in Bonneville County. The rates were adjusted by a factor of 0.7 [82.41 cm (32.45 in)] to more closely estimate the evaporation from naturally existing surfaces such as a shallow lake. The months of January, February, March, April, November, and December will have 0.0 cm (0.0 in) evaporation.
2. To be on the conservative side, precipitation for the winter months of December, January, and February will be included as entering the basin from the Cylinder Storage Pads.
3. Available storage volume in each of the basins is approximately 83,019 m^3 (67.3 acre-feet) that is based on the maximum available water depth of 1.83 m (6.0 ft) with a free board of 0.91 m (3.0 ft). For the minimum rainfall scenario, the basin water level will have a freeboard of 2.7 m (8.7 ft).
4. Overall size of each of the retention basin, to top of berm, is equivalent to 5.3 ha (13.1 acres).
5. The surface of the pads and the sanitary efflulent are divided between two basins. Therefore, each basin will function as calculated above.

Source: WRCC, 2008

Table 3.4-5 Water Balance for the Cylinder Storage Pads Stormwater Retention Basins (one of two identical basins) (Maximum Scenario) (Page 1 of 2)

Month	Precipitation cm (in)	Total Precipitation Inflow to Basin m^3 (gal)	Treated Sanitary Effluent Inflow to Basin m^3 (gal)	Total Inflow to Basin m^3 (gal)	Evaporation per Month cm (in)	Potential Evaporation Outflow from Basin m^3 (gal)	Balance Into Basin: Inflow-Outflow m^3 (gal)	Net in Basin m^3 (gal)
JAN	6.93	11,858	792	12,650	0.00	0	112,650	12,650
	(2.73)	(3,132,545)	(209,250)	(3,341,795)	(0.00)	(0)	(3,341,795)	(3,341,795)
FEB	6.02	10,354	715	11,069	0.00	0	11,069	23,719
	(2.37)	(2,735,271)	(189,000)	(2,924,271)	(0.00)	(0)	(2,924,271)	(6,266,066)
MAR	4.47	7,723	792	8,515	0.00	0	8,515	32,234
	(1.76)	(2,040,181)	(209,250)	(2,249,431)	(0.00)	(0)	(2,249,431)	(8,515,497)
APR	6.40	11,124	767	11,891	0.00	0	11,891	44,125
	(2.52)	(2,938,805)	(202,500)	(3,141,305)	(0.00)	(0)	(3,141,305)	(11,656,801)
MAY	11.00	19,246	792	20,038	13.26	6,227	13,810	57,935
	(4.33)	(5,084,309)	(209,250)	(5,293,559)	(5.22)	(1,645,177)	(3,648,389)	(15,305,190)
JUN	7.85	13,781	767	14,548	15.91	7,566	6,981	64,916
	(3.09)	(3,640,672)	(202,500)	(3,843,172)	(6.27)	(1,998,859)	(1,844,313)	(17,149,503)
JUL	4.80	8,431	792	9,223	18.28	8,699	525	65,441
	(1.89)	(2,227,386)	(209,250)	(2,436,636)	(7.20)	(2,298,054)	(138,582)	(17,288,085)
AUG	6.58	11,578	792	12,370	16.71	8,016	4,354	69,795
	(2.59)	(3,058,773)	(209,250)	(3,268,023)	(6.58)	(2,117,667)	(1,150,355)	(18,438,440)
SEP	6.86	12,113	767	12,879	11.40	5,537	7,342	77,137
	(2.70)	(3,199,916)	(202,500)	(3,402,416)	(4.49)	(1,462,738)	(1,939,678)	(20,378,118)
OCT	7.04	12,485	792	13,277	6.85	3,382	9,895	87,032

Table 3.4-5 Water Balance for the Cylinder Storage Pads Stormwater Retention Basins (one of two identical basins) (Maximum Scenario) (Page 2 of 2)

Month	Precipitation cm (in)	Total Precipitation Inflow to Basin m^3 (gal)	Treated Sanitary Effluent Inflow to Basin m^3 (gal)	Total Inflow to Basin m^3 (gal)	Evaporation per Month cm (in)	Potential Evaporation Outflow from Basin m^3 (gal)	Balance Into Basin: Inflow-Outflow m^3 (gal)	Net in Basin m^3 (gal)
	(2.77)	(3,298,274)	(209,250)	(3,507,524)	(2.70)	(893,536)	(2,613,988)	(22,992,106)
NOV	6.25 (2.46)	11,149 (2,945,446)	767 (202,500)	11,916 (3,147,946)	0.00 (0.00)	0 (0)	11,916 (3,147,946)	98,948 (26,140,053)
DEC	5.16 (2.03)	9,243 (2,441,798)	792 (209,250)	10,035 2,651,048	0.00 (0.00)	0 (0)	10,035 (2,651,048)	108,983 (28,791,101)
Totals	79.35 (31.24)	139,085 (36,743,375)	9,326 (2,463,750)	148,411 (39,207,125)	82.41 (32.45)	39,428 (10,416,025)		

Notes:

1. The annual evaporation rate is 117.73 cm (46.35 in). The pan evaporations are from Aberdeen Experimental Station in Bonneville County. The rates were adjusted by a factor of 0.7 [82.41 cm (32.45 in)] to more closely estimate the evaporation from naturally existing surfaces such as a shallow lake. The months of January, February, March, April, November, and December will have 0.0 cm (0.0 in) evaporation.
2. To be on the conservative side, precipitation for the winter months of December, January, and February will be included as entering the basin from the Cylinder Storage Pads.
3. Based on the 53 year period of record of highest monthly rainfall, no such event happened for any consecutive months and only once - June and August 1968 – that no more than two wettest months occurred in any one year. Therefore, it is highly unlikely that there will be as severe a cumulative occurrence as shown above nor continuation to the next year.
4. Available storage volume in each basin with a freeboard of 0.31 m (1.0 ft) is approximately 113,700 m^3 (92.2 acre-ft) for these extreme conditions. This results in a basin water depth of 2.44 m (8.0 ft). Therefore, there is no discharge from these basins under this highly unlikely chain of events.
5. Overall size of each retention basin to top of berm is equivalent to 5.3 ha (13.1 acres).
6. The surface area of the pads and the sanitary effluent are divided between two basins. Therefore, each basin will function as calculated above.

Source: WRCC, 2008

Table 3.4-6 Water Balance for the Site Stormwater Detention Basin (Minimum Scenario) (Page 1 of 2)

Month	Precipitation cm (in)	Total Precipitation Inflow to Basin m^3 (gal)	Evaporation + Infiltration per Month cm (in)	Potential Evaporation + Potential Infiltration Outflow from Basin per Month m^3 (gal)	Balance Inflow-Outflow m^3 (gal)	Net in Basin m^3 (gal)
JAN	0.08 (0.03)	41 (10,844)	537 (212)	285,296 (75,367,341)	-285,255 (-75,356,497)	0 (0)
FEB	0.18 (0.07)	122 (32,259)	485 (191)	257,687 (68,073,728)	-257,565 (-68,041,469)	0 (0)
MAR	0.00 (0.00)	0 (0	537 (212)	285,296 (75,367,341)	-285,296 (-75,367,341)	0 (0)
APR	0.03 (0.01)	14 (3,614)	520 (205)	276,093 (72,936,137)	-276,080 (-72,932,523)	0 (0)
MAY	0.25 (0.10)	137 (36,140)	551 (217)	299,378 (79,087,253)	-299,241 (-79,051,113)	0 (0)
JUN	0.18 (0.07)	96 (25,302)	536 (211)	292,987 (77,299,033)	-292,891 (-77,373,731)	0 (0)
JUL	0.00 (0.00)	0 (0)	556 (219)	304,701 (80,493,439)	-304,701 (-80,493,439)	0 (0)
AUG	0.00 (0.00)	0 (0)	554 (218)	303,040 (80,054,629)	-303,040 (-80,054,629)	0 (0)
SEP	0.00 (0.00)	0 (0)	532 (209)	288,193 (76,132,468	-288,193 (-76,132,468)	0 (0)
OCT	0.00 (0.00)	0 (0)	544 (214)	292,564 (77,287,135)	-292,564 (-77,287,135)	0 (0)
NOV	0.00 (0.00)	0 (0)	520 (205)	276,093 (72,936,137)	-276,093 (-72,936,137)	0 (0)
DEC	0.10 (0.04)	55 (14,458)	537 (212)	285,296 (75,367,341)	-285,242 (-75,352,883)	0 (0)
Totals	0.81 (0.32)	464 (122,617)	6,410 (2,524)			

Table 3.4-6 Water Balance for the Site Stormwater Detention Basin (Minimum Scenario) (Page 2 of 2)

Notes:

1. The annual evaporation rate is 117.73 cm (46.35 in). The pan evaporations are from Aberdeen Experimental Station in Bonneville County. The rates were adjusted by a factor of 0.7 [82.41 cm (32.45 in)] to more closely estimate the evaporation from naturally existing surfaces such as a shallow lake. The months of January, February, March, April, November, and December will have 0.0 cm (0.0 in) evaporation.
2. The infiltration rate used is conservatively set at 0.000120 m/min (0.000395 ft/min) which is 50% of the low end of the referenced (NRCS, 2008) documented range to account for the effect of the accumulation of sedimentation.
3. Winter Months are December and January, when no precipitation enters the basin from the watershed. The only precipitation entering the basin will be from direct snowfall into the basin.
4. Due to the small amount of precipitation of the remainder of these driest months of record, there is no surface runoff of rain water reaching the basin from the site. The only precipitation entering the basin will be from direct rainfall into the basin.
5. Overall size of the detention basin to top of berm is equivalent to 5.5 ha (13.7 acres).

Sources:

NRCS, 2008d; WRCC, 2008

Table 3.4-7 Water Balance for the Site Stormwater Detention Basin (Maximum Scenario) (Page 1 of 2)

Month	Precipitation cm (in)	Total Precipitation Inflow to Basin m^3 (gal)	Evaporation + Infiltration per Month cm (in)	Potential Evaporation + Potential Infiltration Outflow from Basin per Month m^3 (gal)	Balance Inflow–Outflow m^3 (gal)	Net in Basin m^3 (gal)
JAN	6.93 (2.73)	80,504 (21,267,019)	537 (212)	285,277 (75,362,304)	-204,773 (-54,095,285)	0 (0)
FEB	6.02 (2.37)	66,755 (17,634,753)	485 (191)	257,670 (68,069,177)	-190,915 (-50,434,424)	0 (0)
MAR	4.47 (1.76)	13,889 (3,669,087)	537 (212)	285,277 (75,362,304)	-271,388 (-71,693,217)	0 (0)
APR	6.40 (2.52)	5,866 (1,549,749)	520 (205)	276,075 (72,931,262)	-270,208 (-71,381,513)	0 (0)
MAY	11.00 (4.33)	27,572 (7,283,757)	551 (217)	299,358 (79,082,091)	-271,786 (-71,798,334)	0 (0)
JUN	7.85 (3.09)	7,555 (1,995,840)	536 (211)	292,968 (77,394,009)	-285,413 (-75,398,169)	0 (0)
JUL	4.80 (1.89)	9,096 (2,402,828)	556 (219)	304,681 (80,488,230)	-295,585 (-78,085,402)	0 (0)
AUG	6.58 (2.59)	7,555 (1,995,840)	554 (218)	303,020 (80,049,435)	-295,465 (-78,053,595)	0 (0)
SEP	6.86 (2.70)	5,077 (1,341,204)	532 (209)	288,174 (76,127,486)	-283,097 (-74,786,282)	0 (0)
OCT	7.04 (2.77)	3,029 (800,291)	544 (214)	292,544 (77,282,033)	-289,515 (-76,481,742)	0 (0)
NOV	6.25 (2.46)	36,160 (9,552,335)	520 (205)	276,075 (72,931,262)	-239,915 (-63,378,927)	0 (0)
DEC	5.16 (2.03)	52,096 (13,762,335)	537 (212)	285,277 (75,362,304)	-233,181 (-61,599,969)	0 (0)
Totals	79.35 (31.24)	315,155 (83,255,038)	6,410 (2,524)			

Table 3.4-7 Water Balance for the Site Stormwater Detention Basin (Maximum Scenario) (Page 2 of 2)

Notes:

1. The annual evaporation rate is 117.73 cm (46.35 in). The pan evaporations are from Aberdeen Experimental Station in Bonneville County. The rates were adjusted by a factor of 0.7 [82.41 cm (32.45 in)] to more closely estimate the evaporation from naturally existing surfaces such as a shallow lake. The months of January, February, March, April, November, and December will have 0.0 cm (0.0 in) evaporation.
2. The infiltration rate used is conservatively set at 0.000120 m/min (0.000395 ft/min) which is 50% of the low end of the referenced (NRCS, 2008d) documented range to account for the effect of the accumulation of sedimentation.
3. Overall size of detention basin to top of berm is equivalent to 5.5 ha (13.7 acres).

Sources:

NRCS, 2008d; WRCC, 2008

Table 3.4-8 Total Groundwater Withdrawals from the SRP Aquifer for Irrigation, Public-Supply, and Self-Supplied Industrial Water Uses in 2000

Use	M^3/s (Ft^3/s)	Percent of Total
Irrigation	110.4 (3,898.7)	97
Public water supply	3.0 (106.3)	3
Self-supplied industrial	0.6 (20.5)	<1
Total withdrawals	114.0 (4,025.5)	100

Table 3.4-9 Average Flows by Month for the Snake River
(Page 1 of 1)

		Average Monthly Streamflow												
	Period of Record	Units	October	November	December	January	February	March	April	May	June	July	August	September
Snake River near Lewis-ville	1978-1983	m^3/s	83	92	101	106	110	155	242	389	375	249	142	109
		ft^3/s	2,919	3,237	3,562	3,748	3,889	5,471	8,531	13,748	13,249	8,782	5,008	3,845
Snake River above Eagle Rock near Idaho Falls	1988-2007	m^3/s	92	96	89	91	108	135	177	295	337	226	176	140
		ft^3/s	3,235	3,391	3,134	3,205	3,804	4,752	6,255	10,405	11,893	7,994	6,230	4,932
Snake River near Idaho Falls	1983-1987	m^3/s	152	164	177	188	146	188	326	498	489	298	168	152
		ft^3/s	5,362	5,804	6,242	6,643	5,146	6,633	11,521	17,599	17,252	10,538	5,920	5,356

Table 3.4-10 Snake River Gauge Statistics
(Page 1 of 1)

	Period of Record	Units	Annual Average	Daily Maximum	Average Daily Maximum	Daily Minimum	Average Daily Minimum
Snake River near Lewisville	1978-1983	m^3/s	179	691	275	33	113
		ft^3/s	6,332	24,400	9,694	1,160	4,002
Snake River above Eagle Rock near Idaho Falls	1988-2007	m^3/s	163	1,356	394	27	83
		ft^3/s	5,769	47,900	13,902	950	2,925
Snake River near Idaho Falls	1983-1987	m^3/s	245	818	364	76	129
		ft^3/s	8,668	28,900	12,857	2,670	4,545

Table 3.4-11 Ranges of Hydrologic Properties for the SRP
(Page 1 of 1)

Reference	Area	Porosity	Saturated Hydraulic Conductivity m/s (ft/s)	Groundwater Velocity m/s (ft/s)
Ackerman, 2006*	Eastern Snake River Plain Aquifer	0.05-0.27	3.5E-08 - 8.5E-02 (1.1E-07 - 2.8E-01)	6.9E-07 - 7.1E-05 (2.3E-05 - 2.3E-04)
Garabedian, 1992	Eastern Snake River Plain Aquifer	0.05-0.2	1.6E-06 - 3.4E-02 (5.3E-06 – 1.1E-01)	NA
Smith, 2004	Snake River Plain Aquifer	Up to 0.5	NA	NA
Wood, 1988	Snake River Plain Aquifer	NA	NA	2.3E-05 - 4.6E-05) (7.6E-05 – 1.5E-04)
Stoller, 2007	Snake River Plain Aquifer	NA	NA	1.7E-05 - 7.1E-05 (5.7E-05 - 7.1E-05)
Nimmo, 2004	Sediments at Idaho National Laboratory	NA	1.0E-10 - 1.2E-04 (3.4E-10 - 3.9E-04)	NA
Nimmo, 2004	Basalts at Idaho National Laboratory	NA	3.5E-08 - 1.1E-01 (1.1E-07 - 3.7E-01)	NA
Ackerman, 2006	Hydrogeologic Unit 1** – Younger rocks consisting of thin, densely fractured basalt	0.05-0.27	3.5E-08 - 8.5E-02 (1.1E-07 - 2.8E-01)	NA
Ackerman, 2006	Hydrogeologic Unit 2** – Younger rocks consisting of massive, less densely fractured basalt	0.11	2.3E-05 – 4.9E-03 (7.6E-05 – 1.6E-02)	NA
Ackerman, 2006	Hydrogeologic Unit 3** – Intermediate-age rocks consisting of slightly altered fractured basalt and interbedded sediment**	0.5-0.8	1.2E-06 - 8.5E-02 (3.8E-06 - 2.8E-01)	NA
Ackerman, 2006	Older rocks consisting of intensely altered, fractured basalt and rhyolitic ash-flow tuffs**	<0.09-19	6.9E-09 - 1.0E-04 (2.2E-08 - 3.4E-07)	NA
Ackerman, 2006	Sediment**	0.25-0.73	1.2E-10 - 8.4E-04 (3.8E-10 - 2.8E-03)	NA

NA – Not Available.

*Compilation from a variety of sources.

** Hydrogeologic units as defined by Ackerman (Ackerman, 2006) for Idaho National Laboratory and vicinity.

Table 3.4-12 Mean Concentrations of Analytes in SRP Shallow Zone Groundwater
(Page 1 of 1)

Analyte	Snake River Plain	Eastern Snake River Plain	Western Snake River Plain
Major constituents			
Ca, mg/L	51	51	36
Mg, mg/L	17	18	9.8
Na, mg/L	43	26	46
K, mg/L	5	4	7.4
HCO_3, mg/L	222	220	190
Cl, mg/L	32	28	17
SO_4, mg/L	67	41	52
SiO_2, mg/L	37	31	56
TDS*, mg/L	361	307	318
Minor and trace constituents			
F, mg/L	0.7	0.6	1
NO_3, mg/L	1.5	1.5	1.5
P, mg/L	0.1	0.1	0.09
Al, µg/L	13	13	10
Ba, µg/L	65	69	43
Fe, µg/L	41	36	55
Pb, µg/L	9	8	13
Li, µg/L	36	37	36
Mn, µg/L	22	12	35
Sr, µg/L	254	259	140
Zn, µg/L	100	108	95

*TDS is calculated from the sum of major constituents

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater
(Page 1 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	Spud Well	Lava Well 3	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	LAVA 3-01	SPUD WELL-01	GW-03-01	GW-05-01	SPUD WELL-01	LAVA WELL 03-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	03/25/08	03/25/08	05/20/08	06/19/08	06/19/08	06/19/08	07/07/08	07/09/08	07/10/08		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Field Parameters											
pH (s.u.)	6.73	7.8	7.52	7.70	7.94	7.74	7.83	8.43	8.11	-	6.5 to 8.5 [4]
Temp ºC (ºF)	9.4 (48.9)	6.6 (43.9)	12.3 (54.1)	12.7 (54.9)	11.8 (53.2)	12.0 (53.6)	13.1 (55.6)	13.2 (55.8)	13.7 (56.7)	-	NS
Electrical Conductivity µS/cm (µmhos/cm)	NM	NM	358 (358)	350 (350)	425 (425)	345 (345)	302 (302)	294 (294)	285 (285)	-	NS
Depth to water m (ft) (BGS[2])	217.9 (715)	NM	208.3 (683.3)	219.2 (719.1)	NM	NM	207.8 (681.9)	200.7 (658.4)	202.1 (662.9)	-	
Lab Parameters											
Dissolved											
Aluminum	<0.08 [3]	<0.08 [3]	<0.08 [3]	<0.08 [3]	<0.08 [3]	<0.08 [3]	<0.08 [3]	<0.08 [3]	<0.08 [3]	0.08	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.003	<0.003	<0.003	<0.003	0.00303	<0.003	<0.003	<0.003	<0.003	0.003	0.01
Barium	0.0103	0.0149	0.0115	0.0113	0.0138	0.0101	0.0074	0.0098	0.0103	0.002	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.063	0.065	0.061	0.059	0.065	0.061	0.049	0.052	0.044	0.04	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	40.0	49.7	40.6	38.1	46.4	37.2	32.1	32.8	29.2	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]
Iron	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	11.4	14.1	11.8	11.3	13.8	11.0	9.44	9.75	8.79	0.06	NS
Manganese	<0.004	0.0075	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.0048	0.004	0.05 [4]
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 2 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	Spud Well	Lava Well 3	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	LAVA 3-01	SPUD Well-01	GW-03-01	GW-05-01	SPUD WELL-01	LAVA Well 03-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	03/25/08	03/25/08	05/20/08	06/19/08	06/19/08	06/19/08	07/07/08	07/09/08	07/10/08		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Molybdenum	<0.008	0.0089	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Lab Parameters											
Dissolved											
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	3.10	3.47	3.05	3.11	3.42	2.93	2.47	2.70	2.50	0.5	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	35.9	34.8	32.5	33.4	32.2	33.9	34.9	35.5	34.0	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	16.3	18.5	17.2	17.0	18.2	16.2	14.8	14.0	13.0	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Zinc	<0.01	0.457	0.143	0.0528	0.0853	<0.01	0.0871	0.186	0.113	0.01	5 [4]
Total Recoverable											
Aluminum	**0.366**	**0.223**	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	0.08	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	0.0039	0.00434	0.00443	0.00453	0.00599	0.00584	0.00554	0.00503	<0.003	0.003	0.01
Barium	0.0119	0.0171	0.0103	0.0116	0.0149	0.0102	0.0082	0.0103	0.0130	0.002	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.064	0.07	0.058	0.068	0.071	0.068	0.050	0.060	0.057	0.04	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	41.3	51.1	37.3	40.6	49.8	39.2	35.0	35.3	33.5	0.04	NS
Chromium	<0.006	0.0096	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]
Iron	**1.19**	**0.515**	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.3 [4]
Lead	<0.0075	0.0104	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	12.3	14.5	10.8	11.9	14.5	11.6	10.0	10.4	10.1	0.06	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater
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Well Name	Lava Well 3	Spud Well	GW-3	GW-5	Spud Well	Lava Well 3	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**LAVA 3-01**	**SPUD WELL-01**	**GW-03-01**	**GW-05-01**	**SPUD WELL-01**	**LAVA WELL 03-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**03/25/08**	**03/25/08**	**05/20/08**	**06/19/08**	**06/19/08**	**06/19/08**	**07/07/08**	**07/09/08**	**07/10/08**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Total Recoverable											
Manganese	0.0221	0.0058	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.0064	0.004	0.05 [4]
Mercury (Total)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	3.17	3.48	2.89	3.10	3.38	3.01	2.96	2.85	2.84	0.5	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	38.7	36.5	32.4	35.9	34.9	35.4	37.0	38.2	38.6	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	16.7	18.5	16	16.7	18.0	15.7	15.0	14.5	13.9	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Zinc	0.0146	1.03	0.131	0.0629	0.104	<0.01	0.0925	0.202	0.157	0.01	5 [4]
Organics										**PQL (mg/L)**	
Lube Oil	1.23	ND	ND	ND	ND	ND	ND	ND	ND	0.5	NS
Diesel	ND	ND	ND	ND	ND	ND	ND	0.107	ND	0.1	NS
Gasoline	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	NS
SVOC	ND	ND	ND	ND	ND	ND	ND	ND	ND	Various	Various
VOC	ND	ND	ND	ND	ND	ND	ND	ND	ND	Various	Various
Pesticides	ND	ND	ND	NA	NA	NA	ND	ND	ND	Various	Various
Herbicides	ND	ND	ND	ND	ND	ND	ND	ND	ND	Various	Various
Polychlorinated biphenyls, PCB	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0005

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 4 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	Spud Well	Lava Well 3	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	LAVA 3-01	SPUD WELL-01	GW-03-01	GW-05-01	SPUD WELL-01	LAVA WELL 03-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	03/25/08	03/25/08	05/20/08	06/19/08	06/19/08	06/19/08	07/07/08	07/09/08	07/10/08		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Inorganic major cations and anions											
Bicarbonate	143	170	142	142	165	140	130	129	126	1	NS
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	NS
Chloride	13.4	16.2	12.9	13.1	16.9	13.9	9.73	9.46	8.50	Various	250 [4]
Cyanide (free)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2
Fluoride	0.862	0.728	0.8	1.1	0.834	1.09	0.803	0.810	0.801	0.1	2 [4]
Nitrate as N	1.29	1.44	<0.05	1.29	1.48	1.30	1.38	1.46	1.47	0.05	10
Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1
General Properties[6]											
pH (s.u.)	7.43	7.98	8.12	8.03	8.06	8.05	8.11	8.06	8.19	No RL	6.5 to 8.5 [4]
Specific conductance µS/cm (umhos/cm)	370 (370)	440 (440)	460 (460)	360 (360)	430 (430)	350 (350)	320 (320)	310 (310)	270 (270)	1 (1)	NS
Sulfate as SO4	21.6	33.8	22.7	24.1	35.9	22.7	13.1	12.5	10.4	0.3	250 [4]
Total Alkalinity	143	170	142	142	165	140	130	129	126	1	NS
Total Dissolved Solids	220	260	230	230	260	220	210	200	200	10	500 [4]
Total Organic Carbon	<1.00	<1.00	<1.00	2.18	6.01	2.60	<1.00	<1.00	<1.00	1	NS
Total Suspended Solids	19	13	<5	<5	<5	<5	<5	<5	<5	5	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater
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Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	GW-03-01	LAVA Well 03-01	GW-05-01	SPUD WELL-01-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	9/29/08	9/30/08	9/30/08	9/30/08	9/30/08	10/1/08	10/1/08		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Field Parameters									
pH (s.u.)	7.7	7.9	7.92	7.66	7.84	7.71	7.91	-	6.5 to 8.5 [4]
Temp ºC (ºF)	11.84 (53.31)	15.17 (59.31)	11.9 (53.42)	11.82 (53.28)	13.22 (55.80)	12.68 (54.82)	13.7 (56.66)	-	NS
Electrical Conductivity µS/cm (µmhos/cm)	356 (356)	349 (349)	358 (358)	416 (416)	300 (300)	292 (292)	282 (282)	-	NS
Depth to water m (ft) (BGS[2])	NM	NM	NM	NM	NM	NM	NM	-	
Lab Parameters									
Dissolved									
Aluminum	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	0.08	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.003	<0.003	<0.003	0.00324	<0.003	<0.003	<0.003	0.003	0.01
Barium	0.0098	0.0095	0.0102	0.0139	0.0069	<0.0079	<0.0086	0.002	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.057	0.056	0.056	0.059	0.049	0.048	0.046	0.04	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	36.7	35.5	37	45.3	31.1	30.8	29.3	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3[5]
Iron	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	10.7	10.3	10.9	13.1	9.16	9.04	8.89	0.06	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 6 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**GW-03-01**	**LAVA Well 03-01**	**GW-05-01**	**SPUD WELL-01-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**9/29/08**	**9/29/08**	**9/30/08**	**9/30/08**	**9/30/08**	**10/1/08**	**10/1/08**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Manganese	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.05 [4]
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Lab Parameters									
Dissolved									
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	2.86	2.8	2.9	3.16	2.65	2.6	2.64	0.5	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	32.8	32.6	33	32.1	33.6	33.9	34.3	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	15.9	15.8	16.4	17.4	13.7	13.3	13	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	NS
Zinc	0.0165	<0.01	0.0211	0.0353	<0.01	0.0321	0.0228	0.01	5 [4]
Total Recoverable									
Aluminum	0.175	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	<0.08[3]	0.08	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.01
Barium	0.012	0.011	0.0106	0.014	0.0074	0.0095	0.0091	0.002	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.064	0.065	0.061	0.063	0.051	0.054	0.048	0.04	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	39.6	38	37.4	44.9	31.3	32.4	30.9	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 7 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	GW-03-01	LAVA Well 03-01	GW-05-01	SPUD WELL-01-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	9/29/08	9/29/08	9/30/08	9/30/08	9/30/08	10/1/08	10/1/08		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]
Iron	0.255	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	11.6	11.2	11	13.1	9.16	9.63	9.47	0.06	NS
Total Recoverable									
Manganese	0.0043	<0.004	<0.004	<0.004	<0.004	<0.004	<0.0044	0.004	0.05 [4]
Mercury (Total)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	3.02	2.99	2.97	3.18	2.65	2.67	2.7	0.5	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	35.2	34.1	35.7	34.1	35.8	35.5	36.1	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	17.3	17.4	16.7	17.2	13.6	14	13.8	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	NS
Zinc	0.0669	<0.01	0.0283	0.0377	0.0139	0.0384	0.0536	0.01	5 [4]

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 8 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	GW-03-01	LAVA Well 03-01	GW-05-01	SPUD WELL-01-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	9/29/08	9/29/08	9/30/08	9/30/08	9/30/08	10/1/08	10/1/08		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Organics								**PQL (mg/L)**	
Lube Oil	ND	0.592	ND	ND	ND	ND	ND	Various	NS
Diesel	ND	ND	ND	ND	ND	ND	ND	0.1	NS
Gasoline	ND	ND	ND	ND	ND	ND	ND	0.1	NS
bis(2-Ethylhexyl) Phthalate	1.04	ND	ND	ND	3.1	ND	8.44	0.5	NS
Diethylphthalate	ND	ND	1.62	ND	ND	ND	ND	0.5	NS
Remaining SVOCs	ND	ND	ND	ND	ND	ND	ND	Various	Various
Chloroform	ND	ND	ND	ND	ND	ND	ND	0.5	0.08
Remaining VOCs	ND	ND	ND	ND	ND	ND	ND	Various	Various
Pesticides	ND	ND	ND	ND	ND	ND	ND	Various	Various
Herbicides	ND	ND	ND	ND	ND	ND	ND	Various	Various
Polychlorinated biphenyls, PCB	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0005

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 9 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**GW-03-01**	**LAVA Well 03-01**	**GW-05-01**	**SPUD WELL-01-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**9/29/08**	**9/29//08**	**9/30/08**	**9/30/08**	**9/30/08**	**10/1/08**	**10/1/08**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Bicarbonate	147	148	147	168	133	129	126	1	NS
Carbonate	<1	<1	<1	<1	<1	<1	<1	1	NS
Chloride	13.9	14	14.4	14.4	9.92	9.38	8.73	0. 2 or 1.0	250 [4]
Cyanide (free)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2
Fluoride	0.795	0.805	0.797	0.682	0.801	0.783	0.784	0.1	2 [4]
Nitrate as N	1.31	1.32	1.32	1.46	1.38	1.42	1.45	0.05	10
Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1
General Properties[6]									
pH (s.u..)	8.09	7.91	8.08	8.07	8.13	8.06	8.11	No RL	6.5 to 8.5 [4]
Specific conductance µS/cm (umhos/cm)	370 (370)	370 (370)	390 (390)	460 (460)	330 (330)	310 (310)	300 (300)	1 (1)	NS
Sulfate as SO4	22.1	20.9	22.7	32.9	13.3	12.2	10.1	0.3	250 [4]
Total Alkalinity	147	148	147	168	133	129	126	1	NS
Total Dissolved Solids	250	240	230	280	200	180	170	10	500 [4]
Total Organic Carbon	<1	<1	<1	<1	1.07	1.26	1.59	1	NS
Total Suspended Solids	6	<5	<5	<5	<5	<5	<5	5	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater
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Well Name	Lava Well 3	Spud Well	GW-3	GW-5	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**LAVA WELL-03-01**	**SPUD WELL- 01-01**	**GW-03-01**	**GW-05-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**01/06/09**	**01/05/09**	**01/07/09**	**01/08/09**	**01/06/09**	**01/06/09**	**01/08/09**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Field Parameters									
pH (s.u.)	8.02	7.67	7.75	8.14	8.03	8.28	8.26	-	6.5 to 8.5 [4]
Temp ºC (ºF)	10.98 (51.76)	9.88 (49.78)	12.10 (53.78)	13.78 (56.80)	13.33 (55.99)	11.77 (53.19)	13.40 (56.12)	-	NS
Electrical Conductivity µS/cm (µmhos/cm)	358 (358)	435 (435)	363 (363)	364 (364)	308 (308)	300 (300)	279 (279)	-	NS
Depth to water m (ft)	NM	NM	NM	NM	NM	NM	NM	-	-
Lab Parameters									
Dissolved									
Aluminum	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	0.080	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.00300	0.00306	<0.00300	<0.00300	<0.00300	<0.00300	<0.00300	0.00300	0.01
Barium	0.0110	0.0156	0.0113	0.0118	0.0085	0.0081	0.0076	0.0020	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.065	0.067	0.066	0.059	0.058	0.056	0.052	0.040	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	40.00	49.70	40.30	37.90	34.10	33.20	29.70	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]
Iron	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	0.060	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 11 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	LAVA WELL-03-01	SPUD WELL- 01-01	GW-03-01	GW-05-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	01/06/09	01/05/09	01/07/09	01/08/09	01/06/09	01/06/09	01/08/09		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Magnesium	11.70	14.50	11.70	11.40	10.10	9.73	9.08	0.06	NS
Manganese	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.05 [4]
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Dissolved									
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	3.14	3.46	3.11	3.09	2.87	2.81	2.66	0.50	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	34.80	33.70	34.40	33.50	35.40	35.30	34.00	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	16.8	18.5	17.0	17.5	14.8	14.2	13.0	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	NS
Zinc	<0.0100	0.0483	0.3310	0.4200	0.3520	0.2620	0.2230	0.0100	5 [4]

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 12 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**LAVA WELL-03-01**	**SPUD WELL- 01-01**	**GW-03-01**	**GW-05-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**01/06/09**	**01/05/09**	**01/07/09**	**01/08/09**	**01/06/09**	**01/06/09**	**01/08/09**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Total Recoverable									
Aluminum	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	0.081 [3]	0.088 [3]	<0.080 [3]	0.080	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.01
Barium	0.0101	0.0139	0.0104	0.0111	0.0081	0.0078	0.0073	0.0020	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.058	0.059	0.057	0.057	0.049	0.048	0.047	0.040	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	38.30	46.10	38.40	37.60	32.10	31.20	29.50	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]
Iron	<0.060	<0.060	<0.060	<0.060	0.071	0.081	<0.060	0.060	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	11.30	13.40	11.20	11.20	9.41	9.09	8.91	0.06	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater
(Page 13 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**LAVA WELL-03-01**	**SPUD WELL- 01-01**	**GW-03-01**	**GW-05-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**01/06/09**	**01/05/09**	**01/07/09**	**01/08/09**	**01/06/09**	**01/06/09**	**01/08/09**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Total Recoverable									
Manganese	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.05 [4]
Mercury (Total)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	3.01	3.18	2.99	3.04	2.67	2.60	2.63	0.50	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	34.00	31.60	33.30	33.30	34.00	33.80	34.30	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	16.3	17.1	16.4	17.6	13.6	13.3	13.3	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	NS
Zinc	<0.0100	0.0421	0.3030	0.4030	0.4240	0.2880	0.2240	0.0100	5 [4]
Organics								**PQL (mg/L, or as noted)**	
Lube Oil	5.99	ND	ND	ND	ND	ND	ND	0.50/2.50 [7]	NS
Diesel	ND	ND	ND	ND	ND	ND	ND	0.1	NS
Gasoline	ND	ND	ND	ND	ND	ND	ND	0.1	NS
Phenol	0.00101	ND	ND	ND	ND	ND	ND	0.00050	NS
Remaining SVOCs	ND	ND	ND	ND	ND	ND	ND	0.0005	Various

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**LAVA WELL-03-01**	**SPUD WELL- 01-01**	**GW-03-01**	**GW-05-01**	**GW-01-01**	**GW-04-01**	**GW-02-01**		
Sample Date	**01/06/09**	**01/05/09**	**01/07/09**	**01/08/09**	**01/06/09**	**01/06/09**	**01/08/09**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Organics								**PQL (mg/L, or as noted)**	
Toluene	ND	ND	0.00312	0.00808	0.00998	0.00347	0.00251	0.00050	1
Remaining VOCs	ND	ND	ND	ND	ND	ND	ND	Various	Various
Pesticides	ND	ND	ND	ND	ND	ND	ND	Various	Various
Herbicides	ND	ND	ND	ND	ND	ND	ND	0.0001	Various
Polychlorinated biphenyls, PCB	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0005

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 15 of 21)

Well Name	Lava Well 3	Spud Well	GW-3	GW-5	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	LAVA WELL-03-01	SPUD WELL- 01-01	GW-03-01	GW-05-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	01/06/09	01/05/09	01/07/09	01/08/09	01/06/09	01/06/09	01/08/09		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Inorganic major cations and anions									
Bicarbonate	151	180	152	150	136	136	129	1	NS
Carbonate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	NS
Chloride	13.9	16.4	14.6	13.6	10.9	10.3	8.53	Various	250 [4]
Cyanide (free)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2
Fluoride	0.916	0.779	0.896	0.897	0.935	0.936	0.956	0.100	2 [4]
Nitrate as N	1.44	1.63	1.40	1.53	1.53	1.58	1.66	0.05	10
Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1
General Properties [6]									
pH (s.u.)	8.01	7.99	7.93	7.91	8.00	8.02	7.93	No RL	6.5 to 8.5 [4]
Specific conductance µS/cm (umhos/cm)	390 (390)	470 (470)	380 (380)	400 (400)	340 (340)	330 (330)	310 (310)	1 (1)	NS
Sulfate as SO4	24.2	37.1	24.5	26.2	14.8	13.7	12.2	0.3	250 [4]
Total Alkalinity	151	180	152	150	136	136	129	1	NS
Total Dissolved Solids	220	270	260	240	200	180	180	10	500 [4]
Total Organic Carbon	<1.00	<1.00	<1.00	1.46	<1.00	<1.00	1.13	1.00	NS
Total Suspended Solids	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 16 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	GW-03-01	LAVA WELL-03-01	GW-05-01	SPUD WELL-01-01	GW-01-01	GW-04-01	GW-02-01		
Sample Date	4/08/09	4/07/09	4/08/09	4/06/09	4/07/09	4/07/09	4/06/09		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Field Parameters									
pH (s.u.)	7.85	7.9	7.58	7.96	8.1	8.22	8.18	-	6.5 to 8.5 [4]
Temp ºC (ºF)	12.7 (54.9)	11.3 (52.3)	13.7 (56.7)	10.6 (51.1)	13.8 (56.8)	13.9 (57.0)	13.8 (56.8)	-	NS
Electrical Conductivity µS/cm (µmhos/cm)	372 (372)	362 (362)	367 (367)	439 (439)	312 (312)	306 (306)	291 (291)	-	NS
Depth to water m (ft)	NM	NM	NM	NM	NM	NM	NM	-	-
Lab Parameters									
Dissolved									
Aluminum	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	0.080	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.01
Barium	0.0117	0.0117	0.0119	0.0162	0.0081	0.0086	0.0087	0.0020	2
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.061	0.060	0.059	0.064	0.054	0.052	0.050	0.040	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	41.20	40.00	39.90	49.90	32.80	32.80	31.20	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 17 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	GW-03-01	LAVA WELL-03-01	GW-05-01	SPUD WELL-01-01	GW-01-01	GW-4-01	GW-02-01		
Sample Date	4/08/09	4/07/09	4/08/09	4/06/09	4/07/09	4/07/09	4/06/09		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Dissolved									
Iron	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	12.10	11.70	11.70	14.50	9.78	9.93	9.58	0.06	NS
Manganese	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.05 [4]
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	2.92	2.92	2.88	3.26	2.63	2.72	2.65	0.5	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	35.30	35.40	34.90	34.70	35.90	36.00	36.50	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	17.6	16.9	18.0	18.4	14.3	14.5	13.8	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	NS
Zinc	0.206	<0.010	0.287	0.064	0.192	0.247	0.204	0.010	5 [4]
Total Recoverable									
Aluminum	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	<0.080 [3]	0.080	0.05 - 0.2 [4]
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.006
Arsenic	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.01
Barium	0.0118	0.0099	0.0115	0.0135	0.0068	0.0072	0.0070	0.0020	2

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater
(Page 18 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL [1] (mg/L, or as noted)
Sample Name	GW-03-01	LAVA WELL-03-01	GW-05-01	SPUD WELL-01-01	GW-01-01	GW-4-01	GW-02-01		
Sample Date	4/08/09	4/07/09	4/08/09	4/06/09	4/07/09	4/07/09	4/06/09		
Analyte	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)	(mg/L, or as noted)		
Total Recoverable									
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.004
Boron	0.063	0.056	0.060	0.058	0.047	0.047	0.047	0.040	NS
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.005
Calcium	40.20	38.30	38.80	45.80	31.70	31.00	30.00	0.04	NS
Chromium	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	0.1
Cobalt	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.006	NS
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	1.3 [5]
Iron	<0.06	<0.06	<0.06	0.16	<0.06	<0.06	<0.06	0.06	0.3 [4]
Lead	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	0.015 [5]
Magnesium	11.90	11.10	11.50	13.20	9.25	9.05	8.96	0.06	NS
Manganese	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.05 [4]
Mercury (Total)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.002
Molybdenum	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	NS
Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NS
Potassium	3.07	3.05	3.05	3.15	2.66	2.64	2.60	0.5	NS
Selenium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04	0.05
Silica (SiO2)	35.10	32.30	34.40	30.80	31.80	31.80	32.90	0.17	NS
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.1 [4]
Sodium	17.4	15.8	17.7	16.5	13.2	13.0	12.8	0.5	NS
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002
Vanadium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	NS
Zinc	0.217	<0.010	0.291	0.097	0.218	0.278	0.214	0.010	5 [4]

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 19 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**GW-03-01**	**LAVA WELL-03-01**	**GW-05-01**	**SPUD WELL-01-01**	**GW-01-01**	**GW-4-01**	**GW-2-01**		
Sample Date	**4/08/09**	**4/07/09**	**4/08/09**	**4/06/09**	**4/07/09**	**4/07/09**	**4/06/09**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Organics								**PQL (mg/L)**	
Lube Oil	ND	21.3	ND	ND	ND	ND	ND	0.5/5.0 [7]	NS
Diesel	ND	ND	ND	ND	ND	ND	ND	0.1	NS
Gasoline	ND	ND	ND	ND	ND	ND	ND	0.1	NS
Phenol	ND	0.00153	ND	ND	ND	ND	ND	0.00050	NS
Remaining SVOCs	ND	ND	ND	ND	ND	ND	ND	0.0005	Various
Toluene	0.00239	ND	0.00480	ND	0.00344	0.01740	0.00864	0.00050	1
Remaining VOCs	ND	ND	ND	ND	ND	ND	ND	Various	Various
Pesticides	ND	ND	ND	ND	ND	ND	ND	Various	Various
Herbicides	ND	ND	ND	ND	ND	ND	ND	Various	Various
Polychlorinated biphenyls, PCB	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0005

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 20 of 21)

Well Name	GW-3	Lava Well 3	GW-5	Spud Well	GW-1	GW-4	GW-2	RL (mg/L, or as noted)	EPA MCL[1] (mg/L, or as noted)
Sample Name	**GW-03-01**	**LAVA WELL-03-01**	**GW-05-01**	**SPUD WELL-01-01**	**GW-01-01**	**GW-4-01**	**GW-2-01**		
Sample Date	**4/08/09**	**4/07//09**	**4/08/09**	**4/06/09**	**4/07/09**	**4/07/09**	**4/06/09**		
Analyte	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**	**(mg/L, or as noted)**		
Inorganic major cations and anions									
Bicarbonate	145	141	142	165	130	127	123	1	NS
Carbonate	<1	<1	<1	<1	<1	<1	<1	1	NS
Chloride	14.2	13.5	14.6	15.3	10.2	9.64	8.73	Various	250 [4]
Cyanide (free)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2
Fluoride	0.887	0.900	0.911	0.777	0.898	0.905	0. 895	0.1	2 [4]
Nitrate as N	1.36	1.35	1.40	1.53	1.43	1.47	1.56	0.05	10
Nitrite as N	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1
General Properties [6]									
pH (s.u.)	8.07	8.04	8.00	7.90	8.03	8.01	7.98	No RL	6.5 to 8.5 [4]
Specific conductance µS/cm (umhos/cm)	340 (340)	400 (400)	370 (370)	440 (440)	350 (350)	350 (350)	280 (280)	1	NS
Sulfate as SO4	24.3	20.9	23.5	34.2	14.3	13.2	10.8	Various	250 [4]
Total Alkalinity	145	141	142	165	130	127	123	1	NS
Total Dissolved Solids	270	228	264	292	207	201	204	10	500 [4]
Total Organic Carbon	<1	1.78	<1	2.69	<1	1.03	<1	1	NS
Total Suspended Solids	<5	<5	<5	<5	<5	<5	<5	5	NS

Table 3.4-13 Chemical Analyses for the EREF Site Groundwater (Page 21 of 21)

NOTES:

Highlighted results exceed EPA MCL

1. EPA, 2006
2. BGS = Below ground surface when well was sampled.
3. Detection limit for aluminum above the lowest value of the secondary standard.
4. EPA secondary maximum contaminant levels (SMCLs) (EPA, 2006)
5. Action level requiring treatment (EPA, 2006)
6. Lab measurement
7. Lower value applies to the ND results; higher value applies to remaining result (Lava Well-03-01).

NA = Not analyzed due to bottle breakage
NM = Not measured
NS = No standard
s.u. = standard units
< Denotes result was less than the lab reporting limit (RL). The RL is the number following the less than sign
ND = Non-detect
VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
MCL = Maximum Contaminant Level
RL =Reporting Limit

PQL = Practical Quantitation Limit (see Organics)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater (Page 1 of 35)

Well Name	Lava Well 3				Spud Well				
Sample Date	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	
Sample Name	LAVA 3-01	LAVA 3-01	MDC	MDC	SPUD WELL-01	SPUD WELL-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	1.3E+00	4.7E-02	2.9E+00	1.1E-01	1.4E+00	5.3E-02	2.8E+00	1.0E-01	15 (0.55)
Gross Beta	**5.7E+00**	**2.1E-01**	3.3E+00	1.2E-01	**4.3E+00**	**1.6E-01**	3.2E+00	1.2E-01	15 (0.55)
Ag-108m	7.1E-01	2.6E-02	1.2E+00	4.4E-02	-1.0E-02	-3.7E-04	7.6E-01	2.8E-02	NS
Ag-110m	-7.7E-01	-2.8E-02	1.9E+00	7.0E-02	4.1E-01	1.5E-02	1.3E+00	4.8E-02	NS
Ba-140	1.1E+00	4.1E-02	8.7E+00	3.2E-01	-1.6E+00	-5.9E-02	6.1E+00	2.3E-01	NS
Be-7	-5.1E+00	-1.9E-01	1.5E+01	5.5E-01	9.0E-01	3.3E-02	1.0E+01	3.7E-01	NS
Ce-141	2.1E+00	7.6E-02	3.1E+00	1.1E-01	1.0E-01	3.7E-03	6.0E+00	2.2E-01	NS
Ce-144	-1.0E-01	-3.7E-03	7.1E+00	2.6E-01	2.4E+00	8.9E-02	5.4E+00	2.0E-01	NS
Co-57	3.8E-01	1.4E-02	1.6E+00	5.9E-02	5.6E-01	2.1E-02	7.0E-01	2.6E-02	NS
Co-58	-2.4E-01	-8.9E-03	1.8E+00	6.7E-02	1.0E-02	3.7E-04	1.2E+00	4.4E-02	NS
Co-60	6.0E-02	2.2E-03	1.5E+00	5.5E-02	2.0E-01	7.4E-03	1.0E+00	3.7E-02	NS
Cr-51	5.1E+00	1.9E-01	1.8E+01	6.7E-01	-4.3E+00	-1.6E-01	1.6E+01	5.9E-01	NS
Cs-134	-1.1E-01	-4.1E-03	1.5E+00	5.5E-02	-4.0E-01	-1.5E-02	1.0E+00	3.7E-02	NS
Cs-137	4.3E-01	1.6E-02	1.2E+00	4.4E-02	3.7E-01	1.4E-02	8.9E-01	3.3E-02	NS
Fe-59	-4.0E-01	-1.5E-02	4.3E+00	1.6E-01	-1.6E+00	-5.9E-02	3.0E+00	1.1E-01	NS
I-131	-2.8E+00	-1.0E-01	1.4E+01	5.2E-01	3.4E+00	1.3E-01	1.3E+01	4.8E-01	NS
K-40	-1.5E+00	-5.5E-02	3.1E+01	1.1E+00	1.4E+01	5.2E-01	3.5E+01	1.3E+00	NS
La-140	1.1E+00	4.1E-02	8.7E+00	3.2E-01	-1.6E+00	-5.9E-02	6.1E+00	2.3E-01	NS
Mn-54	-8.0E-02	-3.0E-03	1.4E+00	5.2E-02	6.0E-02	2.2E-03	9.7E-01	3.6E-02	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	Lava Well 3				Spud Well				
Sample Date	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	3/25/2008	
Sample Name	LAVA 3-01	LAVA 3-01	MDC	MDC	SPUD WELL-01	SPUD WELL-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Nb-95	-2.1E-01	-7.8E-03	2.3E+00	8.5E-02	9.6E-01	3.6E-02	1.7E+00	6.3E-02	NS
Ru-103	-3.7E-01	-1.4E-02	2.7E+00	1.0E-01	-9.8E-01	-3.6E-02	2.5E+00	9.2E-02	NS
Ru-106	9.0E-01	3.3E-02	1.1E+01	4.1E-01	-5.3E+00	-2.0E-01	9.4E+00	3.5E-01	NS
Sb-124	-2.2E+00	-8.1E-02	5.1E+00	1.9E-01	7.4E-01	2.7E-02	2.9E+00	1.1E-01	NS
Sb-125	-1.0E+00	-3.7E-02	3.6E+00	1.3E-01	6.8E-01	2.5E-02	2.4E+00	8.9E-02	NS
Se-75	-5.6E-01	-2.1E-02	1.7E+00	6.3E-02	-8.9E-01	-3.3E-02	1.3E+00	4.8E-02	NS
Zn-65	6.3E-01	2.3E-02	2.9E+00	1.1E-01	1.4E+00	5.3E-02	2.1E+00	7.8E-02	NS
Zr-95	-8.9E-01	-3.3E-02	3.2E+00	1.2E-01	-4.9E-01	-1.8E-02	2.2E+00	8.1E-02	NS
H-3	1.1E+02	4.1E+00	4.5E+02	1.7E+01	4.0E+01	1.5E+00	4.5E+02	1.7E+01	NS
Ra-224	-1.1E+04	-4.1E+02	6.5E+05	2.4E+04	0.0E+00	0.0E+00	4.5E+05	1.7E+04	NS
Ra-226	-3.7E-02	-1.4E-03	8.5E-01[3]	3.1E-02[3]	3.2E-01	1.2E-02	8.6E-01 [3]	3.2E-02 [3]	5 (0.18) [Ra-226+Ra-228][2]
Ra-228 [4]	**5.1E+00**	**-1.9E-01**	4.2E+00[3]	1.6E-01[3]	-6.5E+00	-2.4E-01	1.1E+01 [3]	4.1E-01 [3]	5 (0.18) - [Ra-226+Ra-228][2]
Th-228	1.0E-01	3.8E-03	2.9E-01	1.1E-02	1.2E-01	4.5E-03	1.6E-01	5.9E-03	NS
Th-230	**8.5E-01**	**3.1E-02**	4.7E-01	1.7E-02	9.0E-02	3.3E-03	4.1E-01	1.5E-02	NS
Th-232	**2.6E-01**	**9.8E-03**	6.5E-02	2.4E-03	2.0E-02	7.4E-04	5.5E-02	2.0E-03	NS
U-234	**2.0E+00**	**7.5E-02**	3.0E-01	1.1E-02	**1.1E+00**	**3.9E-02**	2.2E-01	8.1E-03	20 (0.74)
U-235	**2.8E-01**	**1.0E-02**	2.5E-01	9.2E-03	2.9E-01	1.1E-02	3.9E-01	1.4E-02	20 (0.74)
U-238	**6.0E-01**	**2.2E-02**	2.7E-01	1.0E-02	**9.5E-01**	**3.5E-02**	3.6E-01	1.3E-02	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				GW-5				
Sample Name Sample Date	GW-03-01 5/20/2008	GW-03-01 5/20/2008	MDC 5/20/2008	MDC 5/20/2008	GW-05-01 6/19/2008	GW-05-01 6/19/2008	MDC 6/19/2008	MDC 6/19/2008	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	5.1E-01	1.9E-02	3.50E-00	1.3E-01	-5.4E-01	-2.0E-02	1.9E+00	7.0E-02	15 (0.55)
Gross Beta	**5.8E-00**	**2.1E-01**	3.7E-00	1.4E-01	9.5E-01	3.5E-02	2.8E+00	1.0E-01	15 (0.55)
Ag-108m	-5.0E-02	-1.8E-03	1.7E+00	6.3E-02	1.1E+00	4.1E-02	3.9E+00	1.4E-01	NS
Ag-110m	-8.0E-02	-3.0E-03	2.8E+00	1.0E-01	-1.1E+00	-4.1E-02	6.3E+00	2.3E-01	NS
Ba-140	-1.6E+00	-5.9E-02	7.1E+00	2.6E-01	4.0E+00	1.5E-01	9.4E+00	3.5E-01	NS
Be-7	2.8E+00	1.0E-01	1.8E+01	6.7E-01	-1.3E+01	-4.8E-01	4.4E+01	1.6E+00	NS
Ce-141	1.2E+00	4.6E-02	3.2E+00	1.2E-01	2.9E+00	1.1E-01	7.3E+00	2.7E-01	NS
Ce-144	-4.0E-01	-1.5E-02	8.8E+00	3.3E-01	1.5E+00	5.5E-02	2.7E+01	1.0E+00	NS
Co-57	1.0E-01	3.7E-03	1.1E+00	4.1E-02	2.0E-01	7.4E-03	3.4E+00	1.3E-01	NS
Co-58	-4.3E-01	-1.6E-02	2.4E+00	8.9E-02	1.6E+00	5.9E-02	4.8E+00	1.8E-01	NS
Co-60	1.1E-01	4.1E-03	2.6E+00	9.6E-02	2.1E+00	7.8E-02	5.1E+00	1.9E-01	NS
Cr-51	-7.3E+00	-2.7E-01	2.0E+01	7.4E-01	-2.6E+01	-9.6E-01	5.1E+01	1.9E+00	NS
Cs-134	2.1E-01	7.8E-03	1.9E+00	7.0E-02	2.0E-01	7.4E-03	4.8E+00	1.8E-01	NS
Cs-137	-7.8E-01	-2.9E-02	2.0E+00	7.4E-02	-1.0E-01	-3.7E-03	5.1E+00	1.9E-01	NS
Fe-59	-6.0E-01	-2.2E-02	5.4E+00	2.0E-01	0.0E+00	0.0E+00	1.1E+01	4.1E-01	NS
I-131	-7.0E-01	-2.6E-02	7.3E+00	2.7E-01	-5.9E+00	-2.2E-01	1.2E+01	4.4E-01	NS
K-40	-6.0E+00	-2.2E-01	5.7E+01	2.1E+00	-2.8E+01	-1.0E+00	7.9E+01	2.9E+00	NS
La-140	-1.6E+00	-5.9E-02	7.1E+00	2.6E-01	4.0E+00	1.5E-01	9.4E+00	3.5E-01	NS
Mn-54	-3.9E-01	-1.4E-02	2.1E+00	7.8E-02	3.2E+00	1.2E-01	3.8E+00	1.4E-01	NS
Nb-95	-1.3E+00	-4.7E-02	3.1E+00	1.1E-01	3.0E-01	1.1E-02	5.9E+00	2.2E-01	NS
Ru-103	-2.2E-01	-8.1E-03	3.4E+00	1.3E-01	-5.0E-01	-1.8E-02	5.0E+00	1.8E-01	NS
Ru-106	-1.3E+01	-4.9E-01	1.8E+01	6.7E-01	-2.8E+01	-1.0E+00	4.6E+01	1.7E+00	NS
Sb-124	6.0E-01	2.2E-02	6.7E+00	2.5E-01	-1.2E+00	-4.4E-02	1.3E+01	4.8E-01	NS
Sb-125	-4.0E-01	-1.5E-02	5.1E+00	1.9E-01	1.8E+00	6.7E-02	1.3E+01	4.8E-01	NS
Se-75	-2.4E+00	-8.9E-02	3.6E+00	1.3E-01	-8.0E-01	-3.0E-02	5.6E+00	2.1E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				GW-5				
Sample Name	GW-03-01	GW-03-01	MDC	MDC	GW-05-01	GW-05-01	MDC	MDC	EPA MCL[1]
Sample Date	5/20/2008	5/20/2008	5/20/2008	5/20/2008	6/19/2008	6/19/2008	6/19/2008	6/19/2008	
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Zn-65	7.0E-01	2.6E-02	9.1E+00	3.4E-01	1.9E+00	7.0E-02	1.9E+01	7.0E-01	NS
Zr-95	-4.0E-01	-1.5E-02	4.2E+00	1.6E-01	-7.0E-01	-2.6E-02	8.3E+00	3.1E-01	NS
H-3	**5.3E+02**	**2.0E+01**	4.3E+02	1.6E+01	2.8E+02	1.0E+01	4.3E+02	1.6E+01	NS
Ra-224	0E+00	0E+00	2.7E+05	1E+04	3.5E+02	1.3E+01	9.6E+02	3.6E+01	NS
Ra-226	-1.8E-02	-6.5E-04	1.6E-01 [3]	5.9E-03 [3]	-2.5E-02	-9.3E-04	1.4E-01 [3]	5.2E-03 [3]	5 (0.18) [Ra-226+Ra-228][2]
Ra-228 [4]	8.9E+00	3.3E-01	1.5E+01 [3]	5.6E-01 [3]	-1E+00	-3.7E-02	2.1E+01 [3]	7.8E-01 [3]	5 (0.18) -[Ra-226+Ra-228][2]
Th-228	-2.9E-03	-1.1E-04	2.1E-02	7.8E-04	4.2E-03	1.6E-04	2.2E-02	8.1E-04	NS
Th-230	-2.6E-02	-9.6E-04	3.7E-02	1.4E-03	9.0E-03	3.3E-04	3.8E-02	1.4E-03	NS
Th-232	**1.3E-02**	**4.8E-04**	7.3E-03	2.7E-04	**4.7E-02**	**1.7E-03**	1.0E-02	3.7E-04	NS
U-234	**1.4E+00**	**5.3E-02**	6.6E-03	2.4E-04	**6.5E-02**	**2.4E-03**	2.4E-02	8.9E-04	20 (0.74)
U-235	**3.7E-02**	**1.4E-03**	1.6E-02	5.9E-04	**7.6E-02**	**2.8E-03**	2.3E-02	8.5E-04	20 (0.74)
U-238	**6.4E-01**	**2.4E-02**	2.4E-03	8.9E-05	**6.7E-02**	**2.5E-03**	2.1E-02	7.8E-04	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	Spud Well				Lava Well 3				
Sample Name Sample Date	SPUD WELL-01 6/19/2008	SPUD WELL-01 6/19/2008	MDC 6/19/2008	MDC 6/19/2008	LAVA WELL 03-01 6/19/2008	LAVA WELL 03-01 6/19/2008	MDC 6/19/2008	MDC 6/19/2008	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	0.0E+00	0.0E+00	4.0E+00	1.5E-01	8.0E-01	3.0E-02	3.8E+00	1.4E-01	15 (0.55)
Gross Beta	**5.5E+00**	**2.0E-01**	2.8E+00	1.0E-01	**4.0E+00**	**1.5E-01**	3.3E+00	1.2E-01	15 (0.55)
Ag-108m	-1.5E+00	-5.5E-02	4.6E+00	1.7E-01	-1.2E+00	-4.4E-02	4.6E+00	1.7E-01	NS
Ag-110m	0.0E+00	0.0E+00	7.6E+00	2.8E-01	-7.0E-01	-2.6E-02	7.3E+00	2.7E-01	NS
Ba-140	-8.5E+00	-3.1E-01	1.4E+01	5.2E-01	3.6E+00	1.3E-01	1.0E+01	3.7E-01	NS
Be-7	3.0E+00	1.1E-01	4.6E+01	1.7E+00	-4.0E+00	-1.5E-01	4.2E+01	1.6E+00	NS
Ce-141	-5.2E+00	-1.9E-01	9.2E+00	3.4E-01	-6.5E+00	-2.4E-01	9.4E+00	3.5E-01	NS
Ce-144	5.0E+00	1.8E-01	2.8E+01	1.0E+00	-1.2E+00	-4.4E-02	2.9E+01	1.1E+00	NS
Co-57	-3.0E-01	-1.1E-02	3.6E+00	1.3E-01	0.0E+00	0.0E+00	3.8E+00	1.4E-01	NS
Co-58	5.0E-01	1.8E-02	5.6E+00	2.1E-01	-1.8E+00	-6.7E-02	5.9E+00	2.2E-01	NS
Co-60	-2.3E+00	-8.5E-02	6.5E+00	2.4E-01	1.0E+00	3.7E-02	5.2E+00	1.9E-01	NS
Cr-51	-1.3E+01	-4.8E-01	5.4E+01	2.0E+00	-3.0E+00	-1.1E-01	4.8E+01	1.8E+00	NS
Cs-134	-2.4E+00	-8.9E-02	6.1E+00	2.3E-01	2.4E+00	8.9E-02	4.9E+00	1.8E-01	NS
Cs-137	1.6E+00	5.9E-02	5.0E+00	1.8E-01	-2.9E+00	-1.1E-01	6.0E+00	2.2E-01	NS
Fe-59	4.7E+00	1.7E-01	1.1E+01	4.1E-01	-5.6E+00	-2.1E-01	1.2E+01	4.4E-01	NS
I-131	0.0E+00	0.0E+00	1.2E+01	4.4E-01	3.1E+00	1.1E-01	9.4E+00	3.5E-01	NS
K-40	6.0E+00	2.2E-01	8.3E+01	3.1E+00	-2.5E+01	-9.2E-01	8.2E+01	3.0E+00	NS
La-140	-8.5E+00	-3.1E-01	1.4E+01	5.2E-01	3.6E+00	1.3E-01	1.0E+01	3.7E-01	NS
Mn-54	-1.5E+00	-5.5E-02	5.6E+00	2.1E-01	-4.3E+00	-1.6E-01	6.3E+00	2.3E-01	NS
Nb-95	2.0E-01	7.4E-03	7.6E+00	2.8E-01	4.0E-01	1.5E-02	7.3E+00	2.7E-01	NS
Ru-103	8.0E-01	3.0E-02	6.3E+00	2.3E-01	2.7E+00	1.0E-01	5.6E+00	2.1E-01	NS
Ru-106	-2.3E+01	-8.5E-01	5.2E+01	1.9E+00	-1.8E+01	-6.7E-01	5.4E+01	2.0E+00	NS
Sb-124	-6.0E-01	-2.2E-02	1.3E+01	4.8E-01	2.6E+00	9.6E-02	1.2E+01	4.4E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	Spud Well				Lava Well 3				
Sample Name Sample Date	SPUD WELL-01 6/19/2008	SPUD WELL-01 6/19/2008	MDC 6/19/2008	MDC 6/19/2008	LAVA WELL 03-01 6/19/2008	LAVA WELL 03-01 6/19/2008	MDC 6/19/2008	MDC 6/19/2008	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Sb-125	-5.3E+00	-2.0E-01	1.4E+01	5.2E-01	1.0E+00	3.7E-02	1.4E+01	5.2E-01	NS
Se-75	2.9E+00	1.1E-01	6.0E+00	2.2E-01	-2.0E+00	-7.4E-02	6.7E+00	2.5E-01	NS
Zn-65	-1.5E+00	-5.5E-02	2.0E+01	7.4E-01	-4.0E-01	-1.5E-02	1.6E+01	5.9E-01	NS
Zr-95	6.0E-01	2.2E-02	9.9E+00	3.7E-01	-1.5E+00	-5.5E-02	1.0E+01	3.7E-01	NS
H-3	2.4E+02	8.9E+00	4.2E+02	1.6E+01	3.2E+02	1.2E+01	4.3E+02	1.6E+01	NS
Ra-224	0.0E+00	0.0E+00	1.3E+03	4.8E+01	0.0E+00	0.0E+00	9.1E+02	3.4E+02	NS
Ra-226	4.7E-02	1.7E-03	1.5E-01 [3]	5.5E-03 [3]	-1.9E-02	-6.9E-04	1.2E-01[3]	4.4E-03[3]	5 (0.18) [Ra-226+Ra-228][2]
Ra-228 [4]	1.8E+00	6.7E-02	2.2E+01 [3]	8.1E-01 [3]	-3E-01	-1.1E-02	2.3E+01[3]	8.5E-03[3]	5 (0.18) - [Ra-226+Ra-228][2]
Th-228	2.4E-03	8.9E-05	3.0E-02	1.1E-03	3.3E-02	1.2E-03	9.3E-02	3.4E-03	NS
Th-230	**2.9E-01**	**1.1E-02**	4.4E-02	1.6E-03	**1.0E-01**	**3.7E-03**	9.1E-02	3.4E-03	NS
Th-232	**2.3E-02**	**8.4E-04**	1.6E-02	5.9E-04	-5.3E-03	-2.0E-04	3.8E-02	1.4E-03	NS
U-234	**1.6E+00**	**5.8E-02**	1.2E-02	4.4E-04	**1.8E+00**	**6.7E-02**	1.5E-02	5.5E-04	20 (0.74)
U-235	**4.1E-02**	**1.5E-03**	8.6E-03	3.2E-04	**5.6E-02**	**2.1E-03**	1.2E-02	4.4E-04	20 (0.74)
U-238	**7.3E-01**	**2.7E-02**	1.0E-02	3.7E-04	**7.4E-01**	**2.7E-02**	8.4E-02	3.1E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name	GW-01-01	GW-01-01	MDC	MDC	GW-04-01	GW-04-01	MDC	MDC	EPA MCL[1]
Sample Date	7/7/2008	7/7/2008	7/7/2008	7/7/2008	7/9/2008	7/9/2008	7/9/2008	7/9/2008	
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	-2.2E+00	-8.0E-02	3.1E-00	1.1E-01	-2.2E-01	-8.1E-03	3.9E+00	1.4E-01	15 (0.55)
Gross Beta	**3.0E+00**	**1.1E-01**	2.7E+00	1.0E-01	**4.7E+00**	**1.7E-01**	3.4E+00	1.3E-01	15 (0.55)
Ag-108m	-2.0E-01	-7.4E-03	3.5E+00	1.3E-01	-8.6E-01	-3.2E-02	2.9E+00	1.1E-01	NS
Ag-110m	4.6E+00	1.7E-01	5.3E+00	2.0E-01	-2.2E+00	-8.1E-02	5.3E+00	2.0E-01	NS
Ba-140	-1.9E+00	-7.0E-02	9.1E+00	3.4E-01	4.7E+00	1.7E-01	8.2E+00	3.0E-01	NS
Be-7	6.8E+00	2.5E-01	3.3E+01	1.2E+00	-1.7E+01	-6.1E-01	3.3E+01	1.2E+00	NS
Ce-141	1.9E+00	7.0E-02	4.1E+00	1.5E-01	5.0E-01	1.8E-02	7.7E+00	2.8E-01	NS
Ce-144	3.8E+00	1.4E-01	1.9E+01	7.0E-01	-6.7E+00	-2.5E-01	2.4E+01	8.9E-01	NS
Co-57	3.0E-01	1.1E-02	3.5E+00	1.3E-01	4.0E-01	1.5E-02	3.1E+00	1.1E-01	NS
Co-58	-1.7E+00	-6.3E-02	4.4E+00	1.6E-01	-1.4E+00	-5.2E-02	4.1E+00	1.5E-01	NS
Co-60	-5.0E-01	-1.8E-02	5.1E+00	1.9E-01	8.3E-01	3.1E-02	2.5E+00	9.2E-02	NS
Cr-51	-1.0E+00	-3.7E-02	3.6E+01	1.3E+00	-3.0E+00	-1.1E-01	4.0E+01	1.5E+00	NS
Cs-134	2.7E+00	1.0E-01	4.0E+00	1.5E-01	7.4E-01	2.7E-02	3.3E+00	1.2E-01	NS
Cs-137	1.5E+00	5.5E-02	4.0E+00	1.5E-01	-2.0E-02	-7.4E-04	3.5E+00	1.3E-01	NS
Fe-59	-3.0E-01	-1.1E-02	9.3E+00	3.4E-01	2.0E+00	7.4E-02	7.4E+00	2.7E-01	NS
I-131	-3.0E-01	-1.1E-02	7.9E+00	2.9E-01	-2.0E+00	-7.4E-02	1.4E+01	5.2E-01	NS
K-40	-2.9E+01	-1.1E+00	8.8E+01	3.3E+00	2.4E+01	8.9E-01	4.7E+01	1.7E+00	NS
La-140	-1.9E+00	-7.0E-02	9.1E+00	3.4E-01	4.7E+00	1.7E-01	8.2E+00	3.0E-01	NS
Mn-54	-9.1E-01	-3.4E-02	3.7E+00	1.4E-01	-1.6E+00	-5.9E-02	4.1E+00	1.5E-01	NS
Nb-95	0.0E+00	0.0E+00	4.5E+00	1.7E-01	2.0E+00	7.4E-02	4.2E+00	1.6E-01	NS
Ru-103	-2.7E+00	-1.0E-01	4.3E+00	1.6E-01	-1.4E+00	-5.2E-02	4.7E+00	1.7E-01	NS
Ru-106	-2.0E+00	-7.4E-02	3.7E+01	1.4E+00	-3.3E+00	-1.2E-01	3.6E+01	1.3E+00	NS
Sb-124	4.0E-01	1.5E-02	1.1E+01	4.1E-01	-5.0E-01	-1.8E-02	9.6E+00	3.6E-01	NS
Sb-125	-1.4E+00	-5.2E-02	1.1E+01	4.1E-01	2.1E+00	7.8E-02	8.7E+00	3.2E-01	NS
Se-75	2.0E-01	7.4E-03	4.2E+00	1.6E-01	-7.0E-01	-2.6E-02	4.6E+00	1.7E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name	**GW-01-01**	**GW-01-01**	**MDC**	**MDC**	**GW-04-01**	**GW-04-01**	**MDC**	**MDC**	**EPA MCL[1]**
Sample Date	**7/7/2008**	**7/7/2008**	**7/7/2008**	**7/7/2008**	**7/9/2008**	**7/9/2008**	**7/9/2008**	**7/9/2008**	
Analyte	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**pCi/L (Bq/L)**
Zn-65	-4.0E+00	-1.5E-01	1.1E+01	4.1E-01	-6.4E+00	-2.4E-01	9.5E+00	3.5E-01	NS
Zr-95	1.1E+00	4.1E-02	7.1E+00	2.6E-01	2.0E-01	7.4E-03	7.0E+00	2.6E-01	NS
H-3	-1.2E+02	-4.4E+00	4.3E+02	1.6E+01	-7.0E+01	-2.6E+00	4.3E+02	1.6E+01	NS
Ra-224	0.0E+00	0.0E+00	6.3E+01	2.3E+00	0.0E+00	0.0E+00	4.7E+02	1.7E+01	NS
Ra-226	4.1E-02	1.5E-03	1.9E-01 [3]	7.0E-03 [3]	1.2E-01	4.4E-03	2.9E-01 [3]	1.1E-02 [3]	5 (0.18) [Ra-226+Ra-228][2]
Ra-228 [4]	1.1E+01	4.1E-01	1.3E+01 [3]	4.8E-01 [3]	1.8E+00	6.7E-02	1.2E+01 [3]	4.4E-02 [3]	5 (0.18) - [Ra-226+Ra-228][2]
Th-228	9.0E-04	3.3E-05	2.2E-02	8.1E-04	-2.7E-02	-1.0E-03	2.0E-01	7.40E-03	NS
Th-230	6.0E-03	2.2E-04	4.1E-02	1.5E-03	**2.4E-01**	**8.9E-03**	1.9E-01	7.03E-03	NS
Th-232	4.9E-03	1.8E-04	1.1E-02	4.1E-04	2E-03	7.4E-05	8.8E-02	3.26E-03	NS
U-234	**1.6E+00**	**6.1E-02**	1.8E-02	6.7E-04	**1.5E-00**	**5.5E-02**	5.3E-02	1.96E-03	20 (0.74)
U-235	**4.2E-02**	**1.5E-03**	2.0E-02	7.4E-04	1.4E-02	5.2E-04	8.0E-02	2.96E-03	20 (0.74)
U-238	**6.8E-01**	**2.5E-02**	1.6E-02	5.9E-04	**5.5E-01**	**2.0E-02**	6.8E-02	2.52E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name **Analyte**	**GW-02-01** **(pCi/L)**	**GW-02-01** **(Bq/L)**	**MDC** **(pCi/L)**	**MDC** **(Bq/L)**	**EPA MCL[1]** **pCi/L (Bq/L)**
Sample Date	**7/10/2008**	**7/10/2008**	**7/10/2008**	**7/10/2008**	
Radioactive Constituent					
Gross Alpha	4.8E-01	1.8E-02	3.7E+00	1.4E-01	15 (0.55)
Gross Beta	**5.0E+00**	**1.9E-01**	3.3E+00	1.2E-01	15 (0.55)
Ag-108m	1.7E-01	6.3E-03	2.3E+00	8.5E-02	NS
Ag-110m	-3.0E-01	-1.1E-02	4.0E+00	1.5E-01	NS
Ba-140	-7.5E+00	-2.8E-01	1.3E+01	4.8E-01	NS
Be-7	-9.6E+00	-3.6E-01	2.9E+01	1.1E+00	NS
Ce-141	4.0E-01	1.5E-02	5.9E+00	2.2E-01	NS
Ce-144	2.1E+00	7.8E-02	1.7E+01	6.3E-01	NS
Co-57	-1.3E-01	-4.8E-03	2.1E+00	7.8E-02	NS
Co-58	-2.0E+00	-7.4E-02	3.6E+00	1.3E-01	NS
Co-60	7.2E-01	2.7E-02	3.3E+00	1.2E-01	NS
Cr-51	-6.0E+00	-2.2E-01	3.5E+01	1.3E+00	NS
Cs-134	6.5E-01	2.4E-02	3.0E+00	1.1E-01	NS
Cs-137	4.6E-01	1.7E-02	3.1E+00	1.1E-01	NS
Fe-59	3.7E+00	1.4E-01	7.5E+00	2.8E-01	NS
I-131	-3.2E+00	-1.2E-01	1.4E+01	5.2E-01	NS
K-40	-4.0E+00	-1.5E-01	4.3E+01	1.6E+00	NS
La-140	-7.5E+00	-2.8E-01	1.3E+01	4.8E-01	NS
Mn-54	-1.6E-01	-5.9E-03	2.8E+00	1.0E-01	NS
Nb-95	2.0E-01	7.4E-03	3.7E+00	1.4E-01	NS
Ru-103	-1.5E+00	-5.5E-02	3.9E+00	1.4E-01	NS
Ru-106	-1.1E+01	-4.0E-01	3.0E+01	1.1E+00	NS
Sb-124	1.2E+00	4.4E-02	8.3E+00	3.1E-01	NS
Sb-125	0.0E+00	0.0E+00	7.4E+00	2.7E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name **Analyte**	**GW-02-01** **(pCi/L)**	**GW-02-01** **(Bq/L)**	**MDC** **(pCi/L)**	**MDC** **(Bq/L)**	**EPA MCL[1]** **pCi/L (Bq/L)**
Sample Date	**7/10/2008**	**7/10/2008**	**7/10/2008**	**7/10/2008**	
Se-75	0.0E+00	0.0E+00	3.6E+00	1.3E-01	NS
Zn-65	1.9E+00	7.0E-02	6.5E+00	2.4E-01	NS
Zr-95	2.4E+00	8.9E-02	5.4E+00	2.0E-01	NS
H-3	1.8E+02	7.6E+00	4.3E+02	1.6E+01	NS
Ra-224	1E+01	3.7E-01	8.6E+02	3.18E+01	NS
Ra-226	-3.8E-02	-1.4E-03	2.5E-01 [3]	9.2E-03 [3]	5 (0.18) -[Ra-226+Ra-228][2]
Ra-228 [4]	9E-01	3.3E-02	1.2E+01 [3]	4.4E-01 [3]	5 (0.18) -[Ra-226+Ra-228][2]
Th-228	-2.0E-03	-7.40E-05	9.2E-02	3.40E-03	NS
Th-230	-2.6E-02	-9.62E-04	1.3 E-01	4.81E-03	NS
Th-232	0E+00	0.00E+00	2.8E-02	1.04E-03	NS
U-234	**1.1E+00**	**4.07E-02**	6.7E-02	2.48E-03	20 (0.74)
U-235	2.5E-02	9.25E-04	7.6E-02	2.81E-03	20 (0.74)
U-238	**6.6E-01**	**2.44E-02**	6.4E-02	2.37E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				Lava Well				
Sample Date	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	
Sample Name	GW-03-01	GW-03-01	MDC	MDC	LAVA WELL 03-01	LAVA WELL 03-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	-1.08E+00	-4.00E-02	3.80E+00	1.41E-01	3.90E-01	1.44E-02	4.00E+00	1.48E-01	15 (0.55)
Gross Beta	**4.76E+00**	**1.76E-01**	2.20E+00	8.14E-02	**5.10E+00**	**1.89E-01**	3.40E+00	1.26E-01	15 (0.55)
Ag-108m	0.00E+00	0.00E+00	3.10E+00	1.15E-01	1.48E+00	5.48E-02	2.80E+00	1.04E-01	NS
Ag-110m	7.00E-01	2.59E-02	4.40E+00	1.63E-01	1.20E+00	4.44E-02	4.50E+00	1.66E-01	NS
Ba-140	2.60E+00	9.62E-02	1.20E+01	4.44E-01	-3.10E+00	-1.15E-01	1.20E+01	4.44E-01	NS
Be-7	2.20E+01	8.14E-01	3.30E+01	1.22E+00	6.30E+00	2.33E-01	2.80E+01	1.04E+00	NS
Ce-141	2.00E+00	7.40E-02	6.30E+00	2.33E-01	-3.00E+00	-1.11E-01	7.30E+00	2.70E-01	NS
Ce-144	6.60E+00	2.44E-01	1.80E+01	6.66E-01	1.90E+00	7.03E-02	2.30E+01	8.51E-01	NS
Co-57	-6.20E-01	-2.29E-02	2.40E+00	8.88E-02	-9.90E-01	-3.66E-02	2.90E+00	1.07E-01	NS
Co-58	-2.00E-01	-7.40E-03	4.30E+00	1.59E-01	-1.30E+00	-4.81E-02	3.90E+00	1.44E-01	NS
Co-60	0.00E+00	0.00E+00	4.90E+00	1.81E-01	-3.10E-01	-1.15E-02	3.40E+00	1.26E-01	NS
Cr-51	3.00E+00	1.11E-01	3.60E+01	1.33E+00	9.00E-01	3.33E-02	3.30E+01	1.22E+00	NS
Cs-134	-1.27E+00	-4.70E-02	3.60E+00	1.33E-01	-4.80E-01	-1.78E-02	3.20E+00	1.18E-01	NS
Cs-137	-1.30E+00	-4.81E-02	4.50E+00	1.66E-01	5.60E-01	2.07E-02	3.30E+00	1.22E-01	NS
Fe-59	-1.20E+00	-4.44E-02	1.00E+01	3.70E-01	-4.00E+00	-1.48E-01	8.00E+00	2.96E-01	NS
I-131	1.40E+00	5.18E-02	1.50E+01	5.55E-01	-4.30E+00	-1.59E-01	1.30E+01	4.81E-01	NS
K-40	8.00E+00	2.96E-01	5.30E+01	1.96E+00	-4.00E+00	-1.48E-01	4.80E+01	1.78E+00	NS
La-140	2.60E+00	9.62E-02	1.20E+01	4.44E-01	-3.10E+00	-1.15E-01	1.20E+01	4.44E-01	NS
Mn-54	-1.50E+00	-5.55E-02	4.40E+00	1.63E-01	1.04E+00	3.85E-02	3.10E+00	1.15E-01	NS
Nb-95	0.00E+00	0.00E+00	6.00E+00	2.22E-01	-1.70E+00	-6.29E-02	5.10E+00	1.89E-01	NS
Ru-103	1.00E-01	3.70E-03	4.60E+00	1.70E-01	-1.60E+00	-5.92E-02	4.50E+00	1.66E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

(Page 12 of 35)

Well Name	GW-3				Lava Well				
Sample Date	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	9/29/2008	
Sample Name	GW-03-01	GW-03-01	MDC	MDC	LAVA WELL 03-01	LAVA WELL 03-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Ru-106	1.07E+01	3.96E-01	2.90E+01	1.07E+00	-3.80E+00	-1.41E-01	3.20E+01	1.18E+00	NS
Sb-124	1.90E+00	7.03E-02	1.00E+01	3.70E-01	3.10E+00	1.15E-01	9.00E+00	3.33E-01	NS
Sb-125	-6.00E-01	-2.22E-02	1.00E+01	3.70E-01	1.30E+00	4.81E-02	8.10E+00	3.00E-01	NS
Se-75	2.00E-01	7.40E-03	4.30E+00	1.59E-01	-4.00E-01	-1.48E-02	4.30E+00	1.59E-01	NS
Zn-65	1.90E+00	7.03E-02	8.20E+00	3.03E-01	3.70E+00	1.37E-01	6.30E+00	2.33E-01	NS
Zr-95	7.00E-01	2.59E-02	7.70E+00	2.85E-01	-9.00E-01	-3.33E-02	6.30E+00	2.33E-01	NS
H-3	5.00E+01	1.85E+00	4.30E+02	1.59E+01	-3.00E+01	-1.11E+00	4.30E+02	1.59E+01	NS
Ra-224	**2.06E+02**	**7.62E+00**	1.70E+02	6.29E+00	-9.00E+00	-3.33E-01	1.10E+02	4.07E+00	NS
Ra-226	5.00E-02	1.85E-03	4.70E-01	1.74E-02	6.60E-02	2.44E-03	3.70E-01	1.37E-02	5 (0.18) [Ra-226+Ra-228][2]
Ra-228	1.30E+00	4.81E-02	3.70E+00	1.37E-01	-4.00E+01	1.48E-02	2.90E+00	1.07E-01	5 (0.18) -[Ra-226+Ra-228][2]
Th-228	1.61E-01	5.96E-03	1.70E-01	6.29E-03	1.80E-02	6.66E-04	1.30E-01	4.81E-03	NS
Th-230	1.60E-02	5.92E-04	1.60E-01	5.92E-03	-5.60E-02	-2.07E-03	1.30E-01	4.81E-03	NS
Th-232	2.60E-02	9.62E-04	5.20E-02	1.92E-03	2.80E-02	1.04E-03	4.30E-02	1.59E-03	NS
U-234	**1.54E+00**	**5.70E-02**	2.60E-02	9.62E-04	**1.54E+00**	**5.70E-02**	3.80E-02	1.41E-03	20 (0.74)
U-235	**3.60E-02**	**1.33E-03**	3.20E-02	1.18E-03	**3.80E-02**	**1.41E-03**	3.70E-02	1.37E-03	20 (0.74)
U-238	**6.44E-01**	**2.38E-02**	5.20E-02	1.92E-03	**5.33E-01**	**1.97E-02**	3.60E-02	1.33E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

Well Name	GW-5				Spud Well				
Sample Name Sample Date	GW-05-01 9/30/2008	GW-05-01 9/30/2008	MDC 9/30/2008	MDC 9/30/2008	SPUD WELL-01 9/30/2008	SPUD WELL-01 9/30/2008	MDC 9/30/2008	MDC 9/30/2008	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	4.20E-01	1.55E-02	3.10E+00	1.15E-01	-1.18E+00	-4.37E-02	3.80E+00	1.41E-01	15 (0.55)
Gross Beta	**4.22E+00**	**1.56E-01**	2.80E+00	1.04E-01	**4.64E+00**	**1.72E-01**	2.10E+00	7.77E-02	15 (0.55)
Ag-108m	-6.60E-01	-2.44E-02	3.30E+00	1.22E-01	-9.40E-01	-3.48E-02	3.70E+00	1.37E-01	NS
Ag-110m	4.00E-01	1.48E-02	5.70E+00	2.11E-01	1.40E+00	5.18E-02	5.80E+00	2.15E-01	NS
Ba-140	-6.10E+00	-2.26E-01	1.50E+01	5.55E-01	-2.50E+00	-9.25E-02	1.20E+01	4.44E-01	NS
Be-7	-9.70E+00	-3.59E-01	3.50E+01	1.29E+00	-4.00E+00	-1.48E-01	3.90E+01	1.44E+00	NS
Ce-141	2.30E+00	8.51E-02	6.60E+00	2.44E-01	1.50E+00	5.55E-02	6.90E+00	2.55E-01	NS
Ce-144	1.20E+01	4.44E-01	2.10E+01	7.77E-01	8.20E+00	3.03E-01	2.40E+01	8.88E-01	NS
Co-57	-7.40E-01	-2.74E-02	2.70E+00	9.99E-02	1.90E-01	7.03E-03	3.30E+00	1.22E-01	NS
Co-58	-5.00E-01	-1.85E-02	4.40E+00	1.63E-01	8.00E-01	2.96E-02	4.50E+00	1.66E-01	NS
Co-60	-4.00E-01	-1.48E-02	4.70E+00	1.74E-01	-1.00E+00	-3.70E-02	5.90E+00	2.18E-01	NS
Cr-51	1.10E+01	4.07E-01	4.00E+01	1.48E+00	-5.00E+00	-1.85E-01	4.30E+01	1.59E+00	NS
Cs-134	6.30E-01	2.33E-02	3.80E+00	1.41E-01	-1.70E-01	-6.29E-03	4.20E+00	1.55E-01	NS
Cs-137	-8.00E-01	-2.96E-02	3.90E+00	1.44E-01	2.00E-01	7.40E-03	4.10E+00	1.52E-01	NS
Fe-59	8.00E-01	2.96E-02	9.80E+00	3.63E-01	-1.00E+00	-3.70E-02	1.10E+01	4.07E-01	NS
I-131	3.60E+00	1.33E-01	1.20E+01	4.44E-01	-2.90E+00	-1.07E-01	1.40E+01	5.18E-01	NS
K-40	-1.30E+01	-4.81E-01	6.30E+01	2.33E+00	1.30E+01	4.81E-01	6.70E+01	2.48E+00	NS
La-140	-6.10E+00	-2.26E-01	1.50E+01	5.55E-01	-2.50E+00	-9.25E-02	1.20E+01	4.44E-01	NS
Mn-54	-2.00E-01	-7.40E-03	3.80E+00	1.41E-01	-4.00E-01	-1.48E-02	4.80E+00	1.78E-01	NS
Nb-95	1.30E+00	4.81E-02	4.30E+00	1.59E-01	6.00E-01	2.22E-02	5.20E+00	1.92E-01	NS
Ru-103	-2.90E+00	-1.07E-01	5.10E+00	1.89E-01	-1.60E+00	-5.92E-02	5.50E+00	2.03E-01	NS
Ru-106	-7.00E+00	-2.59E-01	4.00E+01	1.48E+00	0.00E+00	0.00E+00	3.40E+01	1.26E+00	NS
Sb-124	3.80E+00	1.41E-01	1.30E+01	4.81E-01	-8.00E-01	-2.96E-02	1.30E+01	4.81E-01	NS
Sb-125	-2.00E+00	-7.40E-02	1.10E+01	4.07E-01	1.10E+00	4.07E-02	1.10E+01	4.07E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-5				Spud Well				
Sample Name Sample Date	GW-05-01 9/30/2008	GW-05-01 9/30/2008	MDC 9/30/2008	MDC 9/30/2008	SPUD WELL-01 9/30/2008	SPUD WELL-01 9/30/2008	MDC 9/30/2008	MDC 9/30/2008	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Se-75	1.80E+00	6.66E-02	4.20E+00	1.55E-01	0.00E+00	0.00E+00	5.20E+00	1.92E-01	NS
Zn-65	-2.60E+00	-9.62E-02	9.20E+00	3.40E-01	-2.40E+00	-8.88E-02	1.10E+01	4.07E-01	NS
Zr-95	-1.00E-01	-3.70E-03	8.00E+00	2.96E-01	-5.00E-01	-1.85E-02	9.40E+00	3.48E-01	NS
H-3	-1.60E+02	-5.92E+00	4.30E+02	1.59E+01	-9.00E+01	-3.33E+00	4.30E+02	1.59E+01	NS
Ra-224	2.40E+01	8.88E-01	7.20E+01	2.66E+00	8.10E+01	3.00E+00	1.70E+02	6.29E+00	NS
Ra-226	-1.64E-01	-6.07E-03	4.50E-01	1.66E-02	-9.50E-02	-3.51E-03	4.60E-01	1.70E-02	5 (0.18) [Ra-226+Ra-228][2]
Ra-228	-3.30E-01	-1.22E-02	3.10E+00	1.15E-01	1.60E+00	5.92E-02	3.50E+00	1.29E-01	5 (0.18) - [Ra-226+Ra-228][2]
Th-228	-3.36E-02	-1.24E-03	9.00E-02	3.33E-03	-4.00E-03	-1.48E-04	1.20E-01	4.44E-03	NS
Th-230	-2.30E-02	-8.51E-04	1.30E-01	4.81E-03	8.00E-03	2.96E-04	1.50E-01	5.55E-03	NS
Th-232	9.90E-03	3.66E-04	2.70E-02	9.99E-04	3.20E-02	1.18E-03	6.00E-02	2.22E-03	NS
U-234	**1.85E+00**	**6.84E-02**	4.00E-02	1.48E-03	**1.39E+00**	**5.14E-02**	4.80E-02	1.78E-03	20 (0.74)
U-235	**6.40E-02**	**2.37E-03**	5.90E-02	2.18E-03	3.40E-02	1.26E-03	4.60E-02	1.70E-03	20 (0.74)
U-238	**1.05E+00**	**3.89E-02**	2.50E-02	9.25E-04	**6.98E-01**	**2.58E-02**	4.40E-02	1.63E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name	GW-01-01	GW-01-01	MDC	MDC	GW-04-01	GW-04-01	MDC	MDC	EPA MCL[1]
Sample Date	9/30/08	9/30/08	9/30/08	9/30/08	10/1/08	10/1/08	10/1/08	10/1/08	pCi/L (Bq/L)
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	
Radioactive Constituent									
Gross Alpha	-1.89E+00	-6.99E-02	3.30E+00	1.22E-01	**3.40E+00**	**1.26E-01**	3.30E+00	1.22E-01	15 (0.55)
Gross Beta	**3.22E+00**	**1.19E-01**	2.00E+00	7.40E-02	**7.80E+00**	**2.89E-01**	3.40E+00	1.26E-01	15 (0.55)
Ag-108m	1.17E+00	4.33E-02	3.00E+00	1.11E-01	2.00E-01	7.40E-03	3.10E+00	1.15E-01	NS
Ag-110m	-3.00E-01	-1.11E-02	4.80E+00	1.78E-01	-2.00E-01	-7.40E-03	5.30E+00	1.96E-01	NS
Ba-140	5.80E+00	2.15E-01	1.00E+01	3.70E-01	-5.00E-01	-1.85E-02	8.60E+00	3.18E-01	NS
Be-7	1.00E+00	3.70E-02	3.60E+01	1.33E+00	1.01E+01	3.74E-01	2.80E+01	1.04E+00	NS
Ce-141	-1.00E-01	-3.70E-03	6.10E+00	2.26E-01	-4.20E+00	-1.55E-01	8.10E+00	3.00E-01	NS
Ce-144	1.80E+00	6.66E-02	1.80E+01	6.66E-01	6.90E+00	2.55E-01	2.20E+01	8.14E-01	NS
Co-57	5.90E-01	2.18E-02	2.40E+00	8.88E-02	7.10E-01	2.63E-02	2.90E+00	1.07E-01	NS
Co-58	5.00E-01	1.85E-02	4.50E+00	1.66E-01	-1.00E+00	-3.70E-02	4.50E+00	1.66E-01	NS
Co-60	-6.00E-01	-2.22E-02	4.60E+00	1.70E-01	-1.40E+00	-5.18E-02	4.30E+00	1.59E-01	NS
Cr-51	2.00E+00	7.40E-02	3.70E+01	1.37E+00	4.00E+00	1.48E-01	4.00E+01	1.48E+00	NS
Cs-134	-8.10E-01	-3.00E-02	3.40E+00	1.26E-01	-1.03E+00	-3.81E-02	3.80E+00	1.41E-01	NS
Cs-137	1.70E+00	6.29E-02	3.60E+00	1.33E-01	9.00E-02	3.33E-03	3.60E+00	1.33E-01	NS
Fe-59	4.00E-01	1.48E-02	9.50E+00	3.51E-01	-3.90E+00	-1.44E-01	9.40E+00	3.48E-01	NS
I-131	5.90E+00	2.18E-01	1.30E+01	4.81E-01	-4.40E+00	-1.63E-01	1.40E+01	5.18E-01	NS
K-40	-1.10E+01	-4.07E-01	6.50E+01	2.40E+00	-1.60E+01	-5.92E-01	5.70E+01	2.11E+00	NS
La-140	5.80E+00	2.15E-01	1.00E+01	3.70E-01	-5.00E-01	-1.85E-02	8.60E+00	3.18E-01	NS
Mn-54	3.00E-01	1.11E-02	3.70E+00	1.37E-01	-1.00E+00	-3.70E-02	4.20E+00	1.55E-01	NS
Nb-95	9.00E-01	3.33E-02	4.90E+00	1.81E-01	-1.70E+00	-6.29E-02	5.30E+00	1.96E-01	NS
Ru-103	-6.00E-01	-2.22E-02	5.10E+00	1.89E-01	-1.80E+00	-6.66E-02	5.50E+00	2.03E-01	NS
Ru-106	6.10E+00	2.26E-01	3.00E+01	1.11E+00	-2.00E+00	-7.40E-02	3.60E+01	1.33E+00	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name / Sample Date	GW-01-01 9/30/08	GW-01-01 9/30/08	MDC 9/30/08	MDC 9/30/08	GW-04-01 10/1/08	GW-04-01 10/1/08	MDC 10/1/08	MDC 10/1/08	EPA MCL[1] pCi/L (Bq/L)
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	
Sb-124	-5.20E+00	-1.92E-01	1.50E+01	5.55E-01	-4.90E+00	-1.81E-01	1.30E+01	4.81E-01	NS
Sb-125	3.00E+00	1.11E-01	9.80E+00	3.63E-01	-2.10E+00	-7.77E-02	9.90E+00	3.66E-01	NS
Se-75	1.70E+00	6.29E-02	4.10E+00	1.52E-01	5.00E-01	1.85E-02	5.00E+00	1.85E-01	NS
Zn-65	-1.60E+00	-5.92E-02	8.30E+00	3.07E-01	1.10E+00	4.07E-02	7.80E+00	2.89E-01	NS
Zr-95	-1.90E+00	-7.03E-02	8.90E+00	3.29E-01	-2.20E+00	-8.14E-02	8.30E+00	3.07E-01	NS
H-3	-1.20E+02	-4.44E+00	4.30E+02	1.59E+01	-5.00E+01	-1.85E+00	4.30E+02	1.59E+01	NS
Ra-224	0.00E+00	0.00E+00	1.40E+02	5.18E+00	-3.00E+00	-1.11E-01	1.20E+02	4.44E+00	NS
Ra-226	-6.60E-02	-2.44E-03	4.30E-01	1.59E-02	1.30E-01	4.81E-03	5.30E-01	1.96E-02	5 (0.18) [Ra-226+Ra-228][2]
Ra-228	-1.10E-01	-4.07E-02	2.70E+00	9.99E-02	1.80E+00	6.66E-02	3.00E+00	1.11E-01	5 (0.18) - [Ra-226+Ra-228][2]
Th-228	1.00E-03	3.70E-05	8.40E-02	3.11E-03	1.40E-02	5.18E-04	7.60E-02	2.81E-03	NS
Th-230	0.00E+00	0.00E+00	1.30E-01	4.81E-03	3.30E-02	1.22E-03	1.30E-01	4.81E-03	NS
Th-232	1.70E-02	6.29E-04	4.50E-02	1.66E-03	-1.78E-02	-6.59E-04	7.00E-02	2.59E-03	NS
U-234	**1.84E+00**	**6.81E-02**	5.50E-02	2.03E-03	**1.53E+00**	**5.66E-02**	8.00E-02	2.96E-03	20 (0.74)
U-235	**1.08E-01**	**4.00E-03**	5.50E-02	2.03E-03	8.30E-02	3.07E-03	8.30E-02	3.07E-03	20 (0.74)
U-238	**7.56E-01**	**2.80E-02**	4.20E-02	1.55E-03	**6.09E-01**	**2.25E-02**	7.30E-02	2.70E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name Analyte	GW-02-01 (pCi/L)	GW-02-01 (Bq/L)	MDC (pCi/L)	MDC (Bq/L)	EPA MCL[1] pCi/L (Bq/L)
Sample Date	10/1/2008	10/1/2008	10/1/2008	10/1/2008	
Radioactive Constituent					
Gross Alpha	1.70E+00	6.29E-02	3.40E+00	1.26E-01	15 (0.55)
Gross Beta	2.44E+00	9.03E-02	3.00E+00	1.11E-01	15 (0.55)
Ag-108m	0.00E+00	0.00E+00	3.20E+00	1.18E-01	NS
Ag-110m	-4.00E-01	-1.48E-02	5.40E+00	2.00E-01	NS
Ba-140	-1.10E+00	-4.07E-02	1.20E+01	4.44E-01	NS
Be-7	-9.10E+00	-3.37E-01	3.70E+01	1.37E+00	NS
Ce-141	-1.10E+00	-4.07E-02	8.50E+00	3.14E-01	NS
Ce-144	1.80E+00	6.66E-02	2.60E+01	9.62E-01	NS
Co-57	-1.90E-01	-7.03E-03	3.40E+00	1.26E-01	NS
Co-58	5.00E-01	1.85E-02	4.00E+00	1.48E-01	NS
Co-60	1.90E+00	7.03E-02	3.90E+00	1.44E-01	NS
Cr-51	-1.30E+01	-4.81E-01	4.70E+01	1.74E+00	NS
Cs-134	4.00E-01	1.48E-02	4.00E+00	1.48E-01	NS
Cs-137	1.10E+00	4.07E-02	3.70E+00	1.37E-01	NS
Fe-59	-5.00E-01	-1.85E-02	9.60E+00	3.55E-01	NS
I-131	8.00E-01	2.96E-02	1.30E+01	4.81E-01	NS
K-40	-1.20E+01	-4.44E-01	6.00E+01	2.22E+00	NS
La-140	-1.10E+00	-4.07E-02	1.20E+01	4.44E-01	NS
Mn-54	1.02E+00	3.77E-02	3.30E+00	1.22E-01	NS
Nb-95	-1.00E-01	-3.70E-03	5.00E+00	1.85E-01	NS
Ru-103	7.00E-01	2.59E-02	5.00E+00	1.85E-01	NS
Ru-106	-1.80E+01	-6.66E-01	4.30E+01	1.59E+00	NS
Sb-124	-3.30E+00	-1.22E-01	1.00E+01	3.70E-01	NS
Sb-125	2.80E+00	1.04E-01	1.00E+01	3.70E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name Analyte	GW-02-01 (pCi/L)	GW-02-01 (Bq/L)	MDC (pCi/L)	MDC (Bq/L)	EPA MCL[1] pCi/L (Bq/L)
Sample Date	10/1/2008	10/1/2008	10/1/2008	10/1/2008	
Se-75	-2.00E+00	-7.40E-02	5.70E+00	2.11E-01	NS
Zn-65	3.40E+00	1.26E-01	1.60E+01	5.92E-01	NS
Zr-95	1.40E+00	5.18E-02	6.80E+00	2.52E-01	NS
H-3	-1.40E+02	-5.18E+00	4.30E+02	1.59E+01	NS
Ra-224	-9.80E-01	-3.63E-02	5.20E+01	1.92E+00	NS
Ra-226	5.00E-02	1.85E-03	2.40E-01	8.88E-03	5 (0.18) -[Ra-226+Ra-228][2]
Ra-228	1.30E+00	4.81E-02	2.40E+00	8.88E-02	5 (0.18) -[Ra-226+Ra-228][2]
Th-228	-1.55E-02	-5.73E-04	6.30E-02	2.33E-03	NS
Th-230	-3.30E-02	-1.22E-03	1.20E-01	4.44E-03	NS
Th-232	-8.60E-04	-3.18E-05	3.30E-02	1.22E-03	NS
U-234	**1.42E+00**	**5.25E-02**	4.10E-02	1.52E-03	20 (0.74)
U-235	**1.17E-01**	**4.33E-03**	5.00E-02	1.85E-03	20 (0.74)
U-238	**6.44E-01**	**2.38E-02**	4.80E-02	1.78E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater
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Well Name	Lava Well 3				Spud Well				
Sample Date	1/6/2009	1/6/2009	1/6/2009	1/6/2009	1/5/2009	1/5/2009	1/5/2009	1/5/2009	
Sample Name	LAVA WELL 03-01	LAVA WELL 03-01	MDC	MDC	SPUD WELL 01-01	SPUD WELL 01-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	6.20E-01	2.29E-02	3.30E+00	1.22E-01	1.44E+00	5.33E-02	3.10E+00	1.15E-01	15 (0.55)
Gross Beta	**4.40E+00**	**1.63E-01**	3.30E+00	1.22E-01	**6.00E+00**	**2.22E-01**	2.90E+00	1.07E-01	15 (0.55)
Ag-108m	1.72E+00	6.36E-02	2.10E+00	7.77E-02	-2.50E-01	-9.25E-03	3.00E+00	1.11E-01	NS
Ag-110m	2.20E+00	8.14E-02	3.40E+00	1.26E-01	-1.90E+00	-7.03E-02	5.50E+00	2.03E-01	NS
Ba-140	-7.00E-01	-2.59E-02	8.60E+00	3.18E-01	-4.70E+00	-1.74E-01	1.30E+01	4.81E-01	NS
Be-7	-3.70E+00	-1.37E-01	3.10E+01	1.15E+00	6.70E+00	2.48E-01	3.30E+01	1.22E+00	NS
Ce-141	5.00E-01	1.85E-02	5.70E+00	2.11E-01	1.40E+00	5.18 E-02	6.50E+00	2.40E-01	NS
Ce-144	2.10E+00	7.77 E-02	2.00E+01	7.40E-01	4.40E+00	1.63E-01	2.00E+01	7.40E-01	NS
Co-57	-5.00E-01	-1.85E-02	2.50E+00	9.25E-02	-5.70E-01	-2.11E-02	2.70E+00	9.99E-02	NS
Co-58	9.00E-01	3.33E-02	2.70E+00	9.99E-02	-2.20E-01	-8.14E-03	3.70E+00	1.37E-01	NS
Co-60	-6.00E-01	-2.22E-02	3.10E+00	1.15E-01	-2.00E-01	-7.40E-03	4.30E+00	1.59E-01	NS
Cr-51	-7.00E-01	-2.59E-02	3.20E+01	1.18E+00	3.00E+00	1.11E-01	4.20E+01	1.55E+00	NS
Cs-134	-5.00E-02	-1.85E-03	2.60E+00	9.62E-02	1.40E-01	5.18E-03	3.30E+00	1.22E-01	NS
Cs-137	-5.20E-01	-1.92E-02	2.80E+00	1.04E-01	1.08E+00	4.00E-02	3.10E+00	1.15E-01	NS
Fe-59	1.40E+00	5.18E-02	6.10E+00	2.26E-01	-2.60E+00	-9.62E-02	1.00E+01	3.70E-01	NS
I-131	-7.60E+00	-2.81E-01	1.20E+01	4.44E-01	-7.00E-01	-2.59E-02	1.40E+01	5.18 E-01	NS
K-40	-9.00E+00	-3.33E-01	4.30E+01	1.59E+00	1.10E+01	4.07 E-01	4.30E+01	1.59E+00	NS
La-140	-7.00E-01	-2.59E-02	8.60E+00	3.18E-01	-4.70E+00	-1.74E-01	1.30E+01	4.81E-01	NS
Mn-54	-2.70E-01	-9.99E-03	2.80E+00	1.04E-01	-2.80E-01	-1.04E-02	3.00E+00	1.11E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	Lava Well 3				Spud Well				
Sample Date	1/6/2009	1/6/2009	1/6/2009	1/6/2009	1/5/2009	1/5/2009	1/5/2009	1/5/2009	
Sample Name	LAVA WELL 03-01	LAVA WELL 03-01	MDC	MDC	SPUD WELL 01-01	SPUD WELL 01-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Nb-95	-2.30E+00	-8.51E-02	4.30E+00	1.59E-01	1.40E+00	5.18E-02	4.10E+00	1.52E-01	NS
Ru-103	-7.00E-01	-2.59E-02	3.90E+00	1.44E-01	-1.40E+00	-5.18E-02	4.40E+00	1.63E-01	NS
Ru-106	-7.00E-01	-2.59E-02	2.80E+01	1.04E+00	3.60E+00	1.33E-01	3.40E+01	1.26E+00	NS
Sb-124	-7.00E-01	-2.59E-02	8.90E+00	3.29E-01	1.70E+00	6.29E-02	1.10E+01	4.07E-01	NS
Sb-125	1.90E+00	7.03E-02	7.20E+00	2.66E-01	3.00E+00	1.11E-01	8.20E+00	3.03E-01	NS
Se-75	1.30E+00	4.81E-02	3.80E+00	1.41E-01	-2.00E-01	-7.40E-03	4.10E+00	1.52E-01	NS
Zn-65	-1.10E+00	-4.07E-02	6.40E+00	2.37E-01	-2.30E+00	-8.51E-02	8.60E+00	3.18E-01	NS
Zr-95	-1.40E+00	-5.18E-02	5.80E+00	2.15E-01	-6.00E-01	-2.22E-02	6.40E+00	2.37E-01	NS
H-3	1.50E+02	5.55E+00	4.30E+02	1.59E+01	9.00E+01	3.33E+00	4.30E+02	1.59E+01	NS
Ra-224	**1.36E+00**	**5.03E-02**	5.60E-01	2.07E-02	**4.20E-01**	**1.55E-02**	3.80E-01	1.41E-02	NS
Ra-226	2.60E-02	9.62E-04	2.40E-01	8.88E-03	5.90E-02	2.18E-03	2.70E-01	9.99E-03	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	-1.39E+00	-5.15E-02	3.00E+00	1.11E-01	4.60E-01	1.70E-02	2.70E+00	9.99E-02	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	**3.88E-01**	**1.44E-02**	5.50E-02	2.03E-03	1.00E-03	3.70E-05	1.50E-01	5.55E-03	NS
Th-230	-5.00E-02	-1.85E-03	1.90E-01	7.03E-03	1.27E-01	4.70E-03	1.80E-01	6.66E-03	NS
Th-232	**3.00E-02**	**1.11E-03**	2.70E-02	9.99E-04	**6.00E-02**	**2.22E-03**	4.90E-02	1.81E-03	NS
U-234	**1.31E+00**	**4.85E-02**	4.90E-02	1.81E-03	**1.35E+00**	**4.99E-02**	4.30E-02	1.59E-03	20 (0.74)
U-235	**7.00E-02**	**2.59E-03**	3.20E-02	1.18E-03	6.30E-02	2.33E-03	6.80E-02	2.52E-03	20 (0.74)
U-238	**5.66E-01**	**2.09E-02**	4.20E-02	1.55E-03	**7.02E-01**	**2.60E-02**	6.00E-02	2.22E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				GW-5				
Sample Name	GW-03-01	GW-03-01	MDC	MDC	GW-05-01	GW-05-01	MDC	MDC	EPA MCL[1]
Sample Date	1/7/2009	1/7/2009	1/7/2009	1/7/2009	1/8/2009	1/8/2009	1/8/2009	1/8/2009	
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	1.70E+00	6.29E-02	3.20E+00	1.18E-01	5.10E-01	1.89E-02	3.20E+00	1.18E-01	15 (0.55)
Gross Beta	**4.00E+00**	**1.48E-01**	3.10E+00	1.15E-01	**4.20E+00**	**1.55E-01**	3.10E+00	1.15E-01	15 (0.55)
Ag-108m	1.82E+00	6.73E-02	3.10E+00	1.15E-01	2.30E-01	8.51E-03	2.80E+00	1.04E-01	NS
Ag-110m	1.20E+00	4.44E-02	4.70E+00	1.74E-01	0.00E+00	0.00E+00	4.90E+00	1.81E-01	NS
Ba-140	0.00E+00	0.0E+00	1.10E+01	4.07E-01	6.10E+00	2.26E-01	8.00E+00	2.96E-01	NS
Be-7	3.30E+00	1.22E-01	3.10E+01	1.15E+00	8.00E+00	2.96E-01	2.90E+01	1.07E+00	NS
Ce-141	2.80E+00	1.04E-01	6.80E+00	2.52E-01	6.00E-01	2.22E-02	6.10E+00	2.26E-01	NS
Ce-144	4.70E+00	1.74E-01	2.30E+01	8.51E-01	4.70E+00	1.74E-01	2.00E+01	7.40E-01	NS
Co-57	7.30E-01	2.70E-02	3.20E+00	1.18E-01	3.70E-01	1.37E-02	2.50E+00	9.25E-02	NS
Co-58	-9.00E-01	-3.33E-02	4.30E+00	1.59E-01	-8.80E-01	-3.26E-02	3.80E+00	1.41E-01	NS
Co-60	-8.00E-01	-2.96E-02	4.30E+00	1.59E-01	-8.50E-01	-3.14E-02	3.90E+00	1.44E-01	NS
Cr-51	2.30E+01	8.51E-01	3.60E+01	1.33E+00	8.00E+00	2.96E-01	3.60E+01	1.33E+00	NS
Cs-134	-4.30E-01	-1.59E-02	3.70E+00	1.37E-01	-6.00E-01	-2.22E-02	3.90E+00	1.44E-01	NS
Cs-137	1.40E-01	5.18E-03	3.50E+00	1.29E-01	-1.00E-01	-3.70E-03	3.50E+00	1.29E-01	NS
Fe-59	0.00E+00	0.0E+00	8.00E+00	2.96E-01	-1.30E+00	-4.81E-02	8.70E+00	3.22E-01	NS
I-131	-2.50E+00	-9.25E-02	1.40E+01	5.18E-01	-3.00E+00	-1.11E-01	1.40E+01	5.18E-01	NS
K-40	8.00E+00	2.96E-01	4.20E+01	1.55E+00	**4.80E+01**	**1.78E+00**	4.70E+01	1.74E+00	NS
La-140	0.00E+00	0.0E+00	1.10E+01	4.07E-01	6.10E+00	2.26E-01	8.00E+00	2.96E-01	NS
Mn-54	-9.90E-01	-3.66E-02	3.60E+00	1.33E-01	-6.40E-01	-2.37E-02	3.20E+00	1.18E-01	NS
Nb-95	-1.50E+00	-5.55E-02	4.70E+00	1.74E-01	-9.00E-01	-3.33E-02	4.80E+00	1.78E-01	NS
Ru-103	-1.00E+00	-3.70E-02	4.80E+00	1.78E-01	-2.80E+00	-1.04E-01	4.70E+00	1.74E-01	NS
Ru-106	-9.30E+00	-3.44E-01	3.70E+01	1.37E+00	-3.70E+00	-1.37E-01	3.00E+01	1.11E+00	NS
Sb-124	-2.20E+00	-8.14E-02	1.10E+01	4.07E-01	-5.00E-01	-1.85E-02	9.00E+00	3.33E-01	NS
Sb-125	1.40E+00	5.18E-02	9.60E+00	3.55E-01	-1.20E+00	-4.44E-02	9.20E+00	3.40E-01	NS
Se-75	1.70E+00	6.29E-02	4.50E+00	1.66E-01	-2.40E+00	-8.88E-02	4.30E+00	1.59E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				GW-5				
Sample Name	GW-03-01	GW-03-01	MDC	MDC	GW-05-01	GW-05-01	MDC	MDC	EPA MCL[1]
Sample Date	1/7/2009	1/7/2009	1/7/2009	1/7/2009	1/8/2009	1/8/2009	1/8/2009	1/8/2009	
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Zn-65	3.40E+00	1.26E-01	7.50E+00	2.77E-01	1.00E+00	3.70E-02	1.50E+01	5.55E-01	NS
Zr-95	-3.60E+00	-1.33E-01	7.40E+00	2.74E-01	4.60E+00	1.70E-01	5.10E+00	1.89E-01	NS
H-3	-5.00E+01	-1.85E+00	4.30E+02	1.59E+01	1.60E+02	5.92E+00	4.40E+02	1.63E+01	NS
Ra-224	2.80E-01	1.04E-02	3.80E-01	1.41E-02	**2.10E+00**	**7.77E-02**	7.10E-01	2.63E-02	NS
Ra-226	7.40E-02	2.74E-03	2.70E-01	9.99E-03	1.80E-02	6.66E-04	2.40E-01	8.88E-03	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	1.25E+00	4.62E-02	2.50E+00	9.25E-02	-3.00E-01	-1.11E-02	2.70E+00	9.99E-02	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	1.30E-02	4.81E-04	1.20E-01	4.44E-03	**5.36E-01**	**1.98E-02**	1.60E-01	5.92E-03	NS
Th-230	2.30E-02	8.51E-04	1.80E-01	6.66E-03	7.10E-02	2.63E-03	2.30E-01	8.51E-03	NS
Th-232	1.60E-02	5.92E-04	4.10E-02	1.52E-03	**7.60E-02**	**2.81E-03**	2.90E-02	1.07E-03	NS
U-234	**1.54E+00**	**5.70E-02**	9.40E-02	3.48E-03	**1.30E+00**	**4.81E-02**	4.30E-02	1.59E-03	20 (0.74)
U-235	3.30E-02	1.22E-03	6.60E-02	2.44E-03	**5.90E-02**	**2.18E-03**	4.60E-02	1.70E-03	20 (0.74)
U-238	**5.18E-01**	**1.92E-02**	4.60E-02	1.70E-03	**6.15E-01**	**2.28E-02**	4.30E-02	1.59E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name	GW-01-01	GW-01-01	MDC	MDC	GW-04-01	GW-04-01	MDC	MDC	EPA MCL[1]
Sample Date	1/6/2009	1/6/2009	1/6/2009	1/6/2009	1/6/2009	1/6/2009	1/6/2009	1/6/2009	
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	-1.13E+00	-4.18E-02	3.20E+00	1.18E-01	1.84E+00	6.81E-02	2.60E+00	9.62E-02	15 (0.55)
Gross Beta	3.00E+00	1.11E-01	3.30E+00	1.22E-01	**5.40E+00**	**2.00E-01**	3.20E+00	1.18E-01	15 (0.55)
Ag-108m	2.60E-01	9.62E-03	3.00E+00	1.11E-01	-9.00E-02	-3.33E-03	2.80E+00	1.04E-01	NS
Ag-110m	1.80E+00	6.66E-02	4.90E+00	1.81E-01	3.00E-01	1.11E-02	4.70E+00	1.74E-01	NS
Ba-140	-3.50E+00	-1.29E-01	1.40E+01	5.18E-01	2.90E+00	1.07E-01	1.10E+01	4.07E-01	NS
Be-7	1.09E+01	4.03E-01	3.20E+01	1.18E+00	-4.60E+00	-1.70E-01	3.10E+01	1.15E+00	NS
Ce-141	-3.40E+00	-1.26E-01	7.00E+00	2.59E-01	1.80E+00	6.66E-02	5.00E+00	1.85E-01	NS
Ce-144	1.48E+01	5.48E-01	2.00E+01	7.40E-01	-3.50E+00	-1.29E-01	1.60E+01	5.92E-01	NS
Co-57	3.80E-01	1.41E-02	2.50E+00	9.25E-02	-1.70E-01	-6.29E-03	2.00E+00	7.40E-02	NS
Co-58	-1.06E+00	-3.92E-02	3.90E+00	1.44E-01	2.00E-01	7.40E-03	4.10E+00	1.52E-01	NS
Co-60	-2.00E-01	-7.40E-03	4.80E+00	1.78E-01	8.00E-01	2.96E-02	4.00E+00	1.48E-01	NS
Cr-51	6.00E+00	2.22E-01	3.60E+01	1.33E+00	-3.50E+00	-1.29E-01	3.20E+01	1.18E+00	NS
Cs-134	6.10E-01	2.26E-02	3.20E+00	1.18E-01	1.25E+00	4.62E-02	3.30E+00	1.22E-01	NS
Cs-137	1.00E-01	3.70E-03	3.80E+00	1.41E-01	-4.00E-01	-1.48E-02	3.70E+00	1.37E-01	NS
Fe-59	2.80E+00	1.04E-01	7.90E+00	2.92E-01	2.80E+00	1.04E-01	9.10E+00	3.37E-01	NS
I-131	2.90E+00	1.07E-01	1.30E+01	4.81E-01	-4.00E+00	-1.48E-01	1.30E+01	4.81E-01	NS
K-40	2.00E+00	7.40E-02	5.60E+01	2.07E+00	1.10E+01	4.07E-01	6.40E+01	2.37E+00	NS
La-140	-3.50E+00	-1.29E-01	1.40E+01	5.18E-01	2.90E+00	1.07E-01	1.10E+01	4.07E-01	NS
Mn-54	-6.80E-01	-2.52E-02	3.80E+00	1.41E-01	2.00E-01	7.40E-03	3.50E+00	1.29E-01	NS
Nb-95	-9.00E-01	-3.33E-02	5.20E+00	1.92E-01	1.60E+00	5.92E-02	4.20E+00	1.55E-01	NS
Ru-103	0.00E+00	0.00E+00	4.20E+00	1.55E-01	-1.90E+00	-7.03E-02	4.30E+00	1.59E-01	NS
Ru-106	1.50E+01	5.55E-01	3.30E+01	1.22E+00	1.10E+01	4.07E-01	3.20E+01	1.18E+00	NS
Sb-124	-1.20E+00	-4.44E-02	1.10E+01	4.07E-01	-6.00E-01	-2.22E-02	1.10E+01	4.07E-01	NS
Sb-125	-3.00E-01	-1.11E-02	9.00E+00	3.33E-01	-4.80E+00	-1.78E-01	8.50E+00	3.14E-01	NS
Se-75	4.00E-01	1.48E-02	4.10E+00	1.52E-01	1.20E+00	4.44E-02	3.60E+00	1.33E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name	**GW-01-01**	**GW-01-01**	**MDC**	**MDC**	**GW-04-01**	**GW-04-01**	**MDC**	**MDC**	**EPA MCL[1]**
Sample Date	**1/6/2009**	**1/6/2009**	**1/6/2009**	**1/6/2009**	**1/6/2009**	**1/6/2009**	**1/6/2009**	**1/6/2009**	
Analyte	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**pCi/L (Bq/L)**
Zn-65	-4.50E+00	-1.66E-01	9.60E+00	3.55E-01	-7.10E+00	-2.63E-01	1.20E+01	4.44E-01	NS
Zr-95	-1.20E+00	-4.44E-02	6.40E+00	2.37E-01	1.00E-01	3.70E-03	6.40E+00	2.37E-01	NS
H-3	-6.00E+01	-2.22E+00	4.30E+02	1.59E+01	3.10E+02	1.15E+01	4.30E+02	1.59E+01	NS
Ra-224	**6.30E-01**	**2.33E-02**	3.40E-01	1.26E-02	2.70E-01	9.99E-03	3.70E-01	1.37E-02	NS
Ra-226	-3.90E-02	-1.44E-03	2.60E-01	9.62E-03	3.90E-02	1.44E-03	1.90E-01 [3]	7.03E-03 [3]	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	1.30E-01	4.81E-03	2.60E+00	9.62E-02	-4.60E+00	-1.70E-01	9.30E+00 [3]	3.44E-01 [3]	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	2.40E-02	8.88E-04	1.20E-01	4.44E-03	-1.26E-01	-4.66E-03	2.50E-01	9.25E-03	NS
Th-230	3.00E-03	1.11E-04	1.80E-01	6.66E-03	1.86E-01	6.88E-03	2.20E-01	8.14E-03	NS
Th-232	6.60E-03	2.44E-04	4.10E-02	1.52E-03	**0.00E+00**	**0.00E+00**	8.00E-02	2.96E-03	NS
U-234	**9.66E-01**	**3.57E-02**	6.70E-02	2.48E-03	**1.31E+00**	**4.85E-02**	9.10E-02	3.37E-03	20 (0.74)
U-235	**1.08E-01**	**4.00E-03**	6.00E-02	2.22E-03	**1.24E-01**	**4.59E-03**	8.50E-02	3.14E-03	20 (0.74)
U-238	**3.93E-01**	**1.45E-02**	5.20E-02	1.92E-03	**6.23E-01**	**2.30E-02**	6.90E-02	2.55E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name / **Analyte**	**GW-02-01** (pCi/L)	**GW-02-01** (Bq/L)	**MDC** (pCi/L)	**MDC** (Bq/L)	**EPA MCL[1]** pCi/L (Bq/L)
Sample Date	**1/8/2009**	**1/8/2009**	**1/8/2009**	**1/8/2009**	
Radioactive Constituent					
Gross Alpha	1.19E+00	4.40E-02	3.20E+00	1.18E-01	15 (0.55)
Gross Beta	**4.30E+00**	**1.59E-01**	3.30E+00	1.22E-01	15 (0.55)
Ag-108m	-3.00E-01	-1.11E-02	3.60E+00	1.33E-01	NS
Ag-110m	-2.70E+00	-9.99E-02	6.50E+00	2.40E-01	NS
Ba-140	-3.40E+00	-1.26E-01	1.30E+01	4.81E-01	NS
Be-7	-7.00E+00	-2.59E-01	3.80E+01	1.41E+00	NS
Ce-141	-2.00E-01	-7.40E-03	7.10E+00	2.63E-01	NS
Ce-144	5.60E+00	2.07E-01	2.30E+01	8.51E-01	NS
Co-57	-2.08E+00	-7.70E-02	3.10E+00	1.15E-01	NS
Co-58	2.00E-01	7.40E-03	4.40E+00	1.63E-01	NS
Co-60	-2.70E+00	-9.99E-02	4.90E+00	1.81E-01	NS
Cr-51	1.00E+00	3.70E-02	3.90E+01	1.44E+00	NS
Cs-134	-1.93E+00	-7.14E-02	4.90E+00	1.81E-01	NS
Cs-137	-3.00E-01	-1.11E-02	4.10E+00	1.52E-01	NS
Fe-59	-2.10E+00	-7.77E-02	1.20E+01	4.44E-01	NS
I-131	3.80E+00	1.41E-01	1.40E+01	5.18E-01	NS
K-40	-4.00E+00	-1.48E-01	5.50E+01	2.03E+00	NS
La-140	-3.40E+00	-1.26E-01	1.30E+01	4.81E-01	NS
Mn-54	2.00E-01	7.40E-03	3.80E+00	1.41E-01	NS
Nb-95	2.00E-01	7.40E-03	5.40E+00	2.00E-01	NS
Ru-103	-1.20E+00	-4.44E-02	5.00E+00	1.85E-01	NS
Ru-106	-1.00E+01	-3.70E-01	4.30E+01	1.59E+00	NS
Sb-124	-1.60E+00	-5.92E-02	1.50E+01	5.55E-01	NS
Sb-125	-1.20E+00	-4.44E-02	1.10E+01	4.07E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name / **Analyte**	**GW-02-01** (pCi/L)	**GW-02-01** (Bq/L)	**MDC** (pCi/L)	**MDC** (Bq/L)	**EPA MCL[1]** pCi/L (Bq/L)
Sample Date	**1/8/2009**	**1/8/2009**	**1/8/2009**	**1/8/2009**	
Se-75	3.00E-01	1.11E-02	4.80E+00	1.78E-01	NS
Zn-65	-6.80E+00	-2.52E-01	1.30E+01	4.81E-01	NS
Zr-95	2.20E+00	8.14E-02	7.50E+00	2.77E-01	NS
H-3	6.00E+01	2.22E+00	4.30E+02	1.59E+01	NS
Ra-224	**1.11E+00**	**4.11E-02**	3.70E-01	1.37E-02	NS
Ra-226	5.10E-02	1.89E-03	2.30E-01	8.51E-03	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	-2.10E+00	-7.77E-02	4.70E+00	1.74E-01	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	6.10E-02	2.26E-03	1.10E-01	4.07E-03	NS
Th-230	1.45E-01	5.36E-03	1.90E-01	7.03E-03	NS
Th-232	-3.00E-03	-1.11E-04	7.30E-02	2.70E-03	NS
U-234	**1.26E+00**	**4.66E-02**	7.80E-02	2.89E-03	20 (0.74)
U-235	3.10E-02	1.15E-03	8.50E-02	3.14E-03	20 (0.74)
U-238	**5.59E-01**	**2.07E-02**	6.40E-02	2.37E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				Lava Well				
Sample Date	4/08/2009	4/08/2009	4/08/2009	4/08/2009	4/07/2009	4/07/2009	4/07/2009	4/07/2009	
Sample Name	GW-03-01	GW-03-01	MDC	MDC	LAVA WELL 03-01	LAVA WELL 03-01	MDC	MDC	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	-1.08E+00	-4.00E-02	3.40E+00	1.26E-01	8.60E-01	3.18E-02	3.00E+00	1.11E-01	15 (0.55)
Gross Beta	2.80E+00	1.04E-01	3.10E+00	1.15E-01	**4.30E+00**	**1.59E-01**	3.10E+00	1.15E-01	15 (0.55)
Ag-108m	-1.16E+00	-4.29E-02	3.00E+00	1.11E-01	1.55E+00	5.73E-02	3.10E+00	1.15E-01	NS
Ag-110m	1.90E+00	7.03E-02	4.60E+00	1.70E-01	1.10E+00	4.07E-02	6.70E+00	2.48E-01	NS
Ba-140	0.00E+00	0.00E+00	1.00E+01	3.70E-01	2.40E+00	8.88E-02	1.10E+01	4.07E-01	NS
Be-7	-7.70E+00	-2.85E-01	3.20E+01	1.18E+00	-1.70E+01	-6.29E-01	4.00E+01	1.48E+00	NS
Ce-141	4.00E-01	1.48E-02	5.90E+00	2.18E-01	2.00E-01	7.40E-03	7.90E+00	2.92E-01	NS
Ce-144	-7.70E+00	-2.85E-01	2.10E+01	7.77E-01	5.90E+00	2.18E-01	2.70E+01	9.99E-01	NS
Co-57	4.40E-01	1.63E-02	2.60E+00	9.62E-02	9.00E-01	3.33E-02	3.40E+00	1.26E-01	NS
Co-58	-5.00E-01	-1.85E-02	3.90E+00	1.44E-01	-6.00E-01	-2.22E-02	4.90E+00	1.81E-01	NS
Co-60	-1.40E+00	-5.18E-02	4.80E+00	1.78E-01	-5.00E-01	-1.85E-02	4.30E+00	1.59E-01	NS
Cr-51	0.00E+00	0.00E+00	4.00E+01	1.48E+00	4.00E+00	1.48E-01	4.20E+01	1.55E+00	NS
Cs-134	2.60E+00	9.62E-02	3.40E+00	1.26E-01	-5.20E-01	-1.92E-02	4.90E+00	1.81E-01	NS
Cs-137	-2.00E+00	-7.40E-02	4.30E+00	1.59E-01	-5.00E-01	-1.85E-02	4.30E+00	1.59E-01	NS
Fe-59	1.90E+00	7.03E-02	8.20E+00	3.03E-01	5.00E-01	1.85E-02	1.00E+01	3.70E-01	NS
I-131	9.00E-01	3.33E-02	1.00E+01	3.70E-01	2.30E+00	8.51E-02	1.30E+01	4.81E-01	NS
K-40	-1.00E+01	-3.70E-01	4.90E+01	1.81E+00	2.00E+00	7.40E-02	5.60E+01	2.07E+00	NS
La-140	0.00E+00	0.00E+00	1.00E+01	3.70E-01	2.40E+00	8.88E-02	1.10E+01	4.07E-01	NS
Mn-54	2.00E-01	7.40E-03	3.10E+00	1.15E-01	-2.00E-01	-7.40E-03	4.20E+00	1.55E-01	NS
Nb-95	0.00E+00	0.00E+00	3.90E+00	1.44E-01	1.70E+00	6.29E-02	5.40E+00	2.00E-01	NS
Ru-103	-2.50E+00	-9.25E-02	4.80E+00	1.78E-01	-1.40E+00	-5.18E-02	5.40E+00	2.00E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-3				Lava Well				
Sample Date	**4/08/2009**	**4/08/2009**	**4/08/2009**	**4/08/2009**	**4/07/2009**	**4/07/2009**	**4/07/2009**	**4/07/2009**	
Sample Name	**GW-03-01**	**GW-03-01**	**MDC**	**MDC**	**LAVA WELL 03-01**	**LAVA WELL 03-01**	**MDC**	**MDC**	**EPA MCL[1]**
Analyte	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**pCi/L (Bq/L)**
Ru-106	-2.70E+00	-9.99E-02	3.50E+01	1.29E+00	-1.00E+01	-3.70E-01	4.30E+01	1.59E+00	NS
Sb-124	-5.50E+00	-2.03E-01	1.30E+01	4.81E-01	1.30E+00	4.81E-02	1.10E+01	4.07E-01	NS
Sb-125	3.10E+00	1.15E-01	8.80E+00	3.26E-01	-5.10E+00	-1.89E-01	1.20E+01	4.44E-01	NS
Se-75	4.00E-01	1.48E-02	3.90E+00	1.44E-01	-1.60E+00	-5.92E-02	5.60E+00	2.07E-01	NS
Zn-65	4.10E+00	1.52E-01	1.40E+01	5.18E-01	-4.30E+00	-1.59E-01	1.00E+01	3.70E-01	NS
Zr-95	-1.00E-01	-3.70E-03	6.50E+00	2.40E-01	1.00E+00	3.70E-02	7.10E+00	2.63E-01	NS
H-3	2.00E+01	7.40E-01	4.30E+02	1.59E+01	4.00E+01	1.48E+00	4.30E+02	1.59E+01	NS
Ra-224	0.00E+00	0.00E+00	4.30E+01	1.59E+00	2.90E-01	1.07E-02	4.10E-01	1.52E-02	NS
Ra-226	1.30E-01	4.81E-03	2.80E-01	1.04E-02	1.09E-01	4.03E-03	2.60E-01	9.62E-03	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	3.50E-01	1.29E-02	2.90E+00	1.07E-01	-1.60E+00	-5.92E-02	4.60E+00	1.70E-01	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	1.30E-01	4.81E-03	2.30E-01	8.51E-03	5.80E-02	2.15E-03	2.50E-01	9.25E-03	NS
Th-230	**9.10E-01**	**3.37E-02**	2.40E-01	8.88E-03	**3.77E-01**	**1.39E-02**	2.70E-01	9.99E-03	NS
Th-232	**3.01E-01**	**1.11E-02**	5.90E-02	2.18E-03	**1.88E-01**	**6.96E-03**	7.00E-02	2.59E-03	NS
U-234	**1.27E+00**	**4.70E-02**	1.60E-01	5.92E-03	**1.62E+00**	**5.99E-02**	1.30E-01	4.81E-03	20 (0.74)
U-235	3.50E-02	1.29E-03	1.70E-01	6.29E-03	5.60E-02	2.07E-03	1.20E-01	4.44E-03	20 (0.74)
U-238	**6.50E-01**	**2.40E-02**	1.50E-01	5.55E-03	**6.10E-01**	**2.26E-02**	1.00E-01	3.70E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-5				Spud Well				
Sample Name Sample Date	GW-05-01 4/08/2009	GW-05-01 4/08/2009	MDC 4/08/2009	MDC 4/08/2009	SPUD WELL 01-01 4/06/2009	SPUD WELL 01-01 4/06/2009	MDC 4/06/2009	MDC 4/06/2009	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Radioactive Constituent									
Gross Alpha	-8.60E-01	-3.18E-02	3.00E+00	1.11E-01	6.70E-01	2.48E-02	3.20E+00	1.18E-01	15 (0.55)
Gross Beta	**4.40E+00**	**1.63E-01**	3.20E+00	1.18E-01	**3.40E+00**	**1.26E-01**	3.30E+00	1.22E-01	15 (0.55)
Ag-108m	1.24E+00	4.59E-02	2.90E+00	1.07E-01	1.31E+00	4.85E-02	2.90E+00	1.07E-01	NS
Ag-110m	1.10E+00	4.07E-02	4.90E+00	1.81E-01	-3.00E-01	-1.11E-02	6.60E+00	2.44E-01	NS
Ba-140	1.00E+00	3.70E-02	1.10E+01	4.07E-01	1.40E+00	5.18E-02	1.10E+01	4.07E-01	NS
Be-7	1.28E+01	4.74E-01	2.90E+01	1.07E+00	-1.00E+00	-3.70E-02	3.90E+01	1.44E+00	NS
Ce-141	-2.00E-01	-7.40E-03	7.00E+00	2.59E-01	4.70E+00	1.74E-01	6.80E+00	2.52E-01	NS
Ce-144	-6.10E+00	-2.26E-01	2.20E+01	8.14E-01	2.30E+00	8.51E-02	2.30E+01	8.51E-01	NS
Co-57	3.80E-01	1.41E-02	2.80E+00	1.04E-01	2.07E+00	7.66E-02	2.80E+00	1.04E-01	NS
Co-58	-1.10E+00	-4.07E-02	4.60E+00	1.70E-01	-2.20E+00	-8.14E-02	4.80E+00	1.78E-01	NS
Co-60	1.10E+00	4.07E-02	4.40E+00	1.63E-01	2.20E+00	8.14E-02	4.20E+00	1.55E-01	NS
Cr-51	9.40E+00	3.48E-01	3.30E+01	1.22E+00	-1.10E+01	-4.07E-01	4.50E+01	1.66E+00	NS
Cs-134	-8.60E-01	-3.18E-02	4.00E+00	1.48E-01	4.70E-01	1.74E-02	4.10E+00	1.52E-01	NS
Cs-137	2.00E-01	7.40E-03	3.80E+00	1.41E-01	-9.00E-01	-3.33E-02	4.90E+00	1.81E-01	NS
Fe-59	1.30E+00	4.81E-02	9.00E+00	3.33E-01	-4.70E+00	-1.74E-01	1.20E+01	4.44E-01	NS
I-131	1.50E+00	5.55E-02	1.10E+01	4.07E-01	-3.50E+00	-1.29E-01	1.40E+01	5.18E-01	NS
K-40	-6.00E+00	-2.22E-01	5.40E+01	2.00E+00	-2.00E+01	-7.40E-01	6.60E+01	2.44E+00	NS
La-140	1.00E+00	3.70E-02	1.10E+01	4.07E-01	1.40E+00	5.18E-02	1.10E+01	4.07E-01	NS
Mn-54	4.50E-01	1.66E-02	3.50E+00	1.29E-01	4.00E-01	1.48E-02	4.10E+00	1.52E-01	NS
Nb-95	0.00E+00	0.00E+00	4.80E+00	1.78E-01	-1.90E+00	-7.03E-02	5.60E+00	2.07E-01	NS
Ru-103	-3.60E+00	-1.33E-01	5.10E+00	1.89E-01	3.00E-01	1.11E-02	4.40E+00	1.63E-01	NS
Ru-106	7.00E+00	2.59E-01	3.50E+01	1.29E+00	1.00E+00	3.70E-02	4.00E+01	1.48E+00	NS
Sb-124	-1.40E+00	-5.18E-02	1.30E+01	4.81E-01	-4.30E+00	-1.59E-01	1.50E+01	5.55E-01	NS
Sb-125	-1.70E+00	-6.29E-02	9.40E+00	3.48E-01	-7.00E-01	-2.59E-02	9.50E+00	3.51E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-5				Spud Well				
Sample Name Sample Date	GW-05-01 4/08/2009	GW-05-01 4/08/2009	MDC 4/08/2009	MDC 4/08/2009	SPUD WELL 01-01 4/06/2009	SPUD WELL 01-01 4/06/2009	MDC 4/06/2009	MDC 4/06/2009	EPA MCL[1]
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	pCi/L (Bq/L)
Se-75	2.50E+00	9.25E-02	3.80E+00	1.41E-01	2.00E-01	7.40E-03	4.30E+00	1.59E-01	NS
Zn-65	-9.00E-01	-3.33E-02	1.10E+01	4.07E-01	-1.30E+00	-4.81E-02	9.30E+00	3.44E-01	NS
Zr-95	1.40E+00	5.18E-02	7.50E+00	2.77E-01	-4.00E-01	-1.48E-02	8.60E+00	3.18E-01	NS
H-3	1.60E+02	5.92E+00	4.30E+02	1.59E+01	3.00E+01	1.11E+00	4.30E+02	1.59E+01	NS
Ra-224	4.50E+01	1.66E+00	6.10E+01	2.26E+00	-1.15E+01	-4.25E-01	1.20E+02	4.44E+00	NS
Ra-226	2.07E-01	7.66E-03	2.50E-01	9.25E-03	3.70E-01	1.37E-02	4.00E-01	1.48E-02	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	-3.00E-01	-1.11E-02	4.60E+00	1.70E-01	2.00E-01	7.40E-03	3.70E+00	1.37E-01	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	2.00E-02	7.40E-04	3.20E-01	1.18E-02	1.41E-01	5.22E-03	2.70E-01	9.99E-03	NS
Th-230	4.30E-01	1.59E02	5.40E-01	2.00E-02	1.36E-01	5.03E-03	2.50E-01	9.25E-03	NS
Th-232	3.20E-02	1.18E-03	8.50E-02	3.14E-03	**3.11E-01**	**1.15E-02**	8.60E-02	3.18E-03	NS
U-234	**1.54E+00**	**5.70E-02**	1.30E-01	4.81E-03	**1.58E+00**	**5.85E-02**	1.20E-01	4.44E-03	20 (0.74)
U-235	4.90E-02	1.81E-03	9.50E-02	3.51E-03	6.70E-02	2.48E-03	1.40E-01	5.18E-03	20 (0.74)
U-238	**5.90E-01**	**2.18E-02**	1.10E-01	4.07E-03	**3.87E-01**	**1.43E-02**	9.60E-02	3.55E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name	GW-01-01	GW-01-01	MDC	MDC	GW-04-01	GW-04-01	MDC	MDC	EPA MCL[1]
Sample Date	4/07/09	4/07/09	4/07/09	4/07/09	4/07/09	4/07/09	4/07/09	4/07/09	pCi/L (Bq/L)
Analyte	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	(pCi/L)	(Bq/L)	
Radioactive Constituent									
Gross Alpha	-7.00E-02	-2.59E-03	3.00E+00	1.11E-01	3.70E-01	1.37E-02	2.80E+00	1.04E-01	15 (0.55)
Gross Beta	3.00E+00	1.11E-01	3.10E+00	1.15E-01	3.30E+00	1.22E-01	3.30E+00	1.22E-01	15 (0.55)
Ag-108m	-7.8E-01	-2.89E-02	3.00E+00	1.11E-01	-5.80E-01	-2.15E-02	3.60E+00	1.33E-01	NS
Ag-110m	-5.00E-01	-1.85E-02	4.40E+00	1.63E-01	-2.00E-01	-7.40E-03	5.40E+00	2.00E-01	NS
Ba-140	1.60E+00	5.92E-02	1.00E+01	3.70E-01	2.80E+00	1.04E-01	7.50E+00	2.77E-01	NS
Be-7	-1.70E+00	-6.29E-02	3.00E+01	1.11E+00	3.00E+00	1.11E-01	3.80E+01	1.41E+00	NS
Ce-141	-1.60E+00	-5.92E-02	6.10E+00	2.26E-01	-3.10E+00	-1.15E-01	8.40E+00	3.11E-01	NS
Ce-144	-2.00E-01	-7.40E-03	2.00E+01	7.40E-01	2.20E+00	8.14E-02	2.60E+01	9.62E-01	NS
Co-57	-8.20E-01	-3.03E-02	2.60E+00	9.62E-02	-2.00E-01	-7.40E-03	3.40E+00	1.26E-01	NS
Co-58	-2.70E-01	-9.99E-03	3.60E+00	1.33E-01	-7.00E-01	-2.59E-02	4.00E+00	1.48E-01	NS
Co-60	-7.00E-01	-2.59E-02	5.00E+00	1.85E-01	-9.00E-01	-3.33E-02	4.50E+00	1.66E-01	NS
Cr-51	-3.20E+00	-1.18E-01	3.20E+01	1.18E+00	5.00E+00	1.85E-01	4.40E+01	1.63E+00	NS
Cs-134	1.02E+00	3.77E-02	3.10E+00	1.15E-01	1.77E+00	6.55E-02	3.40E+00	1.26E-01	NS
Cs-137	-7.00E-01	-2.59E-02	4.30E+00	1.59E-01	1.00E-01	3.70E-03	4.20E+00	1.55E-01	NS
Fe-59	2.00E-01	7.40E-03	9.60E+00	3.55E-01	-8.00E-01	-2.96E-02	9.70E+00	3.59E-01	NS
I-131	-4.60E+00	-1.70E-01	1.10E+01	4.07E-01	-3.90E+00	-1.44E-01	1.40E+01	5.18E-01	NS
K-40	-6.00E+00	-2.22E-01	5.20E+01	1.92E+00	1.20E+01	4.44E-01	5.40E+01	2.00E+00	NS
La-140	1.60E+00	5.92E-02	1.00E+01	3.70E-01	2.80E+00	1.04E-01	7.50E+00	2.77E-01	NS
Mn-54	-1.20E+00	-4.44E-02	4.00E+00	1.48E-01	1.00E+00	3.70E-02	4.00E+00	1.48E-01	NS
Nb-95	-1.50E+00	-5.55E-02	4.60E+00	1.70E-01	-2.00E-01	-7.40E-03	5.90E+00	2.18E-01	NS
Ru-103	-8.00E-01	-2.96E-02	4.30E+00	1.59E-01	-1.80E+00	-6.66E-02	5.60E+00	2.07E-01	NS
Ru-106	7.40E+00	2.74E-01	2.90E+01	1.07E+00	1.20E+01	4.44E-01	3.60E+01	1.33E+00	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-1				GW-4				
Sample Name Sample Date	GW-01-01 4/07/09	GW-01-01 4/07/09	MDC 4/07/09	MDC 4/07/09	GW-04-01 4/07/09	GW-04-01 4/07/09	MDC 4/07/09	MDC 4/07/09	EPA MCL[1] pCi/L (Bq/L)
Analyte	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	**(pCi/L)**	**(Bq/L)**	
Sb-124	8.00E-01	2.96E-02	1.10E+01	4.07E-01	-1.90E+00	-7.03E-02	1.20E+01	4.44E-01	NS
Sb-125	-2.60E+00	-9.62E-02	8.90E+00	3.29E-01	-2.80E+00	-1.04E-01	1.10E+01	4.07E-01	NS
Se-75	3.00E-01	1.11E-02	3.60E+00	1.33E-01	-3.00E-01	-1.11E-02	5.50E+00	2.03E-01	NS
Zn-65	-1.60E+00	-5.92E-02	7.50E+00	2.77E-01	-2.10E+00	-7.77E-02	9.60E+00	3.55E-01	NS
Zr-95	3.60E+00	1.33E-01	5.70E+00	2.11E-01	-6.00E-01	-2.22E-02	8.00E+00	2.96E-01	NS
H-3	1.40E+02	5.18E+00	4.30E+02	1.59E+01	2.00E+01	7.40E-01	4.30E+02	1.59E+01	NS
Ra-224	2.20E-01	8.14E-03	1.30E+00	4.81E-02	2.70E+01	9.99E-01	3.60E+01	1.33E+00	NS
Ra-226	**5.30E-01**	**1.96E-02**	2.20E-01	8.14E-03	**2.47E-01**	**9.14E-03**	1.80E-01	6.66E-03	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	-1.00E+00	-3.70E-02	4.10E+00	1.52E-01	6.00E-01	2.22E-02	3.80E+00	1.41E-01	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	**3.53E-01**	**1.31E-02**	1.60E-01	5.92E-03	2.00E-03	7.40E-05	1.80E-01	6.66E-03	NS
Th-230	1.73E-01	6.40E-03	2.70E-01	9.99E-03	-1.00E-01	-3.70E-03	5.00E-01	1.85E-02	NS
Th-232	**4.59E-01**	**1.70E-02**	2.40E-02	8.88E-04	**2.17E-01**	**8.03E-03**	1.40E-01	5.18E-03	NS
U-234	**2.13E+00**	**7.88E-02**	1.40E-01	5.18E-03	**7.60E-01**	**2.81E-02**	9.00E-02	3.33E-03	20 (0.74)
U-235	7.90E-02	2.92E-03	1.10E-01	4.07E-03	**1.45E-01**	**5.36E-03**	1.20E-01	4.44E-03	20 (0.74)
U-238	**5.40E-01**	**2.00E-02**	1.10E-01	4.07E-03	**5.80E-01**	**2.15E-02**	1.10E-01	4.07E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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Well Name	GW-2				
Sample Name Analyte	GW-02-01 (pCi/L)	GW-02-01 (Bq/L)	MDC (pCi/L)	MDC (Bq/L)	EPA MCL[1] pCi/L (Bq/L)
Sample Date	4/06/2009	4/06/2009	4/06/2009	4/06/2009	
Radioactive Constituent					
Gross Alpha	-7.30E-01	-2.70E-02	2.60E+00	9.62E-02	15 (0.55)
Gross Beta	3.00E+00	1.11E-01	3.10E+00	1.15E-01	15 (0.55)
Ag-108m	2.40E-01	8.88E-03	3.40E+00	1.26E-01	NS
Ag-110m	1.70E+00	6.29E-02	5.40E+00	2.00E-01	NS
Ba-140	-3.80E+00	-1.41E-01	1.50E+01	5.55E-01	NS
Be-7	1.40E+01	5.18E-01	3.30E+01	1.22E+00	NS
Ce-141	-2.80E+00	-1.04E-01	7.90E+00	2.92E-01	NS
Ce-144	1.32E+01	4.88E-01	2.50E+01	9.25E-01	NS
Co-57	-2.50E-01	-9.25E-03	3.20E+00	1.18E-01	NS
Co-58	-4.00E-01	-1.48E-02	5.20E+00	1.92E-01	NS
Co-60	1.10E+00	4.07E-02	5.60E+00	2.07E-01	NS
Cr-51	-9.00E+00	-3.33E-01	4.10E+01	1.52E+00	NS
Cs-134	-1.09E+00	-4.03E-02	4.30E+00	1.59E-01	NS
Cs-137	-3.00E-01	-1.11E-02	4.80E+00	1.78E-01	NS
Fe-59	2.90E+00	1.07E-01	1.00E+01	3.70E-01	NS
I-131	2.50E+00	9.25E-02	1.40E+01	5.18E-01	NS
K-40	4.20E+01	1.55E+00	7.30E+01	2.70E+00	NS
La-140	-3.80E+00	-1.41E-01	1.50E+01	5.55E-01	NS
Mn-54	-2.10E+00	-7.77E-02	5.30E+00	1.96E-01	NS
Nb-95	-1.70E+00	-6.29E-02	5.90E+00	2.18E-01	NS
Ru-103	-3.50E+00	-1.29E-01	6.00E+00	2.22E-01	NS
Ru-106	1.90E+01	7.03E-01	3.30E+01	1.22E+00	NS
Sb-124	-2.30E+00	-8.51E-02	1.40E+01	5.18E-01	NS
Sb-125	2.60E+00	9.62E-02	1.00E+01	3.70E-01	NS

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

Well Name	GW-2				
Sample Name Analyte	GW-02-01 (pCi/L)	GW-02-01 (Bq/L)	MDC (pCi/L)	MDC (Bq/L)	EPA MCL[1] pCi/L (Bq/L)
Sample Date	4/06/2009	4/06/2009	4/06/2009	4/06/2009	
Se-75	4.00E-01	1.48E-02	5.00E+00	1.85E-01	NS
Zn-65	0.00E+00	0.00E+00	1.10E+01	4.07E-01	NS
Zr-95	2.10E+00	7.77E-02	6.80E+00	2.52E-01	NS
H-3	9.00E+01	3.33E+00	4.30E+02	1.59E+01	NS
Ra-224	**5.70E+01**	**2.11E+00**	5.10E+01	1.89E+00	NS
Ra-226	2.40E-01	8.88E-03	2.50E-01	9.25E-03	5 (0.18) [Ra-226+Ra-228] [2]
Ra-228	1.90E+00	7.03E-02	4.40E+00	1.63E-01	5 (0.18) [Ra-226+Ra-228] [2]
Th-228	9.30E-02	3.44E-03	2.80E-01	1.04E-02	NS
Th-230	**4.83E-01**	**1.79E-02**	2.40E-01	8.88E-03	NS
Th-232	**2.00E-01**	**7.40E-03**	6.30E-02	2.33E-03	NS
U-234	**9.30E-01**	**3.44E-02**	1.10E-01	4.07E-03	20 (0.74)
U-235	2.90E-02	1.07E-03	1.20E-01	4.44E-03	20 (0.74)
U-238	**5.50E-01**	**2.03E-02**	1.20E-01	4.44E-03	20 (0.74)

Table 3.4-14 Radiochemical Analyses for the EREF Site Groundwater

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NOTES:

Highlighted results above minimum detectable concentration (MDC)

1. EPA, 2002.
2. Radium MCL is to be compared against the summed concentrations of Ra-226 and Ra-228.
3. Combined Ra-226 and Ra-228 MDC is greater than combined EPA MCL due to sample size limitations.
4. Radium-228 concentration derived indirectly from a daughter product, Ac-228.

NM = Not measured
NS = No standard
NA = No analysis
MCL = Maximum Contaminant Level
MDC = Minimum Detectable Concentration
1 Bq = 27.03 pCi
See ER section 3.4.15.4, Site Groundwater Quality, for explanation of negative radiological values

Table 3.4-15 Construction Period Water Use (2011-2022)
(Page 1 of 2)

Construction							
Year	Calendar Year	People (1)	Potable Water Liters (Gallons)	Concrete (2) Liters (Gallons)	Dust(3) Liters (Gallons)	Soil Compaction (4) Liters (Gallons)	Total Construction Liters (Gallons)
1	2011	[*]	19,555,438 (5,166,000)	1,216,370 (321,331)	52,465,810 (13,860,000)	16,981,736 (4,486,100)	90,219,351 (23,833,431)
2	2012	[*]	28,140,751 (7,434,000)	3,649,110 (963,993)	52,129,784 (13,860,000)	12,129,784 (3,204,350)	96,385,453 (25,462,343)
3	2013	[*]	19,078,475 (5,040,000)	10,947,978 (2,891,978)	52,465,810 (13,860,000)	9,703,903 (2,563,500)	92,195,513 (24,355,478)
4	2014	[*]	13,831,895 (3,654,000)	72,989,219 (1,927,985)	52,465,810 (13,860,000)	4,851,952 (1,281,750)	78,447,871 (20,723,735)
5	2015	[*]	13,831,895 (3,654,000)	6,081,655 (1,606,655)	52,465,810 (13,860,000)	4,581,952 (1,281,750)	77,231,504 (20,402,405)
6	2016	[*]	8,346,833 (2,205,000)	4,561,387 (1,204,991)	52,465,810 (13,860,000)	0 (0)	65,374,027 (17,269,991)
7	2017	[*]	6,677,466 (1,764,000)	2,432,740 (642,662)	52,465,810 (13,860,000)	0 (0)	61,576,014 (16,266,662)
8	2018	[*]	6,677,466 (1,764,000)	1,216,370 (321,331)	26,232,904 (6,930,000)	0 (0)	34,126,740 (9,015,331)
9	2019	[*]	6,677,466 (1,764,000)	304,093 (80,333)	6,558,226 (1,732,500)	0 (0)	13,539,785 (3,576,833)
10	2020	[*]	5,962,024 (1,575,000)	76,023 (20,083)	1,639,556 (433,125)	0 (0)	7,677,603 (2,028,208)
11	2021	[*]	5,008,100 (1,323,000)	19,006 (5,021)	409,889 (108,281)	0 (0)	5,436,995 (1,436,302)
12	2022	[*]	3,815,695 (1,008,000)	4,751 (1,255)	102,472 (27,070)	0 (0)	3,922,919 (1,036,326)

Notes:

(1) Estimate of [*] usage per day per person for 252 days per year for construction related activities (5 days a week).

(2) Estimate of 151.4 L (40 gal) used per cubic yard of concrete mixing and curing.

(3) Estimate of 208,198 L (55,000 gal) per day.

(4) Earthwork and soil compaction is assumed to be complete in 2015.

(*) Proprietary Commercial Information withheld in accordance with 10 CFR 2.390.

Table 3.4-15 Construction Period Water Use (2011-2022)
(Page 2 of 2)

Assumptions:

(1) Project Milestones:
- Start site construction = February 2011
- 1st cascade on line = February 2014
- Anticipated completion of heavy construction activity = 2017
- Last 3.3M SWU cascade on line = March 2018
- Full 6.6M SWU production = March 2022

All SBM construction (i.e., SBMs 1, 2, 3, and 4) – construction that generates dust and requires any significant concrete production and curing – is assumed to be completed about 2018 and reduces significantly until 2022.

(2) From Assumption 1 above, concrete mixing and curing values assume progressive decline following completion of heavy construction in 2017. Year 2018 assumes ½ of water usage in 2017 and subsequent years assumes 1/4 of water usage in 2018 for all subsequent years until 2022.

(3) From Assumption 1 above, dust control yearly water values assume progressive decline following completion of heavy construction in 2017. Year 2018 assumes ½ of water usage for dust control in 2017 and subsequent years assumes 1/4 of water usage in 2018 for all subsequent years until 2022.

Table 3.4-16 Operations Water Use (2011-2022)
(Page 1 of 2)

Operations					
Year	**Calendar Year**	**People[1]**	**Potable Water** **Liters (Gallons)**	**Process Water[2]** **Liters (Gallons)**	**Total Operations[3]** **Liters (Gallons)**
1	2011	0	0 (0)	0 (0)	0 (0)
2	2012	50	2,072,513 (547,500)	0 (0)	2,072,513 (547,500)
3	2013	100	4,145,026 (1,095,000)	1,593,027 (420,833)	5,738,053 (1,515,833)
4	2014	420	17,409,109 (4,599,000)	460,558 (121,667)	17,869,667 (4,720,667)
5	2015	420	17,409,109 (4,599,000)	690,838 (182,500)	18,099,946 (4,781,500)
6	2016	480	189,896,124 (5,256,000)	921,117 (243,333)	20,817,241 (5,499,333)
7	2017		22,797,642 (6,022,500)	1,151,396 (304,167)	23,949,039 (6,326,667)
8	2018	550	22,797,642 (6,022,500)	1,381,675 (365,000)	24,179,318 (6,387,500)
9	2019	550	22,797,642 (6,022,500)	1,554,385 (410,625)	24,352,027 (6,433,125)
10	2020	550	22,797,642 (6,022,500)	1,727,094 (456,250)	24,524,737 (6,478,750)
11	2021	550	22,797,642 (6,022,500)	1,899,804 (501,875)	24,697,446 (6,524,375)
12	2022	550	22,797,642 (6,022,500)	2,072,513 (547,500)(	24,870,155 (6,570,000)

Notes:

(1) Estimate of 114 L (30 gal) per day per person for 365 days per year.

(2) Process water includes demineralized water, fire water and liquid effluent water.

(3) Total operations water use is industrial water use and does not include irrigation water use.

Table 3.4-16 Operations Water Use (2011-2022)
(Page 2 of 2)

Assumptions:

(1) Project Milestones:
- Start site construction = February 2011
- 1st cascade on line = February 2014
- Anticipated completion of heavy construction activity = 2017
- Last 3.3M SWU cascade on line = March 2018
- Full 6.6M SWU production = March 2022

All SBM construction (i.e., SBMs 1, 2, 3, and 4) – construction that generates dust and requires any significant concrete production and curing – is assumed to be completed about 2018 and reduces significantly until 2022.

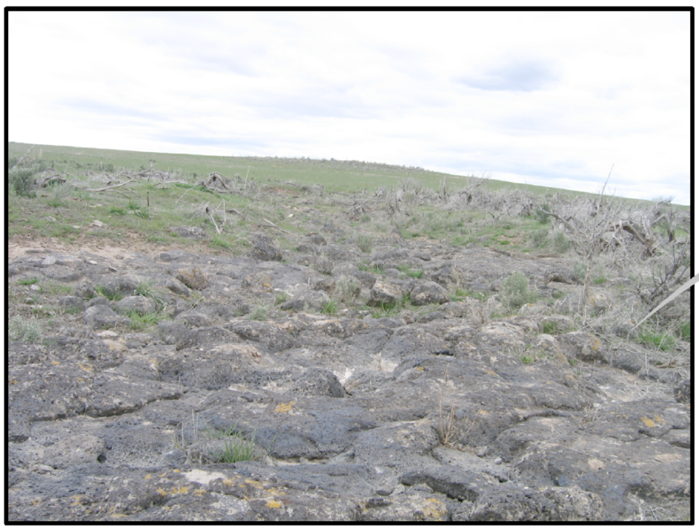
(2) Process water usage begins just before the placement of the 1st cascade on line and increases to "full" usage for 6.6M SWU.

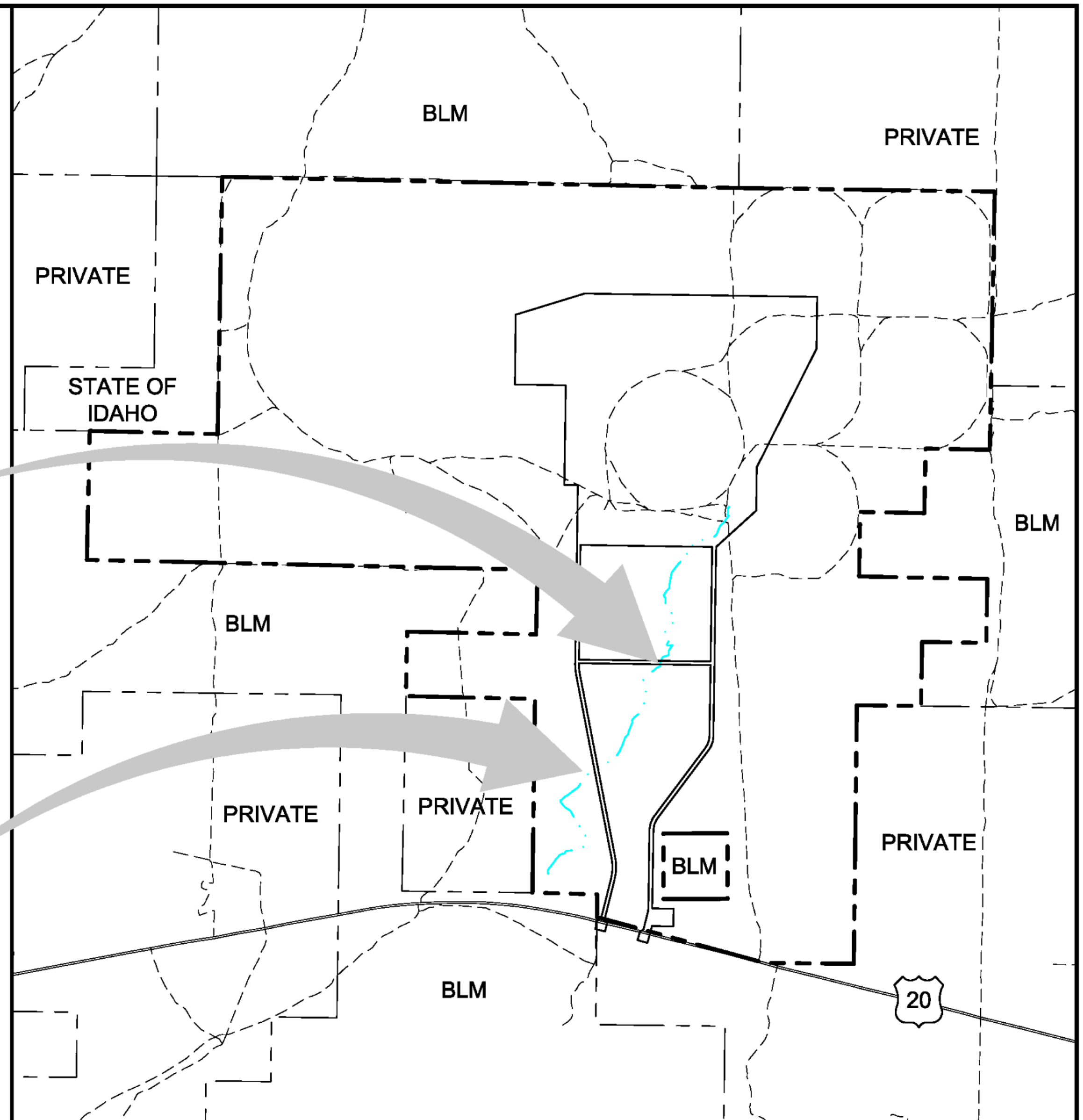
(3) At year 2013, the two fire water tanks are filled to provide site fire protection and process water supply. Each tank has an 180,000 fire water capacity – total of 360,000 gallons to fill the tanks. This is a one time fill and is expected to occur in the year preceding the start of the 1st cascade.

(4) The number of people assumed in Operations is generally conservative. For example, the operations staff is assumed to be at full operating complement upon start of the first cascade for 3.3M SWUs and upon start of the first cascade for 6.6M SWUs.

(5) At year 2018, the process water usage reaches the maximum expected for the 3.3M SWU configuration – that is, 365,000 gallons per year. Since, for the 3.3M SWU scenario, process water usage starts in year 3 (2013) and ends in year 8 (2018), there are six years from the start of process water usage to the point where process water usage reaches the expected 3.3M SWU value. As such, the incremental yearly addition of process water usage is 1/6 of the final 3.3M SWU value per year. This same approach was used to estimate the water usage for the 6.6M SWU scenario.

FIGURES





LEGEND:

PROPOSED SITE BOUNDARY

EXISTING ROADS

DRAINAGE FEATURE

SCALE

0 1000 2000 m

SCALE

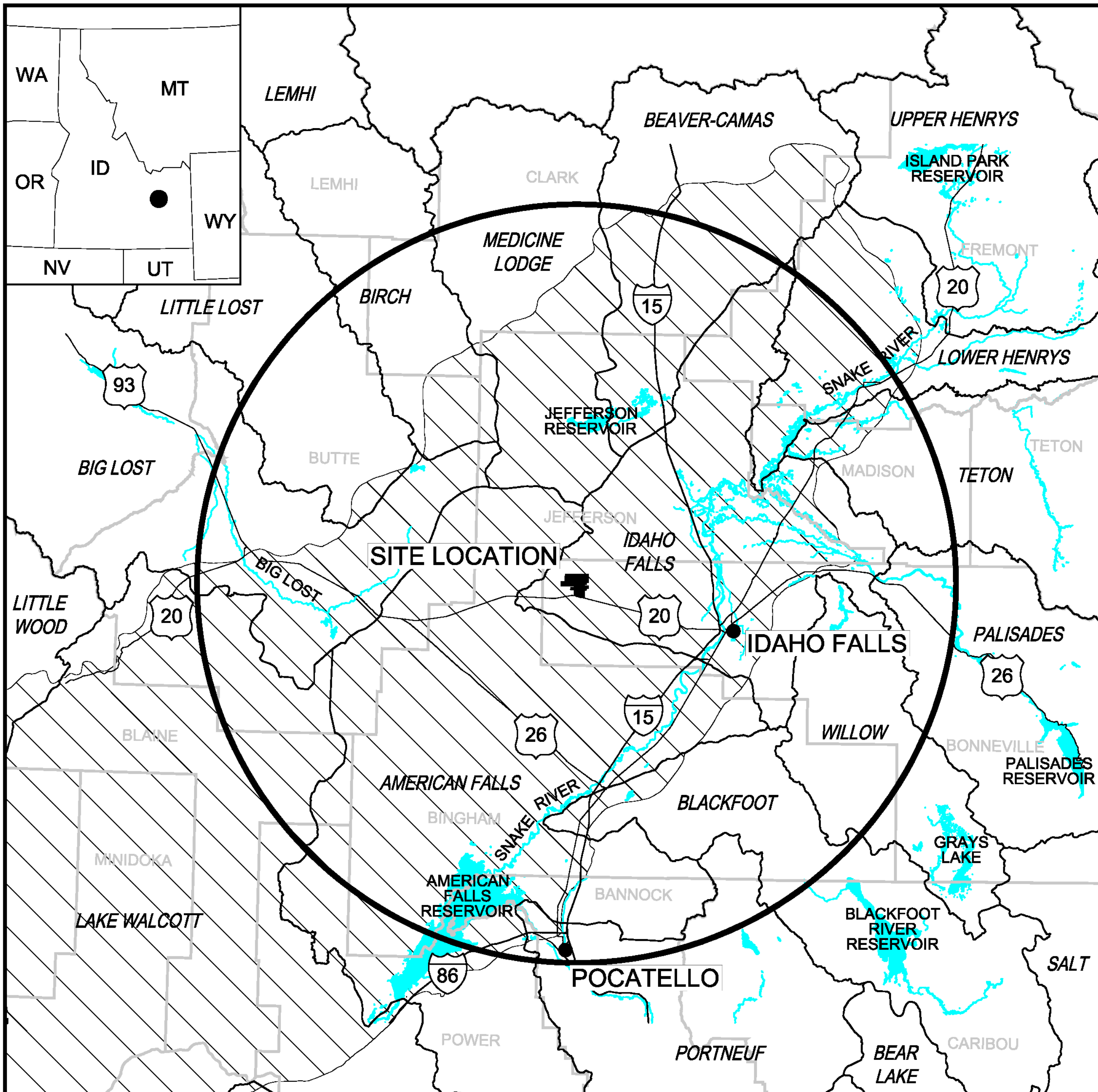
0 4000 8000 ft

N

Figure 3.4-1 **Rev. 2**

Drainage Feature and Location

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



LEGEND:

80 km (50 mi) RADIUS

SNAKE RIVER PLAIN AQUIFER

LEMHI HYDROLOGIC UNIT CODE (HUC)

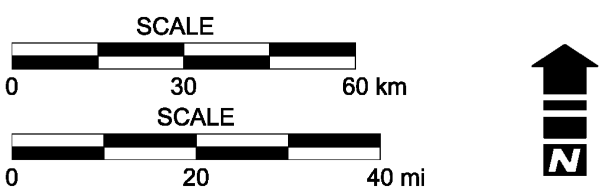
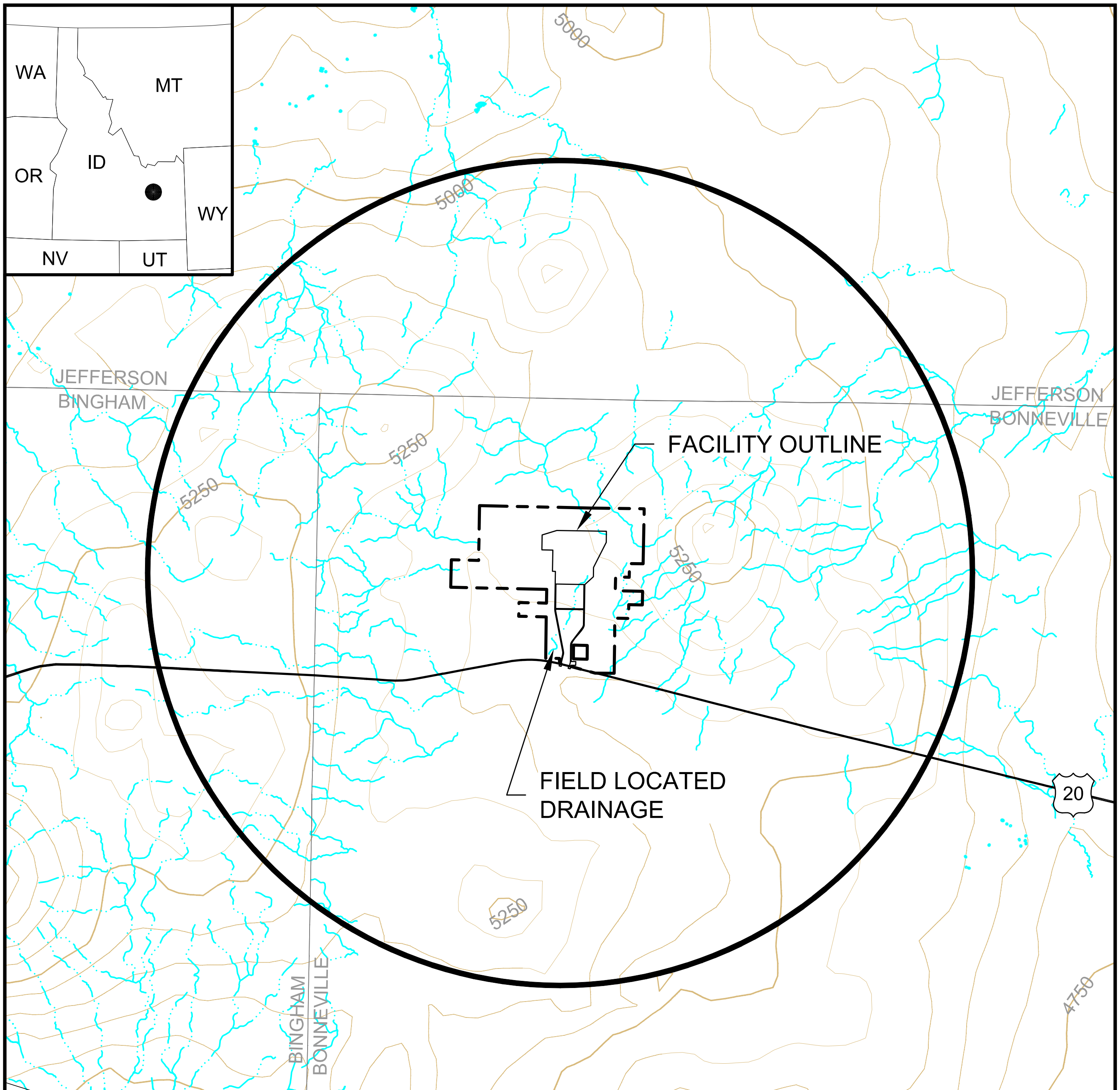


Figure 3.4-2 **Rev. 2**

Regional Hydrologic Features Within 80 km (50 mi)

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



LEGEND:

- 5250 — APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEVATION, ft
- PROPOSED SITE BOUNDARY
- 8 km (5 mi) RADIUS
- DRAINAGE

NOTE:

1. GROUND SURFACE CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft

SCALE

0 4 8 km

SCALE

0 2 4 mi

N

Figure 3.4-3 **Rev. 2**

Local Hydrologic Features Within 8 km (5 mi)

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

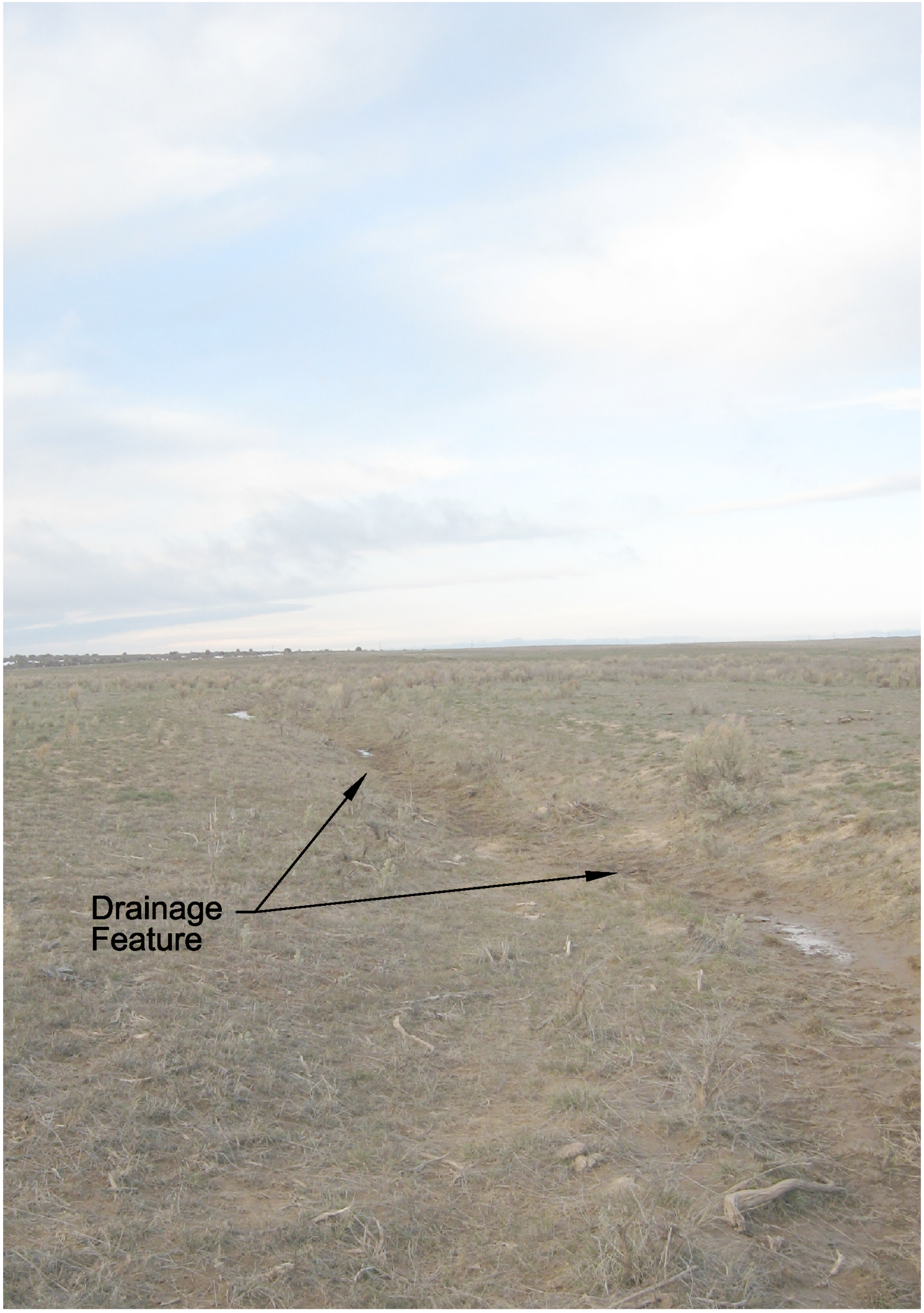
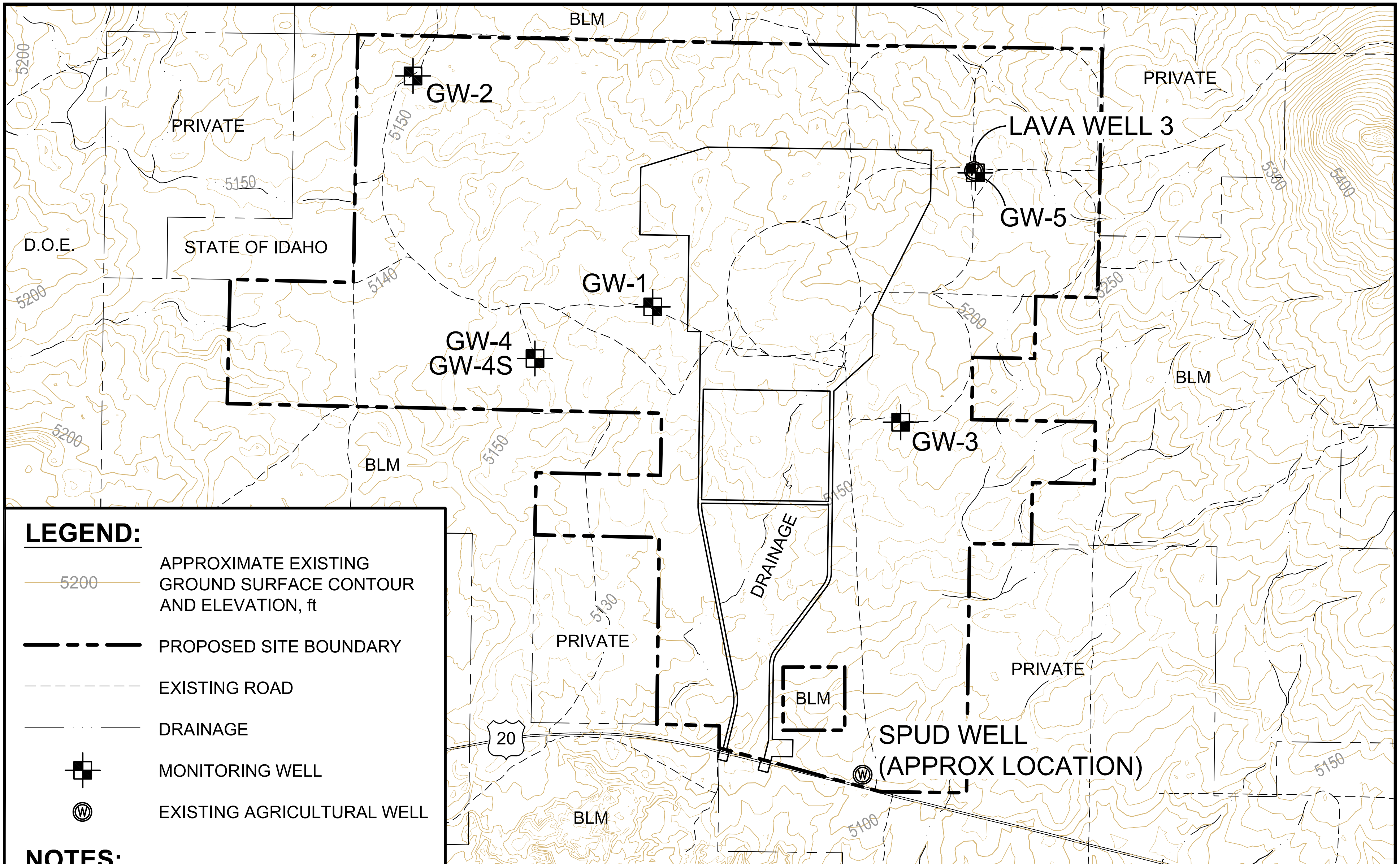


Figure 3.4-4 **Rev. 2**

Photo of Small Drainage Feature

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



LEGEND:

- 5200 — APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEVATION, ft
- PROPOSED SITE BOUNDARY
- EXISTING ROAD
- DRAINAGE
- MONITORING WELL
- (W) EXISTING AGRICULTURAL WELL

NOTES:

1. GROUND SURFACE CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft.
2. MONITORING WELL GW-5 IS 14.7 m (48.2 ft) SOUTHEAST OF LAVA WELL 3.

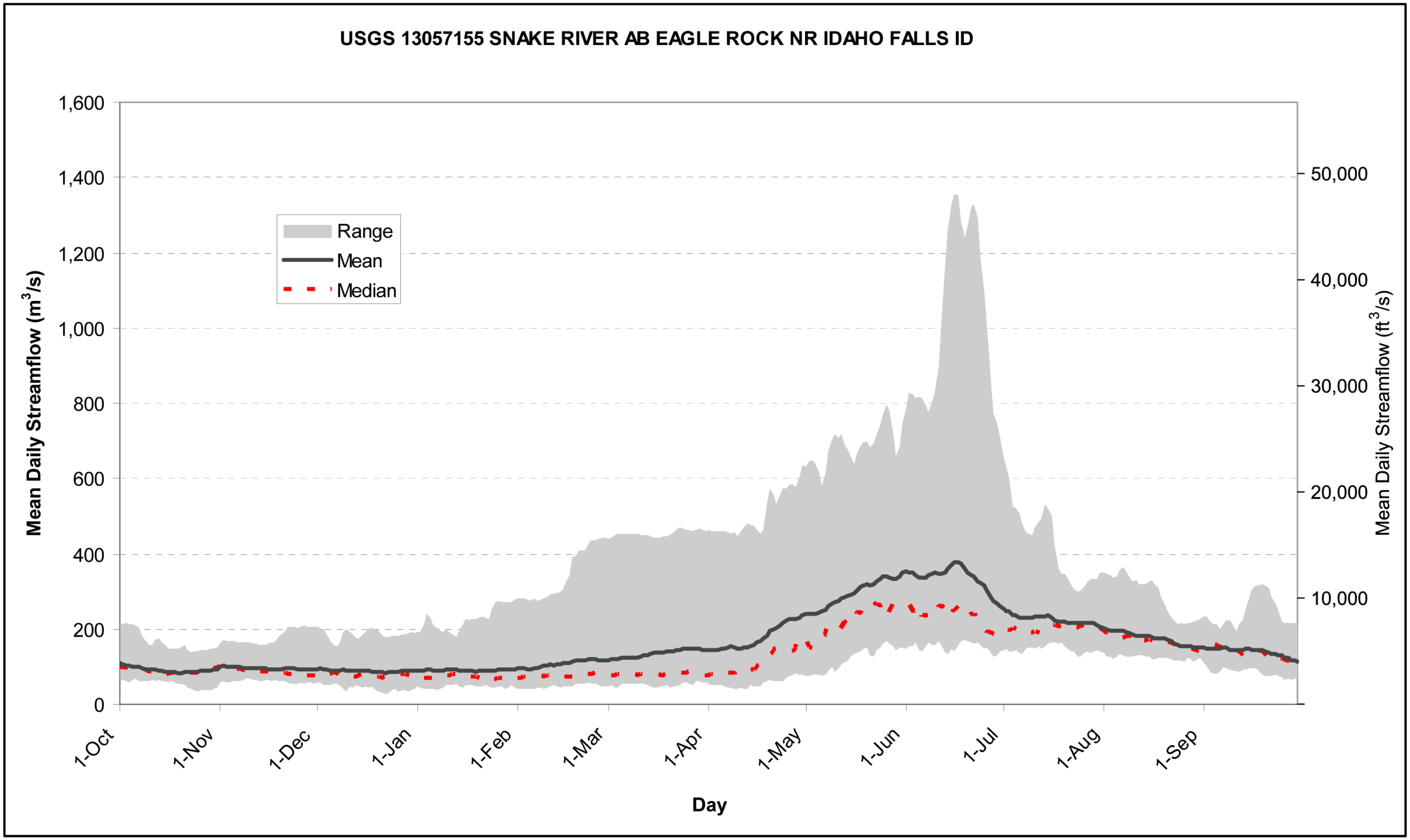
SCALE
0 800 1600 m

SCALE
0 2500 5000 ft

Figure 3.4-5 **Rev. 2**

Existing Agricultural and Newly Installed Monitoring Wells

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

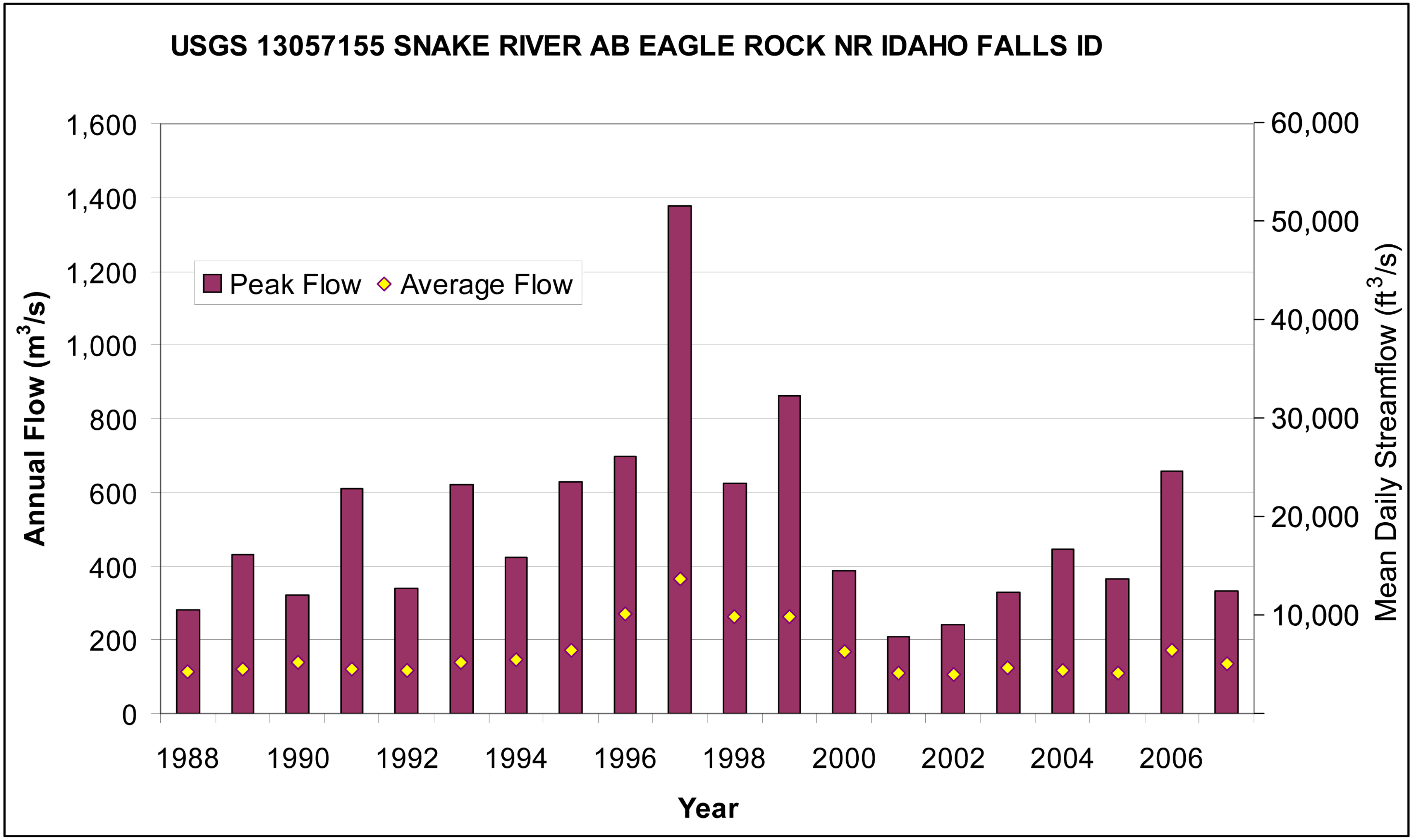


DATA SOURCE: USGS, 2008

Figure 3.4-6 **Rev. 2**

Snake River above Eagle Rock near Idaho Falls Hydrograph

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

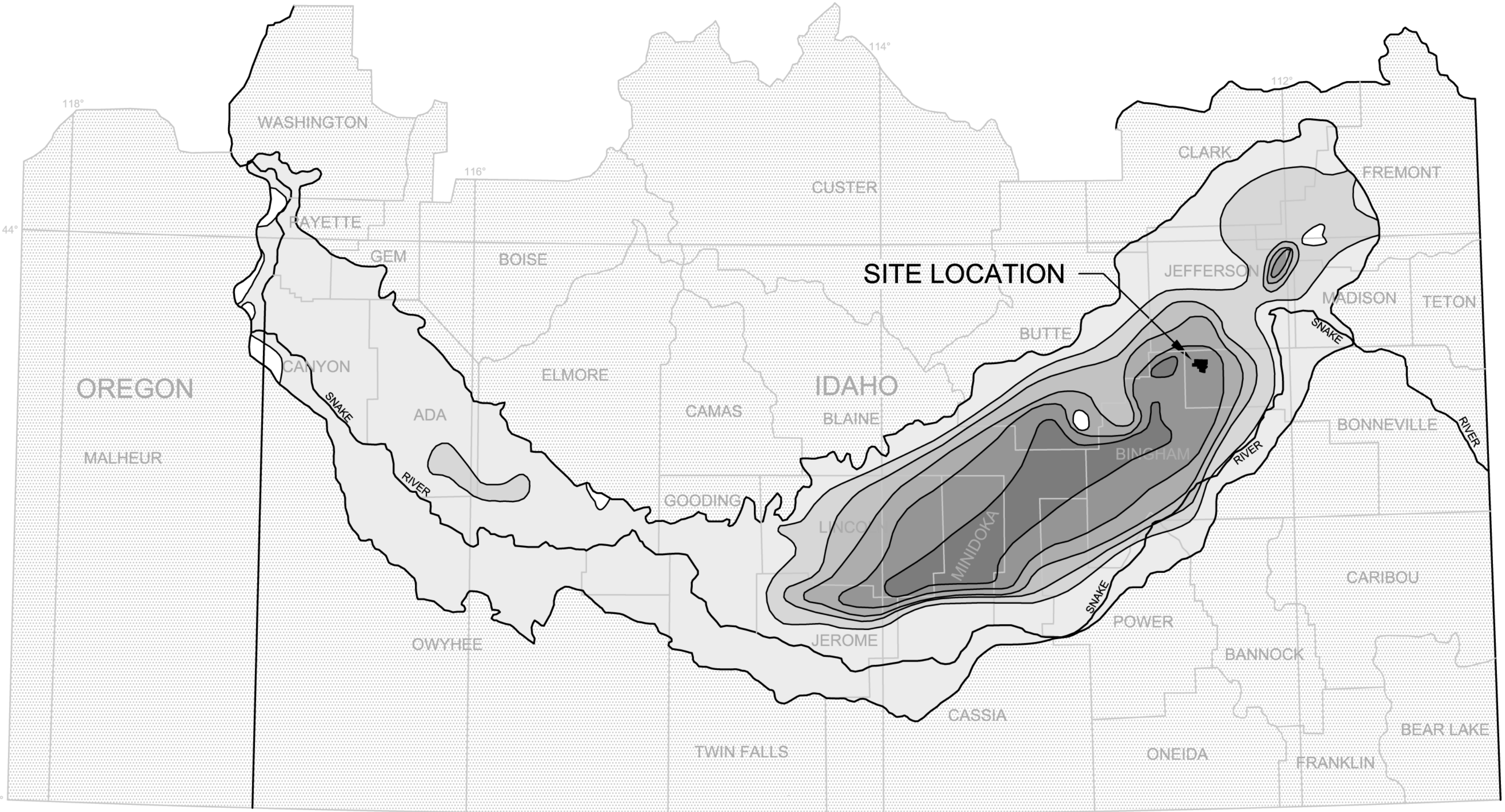


DATA SOURCE: USGS, 2008

Figure 3.4-7 **Rev. 2**

Annual Flows in the Snake River

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



BASE MODIFIED FROM U.S. GEOLOGICAL SURVEY DIGITAL DATA, 1:2,000,000, 1972

NOTE: ADAPTED FROM WHITEHEAD (WHITEHEAD, 1994).

LEGEND

SATURATED THICKNESS OF PLIOCENE AND YOUNGER BASALTIC ROCK

- 152 m (500')
- 305 m (1,000')
- 457 m (1,500')
- 610 m (2,000')
- 762 m (2,500')
- ABSENT

NOTE: CONVERSIONS FROM ENGLISH TO METRIC UNITS ARE APPROXIMATIONS DUE TO ROUNDING.

SCALE
0 60 120 km

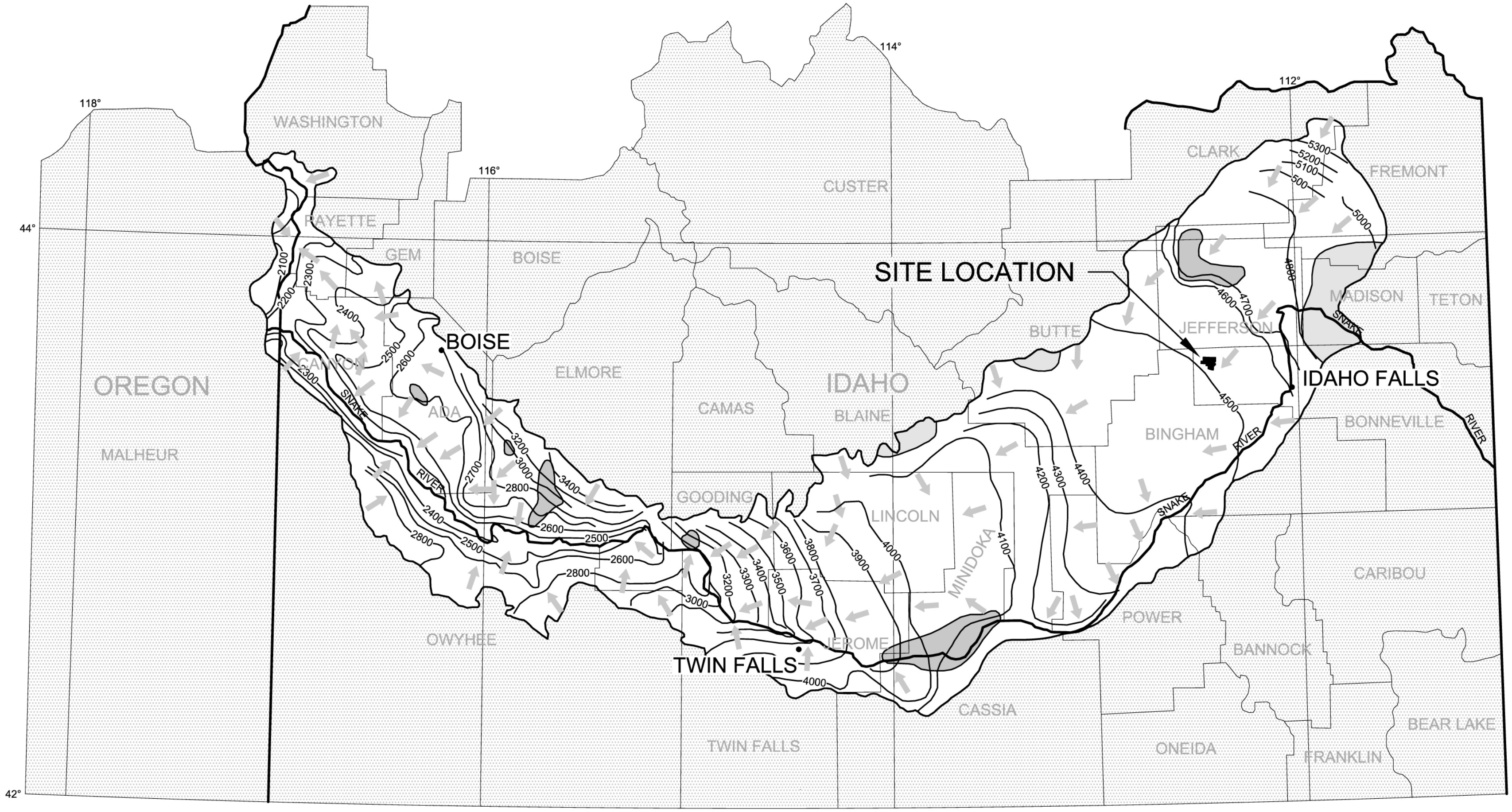
SCALE
0 40 80 mi

N

Figure 3.4-8 **Rev. 2**

Saturated Thickness of Pliocene and Younger Basaltic Rocks in the ESRP Aquifer

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



BASE MODIFIED FROM U.S. GEOLOGICAL
SURVEY DIGITAL DATA, 1:2,000,000, 1972

NOTE: ADAPTED FROM WHITEHEAD (WHITEHEAD, 1994).

LEGEND

—5300— AREA WHERE LOCAL AQUIFER OR PERCHED WATER BODIES OVERLIE REGIONAL AQUIFER SYSTEM

WATER TABLE CONTOUR - SHOWS ALTITUDE OF REGIONAL WATER TABLE DURING SPRING 1980. CONTOUR INTERVAL, IN FEET, IS VARIABLE. DATUM IS SEA LEVEL.

DIRECTION OF GROUNDWATER MOVEMENT

NOTE:

1. WATER CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft

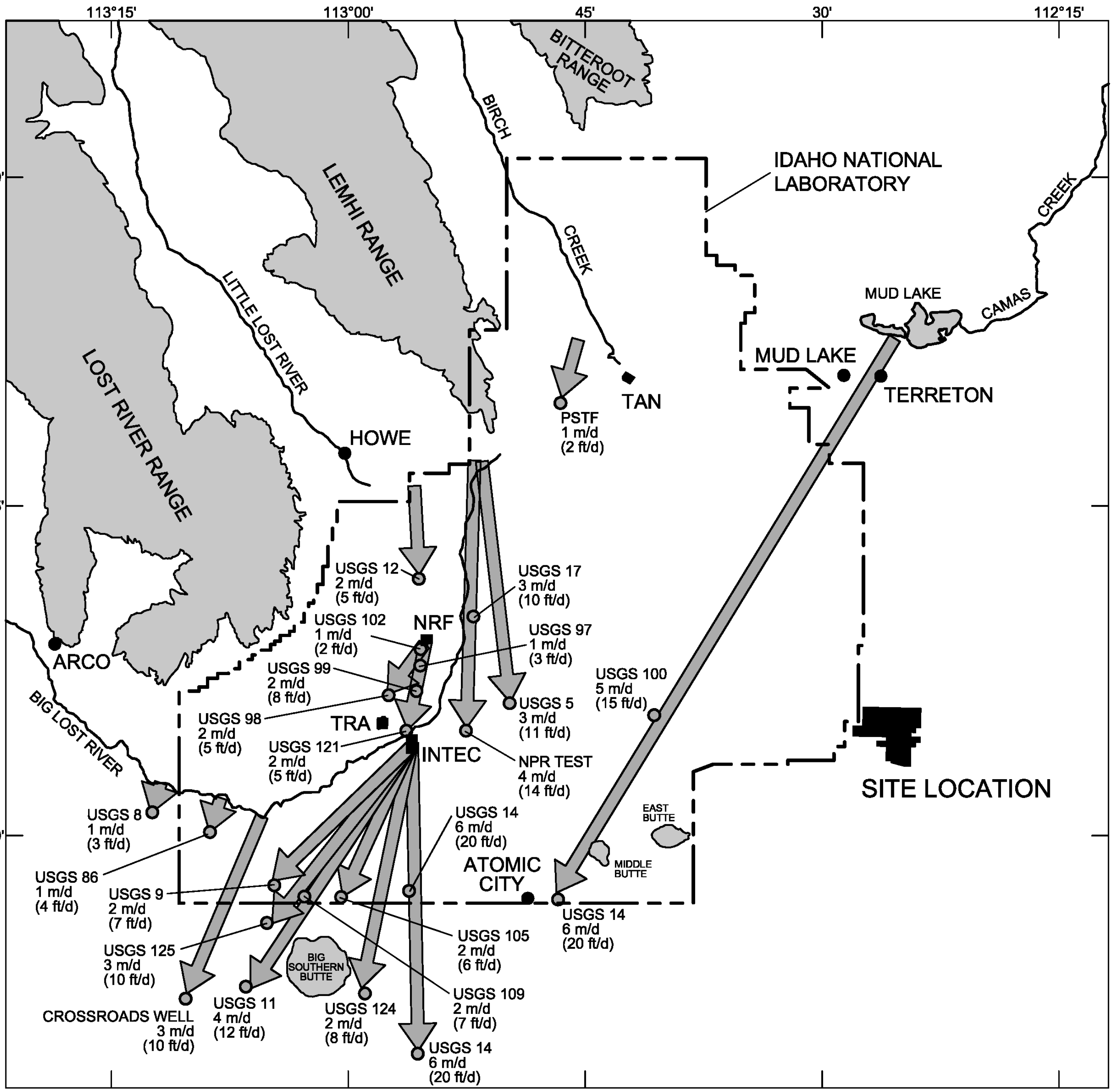
SCALE
0 60 120 km

SCALE
0 40 80 mi

N

Figure 3.4-9 **Rev. 2**
Groundwater Elevations and General Direction of Groundwater Movement in the SRP Aquifer

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000 Universal Transverse Mercator projection, Zone 12 Datum is North American Datum of 1927

LEGEND:

GROUNDWATER FLOW DIRECTION BASED ON LOCATION OF WELL SAMPLED AND INTERPRETED SOURCE OF GROUNDWATER

USGS 5 3 m/d (11 ft/d) — WELL IN THE USGS WATER LEVEL MONITORING NETWORK AND IDENTIFIER WITH CALCULATED GROUNDWATER FLOW VELOCITY

NOTES:

1. GROUNDWATER VELOCITIES ARE BASED ON CHLORIDE-36 AND TRITIUM DATA AT IDAHO NATIONAL LABORATORY (ACKERMAN, 2006).
2. ADAPTED FROM ACKERMAN, 2006.
3. CONVERSIONS FROM ENGLISH TO METRIC UNITS ARE APPROXIMATIONS DUE TO ROUNDING.

SCALE

0 12 24 km

SCALE

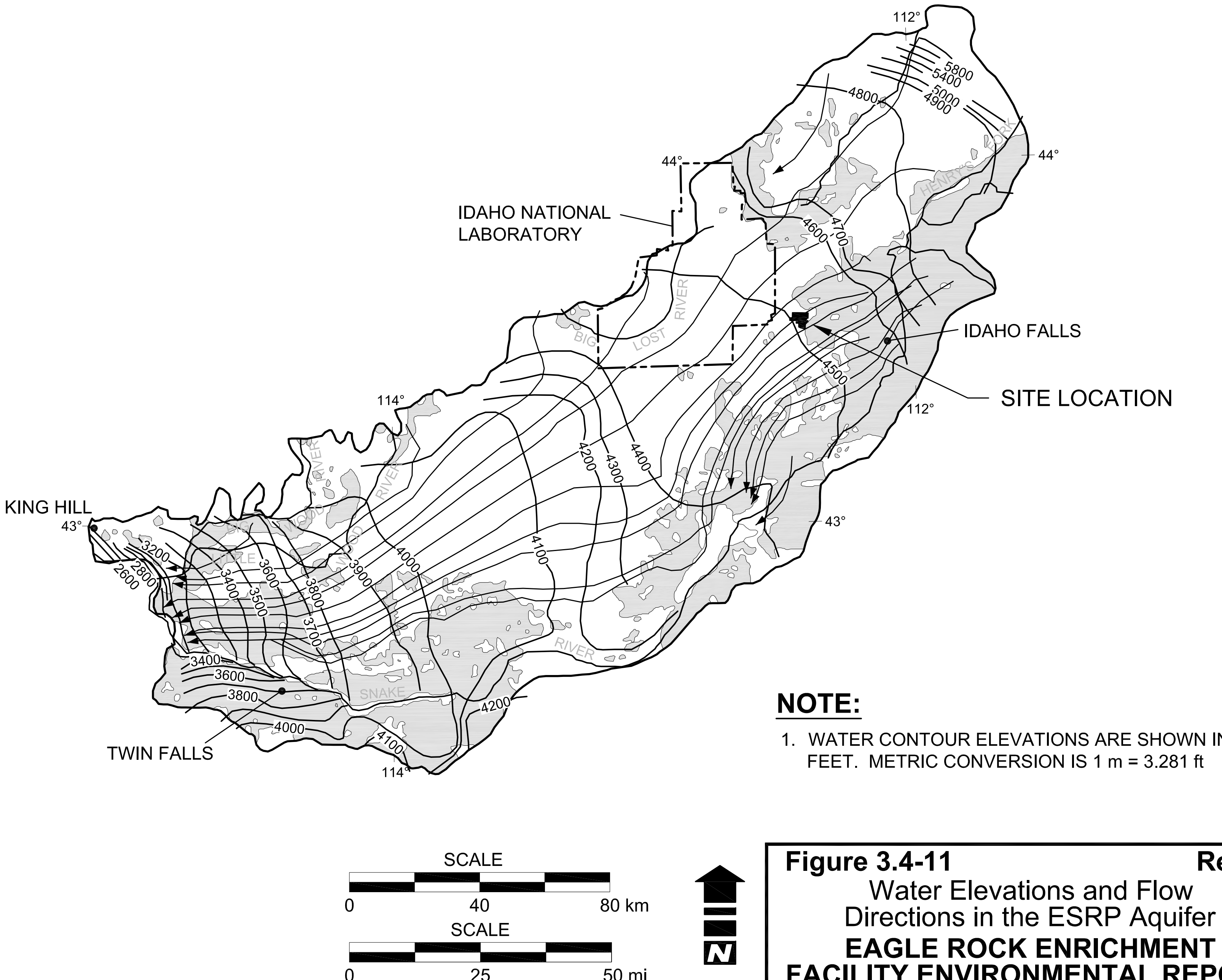
0 8 16 mi

N

Figure 3.4-10 **Rev. 2**

Groundwater Velocities in the ESRP

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



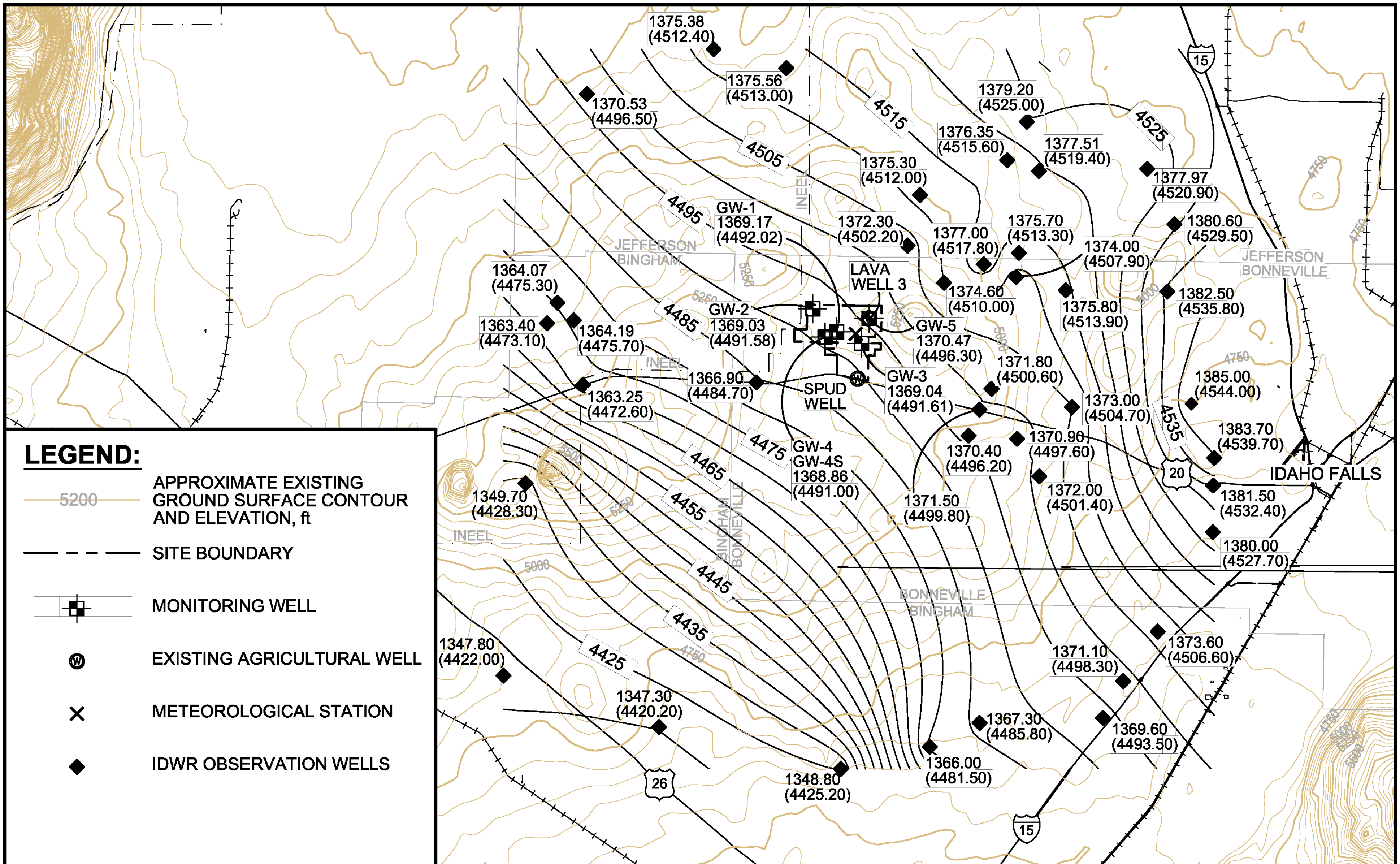
NOTE:

1. WATER CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft

Figure 3.4-11 **Rev. 2**

Water Elevations and Flow Directions in the ESRP Aquifer

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



NOTES:

1. MONITORING WELL GW-5 IS 14.7 m (48.2 FT) SOUTHEAST OF LAVA WELL 3.
2. GROUND SURFACE AND GROUNDWATER CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft.

SCALE
0 8 16 km

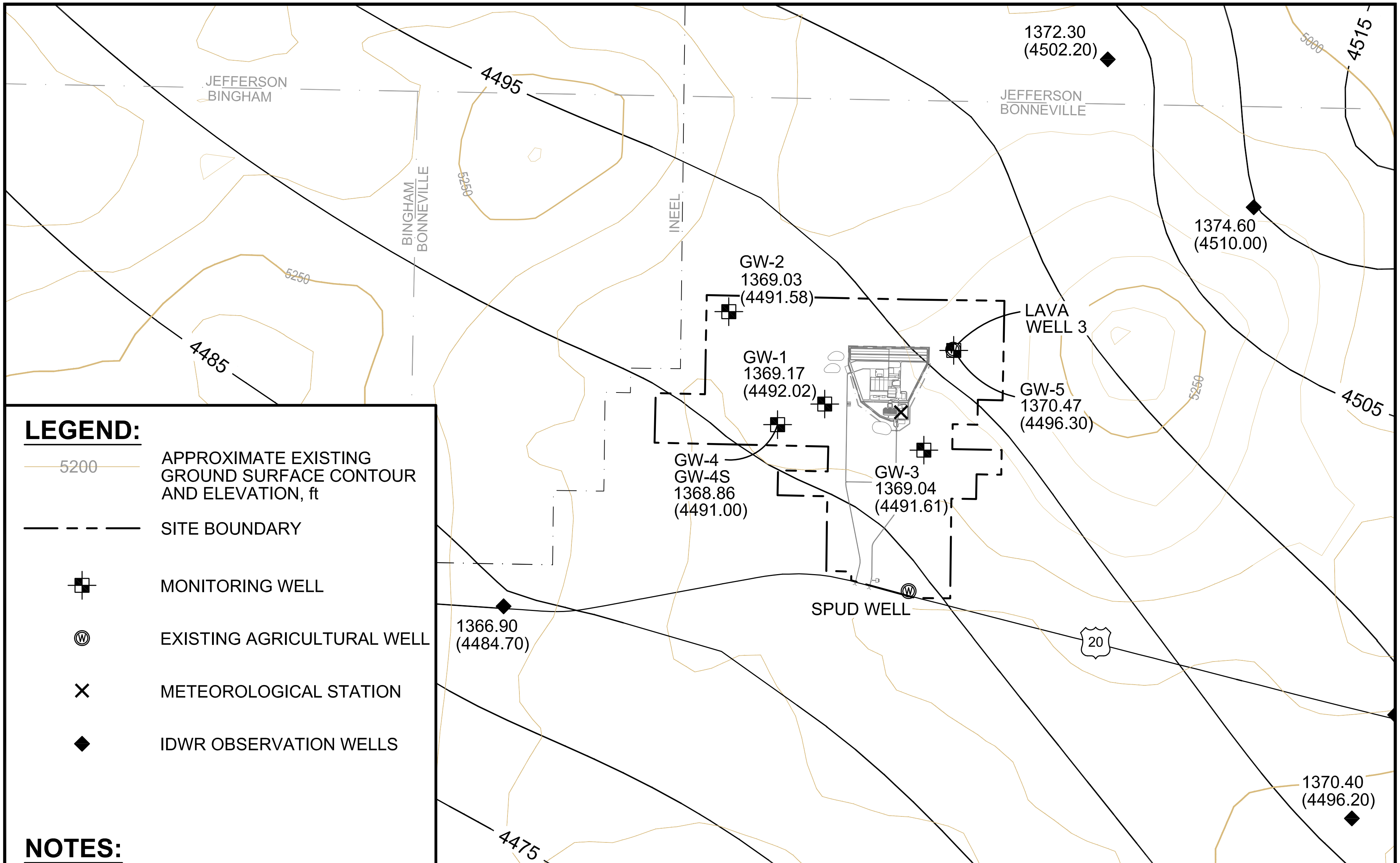
SCALE
0 5 10 mi

N

Figure 3.4-12 **Rev. 2**

Regional Groundwater Potentiometric Surface Map

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



LEGEND:

5200	APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEVATION, ft
— — —	SITE BOUNDARY
	MONITORING WELL
	EXISTING AGRICULTURAL WELL
×	METEOROLOGICAL STATION
◆	IDWR OBSERVATION WELLS

NOTES:

1. GROUND SURFACE AND GROUNDWATER CONTOUR ELEVATIONS ARE SHOWN IN FEET. METRIC CONVERSION IS 1 m = 3.281 ft.
2. MONITORING WELL GW-5 IS 14.7 m (48.2 ft) SOUTHEAST OF LAVA WELL 3.

SCALE
0 2 4 km

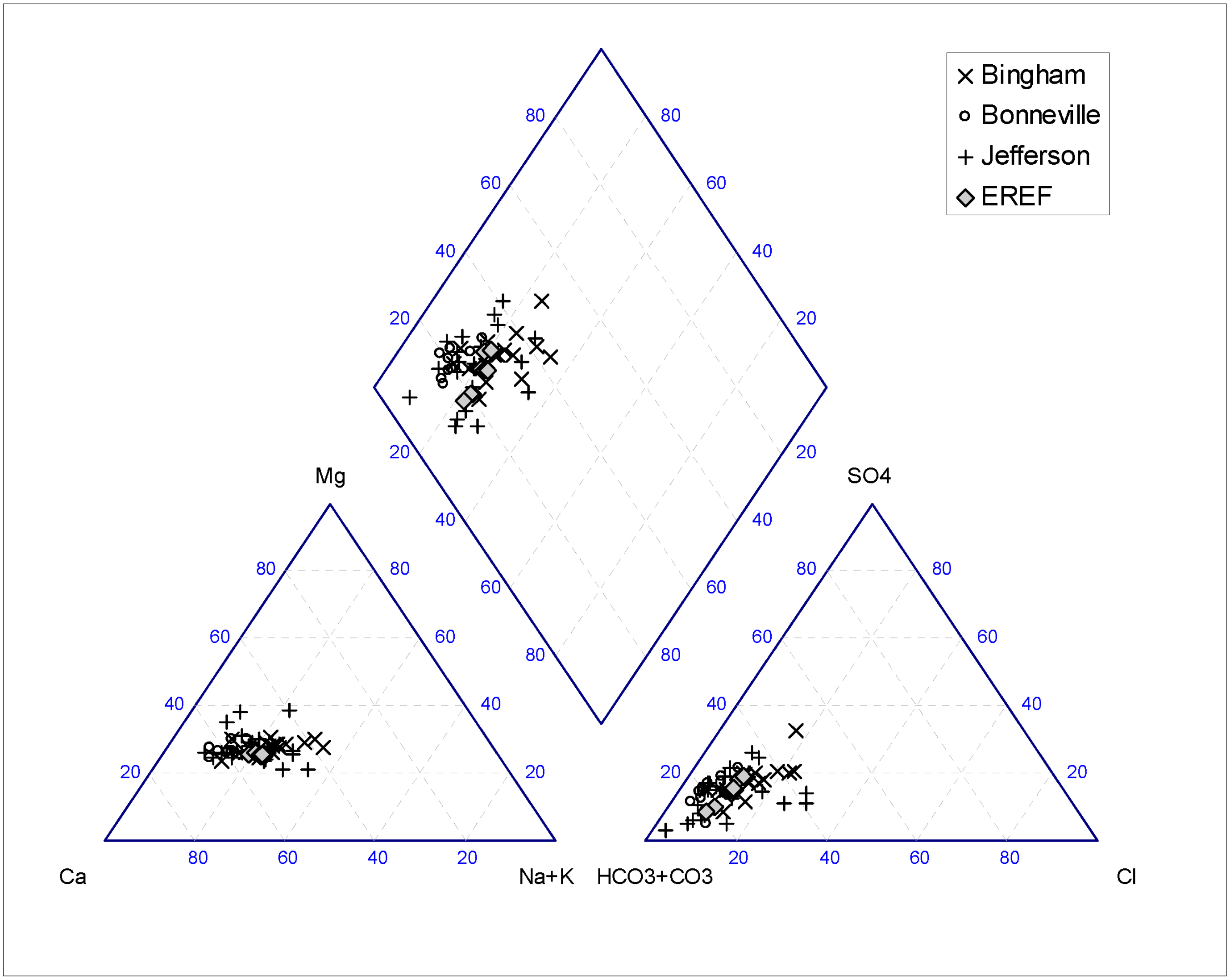
SCALE
0 1 2 mi

N

Figure 3.4-13 **Rev. 2**

Site Groundwater Potentiometric Surface Map

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



NOTE: DIAGRAM BASED ON DATA FROM WELLS IN BINGHAM, BONNEVILLE, AND JEFFERSON COUNTIES REPORTED BY WOOD (WOOD, 1988) AND SITE SPECIFIC DATA.

Figure 3.4-14 **Rev. 2**

Piper Diagram Showing Major Elemental Compositions of Groundwater in the ESRP Aquifer

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

3.5 ECOLOGICAL RESOURCES

This section describes the terrestrial communities of the proposed Eagle Rock Enrichment Facility (EREF) and provides a baseline characterization of the proposed site's ecology prior to any disturbances associated with construction or operation of the proposed plant. Prior environmental disturbances (e.g., roads) not associated with the proposed plant are considered when describing the baseline condition.

The proposed site is within the Intermountain Semi-Desert Province (Bailey, 1995). The primary natural community is sagebrush steppe. The plant and animal species associated with this major community are identified and their distributions are discussed. Those species that are considered important to the ecology of the proposed site are described in detail. Once the important species are identified, their interrelationship with the environment is described. These descriptions include discussions of the species' habitat requirements, life history, and population dynamics. As part of the evaluation of important species at the proposed site, pre-existing environmental conditions that may have impacted the ecological integrity of the proposed site are considered. Unless otherwise indicated, the information provided in this section is based on surveys conducted by AREVA.

3.5.1 Maps

Ecological field surveys at the proposed site were conducted in May 2008, June 2008, October 2008, January 2009, April 2009 and October 2010. Wildlife and vegetation transects were used to obtain information on vegetation cover, mammals, birds, reptiles, and amphibians occurring on the site. The locations of the transects and data collection points for the June 2008, October 2008 and October 2010 surveys are shown in Figure 3.5-1, June 2008, October 2008 and October 2010 Vegetation and Animal Survey Transect Locations and Habitat Map. Wildlife was surveyed along the wildlife survey transects in October 2010. The locations of the transects and data collection points for the January 2009 surveys are shown in Figure 3.5-2, January 2009 Animal Survey Transect Locations and Habitat Map. The locations of the transects and data collection points for the April 2009 surveys are shown in Figure 3.5-3, April 2009 Animal Survey Transect Locations and Habitat Map. The April 2010 sage grouse search points are shown in Figure 3.5-4, April 2010 Sage Grouse Survey Point Locations. Supplemental sage grouse lek searches were performed in April 2010.

3.5.2 General Ecological Conditions of the Site

Bonneville County is located in the eastern portion of the Snake River Plain geologic province. The Snake River Plain is a crescent shaped area of topographic depression that is bounded on three sides by mountain ranges and extends across much of the southern portion of Idaho, covering about 40,400 km^2 (15,600 mi^2). The geology of the Snake River Plain has experienced extensive volcanism that has deposited a thick sequence of rhyolitic and basaltic rocks, ranging up to 1,676 m (5,500 ft) thick. On-site soils are primarily of the Pancheri series. These soils consist of deep silt loams. On-site soils are common to areas used for crops, rangeland, and wildlife habitat. Refer to Section 3.3, Geology and Soils, for further discussion on the Snake River Plain.

The topography of the 1,700-ha (4,200-acre) proposed site has an average slope of about 1.4%. The elevation varies from about 1,556 m (5,106 ft) near U.S. Highway 20 to about 1,600 m (5,250 ft) in a small area at the eastern edge of the property. No major defined drainage features are evident on the proposed site. There is a minor drainage feature that runs from near the center of the proposed site toward the southwest portion of the site.

Soils in the Eastern Snake River Plain are variable, ranging from non-existent in areas of recent volcanism to tens of meters in thickness in areas of wind-blown loess derived from exposed lava flows, lacustrine deposits, and alluvial fill (Hughes, 1999) (Lindholm, 1996) (Whitehead, 1994a). The proposed site is located in an area dominated by Pancheri silt loams formed in loess covered lava plains (NRCS, 2008c). Pancheri silt loams are typically deep, well-drained soils although soil depths often vary depending upon the prevalence of basalt flows near the surface. Soil depth on the proposed site ranges from 30 cm to 6.6 m (6 in to 21.5 ft). The vegetation in this area is dominated by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*).

The sagebrush steppe vegetation community at the proposed site has been influenced by agricultural practices and grazing. The entire proposed site is grazed seasonally; and there is active irrigated farming on about 389 ha (962 acres), as well as approximately 882 ha (2,180 acres) that was dryland farmed as recently as four to five years ago. The sagebrush on portions of the proposed site has been cleared and the land seeded with perennial grasses to utilize as improved pasture for grazing. Existing vegetation on these areas is dominated by crested wheatgrass (*Agropyron cristatum*) and weedy annuals with limited sagebrush presence associated with basalt outcrops.

The composition of the wildlife community at the proposed site is dependent on habitat characteristics in and around the site. Based on initial field surveys of wildlife and with information on regional and local distribution of wildlife species and on species-specific habitat preferences, the wildlife species likely to occur at the proposed site can be identified. The mammals, birds, amphibians and reptiles known or expected to occur on the proposed site are discussed below.

Mammals typical of species that may occur in sagebrush habitats include: black-tailed jackrabbit (*Lepus californicus)*, mountain cottontail (*Sylvilagus nuttallii*), pygmy rabbit (*Brachylagus idahoensis*), Townsend's ground squirrel (*Spermophilus townsendii*), least chipmunk (*Eutamias minimus*), Ord's kangaroo rat (*Dipodomys ordii*), great basin pocket mouse (*Perognathus parvus*), western harvest mouse (*Reithrodontomys megalotis*), deer mouse *Peromyscus maniculatus*), badger (*Taxidea taxus*), coyote (*Canis latrans*), pronghorn (*Antilocapra americana*), and elk (*Cervus elaphus*) (Stoller, 2001). Refer to Table 3.5-1, Mammals Potentially Using the Proposed Eagle Rock Enrichment Facility Site, for a more complete list of mammals potentially using the proposed site. Table 3.5-1 also lists the general habitat requirements of each mammal species potentially occurring at the proposed site and its probable occurrence. The probable occurrence estimates are derived from knowledge of the species-specific habitat preferences and the current composition, structure, and extent of the vegetation communities at the proposed site. Vegetation in the sagebrush community is in an advanced seral stage. Therefore, changes are not anticipated in habitat or animal species. Similarly, the farmed areas are not expected to change. Vegetation on the 882 ha (2,180 acres) that has been dryland farmed is in a low seral stage with a substantial weed component. Seasonal grazing and limited rainfall will limit vegetation change in this area; therefore, changes in habitat or animal use will also be limited.

Field surveys to identify mammals at the proposed site were conducted in May 2008, June 2008, October 2008, January 2009, April 2009 and October 2010. Incidental observations were made during reconnaissance surveys in May 2008 and wildlife transects were walked in June 2008, October 2008, January 2009, April 2009 and October 2010. Small mammal capture and release was not conducted during the field survey.

Common game birds in the region include the mourning dove (*Zenaida macroura*) and greater sage grouse (*Centrocercus urophasianus*). Other birds common to the region include western meadowlark (*Sturnella neglecta)*, horned lark (*Eremophila alpestris*), kildeer (*Charadrius vociferous*), and the sage thrasher (*Oreoscoptes montanus*). Raptors include northern harrier (*Circus cyaneus*) and American kestrel (*Falco sparverius*) (Stoller, 2001). Table 3.5-2, Birds Potentially Using the Proposed Eagle Rock Enrichment Facility Site, lists the bird species that may occur on the proposed site along with their migratory and nesting status. All waterfowl and water birds have been excluded from this list due to the lack of suitable water-related habitat on the proposed site. The 62 species listed were identified as those likely to live in or visit the region. Of these, approximately 13 species are likely to be summer breeder residents, many of which may nest on the proposed site. These species are denoted with the letter "C" under the column "Summer Breeder" in Table 3.5-2. Approximately two of the species are probable winter residents of the proposed site. A site-specific avian survey was conducted on the proposed site in June 2008, October 2008, January 2009, and April 2009 using wildlife transects and point count techniques, and in October 2010 using wildlife transects.

Reptile species that may be present on the proposed site include the western rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis catenifer*), short-horned lizard (*Phrynosoma douglassi*), and sagebrush lizard (*Sceloporus graciosus*) (Stoller, 2001). Amphibians and reptiles (herptiles) potentially occurring on the proposed site are listed in Table 3.5-3, Amphibians/Reptiles Potentially Using the Proposed Eagle Rock Enrichment Facility Site. Table 3.5-3 also lists the general habitat requirements for each amphibian or reptile species potentially occurring at the proposed site as well its probable occurrence. Because the occurrence of amphibian species is closely related to water and the proposed site contains no permanent water, there are very few associated amphibian species.

3.5.3 Description of Important Wildlife and Plant Species

Based on information from the Idaho Department of Fish and Game (IDFG), the U.S. Fish and Wildlife Service (USFWS), and the Bureau of Land Management - Upper Snake Field Office (BLM), the proposed site is located within the known range of four sensitive species: greater sage grouse (*Centrocercus urophasianus*) (IDFG, 2005), ferruginous hawk (*Buteo regalis*) (IDFG, 2005), pygmy rabbit (*Brachylagus idahoensis*) (IDFG, 2005), and Ute ladies'-tresses (*Spiranthes diluvialis*) (IDFG, 2005). The greater sage grouse is listed as a BLM sensitive species (Type 2 Rangewide/Globally Imperiled Species) (IDFG, 2005). The USFWS began a 12-month review in February 2008 to determine if listing of the greater sage grouse is appropriate (USFWS, 2008e) (USFWS, 2008f). However, IDFG maintained a hunting season for the species in 2007 and 2008. In March 2010, the USFWS announced that listing of the greater sage grouse as an endangered species is warranted, but listing precluded by the need to complete other listing actions of higher priority (USFWS, 2010a). The nearest known breeding area or "lek" is located between 6.4 km and 8 km (4 mi and 5 mi) from the proposed site to the northwest. Field surveys of the proposed site in May 2008 and April 2010 did not locate any leks. Greater sage grouse use the sagebrush habitat on the proposed site and have been observed in large flocks moving west in the late fall. They likely use the proposed site throughout the year. The pygmy rabbit has been listed by the BLM as a species of concern and the USFWS initiated a status review in January 2008 to determine if the species should be listed as threatened or endangered. Field surveys of the proposed site in June 2008, October 2008, January 2009, April 2009 and October 2010 did not record the presence of any pygmy rabbits or signs of their presence. In Idaho, pygmy rabbits are listed as a species of concern. In September 2010, the USFWS announced that it had completed a status review of the pygmy rabbit and concluded that it does not warrant protection under the Endangered Species Act in Idaho and other western states (USFWS, 2010b).

The sensitive species that may be present on the proposed site are discussed below in detail based on their special status and potential proximity to the proposed site. Other species are selected for discussion based on their importance for recreation or commercial value. The remaining species listed in Tables 3.5-1 through 3.5-3 are considered less important in terms of protected status, recreation, or commercial value. A complete list of sensitive species that potentially occur in the area surrounding the proposed site is presented in Table 3.5-4, Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site.

GREATER SAGE GROUSE

Habitat Requirements. Greater sage grouse are closely allied with large, woody sagebrushes of western North America and depend on these for food and cover during all periods of the year. Due to greater sage grouse dependence on sagebrush habitats, they are considered a sagebrush obligate. Large, woody species of sagebrush, including big sagebrush (*Artemisia tridentata)*, silver sagebrush (*Artemisia cana*), and threetip sagebrush (*Artemisia tripartita*) are used by greater sage grouse throughout the year in all seasonal habitats. Other shrub species such as rabbitbrush, antelope bitterbrush, and horsebrush have also been used for nesting and hiding cover by greater sage grouse (ISGAC, 2006).

Summer habitats used by greater sage grouse include riparian and upland meadows and sagebrush grasslands. Greater sage grouse breeding habitats are sagebrush-dominated rangelands, typically consisting of large, relatively contiguous sagebrush stands, and are critical for survival of greater sage grouse populations. Greater sage grouse nesting habitat is often a broad area within or adjacent to winter range or between winter and summer range. Productive nesting habitat includes sagebrush with horizontal and vertical structural diversity. The understory of productive nesting habitat should be composed of native grasses and forbs that provide a food source of insects, concealment of the nest and hen, and herbaceous forage for pre-laying and nesting hens (ISGAC, 2006) (Connelly, 2004). Adult males weigh 1.8-3.6 kg (4-8 pounds) and adult females 0.9-1.8 kg (2-4 pounds) (ISGAC, 2006). Sagebrush is a primary food item for adults throughout the year. However, greater sage grouse food habits are complex and forbs and insects are consumed at certain times of year. Insects are a key component of greater sage grouse early brood-rearing habitat. A high protein diet of insects is necessary for all young upland game birds during the first month of life.

Life History. The greater sage grouse is North America’s largest grouse, and is long-lived for an upland game bird. During the spring (normally early March to mid-May), males gather on traditional breeding areas, called leks, for displaying and mating. Using elaborate plumage displays and inflatable air sacs that produce a loud “booming” sound, males attract females and protect their territory on the lek from other males (ISGAC, 2006). Females normally begin moving from winter to breeding areas from late February to early March, but actual lek attendance varies somewhat throughout the species range. After breeding, females move away from the lek to establish nests. In Idaho, hens nest an average of 3-5 km (2-3 mi) from their lek of capture but may move more than 18 km (11 mi) to nest (Connelly, 2004). The breeding and nesting season for greater sage grouse in Idaho extends from March 1 until July 15.

The greater sage grouse has one of the lowest reproductive rates of any North American game bird. Within 7 to 10 days after breeding, the hen builds a nest. The peak of egg-laying and incubation varies from late March through mid-June depending on weather, elevation, and plant phenology. Nest bowls may be scratched or dug immediately before the first egg is laid although relatively few specifics are known. In Idaho, clutch sizes for greater sage grouse average 6 to 7 eggs, relatively low for an upland game bird (ISGAC, 2006).

Population Dynamics. Three types of seasonal movement patterns have been described for greater sage grouse: (1) non-migratory; grouse do not make long distance movements (e.g., ≈10 km (6 mi) one way), (2) one-stage migratory; grouse move between two distinct seasonal ranges, and (3) two-stage migratory; grouse move among three distinct seasonal ranges (Connelly, 2004). Many greater sage grouse populations in Idaho are migratory. In the late summer and early fall, migratory greater sage grouse often congregate into flocks in preparation for movement to traditional wintering grounds. Migratory movements can be slow and meandering, or direct and rapid. Distances between seasonal use areas of migratory greater sage grouse have been reported to vary between 1 and 82 km (0.6 to 51 mi) although birds have moved up to 161 km (100 mi). These large movements result in highly variable home ranges that vary from 6 to 615 km^2 (2.3 to 237 mi^2). In some instances, migratory populations have been reported to use areas in excess of 2,700 km^2 (1042 mi^2). Despite large annual movements, greater sage grouse show high fidelity to seasonal ranges (Connelly, 2004).

Greater sage grouse have been monitored in Idaho since the 1950s, although in some areas, data are limited. Overall, from 1965-2003, Idaho's greater sage grouse population declined at an average rate of 1.5% per year (ISGAC, 2006). In general, Idaho greater sage grouse numbers reached a low in the mid 1990s but have increased since that time (Connelly, 2004). Additional research data for southeast Idaho suggested that bird recruitment was poor in 2006 and 2007 (Connelly, 2007). Greater sage grouse populations in the general region of the proposed site show a long-term population decline (based on lek counts); however, these declines seem to be reversing in the past several years (IDFG, 2007). Similarly, the quantity and quality of greater sage grouse habitat has been declining due to agriculture encroachment, sagebrush manipulation, loss of moist areas, livestock grazing, wildfires, and prescribed burns (IDFG, 2007).

PYGMY RABBIT

Habitat Requirements. The pygmy rabbit is a sagebrush-obligate species that inhabits areas characterized by cold winters, warm summers, and low precipitation at elevations ranging from 900-2,380 m (2,800-7,800 ft). Habitat is generally characterized by dense, tall stands of big sagebrush growing on deep, friable soils that allow the rabbits to dig often extensive burrow systems (Ulmschneider, 2004). Landscape features common to pygmy rabbit habitat include alluvial fans and hillsides, swales within rolling topography, floodplains, brushy draws, riparian channels, edges of rock and lava outcroppings, and mima mounds (low, circular mounds of loose, unstratified soils that support distinctly taller patches of sagebrush). Pygmy rabbits are not randomly distributed within the sagebrush landscape; they are systematically distributed, because they choose particular soils and sagebrush habitats. They do not appear to be abundant in many situations (Ulmschneider, 2004).

Big sagebrush is the primary food item of pygmy rabbits and may comprise up to 99% of their winter diet (Green, 1980). Native forbs and grasses comprise a large proportion of the diet (30-40%) in the summer months (Green, 1980). Under deep snow conditions, dense and structurally diverse stands of big sagebrush facilitate subnivean burrowing, providing access to forage and protection from predators and thermal extremes (Katzner, 1997).

Life History. Pygmy rabbits are the smallest rabbits in North America. They weigh between 246 to 462 g (9-16 oz), averaging 398 to 436 g (14-15 oz). They are 23.5 to 29.5 cm (9.3-11.2 in) long, with a tail length of 15 to 24 mm (0.6-0.9 in) and hind foot length of 67 to 76 mm (2.6–3.0 in). The fur color varies from brown to dark grey with white around the margins of their short, round ears. The ears and feet are densely covered in hair, and they have a very short tail. Rabbits, in general, show some sexual size dimorphism, in that females are 1 to 10% larger than males.

The pygmy rabbit is the only native leporid that digs burrows. Juveniles use burrows more than other age groups. Burrows are usually located on slopes at the base of sagebrush plants, and face north to east (Tesky, 1994a).

Population Dynamics. Mating systems in pygmy rabbits are largely unknown. The breeding season of pygmy rabbits is very short - in Idaho it lasts from March through May. Gestation lasts about 27-30 days (Green, 1980). An average of six young are born per litter, and a maximum of three litters are produced per year (Green, 1980). In Idaho, the third litter is generally produced in June (Tesky, 1994a). Unlike many lagomorphs, pygmy rabbits do not appear to be able to produce extra litters in response to favorable environmental conditions (WDFW, 1995).

PRONGHORN

Habitat Requirements. Pronghorn are found from sea level in Mexico to alpine meadows reaching 3,353 m (11,000 ft) elevation in Oregon and Wyoming. Greatest densities in the Great Basin occur between 1,220-1,830 m (4,000 to 6,000 ft) elevation. Reaching top speeds of 80 km/hr (50 mph), pronghorn are North America's fastest mammal. Pronghorn rely on keen eyesight, vigilant watch, and rapid flight to avoid predation. Pronghorn, therefore, require open cover, either grassland or grassland interspersed with low shrubs, which provides long-range visibility. Pronghorn typically occupy areas where vegetation is at a mean height of 37.5 cm (15 in), even if more suitable forage is available on sites with taller vegetation (Howard, 1995). Pronghorn primarily occur in grasslands and open shrub-grasslands and typically inhabit low, rolling, expansive lands with less than 30 percent slope.

Foods utilized by pronghorn vary seasonally depending upon availability, palatability, and succulence of vegetation. Over a year's time, pronghorn consume nearly all available plant species, with a preference for succulent forage. Forbs are preferentially selected when available. Pronghorn select the most succulent, high-protein browse or grasses available when forbs are scarce. In winter, shrubs are high in protein relative to other forage, and shrubs comprise the majority of the pronghorn diet (Howard, 1995).

Life History. The pronghorn's upper body and legs are tan to brown in color. The lower body, including the cheeks, chest, belly, and rump, are all lighter brown to white. This two-toned coloring is interrupted with a broad, black band down the snout, a black nose, and black neck patch. Pronghorn are the only species to annually shed their horn sheath and are also the only animal to have a forked horn design. Horns of the males are 30-48 cm (12-18 in) in length; the female's horns are much smaller, usually no longer than 15-18 cm (6-8 in). Shortly after mating season, the pronghorn sheds its horns and only the permanent core remains. Male pronghorns are slightly larger than the female species. Pronghorns usually stand about 1 m (3 ft) high at the shoulder and average between 1.0-1.5 m (3-5 ft) long (IDFG, 2008).

The pronghorn inhabits open plains and semi-deserts, living alone or in small bands in summer and forming large herds in winter. Being highly mobile, the pronghorn may cover a large area during the year. Pronghorns successfully survive both bitter cold temperatures and desert heat of up to 54 °C (130 °F). Because of their ability to adapt to various temperatures, pronghorn are abundant throughout various areas of the West and Southwest (IDFG, 2008).

Population Dynamics. Pronghorn breed from late summer to fall; rutting season lasts for 2 to 3 weeks. During this time, male pronghorns gather a harem of about 3 or 4 does. Females are pregnant for about 250 days. Fawning occurs from May to June; does deliver a single fawn at first birth and twins thereafter. Fawns are born weighing about 2.7 to 4.5 kg (6 to10 lb). At birth, fawns lack the spots that are characteristic of deer and elk fawns. Fawns walk within hours of birth but are generally inactive for the first few days of life; they run by their fifth day. Fawns under 3 weeks of age spend up to 90% of their time lying in seclusion; newborns are generally active only for a brief period when their mothers return to the fawning grounds to nurse them. Fawns graze by 3 weeks of age and are completely weaned by fall (IDFG, 2008) (Howard, 1995).

Pronghorn movement is usually in response to changing environmental conditions such as drought, blizzards, or new food sources. Some cold-climate populations migrate from one seasonal-use area to another, using the same routes each year. Migrating populations may travel up to 320 km (200 mi) or more to leave areas of deep snow. Pronghorn seldom live more than 9 years in the wild, but a few wild does have been aged at 16 years (Howard, 1995).

FERRUGINOUS HAWK

Habitat Requirements. Ferruginous hawks inhabit semi-arid to arid western plains and intermountain regions. They are typically found in open country with scattered trees, primarily prairies, plains, and badlands. The ferruginous hawk requires large tracts of relatively undisturbed areas (Clark, 1987). The conversion of extensive tracts of native vegetation into monotypic stands for grazing and agriculture may reduce ferruginous hawk densities and reproductive success. The ferruginous hawk nesting habitat consists of communities with isolated trees, woodland edges, buttes, cliffs, and/or grassland with some relief. The majority of ferruginous hawks will preferentially construct their nests in trees. However, these hawks will use a wide variety of sites for nesting, including riverbed mounds, cut-banks, small hills, and small cliffs (Tesky, 1994b).

The ferruginous hawk generally forages in open habitats with short vegetation containing abundant prey. Food suitability for the ferruginous hawk is optimum when the vegetation occurs at a mix of heights and densities which optimizes prey abundance and minimizes hunting interference. The ferruginous hawk hunts mainly in early morning and late afternoon from low flights and perches (Clark, 1989). The ferruginous hawk feeds primarily on rabbits, ground squirrels, and prairie dogs but also takes mice, rats, gophers, birds, snakes, locusts, and crickets.

Life History. Ferruginous hawks are usually between 50-66 cm (20-26 in) in length, have an average wingspan of 134-152 cm (53-60 in) and weigh 980-2,030 g (2.2-4.5 lb). They are the largest hawks in North America, and are sexually dimorphic. The female hawk may be up to one-and-a half times larger than the male. Adults have a rusty color on their back and shoulders, which extends downward onto the legs (Rogers, 2002).

Ferruginous hawks commonly hunt by flying low to the ground over open fields at high speeds, soaring high above, hovering, or swooping down from perches. Hawks use their excellent eyesight to spot prey on the ground and then attack with talons (Rogers, 2002). When courting, ferruginous hawks will soar with wings held arched above their backs. The male then darts at the female, their talons clasp and the pair display an aerial cartwheel. A pair of hawks mate for life (Rogers, 2002).

Population Dynamics. The ferruginous hawk is an obligate grassland or desert-shrub nester (Tesky, 1994b). The ferruginous hawk generally returns to breeding grounds in late March or early April and begin nest construction in April (Clark, 1989). Breeding pairs aggressively defend their nesting territory. Nests are frequently reused by the same pair in subsequent years. The ferruginous hawk generally lays three to four eggs in April, but this number varies with fluctuating food supply. The eggs are incubated for 28 to 36 days (Clark, 1989). Male nestlings fledge at 38 to 40 days. The females, which are heavier and develop more slowly, fledge about 10 days later.

PLANT SPECIES

The vegetation community at the proposed site provides habitat for wildlife. Certain plant species that are better adapted to soil and climatic conditions of a given area occur at higher frequencies and define the vegetation community. The vegetation community that occupies the proposed site is generally classified as sagebrush steppe. The dominant shrub species associated with the sagebrush steppe community at the proposed site is Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*), with a lesser amount of dwarf goldenbush (*Ericameria nana*). The dominant perennial grass species at the proposed site is Sandberg bluegrass (*Poa secunda*). Significant amounts of cheatgrass (*Bromus tectorum*), foxtail barley *(Hordeum jubatum)* and crested wheatgrass (*Agropyron cristatum*) are also present. Numerous other herbaceous species are present in low densities. Table 3.5-5, Vegetation on the Proposed Eagle Rock Enrichment Facility Site, presents a list of plant species observed on the proposed site. The sagebrush-grass habitat provides nest, foraging, escape, and loafing cover for birds and small mammals. Similarly, this habitat provides foraging, escape, and loafing cover for big game, including pronghorn and elk. The relict sagebrush habitat from previous dryland farming and conversion to seeded pasture provides only limited foraging habitat for some songbirds and small mammals. Utes ladies'-tresses is the only sensitive plant that may be present on the proposed site and is discussed in detail based on its special status and potential proximity to the proposed site. The other specie discussed, Wyoming big sagebrush, was selected based on its importance as wildlife habitat and for ecosystem function and recreation values.

UTE LADIES'-TRESSES

Species Description. The Ute ladies'-tresses orchid is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 60 cm (5 to 24 in) tall arising from tuberous-thickened roots. Its narrow leaves are about 28 cm (11 in) long at the base of the stem and become reduced in size going up the stem. This species flowers from late July to September. Plants do not flower every year and portions of a population remain dormant below ground each year. The flowers consist of small white to ivory colored flowers clustered into a 3 to 15 cm spike arrangement at the top of the stem. Whitish, stout, spirally arranged flowers characterize the species.

Habitat. When the Ute ladies'-tresses orchid was federally listed in 1992, it was known primarily from moist meadows associated with perennial stream terraces, floodplains, and oxbows at elevations between 1,310-2,090 m (4,300-6,850 ft) (USFWS, 1992) (Fertig, 2005). Most sites were reported from openings where vegetation cover was not overly dense or heavily grazed (USFWS, 1992). The Ute ladies'-tresses orchid is currently known to occur in western Nebraska, southeastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central Idaho, southwestern Montana, and north-central Washington. The global population of Ute ladies'-tresses, based on survey and monitoring studies, may be over 83,000 individuals. Surveys since 1992 have expanded the number of vegetation and hydrology types occupied by Ute ladies'-tresses to include seasonally flooded river terraces, sub-irrigated or spring-fed abandoned stream channels and valleys, and lakeshores. In addition, 26 populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human modified wetlands (Fertig, 2005).

Life History. Ute ladies'-tresses occurs primarily in areas where the vegetation is relatively open and not overly dense or overgrown and seems to require "permanent sub-irrigation," indicating a close affinity with floodplain areas where the water table is near the surface throughout the growing season and into the late summer or early autumn (USFWS, 1995). This plant typically blooms from late July through August, and in some cases through September. Blooms have been recorded in early July and in early October. The Ute ladies'-tresses' flower is required for identification. Reproduction is strictly sexual. Reproductively mature plants do not flower every year. These plants may take 5-10 years to reach reproductive maturity.

WYOMING BIG SAGEBRUSH

Species Description. Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*) is a native perennial shrub. Wyoming big sagebrush is the most xeric subspecies of big sagebrush. It generally occurs on shallow soil in areas receiving 200 to 300 mm (7.9 to 11.8 in) of annual precipitation (Cronquist, 1994) (Monsen, 2000). Wyoming big sagebrush plants exhibit a ragged, irregular growth form, and most plants grow to less than 1 meter (3.28 ft) in height. The main stem is often branched at or near ground level. Persistent leaves are narrowly cuneate to cuneate with the margins curved outward, and exhibit a strong, pungent odor when crushed. Wyoming big sagebrush is technically an evergreen but is semi-deciduous in habit. It develops 2 types of leaves: large ephemeral leaves and smaller, perennial leaves produced from ephemeral leaf axes. The inflorescence is an open, many-flowered spike. The fruit is a small, easily shattered cypsela. The plants flower from late July to September, and seed maturation occurs in October and November (Monsen, 2000).

Wyoming big sagebrush is the preferred browse for wild ungulates, and Wyoming big sagebrush communities are important winter ranges for big game (Howard, 1995). Pronghorn usually browse Wyoming big sagebrush heavily (Howard, 1999). Sagebrush also provides cover (nesting, resting, and escape) for a wide variety of game and non-game species.

Habitat. Of the three subspecies, Wyoming big sagebrush is most adapted to poor, infertile sites. Wyoming big sagebrush is intolerant of alkaline soils. In Idaho, it typically grows on dry, gravelly, shallow sites ranging from 700-1,980 m (2,500 to 6,500 ft) (Howard, 1999). Wyoming big sagebrush is most common on foothills, undulating terraces, slopes, and plateaus, but also occurs in basins and valley bottoms. Aspect varies, but shrubs are most common on south- to west-facing slopes.

Life History. Wyoming big sagebrush reproduces from seed; it does not sprout or layer (Howard, 1999). Twig elongation for Wyoming big sagebrush begins in mid-April and lasts until late June. Flowers of this species appear in late August, but flower bud development can last from mid-June until early September (Whitson, 2006). Wyoming big sagebrush forms and sheds seeds between October and December (Whitson, 2006). Seeds remain viable in the soil for one year (Whitson, 2006). Seeds may be transported by wind, water, or animals, but most seeds typically remain near parent plants.

3.5.4 Rare, Threatened or Endangered Species Known or Potentially Occuring in the Project Area

Based on field surveys and contacts with state and federal agency personnel, no currently listed rare, threatened, or endangered species have been found or are known to occur on the proposed site. However, USFWS initiated a status review in January 2008 for the pygmy rabbit (USFWS, 2008d) and in February 2008 for the greater sage grouse (USFWS, 2008e) (USFWS, 2008f) to determine if listing of either species is warranted. In March 2010, the USFWS announced that listing of the greater sage grouse as an endangered species is warranted, but listing precluded by higher listing priorities (USFWS, 2010a). In September 2010, the USFWS announced that it had completed a status review of the pygmy rabbit and concluded that it does not warrant protection under the Endangered Species Act in Idaho and other western states (USFWS, 2010b). Life history and habitat requirements for both species are discussed in Section 3.5.3, Description of Important Wildlife and Plant Species.

Habitat is present on the proposed site for pygmy rabbits but is isolated to the western portion of the proposed site. However, no sign (e.g., pellets, burrows) of pygmy rabbits were observed during field surveys of the proposed site in June 2008, October 2008, January 2009, April 2009 and October 2010. Pygmy rabbits have been found during surveys conducted by BLM in 2005 and 2006 on BLM lands (Crooked Creek and Medicine Creek) north of Market and Mudd lakes. No surveys have been conducted on BLM lands near the proposed site. Similarly, pygmy rabbits have also been found on the INL property during winter surveys conducted by DOE in 2006 and 2007. These surveys were conducted on the INL property at two locations within 3.2 km (2 mi) of the proposed site and at seven other locations within 8 km (5 mi) of the proposed site.

Habitat is present on the proposed site for greater sage grouse. Habitat is primarily isolated to the western portion of the proposed site. No birds were observed or heard during June 2-7, 2008 field surveys on the proposed site. However, greater sage grouse sign (e.g., feathers, and pellets) were observed during the June field surveys. One bird was observed about 1.6 km (1 mi) north of the proposed site and two birds were heard some distance from the proposed site during road point counts in May 2008. There are several leks within 16 km (10 mi) of the proposed site. No sign or sightings of greater sage grouse were observed during the October 2008 field surveys.

During the January 2009 field surveys, several sets of sage grouse tracks were found in a small portion of the sagebrush community in the northwest portion of the site, in a location where sage grouse activity was previously documented during summer surveys. In addition, a single set of sage grouse tracks was found in the irrigated crop portion of the site, far from any standing vegetation.

During the April 2009 field surveys, three areas containing grouse feathers were found along the northern border of the property with adjacent BLM land to the immediate north. One of these feather sets contained wing primaries, perhaps indicative of a raptor kill. No scat could be found in the vicinity of the feathers, and no other indications of sage grouse was found on the site during this spring survey.

During the April 2010 field surveys, old sage grouse pellets were found at three search point locations along or near the northern border of the property. However, no birds were heard or observed, and no other indications of sage grouse were found on the site during this spring survey.

During the October 2010 field surveys, many old sage grouse pellets and cecal casts were found, and a single sage grouse hen was observed at the north end of the proposed site. In addition, a clocker (i.e., grouse will hold their bowel movements while on the nest and then release “clockers” near the nest location) was found at the north end of the property, but no nest was observed.

3.5.5 Major Vegetarian Characteristics

The general vegetation community that the proposed site is located in is classified as sagebrush steppe. However, present and historic land use at the site has also modified portions of this general vegetation community. As such, vegetation at the site has been stratified into three classes, which better represent current vegetation as influenced by recent and ongoing land uses. These three classes are: sagebrush, non-irrigated seeded pasture, and agriculture (center-pivot irrigation). As the agricultural land use class represents a complete modification of native vegetation, it will not be described further.

Cover data from the proposed site was collected during field studies on June 3-6, 2008. A total of 34 species were observed in cover transects in the sagebrush community, while 17 species were observed in sampling the non-irrigated seeded pasture. Species present in all cover transects consisted of the following life forms: 24 forb species, 8 grass species, 5 shrub species, and one species of cactus. See Figure 3.5-1, Vegetation Types and Survey Locations, for location of the transects and Table 3.5-6, Vegetation Cover on the Proposed Eagle Rock Enrichment Facility Site—Rangeland Type, and Table 3.5-7, Vegetation Cover on the Proposed Eagle Rock Enrichment Facility Site—Non-Irrigated Seeded Pasture Type, for a summary of the plant cover data. Shrub density data from the proposed site was collected during field studies on October 21 to 23, 2008. See Figure 3.5-1, Vegetation Types and Survey Locations, for location of the transects.

3.5.5.1 Sagebrush Community

The sagebrush community of the proposed site is characterized by the presence of significant amounts of the indicator species Wyoming big sagebrush (16% cover) and dwarf goldenbush (*Ericameria nana*) (17% cover) (Table 3.5-6). The community is further characterized by the presence of forbs, shrubs, and grasses that are adapted to the soils of the sagebrush steppe in southeastern Idaho. The sagebrush community type is typical for the region and the species encountered during the on-site survey are highly ubiquitous. The natural vegetation of the region typically consists of an overstory of shrubs and an understory of grasses and forbs. Wyoming big sagebrush and dwarf goldenbush are two of the most common shrubs but more than forty other species of shrubs have been recorded on adjacent lands. Perennial and annual grasses and forbs found on the site commonly occur in sagebrush dominated communities in the region (Anderson, 1996a).

Total vegetation cover represents the percentage of ground that has vegetation above it, as opposed to bare ground, rock, or litter. The total plant cover, excluding moss, for the undisturbed sagebrush type at the proposed site is approximately 60%. Grasses contribute approximately 20% ground cover and shrubs contribute approximately 34% ground cover. Forbs contribute approximately 6% cover.

The largest contributor to vegetation cover was dwarf goldenbush with approximately 17% cover, followed by Wyoming big sagebrush with approximately 16% cover. The next two largest contributors were Sandberg bluegrass (*Poa secunda*) with approximately 11% cover and cheatgrass (*Bromus tectorum*) with approximately 4% cover.

Relative cover is the fraction of total vegetation cover that is composed of a certain species or category of plants. Perennial grasses accounted for 33% of the relative cover, forbs accounted for 10% of the relative cover, and shrubs accounted for 57% of the relative cover.

Density board measurements were conducted to estimate the vertical cover and vegetation structure as an index of wildlife cover or concealment. Field survey results indicated that wildlife cover in the sagebrush community decreased with increasing height. Maximum wildlife cover ranged from 91% at a height range of 0-0.1 m (0 – 3.9 in) to 3% at a height range of 0.7-0.8 m (27.5 – 31.5 in). The average maximum vegetation height in the sagebrush community was approximately 43 cm (17 in), with a standard deviation of 8.8 cm (3.5 in). Average shrub density in the sagebrush community including both size classes, is approximately 7,430 shrubs/ha (3,007 shrubs/ac). Wyoming big sagebrush is the tallest and largest shrub in this community and densities of this species are approximately 6,900 shrubs/ha (2,792 shrubs/ac) for the ≥40-cm size class, and 6,000 shrubs/ha (2,428 shrubs/acre) for the <40-cm size class. Dwarf goldenbush does not attain the stature of height of big sagebrush, and its growth habit is often classified as subshrub (a low-growing shrub usually under 0.5 m (1.5 feet) tall, never exceeding 1 meter (3 feet) tall at maturity) (USDA, 2008b). Dwarf goldenbush occurs at a relatively high density as a subshrub in this community, with a density of approximately 16,600 shrubs/ha (6,718 shrubs/ac) for the <40-cm size class. It does not often achieve a height of ≥40-cm in this community, and occurs at an approximate density of 300 shrubs/ha (121 shrubs/ac) for this class size.

3.5.5.2 Non-Irrigated Seeded Pasture Community

The non-irrigated seeded pasture community of the proposed site is characterized by the presence of significant amounts of the indicator species crested wheatgrass (34% cover) and cheatgrass (12% cover). The community is further characterized by the presence of forbs, shrubs, and other grasses that have colonized these mechanically disturbed sites. See Table 3.5-7, Vegetative Cover on the Proposed Eagle Rock Enrichment Facility Site – Non-irrigated Seeded Pasture Type, for a summary of the plant cover data.

The total plant cover for the non-irrigated seeded pasture community at the proposed site was approximately 55%. Grasses dominated this community and contributed approximately 47.5% ground cover. Shrubs contributed approximately 0.5% ground cover, and forbs contributed approximately 7% cover. The largest contributor to vegetation cover was crested wheatgrass with approximately 34% cover, followed by cheatgrass with approximately 12% cover. The next two largest contributors were bur buttercup (*Ranunculus testiculatus*) with approximately 5% cover and Sandberg bluegrass with approximately 2% cover.

Three shrub species were recorded on the non-irrigated seeded pasture community transects. Shrubs comprised only trace amounts of the total vegetation cover. Wyoming big sagebrush, rubber rabbitbrush (*Chrysothamnus nauseosa*), and dwarf goldenbush were all recorded in this community, each representing less than 0.5% cover.

With respect to relative cover, perennial grasses account for 87% of the relative cover, forbs accounted for 12% of the relative cover, and shrubs accounted for 1% of the relative cover.

Density board measurements were also conducted in the non-irrigated seeded pasture to estimate the vertical cover and vegetation structure as an index of wildlife cover or concealment. Field survey results indicate that wildlife cover in the non-irrigated seeded pasture community was very low above 0.2 m (8 in). Maximum wildlife cover ranged from 64% at a height range of 0-0.1 m (0–3.9 in) to 1% at a height range of 0.2-0.3 m (8–12 in). The average maximum vegetation height in the non-irrigated seeded pasture community was approximately 16.5 cm (6.5 in), with a standard deviation of 1.5 cm (0.6 in). While dominated by seeded and invasive grasses, small, isolated sections of the non-irrigated seeded pasture community have a shrub overstory. These areas occur in several locations where outcrops of basalt precluded full mechanical type conversion of this community from shrubland to grassland. Although these shrub-dominated outcrops are not representative of the grassland matrix in which they are found, targeted sampling of three outcrops was conducted in order to compare the shrub densities of these small relict sagebrush stands with those of the adjacent sagebrush community. Average shrub density on the outcrops found in the seeded crested wheatgrass community, including both size classes, is approximately 1,310 shrubs/ha (526 shrubs/ac). Densities of Wyoming big sagebrush are approximately 2,100 shrubs/ha (850 shrubs/ac) for the ≥40-cm size class, and 1,800 shrubs/ha (728 shrubs/ac) for the <40-cm size class. Densities of dwarf goldenbush are approximately 100 shrubs/ha (40 shrubs/ac) for the ≥40-cm size, and 2,100 shrubs/ha (850 shrubs/ac) for the ≥40-cm size class. Densities of rubber rabbitbrush are approximately 500 shrubs/ha (243 shrubs/ac) for the ≥40-cm size class, and 1,100 shrubs/ha (445 shrubs/ac) for the <40-cm size class.

3.5.6 Wildlife Occurrence and Site Use

The importance of the habitat found on the proposed site for threatened, endangered, and other important species relative to the habitat of those species throughout their entire range is rather low. Most of these species have limited habitat on the proposed site, the habitats have been extensively grazed or converted to agriculture and habitats present on the proposed site are not rare or uncommon in the general area.

A field survey conducted in June 2008 revealed that the sagebrush community supports a diversity of bird and mammal species (Table 3.5-8a, Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site-Rangeland Area). During field reconnaissance in May 2008, several mobile mammal species were observed including a small herd of pronghorn, individual white-tailed deer, and numerous black-tailed jackrabbits. Pronghorn and black-tailed jackrabbits were observed incidentally during field surveys in June 2008. The most common species encountered in the sagebrush community during avian transect surveys in June 2008 included the horned lark (49.1% of the total number of birds observed), Brewer's sparrow (*Spizella breweri*) (15.4% of the total number of birds observed), and western meadowlark (13.6% of the total number of birds observed). Other birds commonly encountered included the sage thrasher, vesper sparrow (*Pooecetes gramineus*), mourning dove (*Zenaida macroura*), and northern harrier. A total of 17 bird species were positively identified in the sagebrush community in June 2008. The only commonly observed bird species encountered in the sagebrush community during the October 2008 surveys was the horned lark (79.9% of the total number of birds observed). A total of 7 bird species were positively identified in this community during the fall survey. A total of 5 bird species (or their sign) were positively identified in the sagebrush community during the January 2009 survey. These species include the northern harrier, red-tailed hawk, horned lark, American crow, and greater sage grouse. During the January 2009 surveys, several sets of sage grouse tracks were found in a small portion of the sagebrush community in the northwest portion of the site, in a location where sage grouse activity was previously documented during summer surveys. A total of 10 bird species were positively identified in the sagebrush community during the April 2009 survey. The most common bird species encountered in the sagebrush community during the April 2009 surveys were the horned lark and western meadowlark. Other bird species encountered include the Brewer's sparrow, sage sparrow, and sage thrasher. Raptors encountered during this survey include the red-tailed hawk and prairie falcon. Greater sage grouse feathers were found in three discrete locations along the northern edge of the property in the sagebrush habitat. No scat was found, however, and no birds were either seen or heard during the survey period. During the April 2010 field surveys, old sage grouse pellets were found at three search point locations within the sagebrush community along or near the northern border of the property. However, no birds were heard or observed, and no other indications of sage grouse were found on the site during this spring survey.

During the October 2010 surveys, sage grouse pellets, many old, and cecal casts were found at the north end of the proposed site. A clocker and a single sage grouse hen were observed along the northernmost transient; however, no nest was found. Other birds identified in the sagebrush community during the October 2010 surveys were the horned lark and northern harrier.

The most common species encountered in the non-irrigated seeded pasture community during the June 2008 avian transect surveys include the horned lark (68.2% of the total number of birds observed), Brewer's sparrow (12.9% of the total number of birds observed), and western meadowlark (9.4% of the total number of birds observed) (Table 3.5-8b, Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site-Non-Irrigated Seeded

Pasture Area). The only other bird species commonly encountered was the vesper sparrow. A total of 9 bird species were positively identified in the non-irrigated seeded pasture community in June 2008. The only commonly observed bird species encountered in the non-irrigated seeded pasture community during the October 2008 surveys was the horned lark (74.4% of the total number of birds observed). A total of 5 bird species were positively identified in this community during the fall survey. During the January 2009 surveys, cattle were concentrated on the non-irrigated seeded pasture portion of the site and were fed via tractor on most mornings. As such, this area was avoided during winter surveys, as wildlife occurrence would be reduced by the livestock occupation and associated feeding activities. A total of 5 bird species were positively identified in the seeded crested wheatgrass vegetation type during the April 2009 surveys. The most common bird species encountered was the horned lark. Western meadowlarks, Brewer's sparrows, an American crow, and a black-billed magpie were also observed. Within the non-irrigated seeded pasture community during the October 2010 surveys, about ten horned larks were seen flying overhead.

The most common species encountered in the agriculture (center-pivot) community during June 2008 avian point-count surveys include the horned lark (54.8% of the total number of birds observed), meadowlark (12.9% of the total number of birds observed), northern harrier (12.9% of the total number of birds observed), and long-billed curlew (*Numenius americanus*) (12.9% of the total number of birds observed) (Table 3.5-8c, Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site-Crop Area). The only other bird species encountered was the mourning dove. A total of 5 bird species were positively identified in the non-irrigated seeded pasture community in the June 2008 survey. The only commonly observed bird species encountered in the agriculture community during the October 2008 surveys was the horned lark (82% of the total number of birds observed). A total of 5 bird species were positively identified in this community during the fall survey. A total of 3 bird species (or their sign) were positively identified in the irrigated crop vegetation type during the January 2009 surveys. These species include the horned lark, American crow, and greater sage grouse. During the January 2009 surveys, a single set of sage grouse tracks was found in the irrigated crop portion of the site, far from any standing vegetation. A total of 5 bird species were positively identified in the irrigated crop vegetation type during the April 2009 surveys. Species observed included the horned lark, western meadowlark, Brewer's sparrow, sage sparrow, and American crow. During the April 2010 field surveys, one of the three search point locations where old sage grouse pellets were found was near irrigated cropland.

Mammalian species encountered via direct observation, sign, or vocalization on the site included coyote, pronghorn, badger, weasel, elk, cottontail rabbit, black-tailed jackrabbit, white-tailed deer (*Odocoileus virginianus*), Least chipmunk *(Tamias minimus)*, Townsend's ground squirrel (*Spermophilus townsendii)* and deer mouse *(Peromyscus maniculatus)*.

3.5.7 Location of Important Travel Corridors

The proposed site is within BLM-designated crucial winter-spring range of pronghorn. Pronghorn use the area through the spring and then move to summer range. Elk, white-tailed deer, and mule deer are known to be incidental visitors to the area. Elk have been observed by the current landowner in late fall and winter. Two deer were observed just north of the proposed site in May 2008.

Field surveys conducted on the site in May 2008, June 2008, October 2008, January 2009, April 2009 and October 2010 identified a limited number of migratory bird species present on the proposed site. The closest migratory bird route is located on the INL property approximately 24-32 km (15-20 mi) west of the site (Stoller, 2007). Studies conducted on the INL property indicate that migratory bird populations have increased along the Tractor Flats Route along the eastern portion of the sagebrush steppe. Although migratory birds utilize the property on a limited basis, the site has not been identified as an important travel corridor for migratory bird species.

The proposed site also provides limited habitat for the greater sage grouse. Field surveys for the greater sage grouse that were conducted in May 2008, June 2008, January 2009, April 2009 and October 2010 indicated that the species may use the northwestern portion of the proposed site for roosting. However, no signs were found during the April 2010 surveys to indicate that the western and northern portions of the EREF property are being used by sage grouse for nesting. In addition, no greater sage grouse were identified on the property during the May 2008, June 2008, October 2008, January 2009, April 2009, and April 2010 field surveys, and, although sage grouse was observed during the October 2010 field surveys, no nest was found. Furthermore, even though the site has sagebrush densities that meet the requirements for greater sage grouse habitat, the site has not been identified as an important travel corridor for this species.

3.5.8 Important Ecological Systems

The proposed site contains fair to poor quality wildlife habitat. The sagebrush steppe vegetation community is an important ecological system in the region. On the proposed site and throughout the region, this community has been impacted by past land use practices. While it is susceptible to change, it is not especially vulnerable compared to other ecosystem types. General threats include conversion to other land uses and wildfire (ISGAC, 2006).

As discussed in Section 3.5.4, about one-third of the proposed EREF site is sagebrush steppe vegetation, while the remaining area is in crop land and seeded crested wheatgrass.

The proposed EREF site does not contain any breeding, nursery, feeding, or resting areas for any sensitive, rare, or protected species. The proposed site is within a general area considered crucial winter-spring pronghorn habitat by the BLM. While pronghorn use the site, pronghorn are not known to concentrate on the limited sagebrush steppe vegetation found on the proposed site.

Field observations indicate that greater sage grouse do use the sagebrush community on the proposed site as roosting habitat, but no leks were found on the site or known to exist on the site. The nearest known greater sage grouse lek is between 6.4 and 8 km (4 and 5 mi) to the northwest of the proposed site on Idaho National Laboratory (INL) land. There are no reported observations of ferruginous hawks or pygmy rabbits occupying the proposed site.

3.5.9 Characterization of the Aquatic Environment

The proposed site contains no aquatic habitat. There are no features on the proposed site that support aquatic life, including rare, threatened, or endangered aquatic species. There are no intermittent or perennial waterbodies or jurisdictional wetlands on the proposed site. There is no hydrological/chemical monitoring station on site, and no data have been recorded in the past.

3.5.10 Location and Value of Commercial and Sport Fisheries

Due to the lack of aquatic habitat (no surface water), there are no commercial and/or sport fisheries located on the proposed site or in the local area. The closest fishery, the Snake River, is approximately 32 km (20 mi) east of the proposed site.

3.5.11 Key Aquatic Organism Indicators

Due to the lack of aquatic habitat on the proposed property, there are no key aquatic indicator species that would be used to gauge changes in the distribution and abundance of populations particularly vulnerable to impacts from the proposed action.

3.5.12 Important Aquatic Ecological Systems

There are no important aquatic ecological systems on the proposed site or in the local area that are especially vulnerable to change or that contain important species habitats, such as breeding areas, nursery areas, feeding areas, or other areas of seasonably high concentrations of individuals of important species.

3.5.13 Description of Conditions Indicative of Stress

Pre-existing environmental stresses on the plant and animal communities at the proposed site consist of road right-of-ways, agriculture, and grazing. The roads through the proposed site are dirt roads, limited to a main road into the site that is graded and a few un-maintained two-track roads scattered throughout the site that are used on a minimal basis. The disturbed areas immediately adjacent to the roads are being invaded by weedy species comprised mostly of cheatgrass. This pattern is expected to continue as long as the road is maintained.

The proposed site has intermittent stands of sagebrush indicative of grazing, agricultural use, and other environmental stressors. Areas that were dryland farmed have either been abandoned or seeded to crested wheatgrass, and portions of the sagebrush community have been treated to remove sagebrush and seeded to crested wheatgrass as improved pasture for grazing.

Other periodic environmental stresses are changes in local climatic and precipitation patterns. The proposed site is located in an area of southeastern Idaho that experiences shifts in precipitation amounts that can affect plant community diversity and production on a short-term seasonal basis and also on a long-term basis that may extend for several years. For these reasons, grazing, agricultural use, and drought represent the primary pre-existing environmental stress on the wildlife community of the proposed site.

3.5.14 Description of Ecological Succession

Long-term ecological studies on the proposed site are not available for analysis of ecological succession at this specific location. The proposed site is located in a sagebrush steppe vegetation community, which is a late-seral community that has been established in southeastern Idaho for an extended period. A large portion of the proposed site has been altered from a sagebrush community for purposes of agriculture. Portions of the site are grazed by cattle.

The sagebrush steppe landscape is a mosaic of shrub-dominated and herbaceous-dominated communities. Big sagebrush communities are critical habitat for greater sage grouse and other sagebrush obligate species. Historically, fire was the principal disturbance within this vegetation type; other disturbances included insects, periods of drought and wet cycles, and shifts in climate (return interval of 100 years). Intervals between natural wildfires varied between 25 years and 100+ years (West, 2000).

Wyoming big sagebrush is a mid- to late-seral species (Howard, 1999). Disturbed sagebrush communities are mostly populated with associated grasses. Wyoming big sagebrush may lose dominance in areas that have not experienced fire or other stand-replacing events for half a century or more (Howard, 1999).

3.5.15 Description of Ecological Studies

A vegetation survey of the proposed site was conducted in early June 2008. Plant cover by species on the proposed site was obtained through a series of 100-m (328-ft) transects. Twenty-one transects were located on a map of the property before the survey was conducted in the sagebrush community, and 11 transects were located in the non-irrigated seeded pasture community. The transects were then positioned on the ground (See Figure 3.5-1, Vegetation and Animal Survey Transect Locations and Habitat Map).

Sampling locations were determined by placing a grid over the site showing the communities to be sampled. Two 50-m (164-ft) tapes, one oriented south from the sampling point, the other oriented east from the sampling point, were then placed in the field. Point-intercept measurements were recorded at each 0.5-m (1.64-ft) interval of each transect, for a total of 100 samples points. The sampler traversed each transect, and at each 0.5-m (1.64-ft) interval, recorded the plant species found directly below the point on the transect. The sampler considered only those plants or seedlings touched by the line or lying under it. If a plant was not encountered at a sample point, either litter, bare ground, or rock was recorded.

This point-intercept survey method provides objective and accurate results. Sampling error is reduced since the survey results are based on actual measurements of the plants growing in randomly located and clearly defined sampling units. The survey method results are accurate in mixed plant communities and suited for measuring low vegetation. By direct measurement of small samples, the method allows estimates of known reliability to be obtained concerning the vegetation, its composition, and ecological structure.

Several sampling methods were used to identify animals using the proposed site. Incidental animal sitings were noted during field reconnaissance visits in May 2008. Wildlife transects and avian point survey techniques were used during June 2008, October 2008, January 2009, and April 2009 surveys. In October 2010, wildlife was surveyed along the wildlife survey transects. Linear transects parallel and immediately adjacent to the vegetation transects in the sagebrush community were walked in the mornings from about 30 minutes before sunrise to one and a half to two hours after sunrise. Avian point surveys were also conducted during the mornings in the agricultural areas. Evening surveys were also conducted in October 2010 in the sagebrush and non-irrigated seeded pasture communities, and began one and a half hours before sunset and continued 30 minutes past sunset. Trapping or capture and release sampling was not conducted during the June 2008, October 2008, January 2009, April 2009 and October 2010 surveys. Similarly, the April 2010 supplemental sage grouse lek searches were conducted 30 minutes before sunrise to two hours after sunrise. Ground lek searches were conducted in accordance with IDFG approved methods as described in Connelly et al. (Connelly, 2003). Existing roads within suitable habitat where sage grouse signs had been previously documented were driven, Stops, with the automobile turned off, were made every 1 km (0.6 mi) to listen for sage grouse “popping” vocalizations. Where roads were not established, foot surveys transecting the EREF property were performed Prior to the morning lek searches, day and evening foot surveys for potential lekking areas were conducted across the EREF site to look for signs left by displaying birds.

Many habitat studies have been conducted on the sagebrush steppe areas because of its association with greater sage grouse habitat. Supplemental studies specific to the proposed site were conducted by AREVA and are described elsewhere in Section 3.5. Ecological information of the sagebrush steppe is contained in regional studies by:

Long-term Vegetation Dynamics in Sagebrush Steppe at the Idaho National Laboratory, Environmental Science and Research Foundation (Anderson, 1999).

- This report describes the dynamics of vegetation over 35 years on a subset of permanent vegetation plots. The results suggest that shrub cover may fluctuate by as much as 100% and grass cover by as much as 500% within a decade. Changes in the cover of cheatgrass (*Bromus tectorum)* are also described.

The effects of precipitation timing on sagebrush steppe vegetation, Journal of Arid Environments, 64:670-697 (Bates, 2006).

- Results demonstrate that a shift to less winter and more summer precipitation would have negative consequences for sagebrush/bunchgrass communities. A shift to more winter and less spring/summer precipitation had minimal impact on the plant community. Species change is often used to evaluate rangeland health and response to management. Results show that changes in precipitation pattern can also have an impact on rangeland.

Sagebrush-Steppe Vegetation Dynamics and Restoration Potential in the Interior Columbia Basin, U.S.A. Conservation Biology 16(5):1243-1255 (Hemstrom, 2002).

- This report evaluated changes in the amount and quality of greater sage grouse habitat on 8.1 million ha (20,015,535 ac) of U.S. Forest Service and BLM land in the basin. Changes were estimated from historical to current conditions and from current conditions to those projected 100 years in the future under proposed management and under two restoration scenarios. Habitat quality under both scenarios was substantially improved compared with the current period and proposed management. Results suggest that aggressive restoration could slow the rate of sagebrush loss and improve the quality of remaining habitat.

Big Sagebrush: A Sea Fragmented into Lakes, Ponds, and Puddles, USDA Forest Service, Rocky Mountain Research Station General Technical Report RMRS-GTR-144 (Welch, 2005).

- This report indicates that approximately 50% of the historic sagebrush type has given way to agriculture, cities and towns, and other human developments. What remains is further fragmented by range management practices, creeping expansion of woodlands, alien weed species, and the historic view that big sagebrush is a worthless plant. Two ideas are promoted in this report: (1) big sagebrush is the home to a host of organisms that range from microscopic fungi to large mammals, and (2) many range management practices applied to big sagebrush ecosystems are not science based.

Management Considerations for Sagebrush (*Artemisia*) in the Western United States: a selective summary of current information about the ecology and biology of woody North American sagebrush taxa, U.S. Department of Interior, BLM, Washington, D.C., (BLM, 2002).

- This publication presents a selective summary of current information about the ecology and biology of woody North American sagebrush taxa and describes how sagebrush plant communities and certain species and sub-species respond to management treatments and disturbances, including fire, livestock grazing, and mechanized and chemical restoration practices.

Sage-grouse habitat restoration symposium proceedings; 2001 June 4-7, Boise, ID. Proc. RMRS-P-38. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station (Shaw, 2005).

- This series of 14 papers summarizes current knowledge and research gaps in sagebrush taxonomy and ecology, seasonal greater sage grouse habitat requirements, approaches to community and landscape restoration, and currently available plant materials and revegetation technology to provide a basis for designing and implementing effective management prescriptions.

3.5.16 Information on Rare, Threatened, and Endangered Sightings

A number of rare, threatened, or endangered species could potentially occur on the proposed site based on a literature review (Table 3.5-4). However, habitat types on the proposed site limit the number of these species that may occur. Based on field surveys, a review of habitat requirements, and contacts with state and federal agency personnel, only three sensitive species would likely use the proposed site. These species are the greater sage grouse, pygmy rabbit, and Townsend's big-eared bat (*Corynorhinus townsendii*). The USFWS initiated a status review in January 2008 for the pygmy rabbit (USFWS, 2008d) and in February 2008 for the greater sage grouse (USFWS, 2008e) (USFWS, 2008f) to determine if listing of either species is warranted. In March 2010, the USFWS announced that listing of the greater sage grouse as an endangered species is warranted, but listing precluded by the need to complete other listing actions of higher priority (USFWS, 2010a). In September 2010, the USFWS announced that it had completed a status review of the pygmy rabbit and concluded that it does not warrant protection under the Endangered Species Act in Idaho and other western states (USFWS, 2010b). In addition, Townsend's big-eared bat was formerly a Candidate 2 (C2) species under the Endangered Species Act and is now considered a Species of Concern (non-statutory ranking) by the USFWS (Gruver, 2006).

Information from spring surveys conducted between March and May, 2008 by state and federal agencies indicates that the closest population of greater sage grouse has been sighted in an area approximately 8 km (5 mi) northwest of the proposed site. Field surveys for greater sage grouse leks that were conducted in May 2008 and April 2010 indicated that the species was not found on the proposed site. However, a greater sage grouse roost site was found in June 2008. No sign or sightings of greater sage grouse were observed during the October 2008 survey. During January 2009 surveys, several sets of sage grouse tracks were found in a small portion of the sagebrush community in the northwest portion of the site, in a location where sage grouse activity was previously documented during summer surveys. In addition, a single set of sage grouse tracks was found in the irrigated crop portion of the site, far from any standing vegetation. During the April 2009 survey, three areas containing grouse feathers were found along the northern border of the property with adjacent BLM land to the immediate north. One of these feather sets contained wing primaries, perhaps indicative of a raptor kill. No scat could be found in the vicinity of the feathers, and no other indication of grouse use was found on the site during this spring survey. During the April 2010 field surveys, old sage grouse pellets were found at three search point locations along or near the northern border of the property. However, no birds were heard or observed, and no other indications of sage grouse were found on the site during this spring survey.

During the October 2010 field surveys, many old sage grouse pellets and cecal casts were found, and a single sage grouse hen was observed at the north end of the proposed site. In addition, a clocker was found at the north end of the property, but no nest was observed.

Pygmy rabbit populations have been well documented by the INL (Wilde, 1978) and several dens have been identified throughout the INL property. Pygmy rabbits have also been documented by the Snake River BLM staff to the north at Mudd Lake. Wildlife surveys conducted in June and October of 2008 did not identify any pygmy rabbits on the proposed site, although other species of rabbits were observed. The closest known population of the pygmy rabbit is on the eastern area of the INL about 8.8 km (5.5 mi) west of the proposed site. No indication of pygmy rabbits were found on the proposed site including tracks, pellets, burrows, or direct sightings of the animals themselves during the January 2009, April 2009 and October 2010 surveys.

Townsend's big-eared bat caves are located south of the proposed site in the lava flow area. Habitat at the proposed facility is comprised of sagebrush, agriculture and non-irrigated seeded pasture and does not meet habitat requirements for the Townsend's big-eared bat.

3.5.17 Agency Consultation

Consultation was made with the USFWS and in a letter response dated June 30, 2008, the USFWS did not identify any issues that indicate that consultation under Section 7 of the Endangered Species Act of 1973, as amended, is needed for the proposed EREF. Refer to Appendix A, Consultation Documents, for a complete list of consultation documents.

3.5.18 Rare, Threatened and Endangered Effects by Other Federal Projects

There are no other federal projects within 16 km (10 mi) of the proposed EREF site.

TABLES

Table 3.5-1 Mammals Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 1 of 2)

Common Name	Scientific Name	Preferred Habit	Probable Occurrence at Areva Site
Little Brown Myotis	*Myotis lucifugus*	Coniferous forest, riparian areas in the mountains and lower valleys, woodlots, shelterbelts, and urban areas.	Unlikely to occur due to lack of suitable habitat.
Townsend's Big-eared Bat	*Plecotus townsendii*	Desert scrub, mixed conifer forest, and piñon-juniper habitat. Specifically associated with limestone caves, mines, lava tubes.	Unlikely to occur due to lack of suitable habitat.
White-tailed Jack Rabbit	*Lepus townsendii*	Found in open grasslands and montane shrublands generally above shrub steppe.	Probably occurs at site in limited numbers due to lack of habitat.
Black-tailed Jack Rabbit	*Lepus californicus*	A habitat generalist, primarily found in arid regions supporting shortgrass habitats.	Likely occurs at site.
Mountain Cottontail	*Sylvilagus nattallii*	Brushy, rocky areas in dense sagebrush, and streamside thickets and forest edges.	Likely occurs at site.
Yellow-bellied Marmot	*Marmota flaviventris*	Prefers montane meadows adjacent to talus slopes or rock outcrops; avoids tall vegetation.	Unlikely to occur due to lack of suitable habitat.
Pygmy Rabbit	*Brachylagus idahoensis*	Big sagebrush habitat and secondarily in communities dominated by rabbitbrush.	Potentially occurs at site.
Townsend's Ground Squirrel	*Spermophilus townsendii*	Arid environments with deep, friable, well-drained soils.	Likely occurs at site.
Least Chipmunk	*Eutamias minimus*	Sagebrush, bitterbrush, and other Great Basin shrub habitats.	Likely occurs at site.
Northern Pocket Gopher	*Thomomys talpoides*	Mountain meadows, tundra, grasslands, sagebrush steppe, and agricultural fields - habitats lacking canopy cover, but having abundant ground cover.	Probably occurs at site in limited numbers due to lack of habitat.
Great Basin Pocket Mouse	*Perognathus parvus*	Arid, sparsely vegetated plains and brushy areas.	Likely occurs at site.
Ord's Kangaroo Rat	*Dipodomys ordii*	Semiarid, open habitats. Big sagebrush/crested wheatgrass range; disturbed sites.	Likely occurs at site.

Table 3.5-1 Mammals Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 2 of 2)

Common Name	Scientific Name	Preferred Habit	Probable Occurrence at Areva Site
Beaver	*Castor canadensis*	stable aquatic habitats providing adequate water; channel gradient of less than 15 percent; and quality food species.	Unlikely to occur due to lack of suitable habitat.
Western Harvest Mouse	*Reithrodontomys megalotis*	Open areas, including grasslands, prairies, meadows, and arid areas including deserts, sand dunes, and shrublands.	Likely occurs at site.
Deer Mouse	*Peromyscus maniculatus*	Most common habitats are prairies, bushy areas, and woodlands.	Likely occurs at site.
Coyote	*Canis latrans*	Extremely adaptable; uses a wide range of habitats, including forests, grasslands, deserts.	Likely occurs at site.
Long-tailed Weasel	*Mustela frenata*	Upland brush, grasslands and woods to subalpine rock slides and semi-open forest areas.	Probably occurs at site in limited numbers due to lack of habitat.
Badger	*Taxidea taxus*	Occurs primarily in grasslands, shrublands, and other treeless areas with friable soil and a supply of rodent prey	Likely occurs at site.
Canada Lynx	*Lynx canadensis*	Canada lynxes require early, mid- and late-successional forests	Unlikely to occur due to lack of suitable habitat.
Bobcat	*Lynx rufus*	Adapted to a wide variety of habitats, including canyons, deserts, and mountain ranges. Bobcats are found in desert environments if shade is available.	Probably occurs at site in limited numbers due to lack of habitat.
Elk	*Cervus elaphus*	Found mostly in mountain or foothill areas; prefer alpine meadows in summer, and then move to lower, wooded slopes or sagebrush steppe in winter.	Likely occurs at site.
Mule Deer	*Odocoileus hemionus*	Coniferous forests, shrub steppe, chaparral, and grasslands; from dry, open country to dense forests. Prefer arid, open areas and rocky hillsides.	Probably occurs at site in limited numbers due to lack of habitat.
Pronghorn	*Antilocapra americana*	Open plains and semi-deserts; often found on low, rolling, expansive lands with less than 30 percent slope.	Likely occurs at site.

Table 3.5-2 Birds Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 1 of 4)

Common Name	Scientific Name	Summer Breeder[1]	Wintering	Resident	Migrant
Turkey Vulture	*Cathartes aura*	U	U	--	A
Osprey	*Pandion haliaetus*	--	--	--	R
Bald Eagle	*Haliaeetus leucocephalus*	--	U	--	R
Northern Harrier	*Circus cyaneus*	--	--	C	--
Sharp-shinned Hawk	*Accipiter striatus*	R	R	--	R
Cooper's Hawk	*Accipiter cooperii*	U	R	--	R
Swainson's Hawk	*Buteo swainsoni*	U	R	--	U
Red-tailed Hawk	*Buteo jamaicensis*	U	R	--	R
Ferruginous Hawk	*Buteo regalis*	U	R	--	R
Rough-legged Hawk	*Buteo regalis*	C	A	--	C
Golden Eagle	*Aquila chrysaetos*	U	C	--	U
American Kestrel	*Falco sparverius*	C	U	--	C
Merlin	*Falco columbarius*	--	--	R	--
Peregrine Falcon	*Falco peregrinus*	--	--	R	--
Gyrfalcon	*Falco rusticolus*	--	--		A
Prairie Falcon	*Falco mexicanus*	--	--	U	--
Chukar	*Alectoris chukar*	--	--	U	--
Greater Sage Grouse	*Centrocercus urophasianus*	--	--	C	--
Kildeer	*Charadrius vociferus*	C	--	--	C
Long-billed Curlew	*Numenius americanus*	U	--	--	U
Franklin's Gull	*Larus pipixcan*	U	--	--	U
Ring-billed Gull	*Larus delawarensis*	U	--	--	U
California Gull	*Larus californicus*	R	--	--	U
Herring Gull	*Larus argentatus*	U	--	--	U
Mourning Dove	*Zenaida macroura*	C	R	--	C

Table 3.5-2 Birds Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 2 of 4)

Common Name	Scientific Name	Summer Breeder[1]	Wintering	Resident	Migrant
Great Horned Owl	*Bubo virginianus*	--	--	U	
Burrowing Owl	*Athene cunicularia*	U	A	--	U
Short-eared Owl	*Asio flammeus*	U	--	--	U
Northern Saw-whet Owl	*Aegolius acadicus*	--	A	--	A
Common Nighthawk	*Chordeiles minor*	C	--	--	U
Horned Lark	*Eremophila alpestris*	C	C	--	C
Black-billed Magpie	*Pica pica*	--	--	C	--
American Crow	*Corvus brachyrhynchos*	--	--	U	--
Common Raven	*Corvus corax*	--	--	U	--
Rock Wren	*Salpinctes obsoletus*	U	--	--	U
Canyon Wren	*Catherpes mexicanus*	R	--	--	R
House Wren	*Troglodytes aedon*	U	U	--	U
Western Bluebird	*Sialia mexicana*	U	--	--	U
American Robin	*Turdus migratorius*	C	--	--	C
Sage Thrasher	*Oreoscoptes montanus*	C	--	--	C
Northern Shrike	*Lanius excubitor*	--	R	--	U
Loggerhead Shrike	*Lanius ludovicianus*	--	--	U	--
European Starling	*Sturnus vlugaris*	--	--	C	--
Black-headed Grosbeak	*Pheucticus melanocephalus*	R	--	--	R
Green-tailed Towhee	*Pipilo chlorurus*	U	--	--	U
Rufous-sided Towhee	*Pipilo erythrophthalmus*	U	--	--	U

Table 3.5-2 Birds Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 3 of 4)

Common Name	Scientific Name	Summer Breeder	Wintering	Resident	Migrant
Brewer's Sparrow	*Spizella breweri*	C	--	--	C
Lark Sparrow	*Chondestes grammacus*	U	--	--	R
Black-throated Sparrow	*Amphispiza bilineata*	R	--	--	R
Sage Sparrow	*Amphispiza belli*	C	--	--	C
Lark Bunting	*Calamospiza melanocorys*	R	--	--	R
White-crowned Sparrow	*Zonotrichia leucophrys*	--	--	--	R
Vesper sparrow	*Pooecetes gramineus*	U	--	--	U
Chipping sparrow	*Spizella passerina*	--	--	--	R
Grasshopper sparrow	*Ammodramus savannarum*	U	--	--	U
Brown headed cowbird	*Molothrus ater*	--	--	--	U
Snow Bunting	*Plectrophenax nivalis*	--	R	--	R
Red-winged Blackbird	*Agelaius phoeniceus*	U	--	--	U
Western Meadowlark	*Sturnella neglecta*	C	U	--	C

Table 3.5-2 Birds Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 4 of 4)

Common Name	Scientific Name	Summer Breeder	Wintering	Resident	Migrant
Brewer's Blackbird	*Euphagus cyanocephalus*	C	R	--	C
Rosy Finch	*Leucosticte arctoa*	--	R	--	R
House Sparrow	*Passer domesticus*	C	U	--	C

Note

[1]"U" – Species likely will be uncommon on-site if observed at all; "C" – Species likely will be common on-site; "R" – Species likely will be rare on-site if observed at all; "A" – Accidental occurrence; "—" – Not Applicable

Table 3.5-3 Amphibians/Reptiles Potentially Using the Proposed Eagle Rock Enrichment Facility Site (Page 1 of 1)

Common Name	Scientific Name	Preferred Habitat	Probable Occurrence at Areva Site
Great Basin Spadefoot Toad	*Spea intermontana*	Sagebrush communities below 6,000 feet in elevation having loose soil in which to burrow. Breeding habitat is aquatic.	Unlikely occurs at site due to lack of aquatic habitat.
Long-nosed Leopard Lizard	*Gambelia wislizenii*	Arid and semi-arid plains with sagebrush, grass, and other low scattered vegetation. Prefers flat areas with open space for running, avoiding densely vegetated areas.	Probably occurs at site in limited numbers due to lack of habitat.
Short-horned Lizard	*Phrynosoma douglassi*	Open pine forests, pinion-juniper forests, shortgrass prairies and sagebrush desert .	Likely occurs at site.
Sagebrush Lizard	*Sceloporus graciosus*	Sagebrush and other types of shrublands, in open areas with scattered low bushes and lots of sun.	Likely occurs at site.
Western Skink	*Eumeces skiltonianus*	Piñon -juniper forests, grassy areas, desert shrub, talus slopes and canyon rims; often found in areas associated with water.	Unlikely to occur due to lack of suitable habitat.
Rubber Boa	*Charina bottae*	Desert shrub to open pine forest. Often, near water and near rocks, woody debris or leaf litter that are used for cover.	Unlikely to occur due to lack of suitable habitat.
Desert Striped Whipsnake	*Masticophis taeniatus*	Occurs in open brushy country - desert scrub, sagebrush flats, and mixed woodlands. Often found along the edges of rivers or ponds.	Probably occurs at site in limited numbers due to lack of habitat.
Gopher Snake	*Pituophis catenifer*	Grassland, sagebrush, agricultural lands, riparian areas, woodlands, desert.	Likely occurs at site.
Western Terrestrial Garter Snake	*Thamnophis elegans*	Found statewide in habitats ranging from desert riparian areas to mountain lakes and meadows.	Probably occurs at site in limited numbers due to lack of habitat.
Western Rattlesnake	*Crotalus viridis*	Drier regions with sparse vegetation, usually with a rocky component.	Likely occurs at site.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 1 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Insects						
St. Anthony Dune Tiger Beetle	*Cicindela arenicola*	BLM Type 2	This species is found on sand dunes. Larvae live in burrows located in flat, grassy areas where the sand is at least a meter thick, often on the windward side of sand dunes. Most adults remain in the immediate area of the dune system on which they developed.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2008; NatureServe, 2008.
Amphibians						
Northern Leopard Frog	*Rana pipiens*	BLM Type 2	This species is associated with permanent water sources during all life stages. Populations occur in a variety of wetland situations, including marshes, pond margins, and slow moving sections of streams and rivers.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2008; NatureServe, 2008.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 2 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Birds						
Trumpeter Swan	*Cygnus buccinator*	BLM Type 3; USFS R4 S	Trumpeter swans are predominantly herbivorous, eating submerged and emergent vegetation. Swans need slow, shallow water to effectively reach aquatic vegetation and sediment. Winter habitat must remain ice free and provide adequate forage. Swans nest on islands, muskrat or beaver houses, or exposed hummocks.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2008; NatureServe, 2008.
Harlequin Duck	*Histrionicus histrionicus*	BLM Type 4; USFS R1, R4 S	Harlequin ducks are sea ducks that migrate inland to breed. Breeding occurs along clear, swiftly flowing streams.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2005; NatureServe, 2008.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 3 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Greater Sage Grouse	*Centrocercus urophasianus*	BLM Type 2; USFS R4 S; FC	This species is entirely dependent on sagebrush–dominated habitats. Breeding habitat is characterized by sagebrush canopy coverage of 15–25% with a healthy grass and forb understory. During summer, sage grouse may use a variety of habitats but are generally found in areas with succulent forbs and insects. Winter habitat consists of relatively large areas of sagebrush with 10–25% canopy cover.	Yes. This species is widely distributed throughout sagebrush–dominated habitats of southern Idaho. Sign of species observed on-site during June 2008, January 2009, April 2009, and October 2010 surveys. No sightings of species were observed on-site during the June 2008, October 2008, January 2009, April 2009, and April 2010 surveys. One sage grouse was sighted onsite during the October 2010 surveys.	No. Suitable habitat present within the proposed site. Surveys conducted and signs of species found	IDFG, 2005; NatureServe, 2008; USFWS, 2010.
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	BLM Type 3; USFS R4 S	Columbian sharp–tailed grouse occupy a variety of habitats generally characterized by dense stands of herbaceous cover and a mixture of shrubs.	Low likelihood In southeastern Idaho, Columbian sharp–tailed grouse are reasonably widespread in shrub and grass habitats adjacent to or in mountainous foothills. Nearest mountain are over 80 km (50 mi)	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2005; NatureServe, 2008.
Ferruginous Hawk	*Buteo regalis*	BLM Type 3	This species inhabits flat and rolling terrain in grassland or shrub steppe regions, typically avoiding high elevation, forest interior, and narrow canyons. In Idaho, becomes locally abundant at the interface between piñon–juniper and shrubsteppe environments.	Yes.	No. Suitable habitat present within the proposed site. No animals observed during surveys.	IDFG, 2005; NatureServe, 2008.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 4 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Bald Eagle	*Haliaeetus leucocephalus*	IDFG threatened; BLM Type 1; USFS R4 T	Bald eagles are associated with aquatic ecosystems, including lakes, rivers, coastlines, marshes, and reservoirs. Eagles move to open water in fall and winter. They typically breed in forested areas adjacent to large bodies of water.	Low likelihood. Migrants may rarely be present.	Yes. There are no large water bodies, perch or nest sites on the EREF site or in the area.	IDFG, 2005; NatureServe, 2008.
Peregrine Falcon	*Falco peregrinus*	IDFG threatened; BLM Type 3; USFS R4 S	This species inhabits various landscapes, including mountains, river corridors, marshes, lakes, coastlines, and cities. In Idaho, peregrines are associated with mountains, major river corridors, reservoirs and lake basins. Migrants arrive in spring and depart by mid-October.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2005; NatureServe, 2008.
Mammals						
Yellow-billed Cuckoo	*Coccyzus americanus*	FC; IDFG protected nongame; BLM Type 1	In the western U.S., the yellow-billed cuckoo is a riparian obligate species. This species is usually found in large tracts of cottonwood and willow habitats with dense sub-canopies. In Idaho, they are reported to occur most frequently and consistently in cottonwood forests with thick understory.	None. In Idaho, the yellow-billed cuckoo is a rare visitor and local breeder that occurs in scattered drainages primarily in the southern portion of the state.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2005; NatureServe, 2008.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 5 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Townsend's Big-eared Bat	*Corynorhinus townsendii*	BLM Type 3; USFS R4 S	Distribution and abundance is highly correlated with suitable cavity forming rock formations and historic mining districts. More than 90% of their diet consists of Lepidopterans.	Low likelihood. Only 2 maternity colonies have been confirmed in Idaho and both sites are found in the Craters of the Moon National Monument and in the BLM Hell's half Acre WSA south of the site. Numerous hibernacula in lava tube caves have been identified in south central and southeast Idaho.	No. Foraging may occur because colonies are known to exist within 8 km (5 mi) of the site.	IDFG, 2005; NatureServe, 2008.
Canada Lynx	*Lynx canadensis*	FT; BLM Type 1; USFS R4 S	In Idaho, the Canada lynx inhabits montane and subalpine coniferous forests typically above 1,200 m (4,000 ft). Habitat used during foraging is usually early successional forest. Dens are usually in mature forests. Individuals are wide-ranging and require large tracts of forest.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2005; NatureServe, 2008.
Pygmy Rabbit	*Brachylagus idahoensis*	BLM Type 2; USFS R4 S	This species is a sagebrush obligate. Habitat is dense, tall stands of big sagebrush growing on deep, friable soils that allow the rabbits to dig extensive burrow systems. Landscape features include alluvial fans and hillsides, swales within rolling topography, floodplains, brushy draws, riparian channels, edges of rock and lava outcroppings, and mima mounds.	Yes. Field surveys of the proposed site in June 2008, October 2008, January 2009, April 2009 and October 2010 did not record the presence of any pygmy rabbits or signs of their presence on-site.	No. Suitable habitat present within the proposed site. No signs or animals observed during surveys.	IDFG, 2005; NatureServe, 2008.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 6 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Plants						
Iodine Bush	*Allenrolfea occidentalis*	ID State 1	Native succulent halophyte found in the salt deserts of the Western U.S. Commonly occurs on alkaline soils, mostly on sandy hummocks in salt playas and mud flats; 1000-1700 m. Flowering: late summer.	None. Habitat is not present on site.	Yes. There is no suitable habitat present for this species within the proposed site.	Trent, 1997; FNA, 1993
Green Spleenwort	*Asplenium trichomanes-ramosum*	ID State 1	A fern found in moist crevices and concavities of calcareous rocks, cliffs, talus slopes, and other types of basic rock outcrops in locations that are usually partially or deeply shaded. Typically found at relatively high elevations (> 7,000 feet occurring within fir and spruce-fir forest types.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	USFS, 2002; Pojar, 1994
Meadow Milkvetch	*Astragalus diversifolius*	ID GP2; BLM Type 3; USFS R4	Moist soils in alkaline meadows with flat or hummocky topography supporting graminoid or medium height shrub vegetation. Flowering: June-August, peaking in July.	None. Most Idaho populations are located in Custer and Lemhi counties. The meadow milkvetch population reported from the upper Snake River Plain, near Springfield, in Bingham County, has probably been extirpated.	Yes. There is no suitable habitat present for this species within the proposed site.	IDFG, 2008; Fertig, 1994.

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 7 of 8)

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference
Plants (Cont'd)						
Payson's Milkvetch	*Astragalus paysonii*	ID-GP3; BLM Type 3; USFS R1, R4.	A regional endemic to Idaho and Wyoming, this species occurs primarily in disturbed areas such as recovering burns, clear cuts, road cuts, and blow downs. Usually found on sandy soils with low cover of forbs and grasses at 6,700-9,600 ft[See OI-ER 3.5-020]Flowering: June-August.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	Fertig, 2000; Lorain, 1990.
Payson's Bladderpod	*Lesquerella paysonii*	ID-GP3; USFS R4.	In Idaho, this species mostly occurs on ridgelines and slopes in openings in sagebrush and forest stands. The substrate consists of carbonate parent material with gravelly, skeletal soils. Plant communities are open, with low cover of forbs, grasses, and an occasional shrub. 6,000 – 9,950 ft, [See OI-ER 3.5-020] with most populations occurring above 8,000 ft[See OI-ER 3.5-020]Flowering: early-mid July.	None. This species occurs on the ridges and high peaks of the Snake River Range.	Yes. There is no suitable habitat present for this species within the proposed site.	Mosely, 1996.

Common Name	Scientific Name	Status[1]	Habitat Association	Probable Occurrence at EREF Site	Eliminated from Detailed Analysis	Reference

Table 3.5-4 Sensitive Species Potentially Present in the Area of the Proposed Eagle Rock Enrichment Facility Site (Page 8 of 8)

Red Glasswort (Red Swampfire)	*Salicornia rubra*	ID-1; BLM Type 4.	Moist, saline or alkaline soil of flats, shores, seepage areas, and ditches. In Idaho, populations of Red glasswort are usually associated with low cover of other goosefoot family species. Flowering: late summer-early fall.	Low likelihood of presence. Habitat is not present on site.	No. Survey of drainages was conducted. No habitat or plants observed.	IDFG, 2005.
Gray Willow	*Salix glauca*	ID-2	In the Rocky Mountains, grayleaf willow is restricted to open, alpine and subalpine habitats that commonly have rocky, well-drained soils.	None.	Yes. There is no suitable habitat present for this species within the proposed site.	Uchytil, 1992; Dorn, 1977.
Ute Ladies'- Tresses	*Spiranthes diluvialis*	FT; ID-GP2; BLM Type 1.	Endemic to mesic or wet meadows and riparian/wetland habitats in relatively low elevations near springs, seeps, lakes, or perennial streams, generally; often found on silty-loam alluvial soils. Flowering: early-August through mid-September	Low likelihood of presence. In Idaho, Ute ladies'-tresses is known from the South Fork of the Snake River floodplain in Jefferson, Madison, and Bonneville counties. Populations are scattered along 49 river miles from near the confluence of Henry's Fork, upstream to Swan Valley, nine river miles below Palisades Dam.	No. Surveys were conducted; no habitat or plants were observed; habitat does not appear to be present at site.	Fertig, 2005; Murphy, 2002; Moseley, 1998.

Note:

[1]Status Definitions: BLM Type 1=Threatened, endangered, proposed and candidate; BLM Type 2=Rangewide/globally imperiled; BLM Type 3=Regional/state imperiled; BLM Type 4=Peripheral species to Idaho; USFS R1 S and USFS R4 S=USDA Forest Service Northern Region (R1) and Intermountain Region (R4) indicates species designated sensitive; USFS R4 T=Federally listed threatened species identified in Region 4 on the USFS; IDFG protected game=Animal species that is not threatened, endangered, or is a game species that is protected by the State of Idaho from intentional possession; IDFG threatened=Any native species likely to be classified as endangered within the foreseeable future; FC=Federal candidate; FT=Federal threatened; ID-1=Taxa in danger of becoming extinct in foreseeable future; ID-2=Taxa likely to be classified as Priority 1 within foreseeable future; ID-GP2=Global Priority 2—imperiled; ID-GP3=Global Priority 3—rare or uncommon but not imperiled.

Table 3.5-5 Vegetation on the Proposed Eagle Rock Enrichment Facility Site
(Page 1 of 1)

Scientific Name	Common Name
Shrubs	
Artemisia tridentata var. wyomingensis	Wyoming big sagebrush
Artemisia tripartite	Threetip sagebrush
Atriplex nuttallii	Nutall's saltbush
Chrysothamnus nauseosa	Rubber rabbitbrush
Ericameria nana	Dwarf goldenbush
Krascheninnikovia lanata	Winterfat
Grasses	
Agropyron cristatum	Crested wheatgrass
Bromus tectorum	Cheatgrass
Elymus elymoides	Squirreltail
Elymus lanceolatus	Thickspike wheatgrass
Hesperostipa comata	Needle and thread
Hordeum jubatum	Foxtail barley
Oryzopsis hymenoides	Indian ricegrass
Poa secunda	Sandberg bluegrass
Forbs	
Agoseris glauca	False dandelion
Allium textile	Textile onion
Arabis lignifera	Desert rockcress
Astragalus curvicarpus	Curvepod milkvetch
Castilleja sp.	Indian paintbrush
Chenopodium leptophyllum	Slimleaf goosefoot
Cirsium arvense	Canada thistle
Crepis accuminata	Hawksbeard
Cryptantha interrupta	Bristly cryptantha
Delphinium andersonii	Anderson's larkspur
Descurania Sophia	Tansymustard
Erigeron pumilus	Shaggy fleabane
Lappula occidentalis	Flatspine stickseed
Lepidium sp.	Pepperwort
Lomatium dissectum	Desert parsley
Oenethera caespitosa	Desert evening-primrose
Packera cana	Woolly groundsel
Phlox hoodii	Hood's phlox
Phlox longifolia	Longleaf phlox
Rununculus testiculatus	Bur buttercup
Schoencrambe linifolia	Flaxleaf plainsmustard
Sphaeralcea munroana	Orange globemallow
Tragopogon dubius	Goat's beard
Cactus	
Opuntia polyacantha	Prickly pear

Table 3.5-6 Vegetative Cover on the Proposed Eagle Rock Enrichment Facility Site Rangeland Type

(Page 1 of 1)

Scientific Name	Common Name	Cover (%)
Ericameria nana	Dwarf goldenbush	17.00
Artemisia tridentata var. wyomingensis	Wyoming big sagebrush	16.00
Poa secunda	Sandberg bluegrass	11.00
Bromus tectorum	Cheatgrass	4.00
Hordeum jubatum	Foxtail barley	3.00
Phlox longifolia	Longleaf phlox	2.00
Descurania sophia	Tansymustard	1.00
Elymus lanceolatus	Thickspike wheatgrass	1.00
Phlox hoodii	Hood's phlox	0.60
Agropyron cristatum	Crested wheatgrass	0.60
Lappula occidentalis	Flatspine stickseed	0.50
Erigeron pumilus	Shaggy fleabane	0.40
Lomatium dissectum	Desert parsley	0.30
Schoencrambe linifolia	Flaxleaf plainsmustard	0.30
Artemisia tripartita	Threetip sagebrush	0.30
Arabis lignifera	Desert rockcress	0.20
Opuntia polyacantha	Prickly pear	0.20
Astragalus curvicarpus	Curvepod milkvetch	0.20
Cryptantha interrupta	Bristly cryptantha	0.10
Crepis accuminata	Hawksbeard	0.10
Allium textile	Textile onion	0.10
Atriplex nuttallii	Nutall's saltbush	0.10
Krascheninnikovia lanata	Winterfat	0.09
Elymus elymoides	Squirreltail	0.09
Lepidium sp.	Pepperwort	0.09
Castilleja sp.	Indian paintbrush	0.07
Chenopodium leptophyllum	Slimleaf goosefoot	0.04
Oryzopsis hymenoides	Indian ricegrass	0.04
Packera cana	Woolly groundsel	0.02
Delphinium andersonii	Anderson's larkspur	0.02
Oenethera caespitosa	Desert evening-primrose	0.02
Hesperostipa comata	Needle and thread	0.02
Sphaeralcea munroana	Orange globemallow	0.02
Rununculus testiculatus	Bur buttercup	0.02
OTHER		
Bare Ground		23.00
Rock		3.00
Litter		11.00
Moss		2.00
Total[1]		**98.54**

[1]Note: Total cover equals less than 100% due to rounding.

Table 3.5-7 Vegetative Cover on the Proposed Eagle Rock Enrichment Facility Site Non-irrigated Seeded Pasture Type

(Page 1 of 1)

Scientific Name	Common Name	Cover (%)
Agropyron cristatum	Crested wheatgrass	33.60
Bromus tectorum	Cheatgrass	11.90
Rununculus testiculatus	Bur buttercup	5.00
Poa secunda	Sandberg bluegrass	1.90
Agoseris glauca	False dandelion	0.80
Erigeron Pumilus	Shaggy flebane	0.41
Artemisia tridentata var. *wyomingensis*	Wyoming big sagebrush	0.18
Chrysothamnus nauseosa	Rubber rabbitbrush	0.18
Ericameria nana	Dwarf goldenbush	0.18
Medicago sativa	Alfalfa	0.14
Descurania sophia	Tansymustard	0.14
Tragopogon dubius	Goat's beard	0.09
Hordeum jubatum	Foxtail barley	0.05
Phlox hoodii	Hood's phlox	0.05
Lappula occidentalis	Flatspine stickseed	0.05
Packara cana	Woolley groundsel	0.05
Cirsium arvense	Canada thistle	0.05
OTHER		
Bare Ground		28.00
Litter		16.40
Rock		0.68
Moss		0.09
Total[1]		**99.94**

Note 1: Total cover equals less than 100% due to rounding.

Table 3.5-8a Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site - Rangeland Area (Page 1 of 2)

Species		June 2008		October 2008	
		Total Number*	% of Total Number	Total Number*	% of Total Number
Horned Lark	*Eremophila alpestris*	137	49.1	111	79.9
Western Meadowlark	*Sturnella neglecta*	38	13.6	0	0.0
Sage Thrasher	*Oreoscoptes montanus*	18	6.5	0	0.0
Northern Harrier	*Circus cyaneus*	6	2.2	1	0.7
Brewer's Sparrow	*Spizella breweri*	43	15.4	16	11.5
Chipping Sparrow	*Spizella passerina*	0	0.0	0	0.0
Sage Sparrow	*Amphispiza belli*	3	1.1	2	1.1
Vesper Sparrow	*Pooecetes gramineus*	8	2.9	0	0.0
Grasshopper Sparrow	*Ammodramus savannarum*	5	1.8	0	0.0
Mourning Dove	*Zenaida macroura*	6	2.2	1	1.4
Kildeer	*Charadrius vociferus*	0	0.0	0	0.0
Brown-headed Cowbird	*Molothrus ater*	1	0.4	0	0.0
American Crow	*Corvus brachyrhynchos*	1	0.4	6	4.3
Short-earred Owl	*Asio flammeus*	1	0.4	0	0.0
Red-tailed Hawk	*Buteo jamaicensis*	0	0.0	0	0.0
Greater Sage Grouse	*Centrocercus urophasianus*	5	1.8	0	0.0
Long-billed Curlew	*Numenius americanus*	0	0.0	0	0.0
Black-billed Magpie	*Pica hudsonia*	0	0.0	2	1.1.
Unknown		7	2.5	0	0.0
Total Birds		**279**	**100**	**139**	**100**

*Note: Includes birds observed, heard, or sign observed (e.g., feathers, nests, roosts)

Table 3.5-8a Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site - Rangeland Area (Page 2 of 2)

		January 2009	April 2009	April 2010	October 2010
Species		Observed*	Observed*	Observed*	Observed*
Horned Lark	*Eremophila alpestris*	X	X		X
Western Meadowlark	*Sturnella neglecta*		X		
Sage Thrasher	*Oreoscoptes montanus*		X		
Northern Harrier	*Circus cyaneus*	X			X
Brewer's Sparrow	*Spizella breweri*		X		
Chipping Sparrow	*Spizella passerina*				
Sage Sparrow	*Amphispiza belli*		X		
Vesper Sparrow	*Pooecetes gramineus*				
Grasshopper Sparrow	*Ammodramus savannarum*				
Mourning Dove	*Zenaida macroura*				
Kildeer	*Charadrius vociferus*				
Brown-headed Cowbird	*Molothrus ater*				
American Crow	*Corvus brachyrhynchos*	X	X		
Short-earred Owl	*Asio flammeus*				
Red-tailed Hawk	*Buteo jamaicensis*	X	X		
Greater Sage Grouse	*Centrocercus urophasianus*	X	X	X	X
Long-billed Curlew	*Numenius americanus*				
Black-billed Magpie	*Pica hudsonia*				
Prairie Falcon	*Falco mexicanus*		X		
Brewer's Blackbird	*Euphagus cyanocephalus*		X		
Unknown					

*Note: Includes birds observed, heard, or sign observed (e.g., tracks, scat, etc.)

Table 3.5-8b Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site - Non-irrigated Seeded Pasture Area

(Page 1 of 2)

Species		June 2008		October 2008	
		Total Number*	% of Total Number	Total Number*	% of Total Number
Horned Lark	*Eremophila alpestris*	58	68.2	32	74.4
Western Meadowlark	*Sturnella neglecta*	8	9.4	0	0.0
Sage Thrasher	*Oreoscoptes montanus*	1	1.2	0	0.0
Northern Harrier	*Circus cyaneus*	1	1.2	1	2.3
Brewer's Sparrow	*Spizella breweri*	11	12.9	0	0.0
Chipping Sparrow	*Spizella passerina*	0	0.0	0	0.0
Sage Sparrow	*Amphispiza belli*	0	0.0	0	0.0
Vesper Sparrow	*Pooecetes gramineus*	3	3.5	0	0.0
Grasshopper Sparrow	*Ammodramus savannarum*	0	0.0	0	0.0
Mourning Dove	*Zenaida macroura*	0	0.0	4	9.3
Killdeer	*Charadrius vociferus*	1	1.2	0	0.0
Brown-headed Cowbird	*Molothrus ater*	1	1.2	0	0.0
American Crow	*Corvus brachyrhynchos*	1	1.2	4	9.3
Short-earred Owl	*Asio flammeus*	0	0.0	0	0.0
Red-tailed Hawk	*Buteo jamaicensis*	0	0.0	0	0.0
Greater Sage Grouse	*Centrocercus urophasianus*	0	0.0	0	0.0
Long-billed Curlew	*Numenius americanus*	0	0.0	0	0.0
Black-billed Magpie	*Pica hudsonia*	0	0.0	2	4.7
Unknown		0	0.0	0	0.0
Total Birds		**85**	**100**	**43**	**100**

*Note: Includes birds observed, heard, or sign observed (e.g., feathers, nests, roosts)

Table 3.5-8b Avian Transect Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site - Non-irrigated Seeded Pasture Area

(Page 2 of 2)

		January 2009	April 2009	April 2010	October 2010
Species		**Observed****	**Observed***	**Observed***	**Observed***
Horned Lark	*Eremophila alpestris*	**	X		X
Western Meadowlark	*Sturnella neglecta*	**	X		
Sage Thrasher	*Oreoscoptes montanus*	**			
Northern Harrier	*Circus cyaneus*	**			
Brewer's Sparrow	*Spizella breweri*	**	X		
Chipping Sparrow	*Spizella passerina*	**			
Sage Sparrow	*Amphispiza belli*	**			
Vesper Sparrow	*Pooecetes gramineus*	**			
Grasshopper Sparrow	*Ammodramus savannarum*	**			
Mourning Dove	*Zenaida macroura*	**			
Kildeer	*Charadrius vociferus*	**			
Brown-headed Cowbird	*Molothrus ater*	**			
American Crow	*Corvus brachyrhynchos*	**	X		
Short-earred Owl	*Asio flammeus*	**			
Red-tailed Hawk	*Buteo jamaicensis*	**			
Greater Sage Grouse	*Centrocercus urophasianus*	**		***	
Long-billed Curlew	*Numenius americanus*	**			
Black-billed Magpie	*Pica hudsonia*	**	X		
Unknown		**			

*Note: Includes birds observed, heard, or sign observed (e.g., tracks, scat, etc.)

**Note: During the January 2009 surveys, cattle were concentrated on the non-irrigated seeded pasture portion of the site and were fed via tractor on most mornings. As such, this area was avoided during winter surveys, as wildlife occurrence would be reduced by the livestock occupation and associated feeding activities.

***Note: The April 2010 surveys were only conducted for greater sage grouse. No birds were observed or heard, and no sign observed (e.g., tracks, scat, etc.).

Table 3.5-8c Avian Point Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site- Crop Area (Page 1 of 2)

Species		June 2008							October 2008						
		Total*	% Observed	Pt 1	Pt 2	Pt 3	Pt 4	Pt 5	Total*	% Observed	Pt 1	Pt 2	Pt 3	Pt 4	Pt 5
Horned Lark	*Eremophila alpestris*	17	54.8				10	7	50	82	14	10	9	10	7
Western Meadowlark	*Sturnella neglecta*	4	12.9				1	3	0	0.0					
Sage Thrasher	*Oreoscoptes montanus*	0	0.0						0	0.0					
Northern Harrier	*Circus cyaneus*	4	12.9	2	1			1	1	1.6					1
Brewer's Sparrow	*Spizella breweri*	0	0.0						0	0.0					
Chipping Sparrow	*Spizella passerine*	0	0.0						0	0.0					
Sage Sparrow	*Amphispiza belli*	0	0.0						0	0.0					
Vesper Sparrow	*Pooecetes gramineus*	0	0.0						0	0.0					
Grasshopper Sparrow	*Ammodramus savannarum*	0	0.0						0	0.0					
Mourning Dove	*Zenaida macroura*	2	6.5		2				4	6.6		2			2
Kildeer	*Charadrius vociferous*	0	0.0						0	0.0					
Brown-headed Cowbird	*Molothrus ater*	0	0.0						0	0.0					
American Crow	*Corvus brachyrhynchos*	0	0.0						5	8.2	1		1	3	
Short-earred Owl	*Asio flammeus*	0	0.0						0	0.0					
Red-tailed Hawk	*Buteo jamaicensis*	0	0.0						0	0.0					
Greater Sage Grouse	*Centrocercus urophasianus*	0	0.0						0	0.0					
Long-billed Curlew	*Numenius americanus*	4	12.9	2	1	1			0	0.0					
Black-billed magpie	*Pica hudsonia*	0	0.0						1	1.6	6				1
Unknown		0	0.0						0	0.0					
Total		**31**	**100**	**4**	**4**	**1**	**11**	**11**	**61**	**100**	**15**	**12**	**10**	**13**	**11**

Table 3.5-8c Avian Point Survey Data Summary for the Proposed Eagle Rock Enrichment Facility Site- Crop Area (Page 2 of 2)

		January 2009							April 2009						
Species		**Total***	**% Observed**	**Pt 1**	**Pt 2**	**Pt 3**	**Pt 4**	**Pt 5**	**Total***	**% Observed**	**Pt 1**	**Pt 2**	**Pt 3**	**Pt 4**	**Pt 5**
Horned Lark	*Eremophila alpestris*	1	33.3		1				33	71.7	7	4	3	11	8
Western Meadowlark	*Sturnella neglecta*	0	0.0						7	15.2	2				5
Sage Thrasher	*Oreoscoptes montanus*	0	0.0						0	0.0					
Northern Harrier	*Circus cyaneus*	0	0.0						0	0.0					
Brewer's Sparrow	*Spizella breweri*	0	0.0						3	6.6	2				1
Chipping Sparrow	*Spizella passerine*	0	0.0						0	0.0					
Sage Sparrow	*Amphispiza belli*	0	0.0						2	4.3					2
Vesper Sparrow	*Pooecetes gramineus*	0	0.0						0	0.0					
Grasshopper Sparrow	*Ammodramus savannarum*	0	0.0						0	0.0					
Mourning Dove	*Zenaida macroura*	0	0.0						0	0.0					
Kildeer	*Charadrius vociferous*	0	0.0						0	0.0					
Brown-headed Cowbird	*Molothrus ater*	0	0.0						0	0.0					
American Crow	*Corvus brachyrhynchos*	1	33.3		1				1	2.2			1		
Short-earred Owl	*Asio flammeus*	0	0.0						0	0.0					
Red-tailed Hawk	*Buteo jamaicensis*	0	0.0						0	0.0					
Greater Sage Grouse***	*Centrocercus urophasianus*	1**	33.3		1**				0	0.0					
Long-billed Curlew	*Numenius americanus*	0	0.0						0	0.0					
Black-billed magpie	*Pica hudsonia*	0	0.0						0	0.0					
Unknown		0	0.0						0	0.0					
Total		**3**	**100**		**3**				**46**	**100**	**11**	**4**	**4**	**11**	**16**

*Note: Includes animals seen, heard, or sign observed (e.g., tracks, scat, etc.)

**Note: Tracks of greater sage grouse present at point location, no individuals seen.

***Note: The April 2010 surveys were only conducted for greater sage grouse. No birds were observed or heard, and no sign observed (e.g., tracks, scat, etc.) at search points 5, 14, and 15.

FIGURES

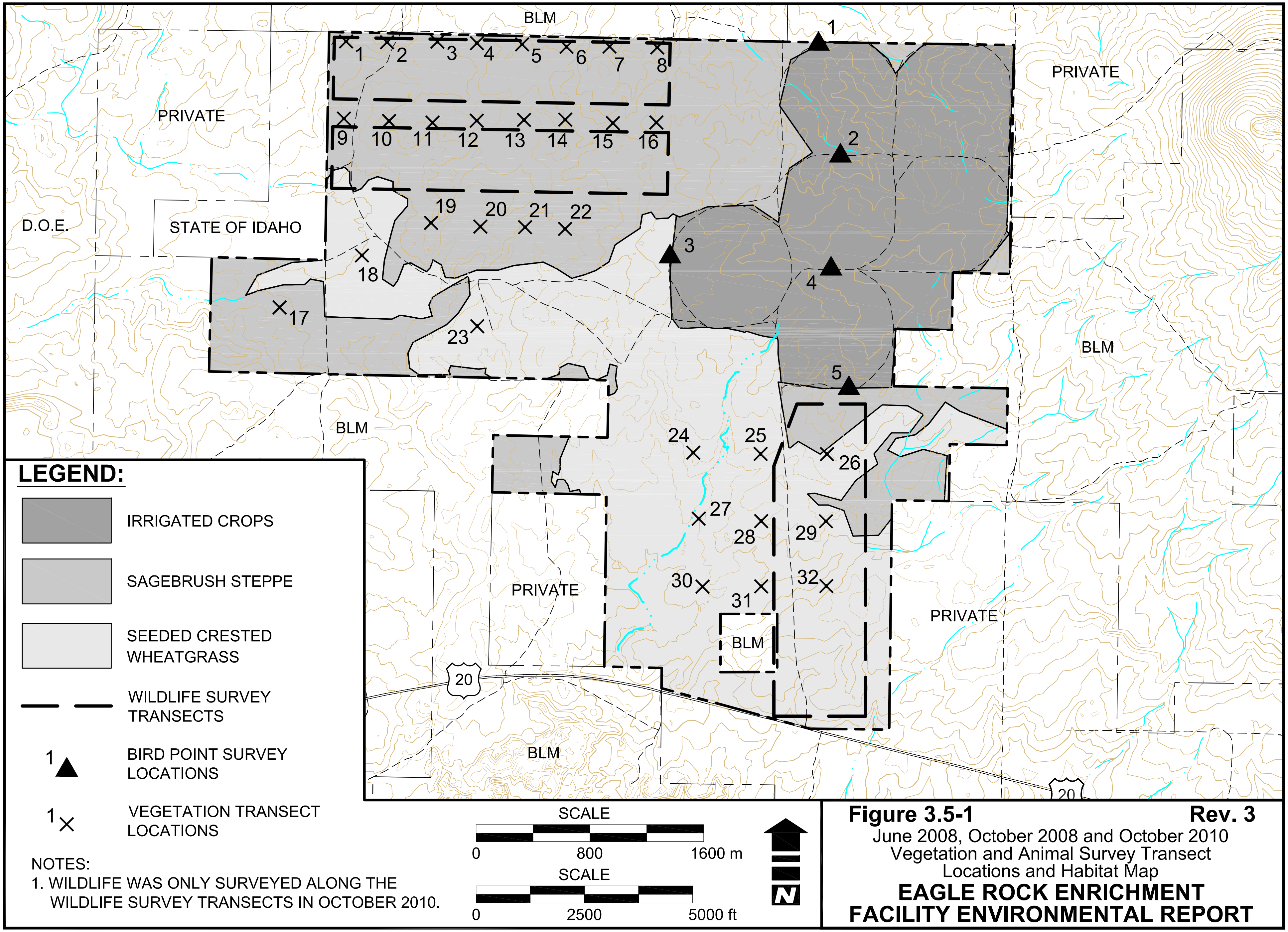


Figure 3.5-1 **Rev. 3**

June 2008, October 2008 and October 2010
Vegetation and Animal Survey Transect
Locations and Habitat Map

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

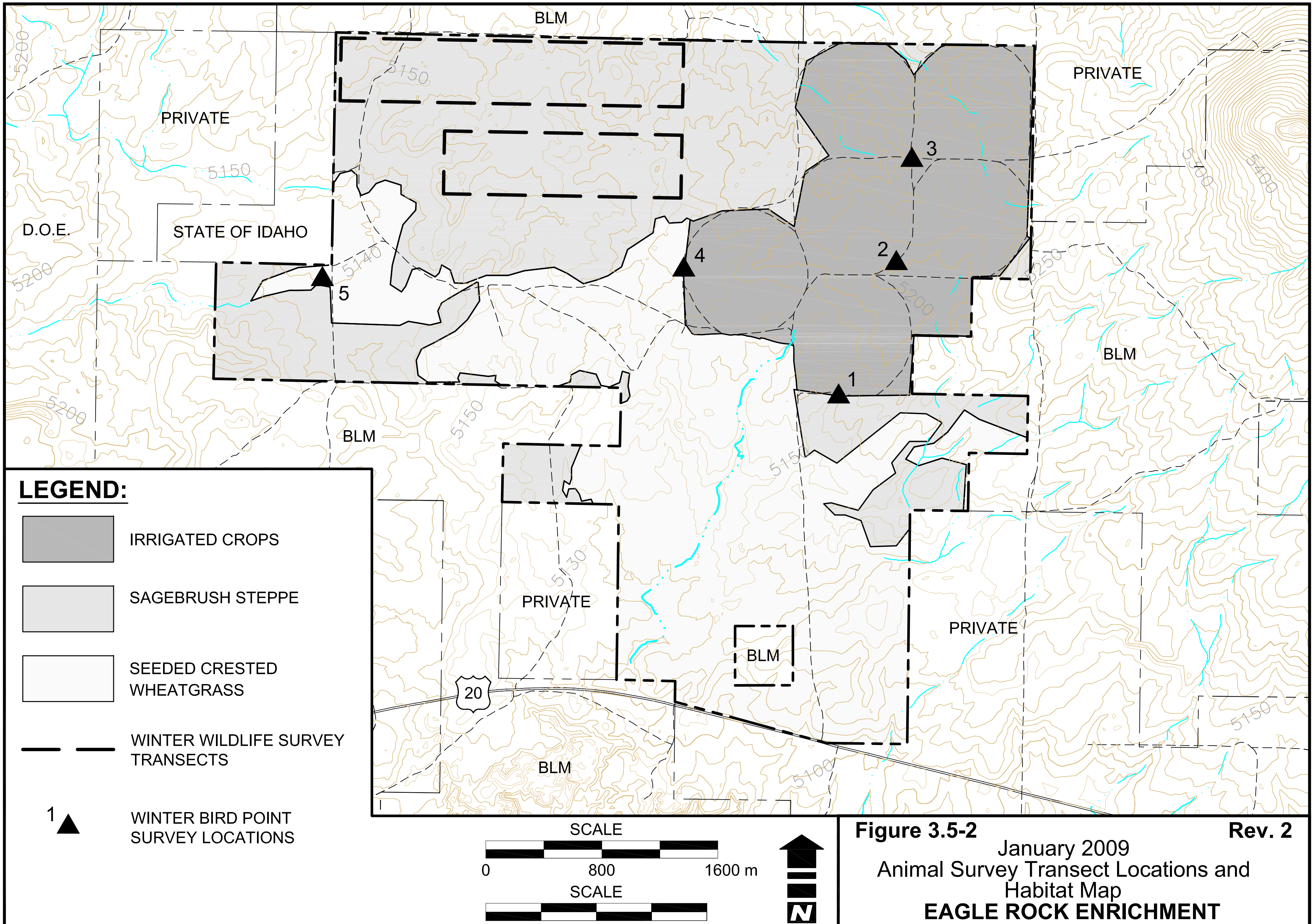


Figure 3.5-2 **Rev. 2**

January 2009
Animal Survey Transect Locations and Habitat Map

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

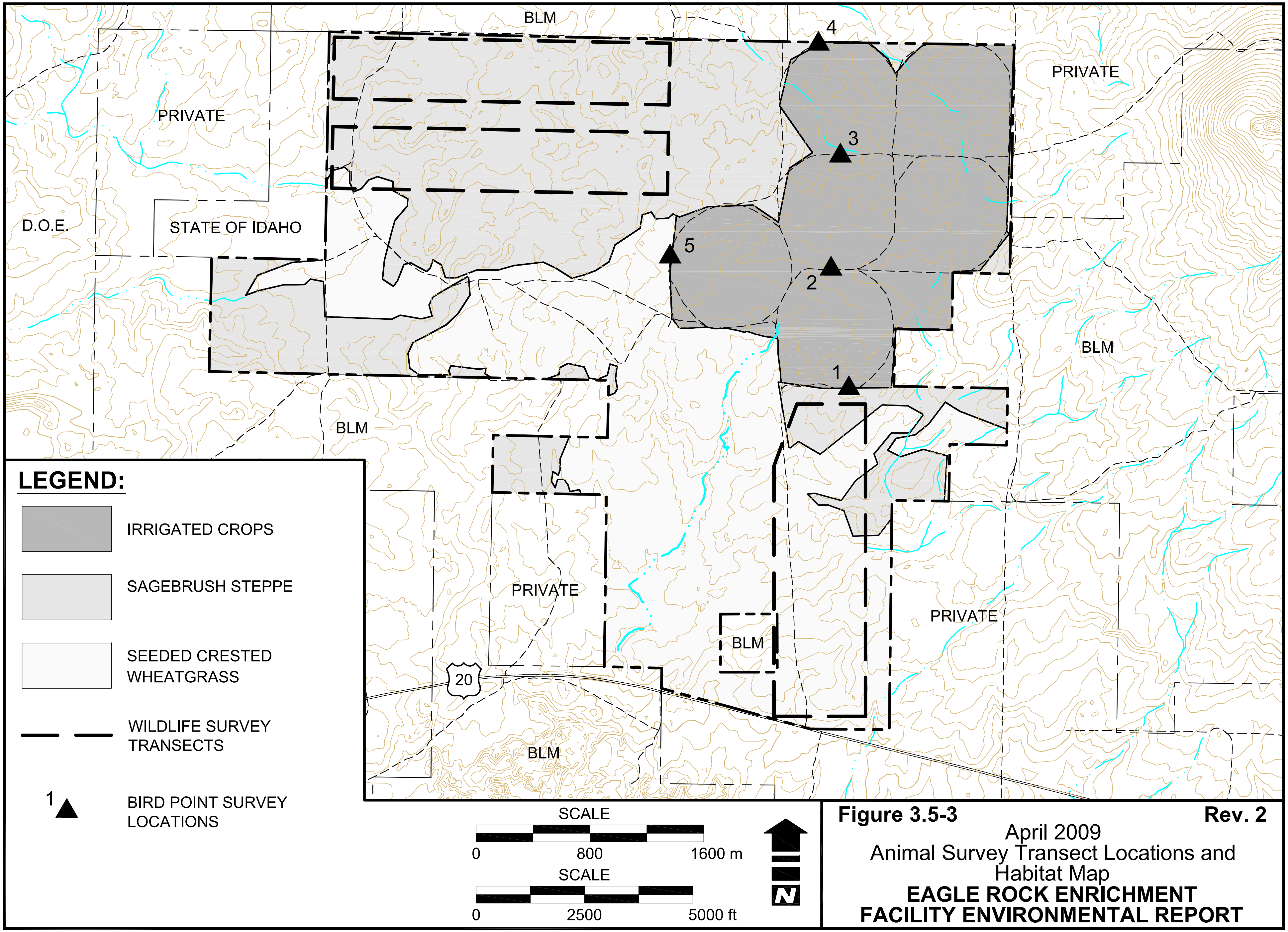
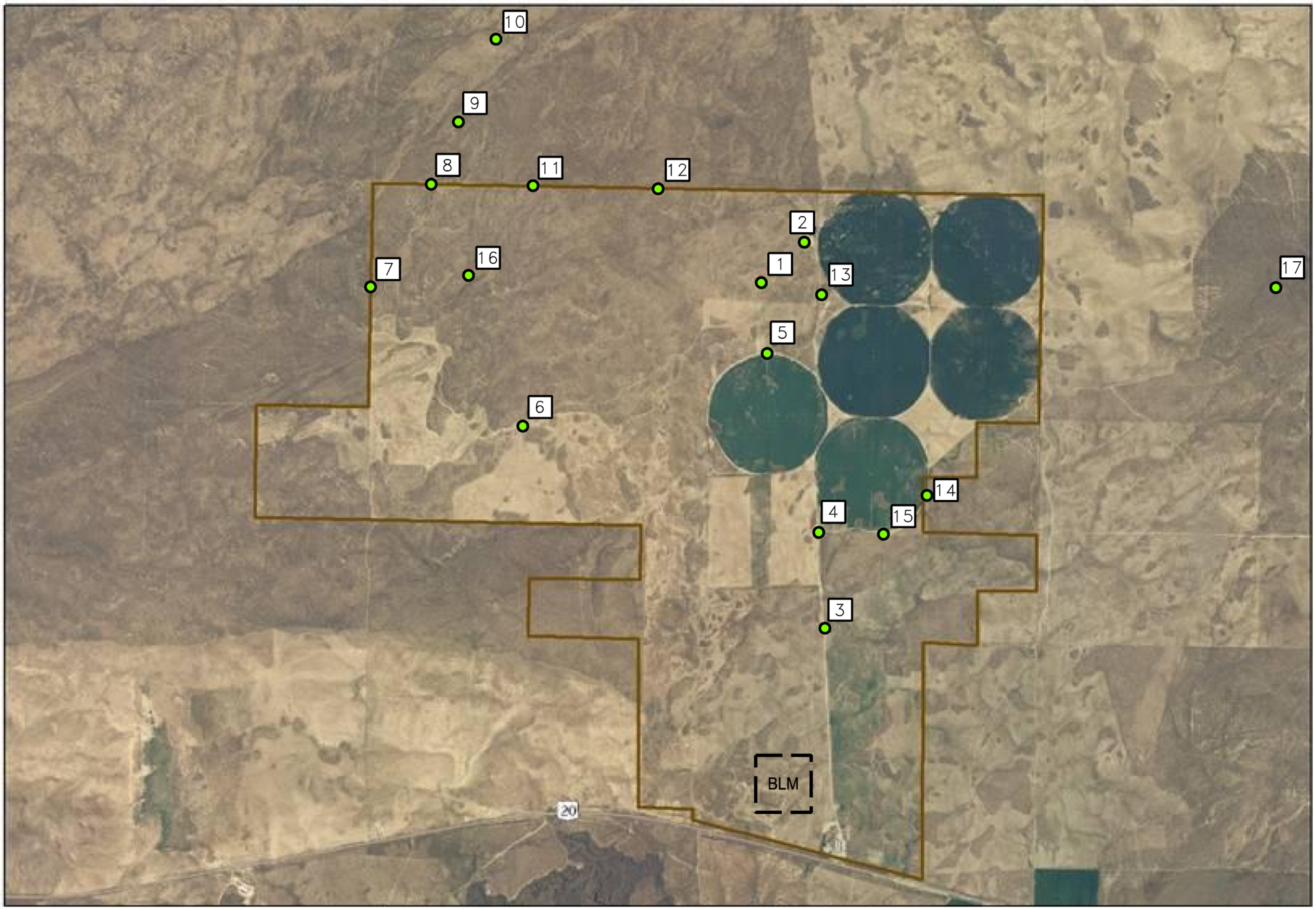


Figure 3.5-3 **Rev. 2**

April 2009

Animal Survey Transect Locations and Habitat Map

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



Legend

1 Sage Grouse Search Points

EREF Property Line

SCALE

0 800 1600 m

SCALE

0 2500 5000 ft

N

Figure 3.5-4 **Rev. 3**

April 2010

Sage Grouse Survey Point Locations

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

3.6 CLIMATOLOGY, METEOROLOGY, AND AIR QUALITY

This section provides information on the general climate of the Eastern Snake River Plain (ESRP), a discussion of meteorological parameters representative of onsite conditions that influence atmospheric transport and diffusion processes, and a summary of regional air quality conditions and compliance with National Ambient Air Quality Standards (NAAQS).

The description of the general climate of the ESRP includes information on climatological averages of temperature, relative humidity, precipitation, wind speed and direction, and atmospheric stability. Information on measured extremes and diurnal ranges is also provided. The climatological discussion also includes information on special and severe meteorological phenomena such as tornadoes, thunderstorms, airborne dust and sand, dust devils, blowing snow, and lightning.

A climate "normal" is defined as the arithmetic mean of a climatological element computed over three consecutive decades. Such data were obtained from the National Climatic Data Center (NCDC) for two stations that bracket the location of the Eagle Rock Enrichment Facility (EREF). These stations are known as Idaho Falls 2 ESE, located approximately 35 km (22 mi) east-southeast of the site and Idaho Falls 46 W, located approximately 42 km (26 mi) west of the site. Both sites are located within the ESRP.

Hourly meteorological data have been obtained from the Idaho National Engineering Laboratory (INL). The Air Resources Laboratory Field Research Division (ARLFRD) of the National Oceanic and Atmospheric Administration (NOAA) furnishes forecast and emergency support to operations sponsored by the U.S. Department of Energy (DOE) at the INEL. ARLFRD also reports basic climatological data to NCDC. ARLFRD maintains a network of 33 meteorological observing stations on the property and in the vicinity of the INL (NOAA, 1989). All stations are equipped with meteorological towers with instrumentation to a height of 15 meters (49 feet). Three tall towers of differing heights (75, 61, and 45 m (246, 200, and 148 ft)) are located on the property of the INEL and are equipped with instrumentation at multiple levels. For the purposes of this section, hourly meteorological data was obtained from ARLFRD for a five-year period from two stations that best represent meteorological and atmospheric dispersion conditions at the EREF site. These stations are located at Kettle Butte (KET – 15-m (49-ft) tower), 10 km (6 mi) east-southeast of the EREF site and Argonne National Lab-West (EBR – 75-m (246-ft) tower), located 18 km (11 mi) west of the EREF site. Both sites are located within the ESRP. Figure 3.6-1, Location of Eagle Rock Enrichment Facility and Nearby Meteorological Monitoring Stations, shows the position of the four meteorological stations relative to the EREF site. The Station Identifier, Type of Station, and Station Coordinates for the four meteorological stations used as sources of meteorological information are as follows:

- ID2ESE (Idaho Falls 2 ESE), National Weather Service Cooperative Station, 43.4833 N and 112.0167 W;
- ID46W (Idaho Falls 46 W), National Weather Service Cooperative Station, 43.5333 N and 112.9500 W;
- KET (Kettle Butte), INL Meteorological Monitoring Network Station, 43.5476 N and 112.3263 W;
- EBR (Argonne National Lab-West) which is now identified as MFC (Materials and Fuels Complex), INL meteorological monitoring network station, 43.5941 N and 112.6517 W.

Regional air quality data and information on compliance with NAAQS were obtained from the Idaho Department of Environmental Quality (IDEQ) (IDEQ, 2006).

3.6.1 Climatology

The EREF site lies in the middle of the ESRP, which is a broad and basically flat 80-km (50-mi) wide valley with a southwest to northeast longitudinal axis. Both sides of the river plain are bordered by mountain ranges that rise to approximately 3,353 m (11,000 ft) above mean sea level (msl). The average elevation of the river plain is about 1,524 m (5,000 ft) msl. The orientation of the river plain and adjacent mountain ranges has a profound effect on wind flow patterns in the region.

Air masses that typically move from west to east across the inter-mountain region lose their moisture through condensation and precipitation over the mountains prior to reaching the ESRP. Annual rainfall in the region is quite light and results in the region being classified as semi-arid. Most air masses traversing the ESRP are of Pacific Ocean origin. The mountains to the east of the ESRP effectively block the intrusion of wintertime arctic outbreaks into the region. This results in a more moderate temperature regime than what is frequently encountered to the east of the Continental Divide. The absence of cloud cover and the presence of relatively dry air allows for intense solar radiation during daylight hours and effective radiational cooling at night, causing large diurnal ranges in temperature.

3.6.1.1 Temperature

Long-term temperature data representative of the EREF site conditions were obtained from NCDC for the following stations: Idaho Falls 2 ESE and Idaho Falls 46 W (NOAA, 2004a; NOAA, 2004b). Table 3.6-1, Eagle Rock Enrichment Facility Site Climate: Normal and Extreme Temperatures, presents normal and extreme temperature data for these stations.

Average monthly temperatures at Idaho Falls 2 ESE range from -6.1°C (21.1°F) in January to 20.4°C (68.7°F) in July. Average monthly temperatures at Idaho Falls 46 W range from a low of -8.8°C (16.2°F) in January to 19.8°C (67.6°F) in July. The average diurnal temperature ranges (the average differences between the daily maximum and minimum temperatures) at Idaho Falls 2 ESE are 9.5°C (17.2°F) in January and 20°C (35.9°F) in August. At Idaho Falls 46 W, the average diurnal temperature ranges are -13.0°C (23.4°F) and 21.6°C (39.0°F) in January and August, respectively. As can be seen, the smallest daily temperature range occurs in the winter, while the largest daily temperature range occurs in summer. Furthermore, the diurnal temperature ranges are larger at Idaho Falls 46 W than at Idaho Falls 2 ESE. The greater diurnal ranges in the summer are due to the intense solar radiation experienced during that time of year. The smaller diurnal temperature ranges experienced at Idaho Falls 2 ESE is likely caused by less efficient radiational cooling at night due to its urban location.

The highest and lowest temperatures recorded during a 50-year period of record at Idaho Falls 2 ESE are 38°C (100°F) and -37°C (-34°F), respectively. Comparable extreme temperatures recorded during the 48-year period of record at Idaho Falls 46 W are 38°C (101°F) and -44°C (-47°F).

Figure 3.6-2, Comparison of Monthly Mean Temperature in the Vicinity of the Eagle Rock Enrichment Facility Site, is a comparison of the monthly mean temperature values of the four meteorological stations in the vicinity of the EREF site. The temperature trends for the four stations over the course of a year compare favorably to each other with two exceptions. During the months of June through August, mean temperatures at KET and EBR are higher than those at Idaho Falls 46 W and Idaho Falls 2 ESE. Also monthly mean temperatures at Idaho Falls 46 W are always lower than the other meteorological stations.

3.6.1.2 Precipitation

Air masses approaching the ESRP and the EREF location must cross over significant mountain ranges prior to their arrival in southeastern Idaho. In doing so, the majority of the moisture contained in these air masses condenses and precipitates over the mountains. As the air masses descend from the mountains, they warm adiabatically and become relatively dry. As a result, annual precipitation in the ESRP is quite light. Table 3.6-2, Eagle Rock Enrichment Facility Site Climate: Normal and Extreme Precipitation, presents normal and extreme precipitation for Idaho Falls 2 ESE and Idaho Falls 46 W (NOAA, 2004a; NOAA, 2004b).

The type of precipitation in the ESRP varies with the seasons. Convective showers and thundershowers occur in the summer. Precipitation during the spring and fall can be characterized as showery or as a steadier rainfall. Winter precipitation is typically in the form of snow. Snow can occur anytime from September through May.

Annual average precipitation at Idaho Falls 2 ESE is 360.93 mm (14.21 in). This precipitation falls fairly evenly throughout the year with the exception of the month of May, which exhibits a significant spike in precipitation. The month with the highest recorded precipitation total is May 1993 with 115.82 mm (4.56 in). There have been several months in the 30-year period of record where no precipitation has fallen for the entire month.

Annual average precipitation at Idaho Falls 46 W is considerably less than what occurs at Idaho Falls 2 ESE and measures 224.03 mm (8.82 in). The precipitation pattern of these two locations is somewhat similar in that precipitation falls fairly evenly throughout the year with the exception of a precipitation maximum in May. The month with the highest recorded precipitation total at Idaho Falls 46 W is June 1995 with 117.86 mm (4.64 in). Over the 30-year period of record, precipitation has always fallen at some time during the months of January, May, June and August. Over the same period of record, there have been at least ten months when no precipitation has occurred for the entire month. The months of February and September have had multiple occurrences with no precipitation.

Figure 3.6-3, Comparison of the Monthly Mean Precipitation in the Vicinity of the Eagle Rock Enrichment Facility Site, is a comparison of the monthly mean precipitation values of the four meteorological stations in the vicinity of the EREF site. It is important to note that the INL data for EBR and KET are from the most recent five-year period available (2003-2007). That five-year period is not concurrent nor as lengthy as the 30-year period of record (1971-2000) that was used in the data obtained from the NCDC for Idaho Falls 46 W and Idaho Falls 2 ESE. The plot of monthly mean precipitation values indicates the following:

- All four stations experience an increase in precipitation in the spring (April-May).
- EBR and KET experience another increase in precipitation in October.
- The mean monthly precipitation at Idaho Falls 2 ESE is always greater than the other three stations. This is likely due to its close proximity to the mountains that border the ESRP to the east.

Table 3.6-3, Precipitation Distribution at KET and EBR (2003 - 2007), provides a distribution of hourly precipitation occurrences categorized by precipitation intensity for both KET and EBR for the period 2003 – 2007. The data indicates that precipitation occurs infrequently (less than 3% of the time) and that precipitation intensity is predominately less than 2.54 mm (0.1 in).

The annual average snowfall for Idaho Falls 2 ESE is 833.12 mm (32.8 in). The highest daily snowfall at this location is 254 mm (10 inches) and has occurred on at least two occasions. The highest monthly snowfall is 571.5 mm (22.5 inches) occurring in December 1994. The highest daily snow depth is 660.4 mm (26 inches) occurring on January 13, 1993.

The annual average snowfall for Idaho Falls 46 W is 637.54 mm (25.1 in). The highest daily snowfall at this location is 218.44 mm (8.6 in), which occurred on March 22, 1973. The highest monthly snowfall is 566.42 mm (22.3 in) occurring in December 1971. The highest daily snow depth is 762 mm (30 in) occurring for several days from late February to early March 1993.

3.6.1.3 Relative Humidity

Relative humidity data were obtained from the ARLFRD for KET, the closest weather station to the EREF site, for the most recent available five-year period (2003 – 2007).

The monthly and annual relative humidity averages and extremes for KET are presented in Table 3.6-4, INL Monthly and Annual Mean Relative Humidity (%) at KET (2003 - 2007). Average relative humidity values are higher in winter and lower in summer. This seasonal dependence is due to the increased precipitation and the smaller daily temperature ranges observed in the winter compared to the summer. Absolute relative humidity values of 100% were observed on several occasions during the colder months of the year. The lowest relative humidity observed was 6.5% in August 2005. This is indicative of the very dry summers experienced across the entire ESRP.

The highest diurnal values usually occur near sunrise, while the lowest values occur during the mid-afternoon. The peaks and valleys in relative humidity values normally occur simultaneously with the minimum and maximum air temperatures, respectively.

Figure 3.6-4, INL Monthly Mean Relative Humidity (%) at KET (2003 - 2007), displays the monthly mean relative humidity values for KET. The figure clearly displays the pattern of higher relative humidity during the winter and lower relative humidity during the summer.

3.6.1.4 Wind

Both Idaho Falls 2 ESE and Idaho Falls 46 W are cooperative weather stations as opposed to first-order National Weather Service stations. As a result, wind data are not available for these locations from NCDC. However, Idaho Falls 46 W is located on the property of the INL, is operated by NOAA staff and is part of the 33-station meteorological network of the ARLFRD. Therefore, wind data is available from Idaho Falls 46 W (identified as CFA in ARLFRD reports) (NOAA, 1989). Five years (2003-2007) of recent wind data has also been obtained from ARLFRD for two additional stations located closer to the EREF site. These stations are identified as Argonne National Lab-West (EBR) and Kettle Butte (KET).

The EREF site is in a region of prevailing westerly winds that are normally channeled within the ESRP. This channeling usually produces a west-southwest or southwest wind. When these prevailing westerly winds become strong, the channeling effect within the ESRP enhances and strengthens the west-southwest to southwest flow. Some of the highest wind speeds within the ESRP are observed under these meteorological conditions.

Drainage winds (also referred to as mountain or gravity winds) also contribute to the wind flow pattern at the EREF site. On clear nights, the valley experiences rapid surface radiational cooling. The air near the surface of the mountain slopes cools, becomes more dense than the air further removed from the mountain slopes and sinks to the floor of the valley. The valley floor also has a slight tilt and the cooler air continues to flow towards lower elevations, in this case generally from the northeast to the southwest. This phenomenon is known as a down-slope valley wind.

During sunny daytime conditions an opposite flow develops as the mountain slopes and valley floor are rapidly heated and the air near the surface begins to rise to create an up-slope valley flow. The up-slope valley wind is usually weaker than the down-slope wind and is typically masked by the more dominant prevailing westerlies that are channeled through the valley from the southwest.

Figures 3.6-5, KET Wind Rose (15 Meters/49.2 Feet), and 3.6-6, EBR Wind Rose (10 Meters/32.8 Feet), present annual wind roses for KET and EBR, respectively. The wind roses clearly display the channeling effect of the mountains that border the ESRP. Figures 3.6-8 through 3.6-19 present monthly wind roses for EBR.

Table 3.6-5, Eagle Rock Enrichment Facility Site Climate: Average Monthly and Annual Wind Speeds for Idaho Falls 46 W, KET and EBR, provides the average monthly and annual wind speed based on data collected at Idaho Falls 46 W, KET and EBR. The comparison of wind speeds at these three locations is somewhat difficult because the measurements were taken at different heights above grade and, in the case of Idaho Falls 46 W, for a different period of record. The months with the highest monthly average wind speeds occur in the spring. The months with the lowest monthly average wind speeds occur in the winter. Table 3.6-6, Eagle Rock Enrichment Facility Site Climate: Highest Hourly Average Wind Speed and Concurrent Wind Direction for Idaho Falls 46 W, KET and EBR, displays the highest hourly average (peak) wind speeds and concurrent wind directions for each month and for the given periods of record. The month with the highest hourly average wind speed is March with peak winds ranging from 68 to 83 km/hr (43 to 51 mi/hr). The wind directions for all of the highest hourly average wind speeds are from the west-southwest.

Table 3.6-7, Number of Wind Direction Persistence Events ≥ 12 Hours – EBR (2003-2007), provides a listing of the number of times over the five-year period of record that the wind blew from the same wind direction for at least 12 consecutive hours at the EBR meteorological station. The wind direction persistence data clearly reflect the northeast-southwest orientation of the ESRP as these are the favored wind persistence directions.

Of the three sources of wind data discussed in this section (Idaho Falls 46 W, KET and EBR), 10-m (33-ft) wind data from EBR was selected for use in the χ/Q calculations discussed in Section 4.6.2.3. The reasons for this selection are as follows:

- Vertical temperature difference data are collected at EBR's 75-m (246-ft) tower. This information is used to calculate atmospheric stability. It is desirable to use atmospheric stability and wind data from the same location.
- EBR is closer to the EREF site than Idaho Falls 46 W.
- EBR generally experiences lower wind speeds than KET. Lower wind speeds typically give rise to conservative (higher) χ/Q values.
- Wind data from EBR are generally representative of conditions in the ESRP and at the EREF site.

Although wind data from the 75-m (246-ft) level at EBR are available, those data are not addressed here because it is assumed that any gaseous release from the EREF will occur at ground level.

3.6.1.5 Atmospheric Stability

The vertical thermal structure of the lower atmosphere is a key component in determining the efficiency of the dispersion of effluents into the atmosphere. The atmosphere is said to be stable when warmer air overlies cooler air so that vertical motions are damped. During the day, rising currents of air heated at the surface mix vertically. It follows that the dispersion of an effluent will be most efficient within the thermally well-mixed portion of the atmosphere. This well-mixed portion of the atmosphere is known as the mixing depth and is defined as that portion of the atmosphere next to the surface through which airborne material can freely diffuse. The mixing depth is bounded above by an inversion layer where air temperature increases with height or where the rate of temperature decrease with height is less than in the air below. The depth of the mixed layer is determined by the heat energy exchange between the air and the ground, and is influenced by cloud cover, time of day, and season.

Seasonal average mixing depths, based on radiosonde data taken at selected airports throughout the contiguous United States, have been analyzed to determine the average mixing depths in the ESRP. The morning mixing height is calculated as the height above the ground at which the dry adiabatic extension of the morning minimum surface temperature plus 5°C (9°F) intersects the vertical temperature profile observed via radiosonde launched at 1200 Greenwich Mean Time (GMT). The afternoon mixing height is calculated in the same way except that the maximum surface temperature between noon and 4 PM local standard time is substituted for the minimum temperature plus 5°C (9°F).

The estimated seasonal and annual mixing depths for mornings and afternoons in the ESRP are shown in Table 3.6-8, Estimated Seasonal and Annual Mixing Depths for Mornings and Afternoons in the ESRP, (NOAA, 1989). The data indicate that the mixing depth is the shallowest in the morning during the summer months, resulting in limited vertical dispersion. The mixing depth is greatest during summer afternoons, which enhances vertical dispersion during that portion of the day and year. The average annual mixing depth for the morning hours is 370 m (1,214 ft) and for the afternoon it is 2,090 m (6,857 ft).

Five years of meteorological data (2003-2007) from Argonne National Lab-West (EBR) were used to generate joint frequency distributions of wind speed and direction as a function of Pasquill stability class (A-G). Stability class was determined using the vertical temperature difference (ΔT) method as specified in Table 1 of Regulatory Guide 1.23, Revision 1 (NRC, 2007c). This method is preferred because it is an effective indicator for the worst-case stability conditions (e.g., Pasquill stability classes E, F and G). Furthermore, models endorsed by the NRC to predict radioactive release concentrations are based on field studies that used vertical temperature differences to classify atmospheric stability.

To prepare the joint frequency distributions, hourly atmospheric stability was determined from the hourly ΔT data from the 75-m (246-ft) meteorological tower at EBR. Temperature data from the 10-m (33-ft) level and the 75-m (246-ft) level were used to calculate ΔT and the stability class. The joint frequency distributions are presented in Table 3.6-9, EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables.

Based on wind data from EBR at the 10-m (33-ft) level (Table 3.6-9, EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables), the most stable classes, E, F and G, occur 21.5%, 17.6% and 18.8% of the time, respectively. The least stable class, A, occurs 5.1% of the time. Important conditions for atmospheric dispersion, stable conditions (stability class F and G) and low wind speeds of 0 to 1.0 m/s (0 to 3.3 ft/s), occur 3.4% of the time. The highest occurrence of Pasquill stability classes F and G and low wind speeds, 0 to 1.0 m/s (0 to 3.3 ft/s), with respect to wind direction is 0.4% with south winds.

Tables 3.6-10 through 3.6-14 provide yearly temperature inversion persistence summaries for the period 2003-2007 at EBR. Note: The EBR station is now identified as the Materials and Fuel Complex (MFC) station. For the purpose of this discussion, a temperature inversion occurs when the temperature at 75 m (246 ft) is greater than the temperature at 10 m (33 ft).

For the five-year period of record at EBR, the 50% percent probability level for inversion duration is between 10 and 11 hours. In other words, it is more likely than not that when an inversion occurs at EBR, it will last for at least 10 hours.

3.6.2 Extreme Weather

3.6.2.1 Thunderstorms

The NCDC Storm Event Database was queried to obtain information on thunderstorms in the vicinity of the EREF site (NOAA, 2008a). The period of record available for review was January 1, 1955 to April 30, 2008. The area of interest was a four-county area surrounding the EREF and included Bonneville, Bingham, Butte and Jefferson counties, an area of 18,871 km^2 (7,286 mi^2). The output from the query contained 228 thunderstorm days during the 53-year period of record or 4.3 thunderstorm days per year. Several individual thunderstorms may occur during each of the thunderstorm days. Thunderstorm days can occur during every month of the year; however, they are most prevalent during the months of March through October. The thunderstorms that occur over the ESRP tend to be less severe than those that are experienced east of the Rocky Mountains. This is due, in part, to high cloud-base altitudes that allow thunderstorm precipitation to evaporate prior to reaching the ground. If the thunderstorms are of sufficient strength, they may be accompanied by strong winds, hail and even tornadoes. Winds greater than 65 km/hr (35 knots) occurred with thunderstorms on 170 occasions during the 53-year period of record. Hail accompanied the thunderstorms on 89 occasions.

3.6.2.2 Tornadoes

A tornado is defined as a violent vortex in the atmosphere. When the vortex reaches the ground, it is classified as a tornado. If the vortex does not reach the ground, it is classified as a funnel cloud. Tornadoes and funnel clouds always occur in association with thunderstorms, especially those which produce hail.

Most of the tornado activity in the United States occurs east of the Rocky Mountains. The total number of tornadoes in the four-county region encompassing the EREF site for the 58-year (January 1, 1950 through April 30, 2008) period of record is 40. Most of the tornado activity (82.4% of occurrences) occurred from April through July. The annual frequency of occurrence of a tornado in the four-county region is 0.69 (40 tornadoes/58 years). The likelihood of a tornado occurring within any 1,000 square mile area in the vicinity of the EREF site is 0.09 (0.69/7.289) tornadoes per year per 1,000 square miles. The probability of a tornado developing at the EREF site is very small.

Tornadoes are commonly classified by their intensity. The F-Scale classification ranks tornadoes based on the level of observable damage, with F0 being the weakest and F5 the strongest. One F2 tornado was sighted in the four-county region during the 58-year period of record. That tornado occurred in Bonneville County on April 7, 1978, causing $2.5 million in damage and one injury. All other tornadoes were either F0 (20 occurrences) or F1 (19 occurrences).

In addition to the tornado activity described above, 12 funnel clouds were sighted during the 58-year period of record in the four-county region.

3.6.2.3 Airborne Dust and Sand

The EREF site is located in a semi-arid environment and, as a result, blowing dust and drifting sand can be a nuisance when the winds are strong in certain areas of the ESRP. Vehicular traffic and construction equipment are also significant contributors to high dust concentrations. These conditions may particularly affect the activities of construction personnel during the spring months after the winter thaw when strong frontal systems pass through the ESRP and during the summer months when thunderstorms are near. During the daylight hours under conditions of strong winds, the concentration of dust sharply decreases with height up to 21 m (70 ft) above grade level.

3.6.2.4 Dust Devils

A dust devil is a rotating updraft ranging from 0.5 m (1.6 ft) in diameter and a few meters tall to over 10 m (33 ft) wide and over 1,000 m (3,281 ft) tall. Dust devils form as an updraft under calm, sunny conditions and intense solar heating of the ground. Dust devils are common during the summer in the ESRP (NOAA, 1989). As the dust devil develops, the rising air within the rotating updraft picks up dust and pebbles and can move objects that are not properly secured. Due to their short duration and relatively weak wind speeds 48 to 80 lm/hr (30 to 50 mi/hr), dust devils very rarely cause damage to people or property.

3.6.2.5 Blowing Snow

Blowing snow occurs when snow is on the ground and high winds cause the snow to be entrained into the air near the surface. Blowing snow can become a hazard because it reduces visibility and causes the snow to accumulate into drifts on the leeward side of buildings, vehicles, fence posts and structures, in general. During blizzard conditions, visibility can be reduced to zero. The formation of drifts can make roads and parking lots impassable. The terrain in the vicinity of the EREF site is predominately flat. This type of terrain is not conducive to the formation of snowdrifts. Nevertheless, snowdrifts can form on the leeward side of structures and obstacles. With a recorded maximum daily snowfall of 254 mm (10 in) and a maximum snow depth of 762 mm (30 in) in the vicinity of the EREF site, however, heavy drifting of snow is not anticipated.

3.6.2.6 Lightning

The only lightning data contained in the NCDC Storm Event Database are lightning events that result in fatality, injury and/or property and crop damage. According to the Database (NOAA, 2008a), there were nine lightning strikes in the four-county region encompassing the EREF site that accounted for $517,000 in property damage between January 1, 1950 and May 31, 2008. There were no reported deaths, injury or crop damage caused by lightning. According to ARLFRD (NOAA, 1989), the INL is not frequently struck by lightning. The INL is located immediately west of the EREF site. Nevertheless, the lack of natural targets and the poor conductivity of the dry desert soil and underlying lava rock cause man-made structures in this region to be susceptible to lightning strikes.

J.L. Marshall (Marshall, 1973) presented a methodology for estimating lightning strike frequencies which includes consideration of the attractive area of structures. His method consists of determining the number of lightning flashes to earth per year per square kilometer and then defining an area over which the structure can be expected to attract a lightning strike. Assuming that there is one flash to earth per year per square kilometer (2.59 flashes to earth per square mile) in the vicinity of the EREF (conservatively estimated using Figure 3.6-20, Average Lightning Flash Density, Average Lightning Flash Density, which is taken from the National Weather Service (NOAA, 2008b)). Marshall defines the total attractive area, A, of a structure with length, L, width W, and height H, for lightning flashes with a current magnitude of 50% of all lightning flashes as:

$A = LW + 4H (L + W) + 12.57 H^2$

The following building complex dimensions were used to estimate conservatively the attractive area of the EREF:

L = 655 m (2,150 ft) (Measured from northern edge of the Cylinder Receipt and Shipping Building to the southern edge of the Administration Building)

W = 598 m (1,961 ft) (Measured from the western edge of Cascade Halls to the eastern edge of the Centrifuge Assembly Building)

H = 16 m (53 ft) (Maximum building height)

In addition, the area of the Cylinder Storage Pads was determined to be 250,542 m^2 (2,696,810 ft^2). Adding the area of the Cylinder Storage Pads to the area of the building complex (391,690 m^2 (4,216,116 ft^2) results in a total area of 642,232 m^2 (6,912,928 ft^2). Assuming a square, the effective length and width would be the square root of the total area, or 801 m (2,628 ft). Therefore:

$$A = (801 m)(801 m) + 4(16 m)(801 m + 801 m) + 12.57(16 m)^2$$

$$= 747{,}346.92 m^2$$

The total attractive area is therefore equal to 0.75 km^2 (0.29 mi^2). Consequently, the lightning strike frequency computed using Marshall's methodology is given as 0.75 flashes per year.

3.6.3 Air Quality

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered to be harmful to public health and the environment (USC, 2008p). The standards are designed to primarily protect the general public, including sensitive populations such as asthmatics, children and the elderly. They are also intended to safeguard public welfare by reducing effects such as decreased visibility and damage to animals, crops, vegetation and buildings. EPA has established standards for six criteria pollutants, including two size ranges for particulate matter. The state of Idaho has adopted the federal NAAQS. Table 3.6-15, Ambient Air Quality Standards for Criteria Pollutants, lists the ambient air quality standards as administered by the Idaho Department of Environmental Quality (IDEQ).

The Air Quality Index (AQI) is a national index that categorizes air quality based on a 500-point scale for each of the criteria air pollutants. The categories and numeric values are as follows: Good (0-50); Moderate (51-100); Unhealthy for Sensitive Groups (101-150); Unhealthy (151-200); Very Unhealthy (201-300); and Hazardous (300-500). Idaho generally enjoys “good” air quality. The AQI for Bonneville County (the county in which the EREF will be located) in 2007 was classified as “good” 95.7% of the time and “moderate” 4.3% of the time (EPA, 2007).

Air quality data for the state of Idaho was obtained from the IDEQ 2006 Air Quality Monitoring Data Summary (IDEQ, 2006).

3.6.3.1 Ozone

Ozone is a summertime air pollution problem which primarily forms when photochemical pollutants from cars and industrial sources react with sunlight. These photochemical pollutants are called ozone precursors and include oxides of nitrogen (NO_x) and volatile organic compounds (VOC). Levels of ozone are usually highest in the afternoon because of the intense sunlight, warm temperatures and the time required for ozone to form. Based upon IDEQ monitoring data (IDEQ, 2006), ozone concentrations have remained below the ozone standard since monitoring began.

3.6.3.2 Particulate Matter (10 micrometers)

Particulate matter (PM) includes both solid matter and liquid droplets suspended in the air. Particles smaller than 2.5 micrometers in diameter are called "fine" particles, or $PM_{2.5}$. Particles between 2.5 and 10 micrometers in diameter are called "coarse" particles. PM_{10} includes both fine and coarse particles. In Idaho, coarse particles typically come from crushing or grinding operations and dust from roads. Idaho currently has one area that had previously exceeded the PM_{10} standard and is designated as a nonattainment area. This PM_{10} nonattainment area is in Pinehurst (EPA, 2008c). Pinehurst is in the northern reaches of Idaho, near the Canadian border, and is several hundred miles removed from the EREF site. Based upon IDEQ monitoring data (IDEQ, 2006), Idaho's airsheds have been in compliance with the PM_{10} standard from 1997 through 2006.

3.6.3.3 Particulate Matter (2.5 micrometers)

$PM_{2.5}$ generally comes from wood burning, agricultural burning and other area sources, as well as vehicle exhaust including cars, diesel trucks and buses. Fine particulate can also be formed secondarily in the atmosphere by chemical reactions of pollutant gases. All of Idaho was classified as attainment/unclassifiable for $PM_{2.5}$ in 2006. This designation is supported by IDEQ monitoring data (IDEQ, 2006), which show that $PM_{2.5}$ concentrations were all below the former $PM_{2.5}$ standard of 65 $\mu g/m^3$. The same IDEQ monitoring data, however, also show that the three-year average for $PM_{2.5}$ for Pinehurst exceeds the new $PM_{2.5}$ standard of 35 $\mu g/m^3$. The new $PM_{2.5}$ standard was made effective on December 17, 2006. Based upon only one year of data from Franklin County (near Logan, Utah and more than 161 km (100 mi) from the EREF site), $PM_{2.5}$ concentrations have exceeded the new standard at that location as well.

3.6.3.4 Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas that forms when the carbon in fuels does not burn completely. In Idaho, the majority of CO comes from vehicle exhaust. IDEQ CO monitoring data (IDEQ, 2006) confirm that CO concentrations have been steadily decreasing since the early 1990's. The maximum 8-hour concentration for CO in 2006 was 2.1 ppm, which is well below the 8-hour standard. Measured 1-hour CO concentrations in Idaho are historically much lower than the 35 ppm standard. The maximum and second-highest 1-hour CO concentrations in 2006 were 4.8 and 3.5 ppm, respectively.

3.6.3.5 Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless, reactive gas produced by burning fuels containing sulfur, such as coal and oil, and by industrial processes. Historically, the greatest sources of SO_2 were industrial facilities that derived their products from raw materials like metallic ore, coal and crude oil, or that burned coal or oil to produce process heat (petroleum refineries, cement manufacturing and metal processing facilities). Currently, on-road vehicles, marine craft and diesel construction equipment also release significant SO_2 emissions to the air. IDEQ SO_2 monitoring data (IDEQ, 2006) shows that SO_2 concentrations are well below all SO_2 ambient air quality standards. The maximum 24-hour and 3-hour averages recorded in 2006 were 0.033 ppm and 0.107 ppm, respectively. The highest annual SO_2 concentration in 2006 was 0.005 ppm.

3.6.3.6 Lead

Lead is a highly toxic metal that was used for many years in household products, automobile fuel and industrial chemicals. Airborne lead was associated primarily with automobile exhaust and lead smelters. Lead has not been monitored in Idaho since 2002. With the phase-out of lead in fuel and the closure of the Bunker Hill lead smelter in Kellogg, airborne lead is no longer a public health concern in Idaho (IDEQ, 2006).

3.6.3.7 Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a reddish brown, highly reactive gas that forms from the reaction of nitrogen oxide (NO) and oxygen in the atmosphere. The term “NO_x” refers to both NO and NO_2. NO_x and VOC are both photochemically reactive and can result in the formation of ozone. On-road vehicles are the major sources of NO_x. Industrial boilers and processes, home heaters and gas stoves can also produce NO_x. NO_x is not considered a significant pollution problem in Idaho. In 2006, IDEQ only maintained one monitoring site for NO_2 at the Lancaster site near Coeur d’Alene. The annual average has consistently been less than half of the NAAQS standard. The 2006 annual average concentration at this site was 0.006 ppm. NO_2 monitoring at this site was stopped on December 31, 2006 (IDEQ, 2006).

3.6.3.8 Nonattainment and PSD Class I Areas

There is currently one nonattainment area in Idaho. This nonattainment area is for PM_{10}. The Shoshone County, Pinehurst, Idaho area was designated nonattainment for PM_{10} and classified as moderate upon enactment of the Clean Air Act Amendments of 1990 (EPA, 2008d). IDEQ submitted a PM_{10} attainment plan on April 14, 1992, and EPA approved the plan on August 25, 1994. On April 14, 1992, IDEQ also submitted a PM_{10} attainment plan revision for the portion of the Shoshone County, Idaho nonattainment area just outside of Pinehurst. This area was designated nonattainment in January 1994. EPA approved the plan revision on May 26, 1995. The plan relies on control strategies needed to assure attainment of the PM_{10} NAAQS. The strategy focuses on control of residential wood combustion.

The Sandpoint area in Bonner County, Idaho was designated as a nonattainment area for PM_{10} and classified as moderate upon enactment of the Clean Air Act Amendments of 1990. IDEQ submitted a PM_{10} attainment plan in May 1993. On August 16, 1996, IDEQ submitted a revised plan and EPA approved the plan on June 26, 2002. The control strategies that are contained in the plan and designed to achieve attainment are control of residential wood combustion, fugitive road dust and industrial processes. Effective as of August 23, 2010, the EPA determined that the Sandpoint nonattainment area in Idaho attained the NAAQS for PM_{10} (FR, 2010a).

Portions of Power and Bannock Counties (Portneuf Valley area including Pocatello and the Fort Hall Area) (IDEQ, 2010), located approximately 56 km (35 mi) south of the EREF site, had been designated as a moderate nonattainment area for PM_{10} upon enactment of the Clean Air Act (CAA) Amendments of 1990 (EPA, 2008d). On June 30, 2004, IDEQ submitted a plan to EPA that met nonattainment and maintenance plan obligations. As part of the plan, IDEQ requested redesignation of the Portneuf Valley to attainment for PM_{10}. On May 20, 2005, EPA proposed in the Federal Register to approve the plan and grant the redesignation request. On July 13, 2006, EPA approved the plan and granted the redesignation request (71 FR 39574) (FR, 2006). Effective as of August 27, 2010, the Fort Hall nonattainment area on the Fort Hall Indian Reservation attained the PM_{10} NAAQS; however, the Fort Hall PM_{10} nonattainment area will remain moderate nonattainment until the area is redesignated to attainment under the CAA (FR, 2010b).

IDEQ has highlighted Franklin County as a $PM_{2.5}$ Area of Concern based upon exceedances recorded in 2006, the first year of $PM_{2.5}$ monitoring at that location. Depending on monitoring results from 2006-2008, portions of Franklin County may be redesignated as nonattainment for $PM_{2.5}$.

Prevention of Significant Deterioration (PSD) Class I areas are areas of special national or regional natural, scenic, recreational, or historic value for which the PSD regulations provide special protection. The following areas are the closest Class I areas to the EREF site:

- Craters of the Moon National Monument & Preserve – 75 km (47 mi) to the west
- Red Rock Lakes National Wildlife Refuge – 95 km (59 mi) to the north-northeast
- Yellowstone National Park – 105 km (65 mi) to the northeast
- Grand Teton National Park – 105 km (65 mi) to the east

Figure 3.6-7 is a map of Idaho's Air Quality Planning Areas highlighting nonattainment areas, maintenance areas, PSD Class I areas and areas of concern.

3.6.3.9 Regional Emissions

EPA's AirData website 2006 provides access to air pollution data for the entire United States. The National Emissions Inventory database provides estimates of annual emissions of criteria air pollutants from all types of sources. The database was queried to provide facility emissions data from the four-county area surrounding the EREF site (EPA, 1999a). The counties included in the search were Bingham, Bonneville, Butte and Jefferson. The requested pollutants were CO, NO_x, PM_{10}, $PM_{2.5}$, SO_2 and VOC. The most recent year for which data were available was 1999. The query resulted in a listing of 10 facilities located in Bingham and Butte Counties (EPA, 1999b). Eight of the ten facilities were emission sources associated with activities at the INEL. The other two facilities were owned by Basic American Foods, Inc., a producer of dehydrated fruits, vegetables and soups. Table 3.6-16, Facility Criteria Air Pollutant Emissions in the Four-County Region Surrounding the Eagle Rock Enrichment Facility Site, summarizes the annual emissions from these facilities as of 1999.

Since air quality in Bonneville County has not changed over the last decade and is categorized as "good," it can be assumed that the air emissions from these regional sources have remained fairly constant over the same period of time and/or the air emissions have minimal impact within the region. It is anticipated that air quality in the region will continue to be in attainment of the ambient air quality standards for the foreseeable future.

TABLES

Table 3.6-1 Eagle Rock Enrichment Facility Site Climate: Normal and Extreme Temperatures (Page 1 of 1)

			Temperature (ºF/ºC)												
Station Name	**Temperature**	**POR[1]**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Ann**
	Extreme High	1952-2001	55.0	63.0	75.0	85.0	92.0	100.0	100.0	100.0	95.0	87.0	73.0	60.0	100.0
			12.8	17.2	23.9	29.4	33.3	37.8	37.8	37.8	35.0	30.6	22.8	15.6	37.8
	Normal[2] High	1971-2000	29.7	36.6	47.6	58.7	67.9	77.8	86.0	85.8	75.1	61.4	43.0	31.3	58.4
			-1.3	2.6	8.7	14.8	19.9	25.4	30.0	29.9	23.9	16.3	6.1	-0.4	14.7
Idaho Falls 2 ESE	Average	1971-2000	21.1	26.7	36.2	45.0	53.3	61.9	68.7	67.9	58.2	46.8	33.1	22.4	45.1
			-6.1	-2.9	2.3	7.2	11.8	16.6	20.4	19.9	14.6	8.2	0.6	-5.3	7.3
	Normal[2] Low	1971-2000	12.5	16.8	24.8	31.3	38.7	46.0	51.4	49.9	41.3	32.2	23.2	13.4	31.8
			-10.8	-8.4	-4.0	-0.4	3.7	7.8	10.8	9.9	5.2	0.1	-4.9	-10.3	-0.1
	Extreme Low	1952-2001	-29.0	-34.0	-15.0	9.0	20.0	28.0	34.0	31.0	18.0	7.0	-12.0	-29.0	-34.0
			-33.4	-36.7	-26.1	-12.8	-6.7	-2.2	1.1	-0.6	-7.8	-13.9	-24.4	-33.7	-36.7
	Extreme High	1954-2001	51.0	60.0	73.0	86.0	91.0	100.0	101.0	101.0	96.0	87.0	67.0	57.0	101.0
			10.6	15.6	22.8	30.0	32.8	37.8	38.3	38.3	35.6	30.6	19.4	13.9	38.3
	Normal[2] High	1971-2000	27.9	34.0	44.8	56.9	66.3	76.8	86.6	85.7	74.6	60.9	41.4	29.4	57.1
			-2.3	1.1	7.1	13.8	19.1	24.9	30.3	29.8	23.7	16.1	5.2	-1.4	13.9
Idaho Falls 46 W	Average	1971-2000	16.2	22.1	32.8	42.4	51.2	60.0	67.6	66.2	55.7	43.4	28.7	17.1	42.0
			-8.8	-5.5	0.4	5.8	10.7	15.6	19.8	19.0	13.2	6.3	-1.8	-8.3	5.6
	Normal[2] Low	1971-2000	4.5	10.2	20.7	27.9	36.1	43.2	48.5	46.7	36.8	25.9	15.9	4.8	26.8
			-15.3	-12.1	-6.3	-2.3	2.3	6.2	9.2	8.2	2.7	-3.4	-8.9	-15.1	-2.9
	Extreme Low	1954-2001	-40.0	-36.0	-28.0	6.0	13.0	23.0	28.0	24.0	12.0	1.0	-24.0	-47.0	-47.0
			-40.0	-37.8	-33.3	-14.4	-10.6	-5.0	-2.2	-4.4	-11.1	-17.2	-31.1	-43.9	-43.9

[1] POR - Period of Record

[2] A climate "normal" is defined as the arithmetic mean of a climatological element computed over three consecutive decades.

Table 3.6-2 Eagle Rock Enrichment Facility Site Climate: Normal and Extreme Precipitation (Page 1 of 1)

			Precipitation (in/mm)												
Station Name	**Precipitation**	**POR[1]**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Ann**
	Extreme High[2]	1952-2001	2.38	3.13	4.30	2.82	4.56	3.16	2.13	2.66	2.81	2.49	3.20	3.18	
			60.45	79.50	109.22	71.63	115.82	80.26	54.10	67.56	71.37	63.25	81.28	80.77	
Idaho Falls 2 ESE	Average	1971-2000	1.25	1.01	1.33	1.27	2.01	1.18	0.74	0.93	0.94	1.12	1.17	1.26	14.21
			31.75	25.65	33.78	32.26	51.05	29.97	18.80	23.62	23.88	28.45	29.72	32.00	360.93
	Extreme Low[2]	1952-2001	0.22	0.00	0.04	0.20	0.33	0.15	0.00	0.07	0.00	0.00	0.00	0.00	
			5.59	0.00	1.02	5.08	8.38	3.81	0.00	1.78	0.00	0.00	0.00	0.00	
	Extreme High[2]	1954-2001	1.20	2.36	2.03	1.99	2.34	4.64	2.29	1.13	2.08	1.67	1.74	1.91	
			30.48	59.94	51.56	50.55	59.44	117.86	58.17	28.70	52.83	42.42	44.20	48.51	
Idaho Falls 46 W	Average	1971-2000	0.64	0.62	0.69	0.79	1.24	1.08	0.66	0.44	0.73	0.57	0.69	0.67	8.82
			16.26	15.75	17.53	20.07	31.50	27.43	16.76	11.18	18.54	14.48	17.53	17.02	224.03
	Extreme Low[2]	1954-2001	0.01	0.00	0.00	0.00	0.31	0.01	0.00	0.02	0.00	0.00	0.00	0.00	
			0.25	0.00	0.00	0.00	7.87	0.25	0.00	0.51	0.00	0.00	0.00	0.00	

[1]POR - Period of Record

[2]Precipitation extremes are provided in the NCDC Monthly Climate summaries for highest daily, highest monthly, and lowest monthly. Highest and lowest annuals are not provided.

Table 3.6-3 Precipitation Distribution at KET and EBR (2003 – 2007)
(Page 1 of 1)

KET			EBR		
Inches	Millimeters	Number of Hours	Inches	Millimeters	Number of Hours
0	0	40990	0	0	42322
0.0 - 0.1	0.00 - 2.54	1065	0.0 - 0.1	0.00 - 2.54	1172
0.1 - 0.2	2.54 - 5.08	48	0.1 - 0.2	2.54 - 5.08	36
0.2 - 0.3	5.08 - 7.62	5	0.2 - 0.3	5.08 - 7.62	7
0.3 - 0.4	7.62 - 10.16	2	0.3 - 0.4	7.62 - 10.16	5
0.4 - 0.5	10.16 - 12.70	0	0.4 - 0.5	10.16 - 12.70	1
0.5 - 0.6	12.70 - 15.24	0	0.5 - 0.6	12.70 - 15.24	0
0.6 - 0.7	15.24 - 17.78	0	0.6 - 0.7	15.24 - 17.78	0
0.7 – 0.8	17.78 - 20.32	0	0.7 – 0.8	17.78 - 20.32	0
0.8 - 0.9	20.32 - 22.86	0	0.8 - 0.9	20.32 - 22.86	0
0.9 - 1.0	22.86 - 25.40	0	0.9 - 1.0	22.86 - 25.40	1
1.0 - 2.0	25.40 - 50.80	0	1.0 - 2.0	25.40 - 50.80	0
2.0 - 3.0	50.80 - 76.20	0	2.0 - 3.0	50.80 - 76.20	0
3.0 - 4.0	76.20 - 101.60	0	3.0 - 4.0	76.20 - 101.60	0
4.0 - 5.0	101.60 - 127.00	0	4.0 - 5.0	101.60 - 127.00	0
5.0 - 10.0	127.00 - 254.00	0	5.0 - 10.0	127.00 - 254.00	0
Missing		1714	Missing		280

Table 3.6-4 INEL Monthly and Annual Mean Relative Humidity at KET (2003-2007)
(Page 1 of 1)

Month	Relative Humidity (%)
January	89.0
February	82.0
March	69.9
April	59.1
May	51.4
June	51.3
July	42.7
August	38.6
September	45.3
October	61.4
November	73.6
December	85.3
January-December	62.1

Table 3.6-5 Eagle Rock Enrichment Facility Site Climate: Average Monthly and Annual Wind Speeds for Idaho Falls 46 W, KET and EBR
(Page 1 of 1)

	Idaho Falls 46 W[1]		KET[2]		EBR[2]	
	6-m (20-ft) Level		15-m (49-ft) Level		10-m (33-ft) Level	
	(mph)	(m/s)	(mph)	(m/s)	(mph)	(m/s)
January	5.6	2.5	10.8	4.8	6.8	3.0
February	6.9	3.1	11.9	5.3	7.6	3.4
March	8.7	3.9	13.7	6.1	10.7	4.8
April	9.3	4.2	13.5	6.0	10.8	4.8
May	9.3	4.2	13.7	6.1	10.9	4.9
June	8.9	4.0	12.9	5.8	10.5	4.7
July	8.0	3.6	11.6	5.2	9.7	4.3
August	7.7	3.4	11.6	5.2	9.8	4.4
September	7.2	3.2	11.5	5.1	9.1	4.1
October	6.8	3.0	11.5	5.1	9.0	4.0
November	6.4	2.9	12.0	5.4	8.9	4.0
December	5.1	2.3	11.7	5.2	8.4	3.8
ANNUAL	7.5	3.4	12.2	5.5	9.3	4.2

[1] Data period of record: April 1950-October 1964

[2] Data period of record: January 1, 2003-December 31, 2007

Table 3.6-6 Eagle Rock Enrichment Facility Site Climate: Highest Hourly Average Wind Speed and Concurrent Wind Direction for Idaho Falls 46 W, KET and EBR

(Page 1 of 1)

	Idaho Falls 46 W[1]			KET[2]			EBR[2]		
	6-m (20-ft) Level			15-m (49-ft) Level			10-m (33-ft) Level		
	Speed		Direction	Speed		Direction	Speed		Direction
	(mph)	(m/s)		(mph)	(m/s)		(mph)	(m/s)	
January	48	21	WSW	42	19	SW	37	17	SSW
February	36	16	SW	39	17	WSW	36	16	SW
March	51	23	WSW	51	23	WSW	43	19	WSW
April	39	17	WSW	45	20	WSW	39	17	SW
May	41	18	SW	42	19	SW	37	17	SW
June	36	16	SW	37	17	WSW	35	16	SW
July	35	16	WSW	40	18	SW	38	17	WSW
August	40	18	WSW	39	17	WSW	36	16	WSW
September	42	19	WSW	42	19	WSW	36	16	WSW
October	44	20	WSW	48	21	SW	36	16	SSW
November	40	18	WSW	44	20	WSW	38	17	WSW
December	43	19	SW	41	18	SW	34	15	SSW
ANNUAL	51	23	WSW	51	23	WSW	43	19	WSW

Table 3.6-7 Number of Wind Direction Persistence Events ≥ 12 Hours – EBR (2003-2007)
(Page 1 of 1)

	10 m (33 ft)
N	4
NNE	11
NE	6
ENE	
E	
ESE	
SE	
SSE	
S	1
SSW	4
SW	23
WSW	1
W	
WNW	
NW	
NNW	

Table 3.6-8 Estimated Seasonal and Annual Mixing Depths for Mornings and Afternoons in the ESRP
(Page 1 of 1)

	Morning		Afternoon	
	Meters AGL[1]	**Feet AGL[1]**	**Meters AGL[1]**	**Feet AGL[1]**
Spring	480	1575	2330	7644
Summer	260	853	2900	9514
Autumn	330	1083	1550	5085
Winter	400	1312	730	2395
ANNUAL	370	1214	2090	6857

[1] AGL = Above Ground Level

Source: NOAA, 1989

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 1 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA   STABILITY CLASS A   CLASS FREQUENCY (PERCENT) = 5.10

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.5- 1.0 (1.0-2.2)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
(1)	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.1- 1.5 (2.3-3.4)	7	0	3	1	2	0	0	0	0	0	0	0	1	4	4	2	0	24
(1)	.32	.00	.14	.05	.09	.00	.00	.00	.00	.00	.00	.00	.05	.18	.18	.09	.00	1.09
(2)	.02	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01	.00	.00	.06
1.6- 2.0 (3.5-4.5)	24	24	13	7	6	1	0	1	1	1	6	5	6	5	18	17	0	135
(1)	1.09	1.09	.59	.32	.27	.05	.00	.05	.05	.05	.27	.23	.27	.23	.81	.77	.00	6.11
(2)	.06	.06	.03	.02	.01	.00	.00	.00	.00	.00	.01	.01	.01	.01	.04	.04	.00	.31
2.1- 3.0 (4.6-6.7)	40	64	73	45	28	17	14	16	4	11	14	15	25	13	12	15	0	406
(1)	1.81	2.89	3.30	2.04	1.27	.77	.63	.72	.18	.50	.63	.68	1.13	.59	.54	.68	.00	18.36
(2)	.09	.15	.17	.10	.06	.04	.03	.04	.01	.03	.03	.03	.06	.03	.03	.03	.00	.94
3.1- 4.0 (6.8-8.9)	17	47	80	32	12	8	5	17	12	16	27	16	15	8	9	6	0	327
(1)	.77	2.13	3.62	1.45	.54	.36	.23	.77	.54	.72	1.22	.72	.68	.36	.41	.27	.00	14.79
(2)	.04	.11	.18	.07	.03	.02	.01	.04	.03	.04	.06	.04	.03	.02	.02	.01	.00	.75

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 2 of 16)

4.1- 5.0 (9.0-11.2)	6	31	61	22	3	4	3	8	17	30	26	5	3	4	4	6	0	233
(1)	.27	1.40	2.76	1.00	.14	.18	.14	.36	.77	1.36	1.18	.23	.14	.18	.18	.27	.00	10.54
(2)	.01	.07	.14	.05	.01	.01	.01	.02	.04	.07	.06	.01	.01	.01	.01	.01	.00	.54
5.1- 6.0 (11.3-13.4)	6	26	44	8	1	0	2	3	26	48	18	3	1	1	0	0	0	187
(1)	.27	1.18	1.99	.36	.05	.00	.09	.14	1.18	2.17	.81	.14	.05	.05	.00	.00	.00	8.46
(2)	.01	.06	.10	.02	.00	.00	.00	.01	.06	.11	.04	.01	.00	.00	.00	.00	.00	.43
6.1- 8.0 (13.5-17.9)	5	28	44	8	1	0	3	9	48	113	78	17	1	3	4	2	0	364
(1)	.23	1.27	1.99	.36	.05	.00	.14	.41	2.17	5.11	3.53	.77	.05	.14	.18	.09	.00	16.46
(2)	.01	.06	.10	.02	.00	.00	.01	.02	.11	.26	.18	.04	.00	.01	.01	.00	.00	.84
8.1-10.0 (18.0-22.4)	6	19	8	2	2	0	0	2	31	64	162	25	4	4	3	2	0	334
(1)	.27	.86	.36	.09	.09	.00	.00	.09	1.40	2.89	7.33	1.13	.18	.18	.14	.09	.00	15.11
(2)	.01	.04	.02	.00	.00	.00	.00	.00	.07	.15	.37	.06	.01	.01	.01	.00	.00	.77
10.1-40.3 (22.5-90.1)	2	38	5	0	0	0	0	0	8	9	99	35	2	0	1	1	0	200
(1)	.09	1.72	.23	.00	.00	.00	.00	.00	.36	.41	4.48	1.58	.09	.00	.05	.05	.00	9.05
(2)	.00	.09	.01	.00	.00	.00	.00	.00	.02	.02	.23	.08	.00	.00	.00	.00	.00	.46
ALL SPEEDS	114	277	331	125	55	30	27	56	147	292	430	121	58	42	55	51	0	2211
(1)	5.16	12.53	14.97	5.65	2.49	1.36	1.22	2.53	6.65	13.21	19.45	5.47	2.62	1.90	2.49	2.31	.00	100.00
(2)	.26	.64	.76	.29	.13	.07	.06	.13	.34	.67	.99	.28	.13	.10	.13	.12	.00	5.10

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 3 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = 5.79

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.5- 1.0 (1.0-2.2)	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	4
(1)	.00	.04	.00	.00	.00	.00	.00	.00	.00	.00	.00	.04	.08	.00	.00	.00	.00	.16
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
1.1- 1.5 (2.3-3.4)	5	5	1	2	1	0	0	0	1	0	1	3	0	9	9	11	0	48
(1)	.20	.20	.04	.08	.04	.00	.00	.00	.04	.00	.04	.12	.00	.36	.36	.44	.00	1.91
(2)	.01	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.02	.02	.03	.00	.11
1.6- 2.0 (3.5-4.5)	21	19	16	3	2	3	0	4	2	3	8	6	12	18	27	16	0	160
(1)	.84	.76	.64	.12	.08	.12	.00	.16	.08	.12	.32	.24	.48	.72	1.08	.64	.00	6.38
(2)	.05	.04	.04	.01	.00	.01	.00	.01	.00	.01	.02	.01	.03	.04	.06	.04	.00	.37
2.1- 3.0 (4.6-6.7)	47	64	54	27	18	7	9	20	20	25	32	48	42	24	17	25	0	479
(1)	1.87	2.55	2.15	1.08	.72	.28	.36	.80	.80	1.00	1.28	1.91	1.67	.96	.68	1.00	.00	19.10
(2)	.11	.15	.12	.06	.04	.02	.02	.05	.05	.06	.07	.11	.10	.06	.04	.06	.00	1.11
3.1- 4.0 (6.8-8.9)	16	47	43	18	9	6	6	15	28	48	50	36	16	9	7	6	0	360
(1)	.64	1.87	1.71	.72	.36	.24	.24	.60	1.12	1.91	1.99	1.44	.64	.36	.28	.24	.00	14.35
(2)	.04	.11	.10	.04	.02	.01	.01	.03	.06	.11	.12	.08	.04	.02	.02	.01	.00	.83

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 4 of 16)

4.1- 5.0 (9.0-11.2)	9	21	44	7	1	2	2	7	26	78	55	27	11	4	4	1	0	299
(1)	.36	.84	1.75	.28	.04	.08	.08	.28	1.04	3.11	2.19	1.08	.44	.16	.16	.04	.00	11.92
(2)	.02	.05	.10	.02	.00	.00	.00	.02	.06	.18	.13	.06	.03	.01	.01	.00	.00	.69
5.1- 6.0 (11.3-13.4)	4	14	29	5	1	0	0	3	25	93	56	18	4	2	2	5	0	261
(1)	.16	.56	1.16	.20	.04	.00	.00	.12	1.00	3.71	2.23	.72	.16	.08	.08	.20	.00	10.41
(2)	.01	.03	.07	.01	.00	.00	.00	.01	.06	.21	.13	.04	.01	.00	.00	.01	.00	.60
6.1- 8.0 (13.5-17.9)	7	11	23	1	2	1	0	3	44	115	143	36	3	4	4	3	0	400
(1)	.28	.44	.92	.04	.08	.04	.00	.12	1.75	4.59	5.70	1.44	.12	.16	.16	.12	.00	15.95
(2)	.02	.03	.05	.00	.00	.00	.00	.01	.10	.27	.33	.08	.01	.01	.01	.01	.00	.92
8.1-10.0 (18.0-22.4)	5	11	7	1	2	1	0	0	19	49	163	40	1	1	2	0	0	302
(1)	.20	.44	.28	.04	.08	.04	.00	.00	.76	1.95	6.50	1.59	.04	.04	.08	.00	.00	12.04
(2)	.01	.03	.02	.00	.00	.00	.00	.00	.04	.11	.38	.09	.00	.00	.00	.00	.00	.70
10.1-40.3 (22.5-90.1)	6	5	3	0	0	0	0	0	4	12	120	43	1	0	1	0	0	195
(1)	.24	.20	.12	.00	.00	.00	.00	.00	.16	.48	4.78	1.71	.04	.00	.04	.00	.00	7.78
(2)	.01	.01	.01	.00	.00	.00	.00	.00	.01	.03	.28	.10	.00	.00	.00	.00	.00	.45
ALL SPEEDS	120	198	220	64	36	20	17	52	169	423	628	258	92	71	73	67	0	2508
(1)	4.78	7.89	8.77	2.55	1.44	.80	.68	2.07	6.74	16.87	25.04	10.29	3.67	2.83	2.91	2.67	.00	100.00
(2)	.28	.46	.51	.15	.08	.05	.04	.12	.39	.98	1.45	.60	.21	.16	.17	.15	.00	5.79

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 5 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA   STABILITY CLASS C   CLASS FREQUENCY (PERCENT) = 7.09

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.5- 1.0 (1.0-2.2)	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	4
(1)	.03	.00	.00	.00	.00	.00	.00	.00	.00	.03	.00	.00	.00	.00	.00	.07	.00	.13
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
1.1- 1.5 (2.3-3.4)	19	8	9	4	2	2	0	1	2	1	0	6	13	25	27	12	0	131
(1)	.62	.26	.29	.13	.07	.07	.00	.03	.07	.03	.00	.20	.42	.81	.88	.39	.00	4.26
(2)	.04	.02	.02	.01	.00	.00	.00	.00	.00	.00	.00	.01	.03	.06	.06	.03	.00	.30
1.6- 2.0 (3.5-4.5)	38	29	25	10	4	7	2	2	2	5	10	23	17	21	21	41	0	257
(1)	1.24	.94	.81	.33	.13	.23	.07	.07	.07	.16	.33	.75	.55	.68	.68	1.33	.00	8.36
(2)	.09	.07	.06	.02	.01	.02	.00	.00	.00	.01	.02	.05	.04	.05	.05	.09	.00	.59
2.1- 3.0 (4.6-6.7)	45	94	64	27	15	4	14	18	28	38	59	56	42	18	16	45	0	583
(1)	1.46	3.06	2.08	.88	.49	.13	.46	.59	.91	1.24	1.92	1.82	1.37	.59	.52	1.46	.00	18.97
(2)	.10	.22	.15	.06	.03	.01	.03	.04	.06	.09	.14	.13	.10	.04	.04	.10	.00	1.34
3.1- 4.0 (6.8-8.9)	15	58	59	12	6	4	5	22	36	55	62	40	20	12	4	3	0	413
(1)	.49	1.89	1.92	.39	.20	.13	.16	.72	1.17	1.79	2.02	1.30	.65	.39	.13	.10	.00	13.44
(2)	.03	.13	.14	.03	.01	.01	.01	.05	.08	.13	.14	.09	.05	.03	.01	.01	.00	.95

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 6 of 16)

4.1- 5.0 (9.0-11.2)	9	33	31	5	1	1	0	11	35	70	96	34	4	6	9	1	0	346
(1)	.29	1.07	1.01	.16	.03	.03	.00	.36	1.14	2.28	3.12	1.11	.13	.20	.29	.03	.00	11.26
(2)	.02	.08	.07	.01	.00	.00	.00	.03	.08	.16	.22	.08	.01	.01	.02	.00	.00	.80
5.1- 6.0 (11.3-13.4)	8	16	27	3	1	1	0	9	44	69	76	14	9	6	6	4	0	293
(1)	.26	.52	.88	.10	.03	.03	.00	.29	1.43	2.25	2.47	.46	.29	.20	.20	.13	.00	9.53
(2)	.02	.04	.06	.01	.00	.00	.00	.02	.10	.16	.18	.03	.02	.01	.01	.01	.00	.68
6.1- 8.0 (13.5-17.9)	6	12	30	3	0	1	0	10	37	96	167	67	6	7	11	8	0	461
(1)	.20	.39	.98	.10	.00	.03	.00	.33	1.20	3.12	5.43	2.18	.20	.23	.36	.26	.00	15.00
(2)	.01	.03	.07	.01	.00	.00	.00	.02	.09	.22	.39	.15	.01	.02	.03	.02	.00	1.06
8.1-10.0 (18.0-22.4)	9	16	7	1	0	0	0	0	13	57	154	69	3	3	3	0	0	335
(1)	.29	.52	.23	.03	.00	.00	.00	.00	.42	1.85	5.01	2.25	.10	.10	.10	.00	.00	10.90
(2)	.02	.04	.02	.00	.00	.00	.00	.00	.03	.13	.36	.16	.01	.01	.01	.00	.00	.77
10.1-40.3 (22.5-90.1)	4	13	2	0	0	0	0	0	5	12	134	77	2	0	0	1	0	250
(1)	.13	.42	.07	.00	.00	.00	.00	.00	.16	.39	4.36	2.51	.07	.00	.00	.03	.00	8.14
(2)	.01	.03	.00	.00	.00	.00	.00	.00	.01	.03	.31	.18	.00	.00	.00	.00	.00	.58
ALL SPEEDS	154	279	254	65	29	20	21	73	202	404	758	386	116	98	97	117	0	3073
(1)	5.01	9.08	8.27	2.12	.94	.65	.68	2.38	6.57	13.15	24.67	12.56	3.77	3.19	3.16	3.81	.00	100.00
(2)	.36	.64	.59	.15	.07	.05	.05	.17	.47	.93	1.75	.89	.27	.23	.22	.27	.00	7.09

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 7 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 24.20

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	5
(1)	.01	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01	.00	.01	.00	.05
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
.5- 1.0 (1.0-2.2)	17	27	10	8	10	6	5	3	2	9	13	13	14	17	19	25	0	198
(1)	.16	.26	.10	.08	.10	.06	.05	.03	.02	.09	.12	.12	.13	.16	.18	.24	.00	1.89
(2)	.04	.06	.02	.02	.02	.01	.01	.01	.00	.02	.03	.03	.03	.04	.04	.06	.00	.46
1.1- 1.5 (2.3-3.4)	64	64	55	26	25	21	14	14	16	26	32	36	45	42	66	77	0	623
(1)	.61	.61	.52	.25	.24	.20	.13	.13	.15	.25	.31	.34	.43	.40	.63	.73	.00	5.94
(2)	.15	.15	.13	.06	.06	.05	.03	.03	.04	.06	.07	.08	.10	.10	.15	.18	.00	1.44
1.6- 2.0 (3.5-4.5)	94	159	73	34	14	5	20	24	24	47	61	72	43	68	64	85	0	887
(1)	.90	1.52	.70	.32	.13	.05	.19	.23	.23	.45	.58	.69	.41	.65	.61	.81	.00	8.45
(2)	.22	.37	.17	.08	.03	.01	.05	.06	.06	.11	.14	.17	.10	.16	.15	.20	.00	2.05
2.1- 3.0 (4.6-6.7)	114	330	195	44	24	21	21	47	84	140	159	150	78	47	62	63	0	1579
(1)	1.09	3.15	1.86	.42	.23	.20	.20	.45	.80	1.33	1.52	1.43	.74	.45	.59	.60	.00	15.05
(2)	.26	.76	.45	.10	.06	.05	.05	.11	.19	.32	.37	.35	.18	.11	.14	.15	.00	3.64
3.1- 4.0 (6.8-8.9)	48	187	147	36	18	13	19	59	97	190	190	125	70	42	46	32	0	1319
(1)	.46	1.78	1.40	.34	.17	.12	.18	.56	.92	1.81	1.81	1.19	.67	.40	.44	.31	.00	12.57
(2)	.11	.43	.34	.08	.04	.03	.04	.14	.22	.44	.44	.29	.16	.10	.11	.07	.00	3.04

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 8 of 16)

4.1- 5.0 (9.0-11.2)	42	113	94	24	12	10	9	49	97	168	239	137	45	35	33	33	0	1140
(1)	.40	1.08	.90	.23	.11	.10	.09	.47	.92	1.60	2.28	1.31	.43	.33	.31	.31	.00	10.87
(2)	.10	.26	.22	.06	.03	.02	.02	.11	.22	.39	.55	.32	.10	.08	.08	.08	.00	2.63
5.1- 6.0 (11.3-13.4)	31	45	68	22	13	3	6	52	117	235	241	117	24	25	26	27	0	1052
(1)	.30	.43	.65	.21	.12	.03	.06	.50	1.12	2.24	2.30	1.12	.23	.24	.25	.26	.00	10.03
(2)	.07	.10	.16	.05	.03	.01	.01	.12	.27	.54	.56	.27	.06	.06	.06	.06	.00	2.43
6.1- 8.0 (13.5-17.9)	56	89	68	20	8	2	3	38	156	336	489	217	34	27	22	48	0	1613
(1)	.53	.85	.65	.19	.08	.02	.03	.36	1.49	3.20	4.66	2.07	.32	.26	.21	.46	.00	15.38
(2)	.13	.21	.16	.05	.02	.00	.01	.09	.36	.78	1.13	.50	.08	.06	.05	.11	.00	3.72
8.1-10.0 (18.0-22.4)	53	50	39	7	2	2	0	13	101	265	515	198	5	6	3	11	0	1270
(1)	.51	.48	.37	.07	.02	.02	.00	.12	.96	2.53	4.91	1.89	.05	.06	.03	.10	.00	12.11
(2)	.12	.12	.09	.02	.00	.00	.00	.03	.23	.61	1.19	.46	.01	.01	.01	.03	.00	2.93
10.1-40.3 (22.5-90.1)	34	42	7	5	1	0	0	2	39	123	370	174	6	0	0	2	0	805
(1)	.32	.40	.07	.05	.01	.00	.00	.02	.37	1.17	3.53	1.66	.06	.00	.00	.02	.00	7.67
(2)	.08	.10	.02	.01	.00	.00	.00	.00	.09	.28	.85	.40	.01	.00	.00	.00	.00	1.86
ALL SPEEDS	554	1106	757	226	127	83	97	301	733	1539	2309	1239	365	310	341	404	0	10491
(1)	5.28	10.54	7.22	2.15	1.21	.79	.92	2.87	6.99	14.67	22.01	11.81	3.48	2.95	3.25	3.85	.00	100.00
(2)	1.28	2.55	1.75	.52	.29	.19	.22	.69	1.69	3.55	5.33	2.86	.84	.72	.79	.93	.00	24.20

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 9 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA STABILITY CLASS E CLASS FREQUENCY (PERCENT) = 21.50

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	1	0	1	0	0	0	1	1	1	2	2	1	0	1	0	1	0	12
(1)	.01	.00	.01	.00	.00	.00	.01	.01	.01	.02	.02	.01	.00	.01	.00	.01	.00	.13
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03
.5- 1.0 (1.0-2.2)	44	38	46	40	24	23	23	29	20	29	27	23	14	27	23	34	0	464
(1)	.47	.41	.49	.43	.26	.25	.25	.31	.21	.31	.29	.25	.15	.29	.25	.36	.00	4.98
(2)	.10	.09	.11	.09	.06	.05	.05	.07	.05	.07	.06	.05	.03	.06	.05	.08	.00	1.07
1.1- 1.5 (2.3-3.4)	88	108	87	64	36	26	23	31	43	50	38	62	34	26	54	62	0	832
(1)	.94	1.16	.93	.69	.39	.28	.25	.33	.46	.54	.41	.67	.36	.28	.58	.67	.00	8.93
(2)	.20	.25	.20	.15	.08	.06	.05	.07	.10	.12	.09	.14	.08	.06	.12	.14	.00	1.92
1.6- 2.0 (3.5-4.5)	102	140	133	60	25	19	21	33	58	61	44	54	38	34	33	50	0	905
(1)	1.09	1.50	1.43	.64	.27	.20	.23	.35	.62	.65	.47	.58	.41	.36	.35	.54	.00	9.71
(2)	.24	.32	.31	.14	.06	.04	.05	.08	.13	.14	.10	.12	.09	.08	.08	.12	.00	2.09
2.1- 3.0 (4.6-6.7)	97	261	219	80	29	23	34	67	103	125	121	104	58	51	54	53	0	1479
(1)	1.04	2.80	2.35	.86	.31	.25	.36	.72	1.11	1.34	1.30	1.12	.62	.55	.58	.57	.00	15.87
(2)	.22	.60	.51	.18	.07	.05	.08	.15	.24	.29	.28	.24	.13	.12	.12	.12	.00	3.41
3.1- 4.0 (6.8-8.9)	64	124	132	54	18	13	19	87	120	125	127	92	39	35	39	55	0	1143
(1)	.69	1.33	1.42	.58	.19	.14	.20	.93	1.29	1.34	1.36	.99	.42	.38	.42	.59	.00	12.27
(2)	.15	.29	.30	.12	.04	.03	.04	.20	.28	.29	.29	.21	.09	.08	.09	.13	.00	2.64

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 10 of 16)

4.1- 5.0 (9.0-11.2)	76	91	58	32	11	10	9	63	137	191	173	77	22	19	30	56	0	1055
(1)	.82	.98	.62	.34	.12	.11	.10	.68	1.47	2.05	1.86	.83	.24	.20	.32	.60	.00	11.32
(2)	.18	.21	.13	.07	.03	.02	.02	.15	.32	.44	.40	.18	.05	.04	.07	.13	.00	2.43
5.1- 6.0 (11.3-13.4)	40	55	66	32	7	3	8	53	119	204	222	69	11	16	15	37	0	957
(1)	.43	.59	.71	.34	.08	.03	.09	.57	1.28	2.19	2.38	.74	.12	.17	.16	.40	.00	10.27
(2)	.09	.13	.15	.07	.02	.01	.02	.12	.27	.47	.51	.16	.03	.04	.03	.09	.00	2.21
6.1- 8.0 (13.5-17.9)	69	89	94	14	1	2	2	31	166	387	386	100	7	9	8	33	0	1398
(1)	.74	.96	1.01	.15	.01	.02	.02	.33	1.78	4.15	4.14	1.07	.08	.10	.09	.35	.00	15.00
(2)	.16	.21	.22	.03	.00	.00	.00	.07	.38	.89	.89	.23	.02	.02	.02	.08	.00	3.23
8.1-10.0 (18.0-22.4)	34	39	23	7	1	0	3	4	54	229	211	49	1	3	1	6	0	665
(1)	.36	.42	.25	.08	.01	.00	.03	.04	.58	2.46	2.26	.53	.01	.03	.01	.06	.00	7.14
(2)	.08	.09	.05	.02	.00	.00	.01	.01	.12	.53	.49	.11	.00	.01	.00	.01	.00	1.53
10.1-40.3 (22.5-90.1)	11	7	0	0	0	0	0	2	39	130	170	47	1	1	0	0	0	408
(1)	.12	.08	.00	.00	.00	.00	.00	.02	.42	1.40	1.82	.50	.01	.01	.00	.00	.00	4.38
(2)	.03	.02	.00	.00	.00	.00	.00	.00	.09	.30	.39	.11	.00	.00	.00	.00	.00	.94
ALL SPEEDS	626	952	859	383	152	119	143	401	860	1533	1521	678	225	222	257	387	0	9318
(1)	6.72	10.22	9.22	4.11	1.63	1.28	1.53	4.30	9.23	16.45	16.32	7.28	2.41	2.38	2.76	4.15	.00	100.00
(2)	1.44	2.20	1.98	.88	.35	.27	.33	.93	1.98	3.54	3.51	1.56	.52	.51	.59	.89	.00	21.50

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 11 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA STABILITY CLASS F CLASS FREQUENCY (PERCENT) = 17.57

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	0	0	2	0	1	1	0	1	2	0	0	0	0	0	1	1	0	9
(1)	.00	.00	.03	.00	.01	.01	.00	.01	.03	.00	.00	.00	.00	.00	.01	.01	.00	.12
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
.5- 1.0 (1.0-2.2)	40	48	54	66	43	48	39	58	79	56	38	21	21	19	21	30	0	681
(1)	.53	.63	.71	.87	.56	.63	.51	.76	1.04	.74	.50	.28	.28	.25	.28	.39	.00	8.94
(2)	.09	.11	.12	.15	.10	.11	.09	.13	.18	.13	.09	.05	.05	.04	.05	.07	.00	1.57
1.1- 1.5 (2.3-3.4)	72	76	113	104	83	39	56	103	138	101	74	38	30	49	33	48	0	1157
(1)	.95	1.00	1.48	1.37	1.09	.51	.74	1.35	1.81	1.33	.97	.50	.39	.64	.43	.63	.00	15.20
(2)	.17	.18	.26	.24	.19	.09	.13	.24	.32	.23	.17	.09	.07	.11	.08	.11	.00	2.67
1.6- 2.0 (3.5-4.5)	56	92	148	121	65	46	43	78	145	120	66	40	31	33	28	46	0	1158
(1)	.74	1.21	1.94	1.59	.85	.60	.56	1.02	1.90	1.58	.87	.53	.41	.43	.37	.60	.00	15.21
(2)	.13	.21	.34	.28	.15	.11	.10	.18	.33	.28	.15	.09	.07	.08	.06	.11	.00	2.67
2.1- 3.0 (4.6-6.7)	79	145	233	219	88	34	36	144	196	151	94	59	42	28	29	73	0	1650
(1)	1.04	1.90	3.06	2.88	1.16	.45	.47	1.89	2.57	1.98	1.23	.77	.55	.37	.38	.96	.00	21.67
(2)	.18	.33	.54	.51	.20	.08	.08	.33	.45	.35	.22	.14	.10	.06	.07	.17	.00	3.81
3.1- 4.0 (6.8-8.9)	54	97	129	143	45	23	36	172	142	145	123	50	21	10	23	35	0	1248
(1)	.71	1.27	1.69	1.88	.59	.30	.47	2.26	1.86	1.90	1.62	.66	.28	.13	.30	.46	.00	16.39
(2)	.12	.22	.30	.33	.10	.05	.08	.40	.33	.33	.28	.12	.05	.02	.05	.08	.00	2.88

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 12 of 16)

4.1- 5.0 (9.0-11.2)	46	74	73	69	21	8	16	128	105	162	116	28	4	4	8	20	0	882
(1)	.60	.97	.96	.91	.28	.11	.21	1.68	1.38	2.13	1.52	.37	.05	.05	.11	.26	.00	11.58
(2)	.11	.17	.17	.16	.05	.02	.04	.30	.24	.37	.27	.06	.01	.01	.02	.05	.00	2.03
5.1- 6.0 (11.3-13.4)	11	26	45	21	7	7	5	48	79	118	92	10	3	0	4	2	0	478
(1)	.14	.34	.59	.28	.09	.09	.07	.63	1.04	1.55	1.21	.13	.04	.00	.05	.03	.00	6.28
(2)	.03	.06	.10	.05	.02	.02	.01	.11	.18	.27	.21	.02	.01	.00	.01	.00	.00	1.10
6.1- 8.0 (13.5-17.9)	1	17	23	8	0	3	1	20	41	115	49	5	0	1	0	2	0	286
(1)	.01	.22	.30	.11	.00	.04	.01	.26	.54	1.51	.64	.07	.00	.01	.00	.03	.00	3.76
(2)	.00	.04	.05	.02	.00	.01	.00	.05	.09	.27	.11	.01	.00	.00	.00	.00	.00	.66
8.1-10.0 (18.0-22.4)	0	0	1	0	0	0	0	0	3	28	15	1	0	0	0	0	0	48
(1)	.00	.00	.01	.00	.00	.00	.00	.00	.04	.37	.20	.01	.00	.00	.00	.00	.00	.63
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.01	.06	.03	.00	.00	.00	.00	.00	.00	.11
10.1-40.3 (22.5-90.1)	0	0	0	0	0	0	0	0	5	7	5	0	0	0	0	0	0	17
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.07	.09	.07	.00	.00	.00	.00	.00	.00	.22
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.01	.02	.01	.00	.00	.00	.00	.00	.00	.04
ALL SPEEDS	359	575	821	751	353	209	232	752	935	1003	672	252	152	144	147	257	0	7614
(1)	4.71	7.55	10.78	9.86	4.64	2.74	3.05	9.88	12.28	13.17	8.83	3.31	2.00	1.89	1.93	3.38	.00	100.00
(2)	.83	1.33	1.89	1.73	.81	.48	.54	1.73	2.16	2.31	1.55	.58	.35	.33	.34	.59	.00	17.57

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 13 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA STABILITY CLASS G CLASS FREQUENCY (PERCENT) = 18.76

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	1	2	4	1	0	2	2	0	2	0	0	0	1	1	2	0	0	18
(1)	.01	.02	.05	.01	.00	.02	.02	.00	.02	.00	.00	.00	.01	.01	.02	.00	.00	.22
(2)	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.04
.5- 1.0 (1.0-2.2)	27	43	59	96	112	65	63	74	83	46	25	23	10	13	12	26	0	777
(1)	.33	.53	.73	1.18	1.38	.80	.77	.91	1.02	.57	.31	.28	.12	.16	.15	.32	.00	9.56
(2)	.06	.10	.14	.22	.26	.15	.15	.17	.19	.11	.06	.05	.02	.03	.03	.06	.00	1.79
1.1- 1.5 (2.3-3.4)	50	79	124	176	161	76	60	113	142	88	53	39	23	14	21	26	0	1245
(1)	.61	.97	1.53	2.16	1.98	.93	.74	1.39	1.75	1.08	.65	.48	.28	.17	.26	.32	.00	15.31
(2)	.12	.18	.29	.41	.37	.18	.14	.26	.33	.20	.12	.09	.05	.03	.05	.06	.00	2.87
1.6- 2.0 (3.5-4.5)	44	73	148	206	119	45	35	89	152	121	62	27	8	10	15	22	0	1176
(1)	.54	.90	1.82	2.53	1.46	.55	.43	1.09	1.87	1.49	.76	.33	.10	.12	.18	.27	.00	14.46
(2)	.10	.17	.34	.48	.27	.10	.08	.21	.35	.28	.14	.06	.02	.02	.03	.05	.00	2.71
2.1- 3.0 (4.6-6.7)	39	91	274	346	153	36	35	150	286	247	123	41	10	7	6	18	0	1862
(1)	.48	1.12	3.37	4.26	1.88	.44	.43	1.84	3.52	3.04	1.51	.50	.12	.09	.07	.22	.00	22.90
(2)	.09	.21	.63	.80	.35	.08	.08	.35	.66	.57	.28	.09	.02	.02	.01	.04	.00	4.30
3.1- 4.0 (6.8-8.9)	16	41	115	244	90	17	57	234	303	183	90	11	2	2	3	3	0	1411
(1)	.20	.50	1.41	3.00	1.11	.21	.70	2.88	3.73	2.25	1.11	.14	.02	.02	.04	.04	.00	17.35
(2)	.04	.09	.27	.56	.21	.04	.13	.54	.70	.42	.21	.03	.00	.00	.01	.01	.00	3.26

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables (Page 14 of 16)

4.1- 5.0 (9.0-11.2)	3	7	50	124	79	20	41	479	128	147	84	14	0	0	1	0	0	1177
(1)	.04	.09	.61	1.53	.97	.25	.50	5.89	1.57	1.81	1.03	.17	.00	.00	.01	.00	.00	14.48
(2)	.01	.02	.12	.29	.18	.05	.09	1.11	.30	.34	.19	.03	.00	.00	.00	.00	.00	2.72
5.1- 6.0 (11.3-13.4)	0	4	16	29	9	3	12	197	40	46	35	1	0	0	0	0	0	392
(1)	.00	.05	.20	.36	.11	.04	.15	2.42	.49	.57	.43	.01	.00	.00	.00	.00	.00	4.82
(2)	.00	.01	.04	.07	.02	.01	.03	.45	.09	.11	.08	.00	.00	.00	.00	.00	.00	.90
6.1- 8.0 (13.5-17.9)	0	0	8	6	1	0	0	21	2	14	10	2	0	0	0	0	0	64
(1)	.00	.00	.10	.07	.01	.00	.00	.26	.02	.17	.12	.02	.00	.00	.00	.00	.00	.79
(2)	.00	.00	.02	.01	.00	.00	.00	.05	.00	.03	.02	.00	.00	.00	.00	.00	.00	.15
8.1-10.0 (18.0-22.4)	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	6
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.07	.00	.00	.00	.00	.00	.00	.00	.07
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.01
10.1-40.3 (22.5-90.1)	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	3
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02	.01	.00	.00	.00	.00	.00	.00	.04
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
ALL SPEEDS	180	340	798	1228	724	264	305	1357	1138	900	483	158	54	47	60	95	0	8131
(1)	2.21	4.18	9.81	15.10	8.90	3.25	3.75	16.69	14.00	11.07	5.94	1.94	.66	.58	.74	1.17	.00	100.00
(2)	.42	.78	1.84	2.83	1.67	.61	.70	3.13	2.63	2.08	1.11	.36	.12	.11	.14	.22	.00	18.76

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 15 of 16)

INEL EBR JAN03-DEC07 MET DATA JOINT FREQUENCY DISTRIBUTION (75-METER TOWER)

33.0 FT WIND DATA   STABILITY CLASS ALL   CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED mps (mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL(3)	TOTAL
LT .3 (LT .7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.3- .4 (.7-.9)	3	2	8	1	1	3	3	2	5	2	2	1	2	3	3	3	0	44
(1)	.01	.00	.02	.00	.00	.01	.01	.00	.01	.00	.00	.00	.00	.01	.01	.01	.00	.10
(2)	.01	.00	.02	.00	.00	.01	.01	.00	.01	.00	.00	.00	.00	.01	.01	.01	.00	.10
.5- 1.0 (1.0-2.2)	130	157	169	210	189	142	130	164	184	141	103	81	61	76	75	117	0	2129
(1)	.30	.36	.39	.48	.44	.33	.30	.38	.42	.33	.24	.19	.14	.18	.17	.27	.00	4.91
(2)	.30	.36	.39	.48	.44	.33	.30	.38	.42	.33	.24	.19	.14	.18	.17	.27	.00	4.91
1.1- 1.5 (2.3-3.4)	305	340	392	377	310	164	153	262	342	266	198	184	146	169	214	238	0	4060
(1)	.70	.78	.90	.87	.72	.38	.35	.60	.79	.61	.46	.42	.34	.39	.49	.55	.00	9.37
(2)	.70	.78	.90	.87	.72	.38	.35	.60	.79	.61	.46	.42	.34	.39	.49	.55	.00	9.37
1.6- 2.0 (3.5-4.5)	379	536	556	441	235	126	121	231	384	358	257	227	155	189	206	277	0	4678
(1)	.87	1.24	1.28	1.02	.54	.29	.28	.53	.89	.83	.59	.52	.36	.44	.48	.64	.00	10.79
(2)	.87	1.24	1.28	1.02	.54	.29	.28	.53	.89	.83	.59	.52	.36	.44	.48	.64	.00	10.79
2.1- 3.0 (4.6-6.7)	461	1049	1112	788	355	142	163	462	721	737	602	473	297	188	196	292	0	8038
(1)	1.06	2.42	2.57	1.82	.82	.33	.38	1.07	1.66	1.70	1.39	1.09	.69	.43	.45	.67	.00	18.54
(2)	1.06	2.42	2.57	1.82	.82	.33	.38	1.07	1.66	1.70	1.39	1.09	.69	.43	.45	.67	.00	18.54
3.1- 4.0 (6.8-8.9)	230	601	705	539	198	84	147	606	738	762	669	370	183	118	131	140	0	6221
(1)	.53	1.39	1.63	1.24	.46	.19	.34	1.40	1.70	1.76	1.54	.85	.42	.27	.30	.32	.00	14.35
(2)	.53	1.39	1.63	1.24	.46	.19	.34	1.40	1.70	1.76	1.54	.85	.42	.27	.30	.32	.00	14.35

Table 3.6-9 EBR 10-m (33-ft) 2003-2007 Joint Frequency Distribution Tables
(Page 16 of 16)

4.1- 5.0 (9.0-11.2)	191	370	411	283	128	55	80	745	545	846	789	322	89	72	89	117	0	5132
(1)	.44	.85	.95	.65	.30	.13	.18	1.72	1.26	1.95	1.82	.74	.21	.17	.21	.27	.00	11.84
(2)	.44	.85	.95	.65	.30	.13	.18	1.72	1.26	1.95	1.82	.74	.21	.17	.21	.27	.00	11.84
5.1- 6.0 (11.3-13.4)	100	186	295	120	39	17	33	365	450	813	740	232	52	50	53	75	0	3620
(1)	.23	.43	.68	.28	.09	.04	.08	.84	1.04	1.88	1.71	.54	.12	.12	.12	.17	.00	8.35
(2)	.23	.43	.68	.28	.09	.04	.08	.84	1.04	1.88	1.71	.54	.12	.12	.12	.17	.00	8.35
6.1- 8.0 (13.5-17.9)	144	246	290	60	13	9	9	132	494	1176	1322	444	51	51	49	96	0	4586
(1)	.33	.57	.67	.14	.03	.02	.02	.30	1.14	2.71	3.05	1.02	.12	.12	.11	.22	.00	10.58
(2)	.33	.57	.67	.14	.03	.02	.02	.30	1.14	2.71	3.05	1.02	.12	.12	.11	.22	.00	10.58
8.1-10.0 (18.0-22.4)	107	135	85	18	7	3	3	19	221	698	1220	382	14	17	12	19	0	2960
(1)	.25	.31	.20	.04	.02	.01	.01	.04	.51	1.61	2.81	.88	.03	.04	.03	.04	.00	6.83
(2)	.25	.31	.20	.04	.02	.01	.01	.04	.51	1.61	2.81	.88	.03	.04	.03	.04	.00	6.83
10.1-40.3 (22.5-90.1)	57	105	17	5	1	0	0	4	100	295	899	376	12	1	2	4	0	1878
(1)	.13	.24	.04	.01	.00	.00	.00	.01	.23	.68	2.07	.87	.03	.00	.00	.01	.00	4.33
(2)	.13	.24	.04	.01	.00	.00	.00	.01	.23	.68	2.07	.87	.03	.00	.00	.01	.00	4.33
ALL SPEEDS	2107	3727	4040	2842	1476	745	842	2992	4184	6094	6801	3092	1062	934	1030	1378	0	43346
(1)	4.86	8.60	9.32	6.56	3.41	1.72	1.94	6.90	9.65	14.06	15.69	7.13	2.45	2.15	2.38	3.18	.00	100.00
(2)	4.86	8.60	9.32	6.56	3.41	1.72	1.94	6.90	9.65	14.06	15.69	7.13	2.45	2.15	2.38	3.18	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
(3)=VARIABLE

Table 3.6-10 MFC/EBR Temperature Inversion Persistence Summary for 2003

(Page 1 of 1)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
1	57	12.67
2	24	18.00
3	17	21.78
4	17	25.56
5	14	28.67
6	12	31.33
7	12	34.00
8	10	36.22
9	11	38.67
10	31	45.56
11	44	55.33
12	55	67.56
13	36	75.56
14	33	82.89
15	20	87.33
16	28	93.56
17	16	97.11
18	6	98.44
19	4	99.33
20	3	100.00

THE LONGEST INVERSION LASTED 20 HOURS

OF THE LONGEST INVERSIONS
NUMBER 1 STARTED 15 HOURS INTO DAY 3
NUMBER 2 STARTED 17 HOURS INTO DAY 353
NUMBER 3 STARTED 17 HOURS INTO DAY 354

THIRD COLUMN DEFINES THE PERCENT PROBABILITY
THAT IF AN INVERSION OCCURS, ITS DURATION
WILL BE LESS THAN THE NUMBER OF HOURS SPECIFIED

Table 3.6-11 MFC/EBR Temperature Inversion Persistence Summary for 2004 (Page 1 of 3)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
1	60	12.85
2	33	19.91
3	28	25.91
4	18	29.76
5	13	32.55
6	12	35.12
7	13	37.90
8	17	41.54
9	11	43.90
10	27	49.68
11	31	56.32
12	51	67.24
13	29	73.45
14	33	80.51
15	19	84.58
16	28	90.58
17	17	94.22
18	6	95.50
19	7	97.00
20	4	97.86
21	2	98.29
22	1	98.50
23	1	98.72
24	1	98.93
25	0	98.93
26	0	98.93
27	0	98.93
28	0	98.93
29	0	98.93
30	0	98.93
31	0	98.93

Table 3.6-11 MFC/EBR Temperature Inversion Persistence Summary for 2004
(Page 2 of 3)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
32	0	98.93
33	0	98.93
34	0	98.93
35	0	98.93
36	0	98.93
37	0	98.93
38	0	98.93
39	1	99.14
40	0	99.14
41	0	99.14
42	0	99.14
43	0	99.14
44	1	99.36
45	0	99.36
46	0	99.36
47	0	99.36
48	1	99.57
49	0	99.57
50	0	99.57
51	0	99.57
52	0	99.57
53	0	99.57
54	0	99.57
55	0	99.57
56	0	99.57
57	0	99.57
58	0	99.57
59	0	99.57
60	0	99.57
61	0	99.57
62	0	99.57
63	1	99.79

Table 3.6-11 MFC/EBR Temperature Inversion Persistence Summary for 2004
(Page 3 of 3)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
64	0	99.79
65	0	99.79
66	0	99.79
67	0	99.79
68	0	99.79
69	0	99.79
70	1	100.00

THE LONGEST INVERSION LASTED 70 HOURS

OF THE LONGEST INVERSIONS
NUMBER 1 STARTED 15 HOURS INTO DAY 13

THIRD COLUMN DEFINES THE PERCENT PROBABILITY
THAT IF AN INVERSION OCCURS, ITS DURATION
WILL BE LESS THAN THE NUMBER OF HOURS SPECIFIED

Table 3.6-12 MFC/EBR Temperature Inversion Persistence Summary for 2005
(Page 1 of 5)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
1	56	12.96
2	33	20.60
3	20	25.23
4	15	28.70
5	15	32.18
6	11	34.72
7	8	36.57
8	12	39.35
9	9	41.44
10	15	44.91
11	46	55.56
12	50	67.13
13	29	73.84
14	23	79.17
15	10	81.48
16	26	87.50
17	17	91.44
18	12	94.21
19	7	95.83
20	4	96.76
21	4	97.69
22	1	97.92
23	0	97.92
24	1	98.15
25	0	98.15
26	1	98.38
27	0	98.38
28	0	98.38
29	0	98.38
30	0	98.38
31	0	98.38

Table 3.6-12 MFC/EBR Temperature Inversion Persistence Summary for 2005 (Page 2 of 5)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
32	0	98.38
33	0	98.38
34	1	98.61
35	1	98.84
36	0	98.84
37	0	98.84
38	0	98.84
39	1	99.07
40	0	99.07
41	0	99.07
42	1	99.31
43	0	99.31
44	0	99.31
45	0	99.31
46	0	99.31
47	0	99.31
48	0	99.31
49	0	99.31
50	0	99.31
51	0	99.31
52	0	99.31
53	0	99.31
54	0	99.31
55	0	99.31
56	0	99.31
57	0	99.31
58	0	99.31
59	0	99.31
60	0	99.31
61	0	99.31

Table 3.6-12 MFC/EBR Temperature Inversion Persistence Summary for 2005
(Page 3 of 5)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
62	0	99.31
63	0	99.31
64	0	99.31
65	0	99.31
66	0	99.31
67	1	99.54
68	0	99.54
69	0	99.54
70	0	99.54
71	0	99.54
72	0	99.54
73	0	99.54
74	1	99.77
75	0	99.77
76	0	99.77
77	0	99.77
78	0	99.77
79	0	99.77
80	0	99.77
81	0	99.77
82	0	99.77
83	0	99.77
84	0	99.77
85	0	99.77
86	0	99.77
87	0	99.77
88	0	99.77
89	0	99.77
90	0	99.77
91	0	99.77

Table 3.6-12 MFC/EBR Temperature Inversion Persistence Summary for 2005
(Page 4 of 5)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
92	0	99.77
93	0	99.77
94	0	99.77
95	0	99.77
96	0	99.77
97	0	99.77
98	0	99.77
99	0	99.77
100	0	99.77
101	0	99.77
102	0	99.77
103	0	99.77
104	0	99.77
105	0	99.77
106	0	99.77
107	0	99.77
108	0	99.77
109	0	99.77
110	0	99.77
111	0	99.77
112	0	99.77
113	0	99.77
114	0	99.77
115	0	99.77
116	0	99.77
117	0	99.77
118	0	99.77
119	0	99.77
120	0	99.77
121	0	99.77

Table 3.6-12 MFC/EBR Temperature Inversion Persistence Summary for 2005
(Page 5 of 5)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
122	0	99.77
123	0	99.77
124	0	99.77
125	0	99.77
126	0	99.77
127	0	99.77
128	0	99.77
129	0	99.77
130	0	99.77
131	0	99.77
132	0	99.77
133	0	99.77
134	0	99.77
135	0	99.77
136	0	99.77
137	0	99.77
138	0	99.77
139	1	100.00

THE LONGEST INVERSION LASTED 139 HOURS

OF THE LONGEST INVERSIONS
NUMBER 1 STARTED 6 HOURS INTO DAY 22

THIRD COLUMN DEFINES THE PERCENT PROBABILITY
THAT IF AN INVERSION OCCURS, ITS DURATION
WILL BE LESS THAN THE NUMBER OF HOURS SPECIFIED

Table 3.6-13 MFC/EBR Temperature Inversion Persistence Summary for 2006
(Page 1 of 2)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
1	51	11.33
2	35	19.11
3	26	24.89
4	14	28.00
5	17	31.78
6	12	34.44
7	12	37.11
8	10	39.33
9	14	42.44
10	21	47.11
11	38	55.56
12	62	69.33
13	27	75.33
14	26	81.11
15	17	84.89
16	19	89.11
17	22	94.00
18	5	95.11
19	6	96.44
20	5	97.56
21	1	97.78
22	2	98.22
23	2	98.67
24	0	98.67
25	2	99.11
26	0	99.11
27	0	99.11
28	0	99.11
29	1	99.33
30	0	99.33
31	0	99.33

Table 3.6-13 MFC/EBR Temperature Inversion Persistence Summary for 2006 (Page 2 of 2)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
32	0	99.33
33	0	99.33
34	0	99.33
35	0	99.33
36	0	99.33
37	0	99.33
38	0	99.33
39	0	99.33
40	0	99.33
41	0	99.33
42	1	99.56
43	0	99.56
44	0	99.56
45	0	99.56
46	0	99.56
47	0	99.56
48	1	99.78
49	0	99.78
50	1	100.00

THE LONGEST INVERSION LASTED 50 HOURS

OF THE LONGEST INVERSIONS
NUMBER 1 STARTED 16 HOURS INTO DAY 5

THIRD COLUMN DEFINES THE PERCENT PROBABILITY
THAT IF AN INVERSION OCCURS, ITS DURATION
WILL BE LESS THAN THE NUMBER OF HOURS SPECIFIED

Table 3.6-14 MFC/EBR Temperature Inversion Persistence Summary for 2007
(Page 1 of 1)

DURATION (HOURS)	NUMBER OF OBSERVATIONS	PERCENT PROBABILITY
1	63	14.19
2	31	21.17
3	18	25.23
4	11	27.70
5	8	29.50
6	9	31.53
7	14	34.68
8	9	36.71
9	13	39.64
10	34	47.30
11	40	56.31
12	59	69.59
13	25	75.23
14	25	80.86
15	22	85.81
16	34	93.47
17	18	97.52
18	6	98.87
19	4	99.77
20	1	100.00

THE LONGEST INVERSION LASTED 20 HOURS

OF THE LONGEST INVERSIONS
NUMBER 1 STARTED 17 HOURS INTO DAY 360

THIRD COLUMN DEFINES THE PERCENT PROBABILITY
THAT IF AN INVERSION OCCURS, ITS DURATION
WILL BE LESS THAN THE NUMBER OF HOURS SPECIFIED

Table 3.6-15 Ambient Air Quality Standards for Criteria Pollutants
(Page 1 of 1)

Pollutant	Standard	Level
Ozone	The 3-year average of the 4th highest daily maximum 8-hour average concentration cannot exceed the level measured at each monitor within an area over each year.	0.075 ppm
Particulate Matter (10 micrometers)	The 24-hour average cannot exceed the level more than once per year on average over three years.	150 µg/m^3
Particulate Matter (2.5 micrometers)	The 3-year annual average of the weighted annual mean concentration cannot exceed the level.	15.0 µg/m^3
	The 3-year average of the 98th percentile (based on the number of samples taken) of the daily concentrations must not exceed the level.	35 µg/m^3
Carbon Monoxide	The 1-hour average cannot exceed the level more than once per year.	35 ppm
	The 8-hour average cannot exceed the level more than once per year.	9 ppm
Sulfur Dioxide	Annual arithmetic mean of 1-hour averages cannot exceed the level.	0.03 ppm
	The 24-hour average cannot exceed the level more than once per year.	0.14 ppm
	The 3-hour average cannot exceed the level more than once per year.	0.5 ppm
Lead	The quarterly average (by calendar) cannot exceed the level.	1.5 µg/m^3
Nitrogen Dioxide	The annual mean of 1-hour averages cannot exceed the level.	0.053 ppm

Note: Daily concentration is the 24-hour average, measured from midnight to midnight.

Source: IDEQ, 2006

Table 3.6-16 Facility Criteria Air Pollutant Emissions in the Four-County Region Surrounding the Eagle Rock Enrichment Facility Site

(Page 1 of 1)

	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Tons per Year	431	624	641	417	38.3	35.7
Kilograms per Year	390,997	566,083	581,505	378,296	34,745	32,386

FIGURES

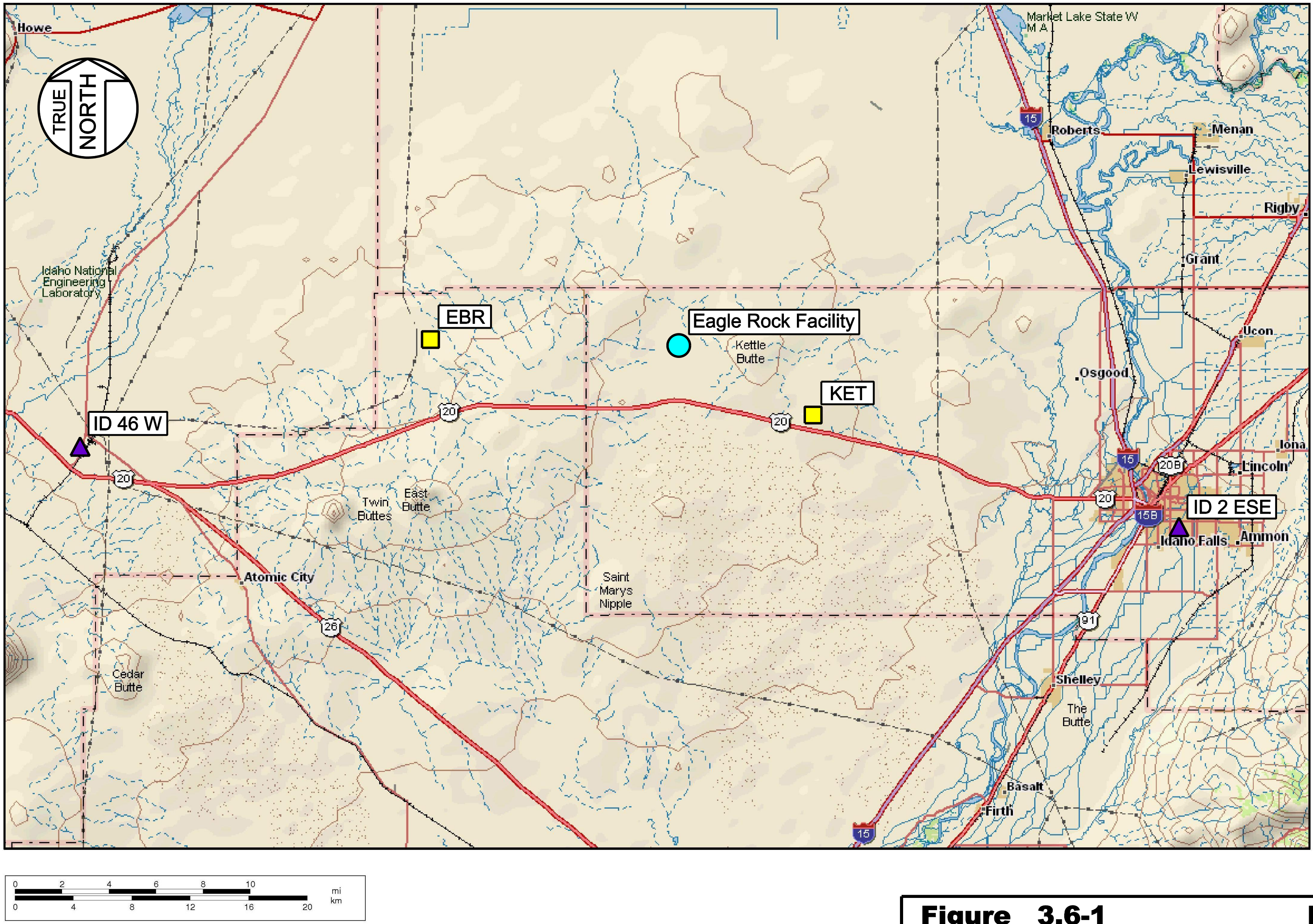


Figure 3.6-1 Rev. 2

Location of Eagle Rock Enrichment Facility and Nearby Meterological Monitoring Stations

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

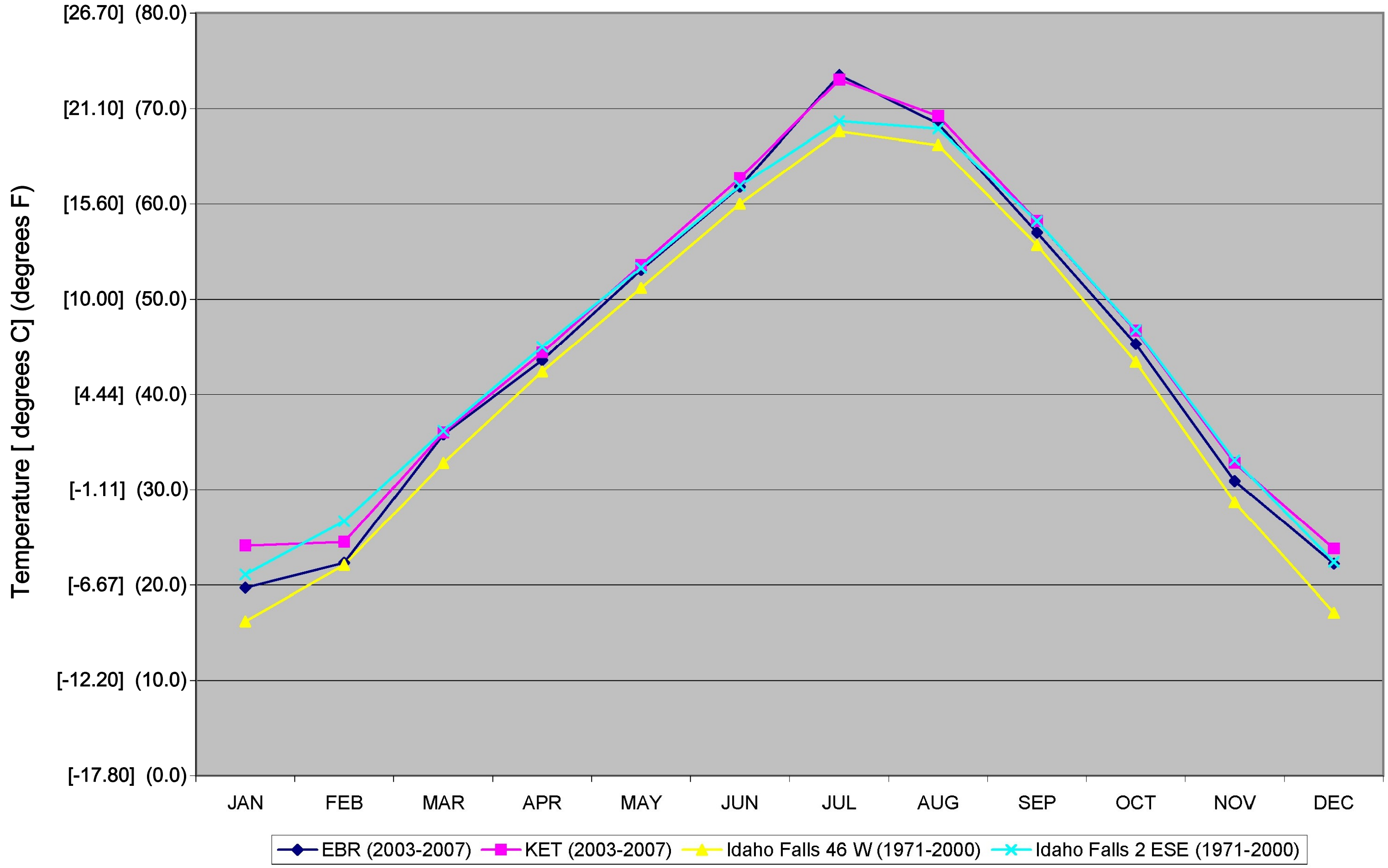


Figure 3.6-2 **Rev. 2**

Comparison of Monthly Mean Temperature in the Vicinity of Eagle Rock Enrichment Facility Site

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

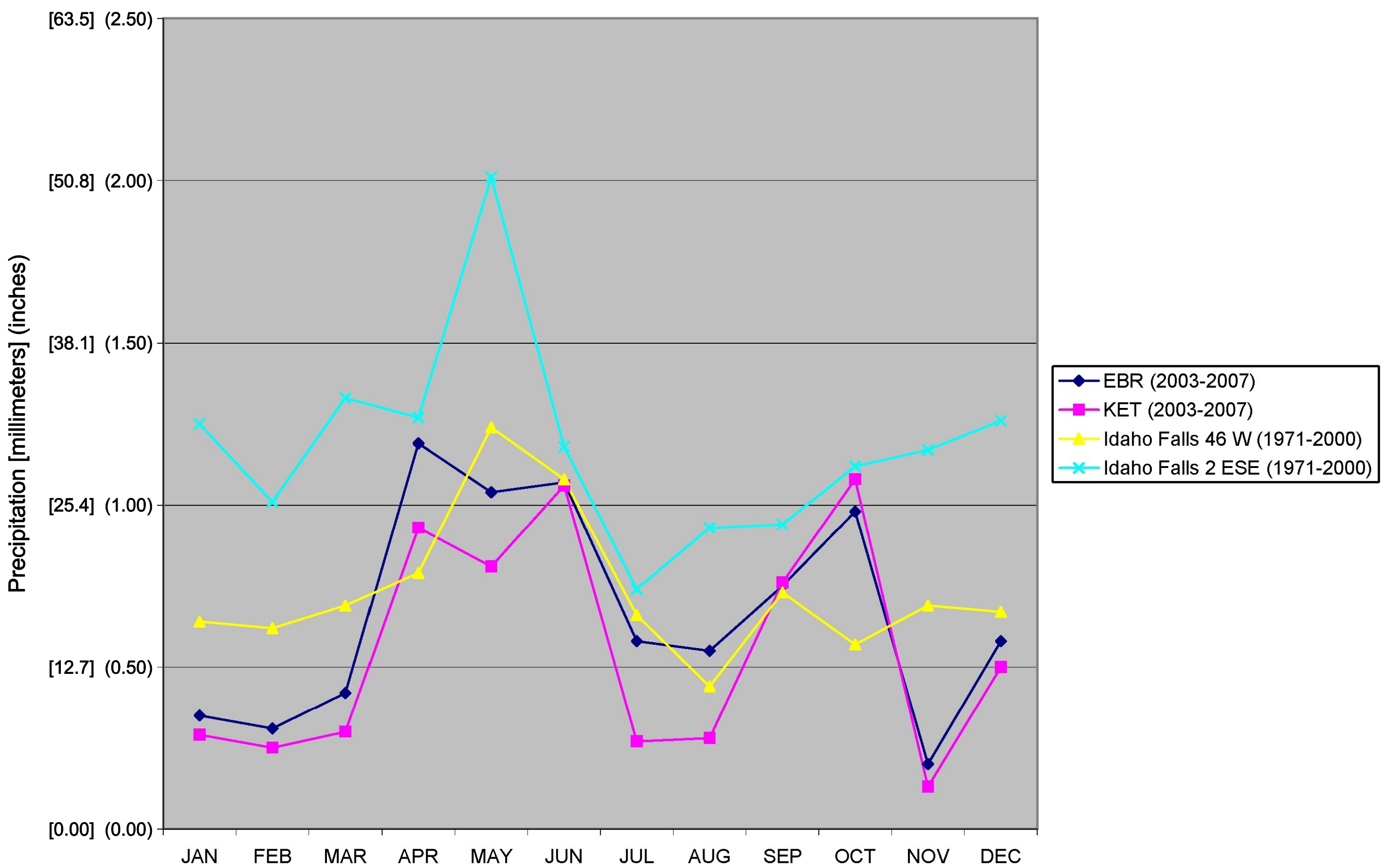


Figure 3.6-3 **Rev. 2**

Comparison of the Monthly Mean Precipitation in the Vicinity of Eagle Rock Enrichment Facility Site

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

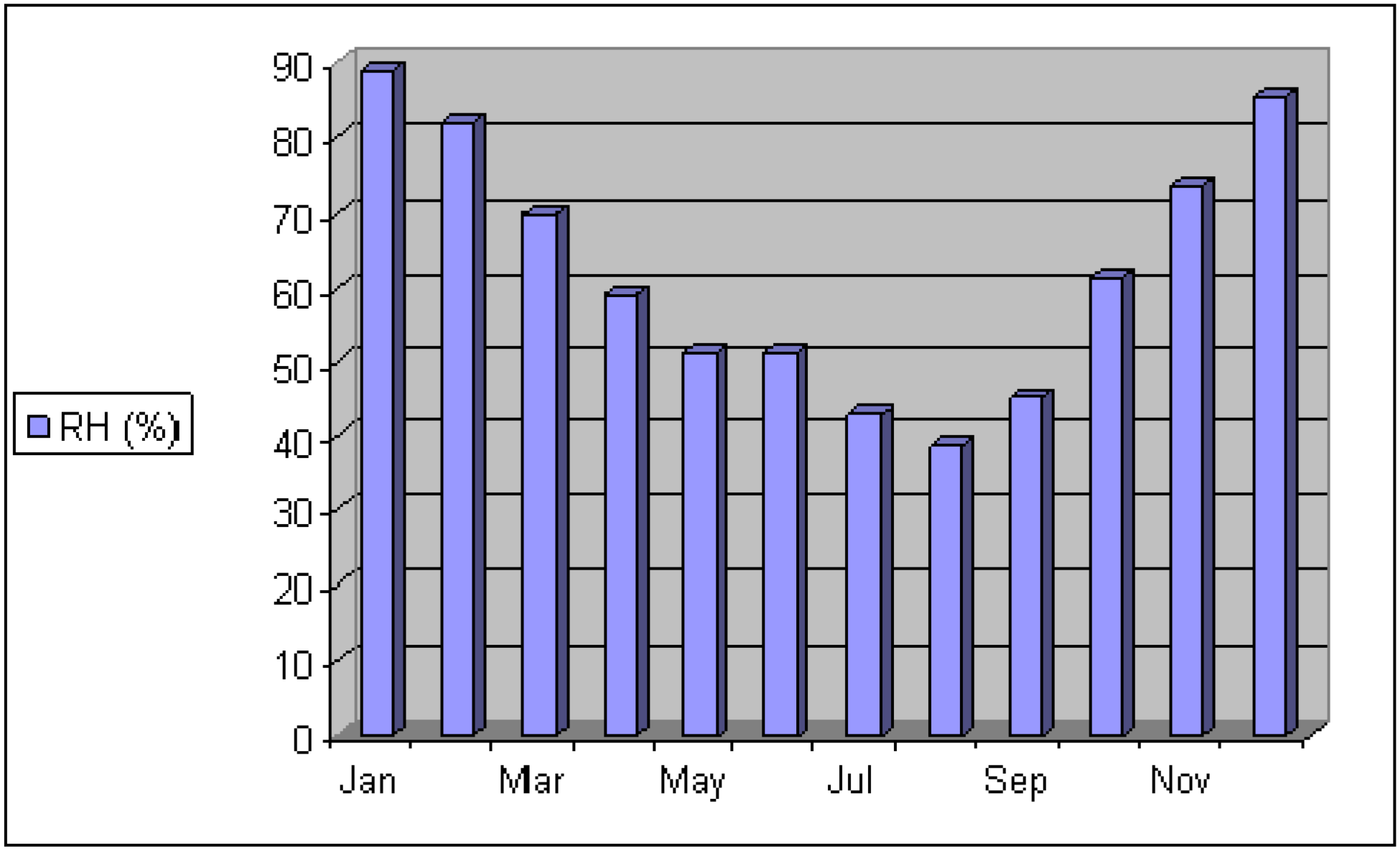


Figure 3.6-4 **Rev. 2**

INL Monthly Mean Relative Humidity (%) at KET (2003-2007)

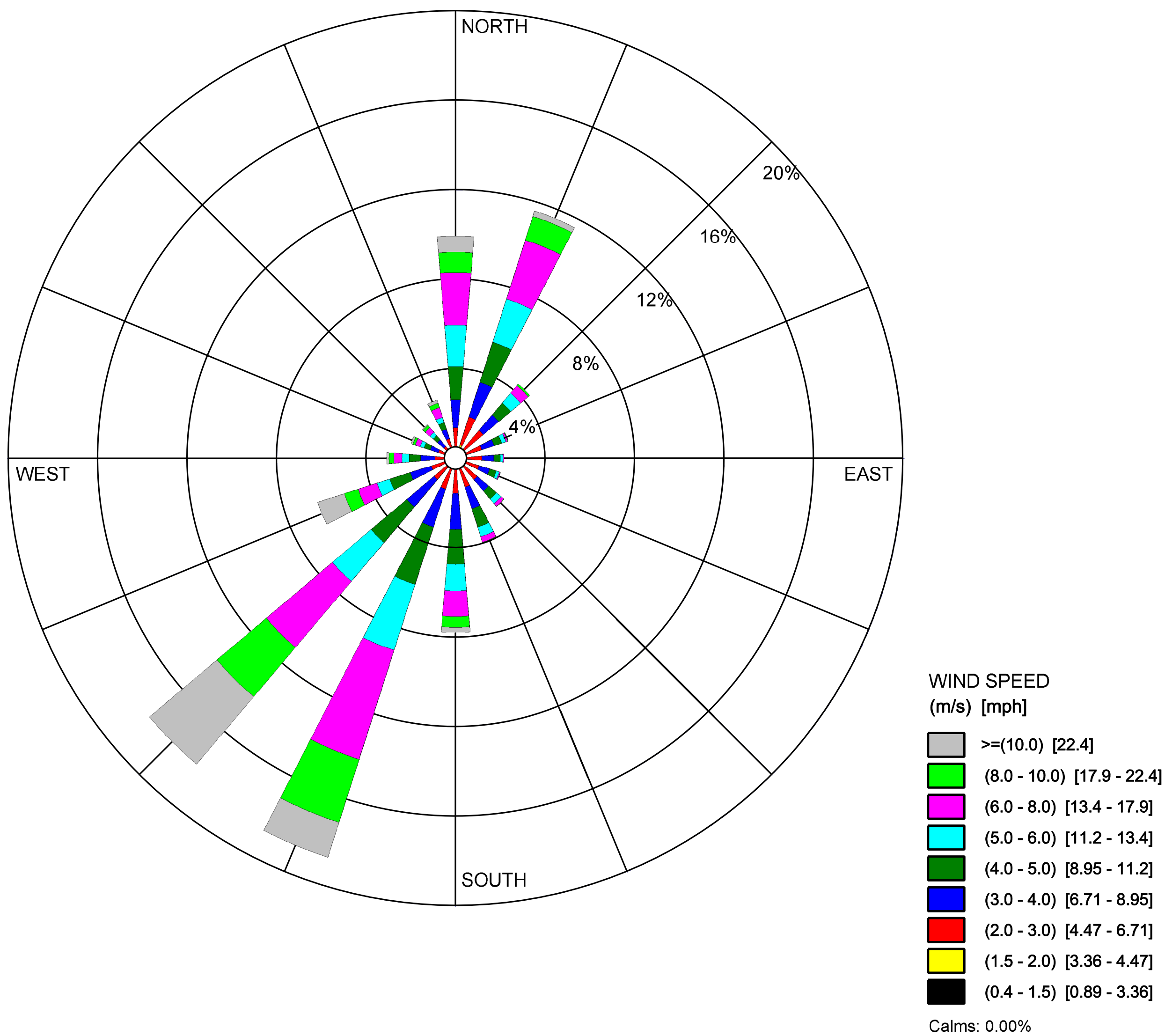
EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

WIND ROSE PLOT:

Station #KetBt

DISPLAY:

Wind Speed Direction (blowing from)



DATA PERIOD:
2003, 2004, 2005, 2006, 2007
Jan 1 - Dec 31 (00:00-23:00)

CALM WINDS: 0.00 %	AVG. WIND SPEED: (5.45 m/s) [12.2 mph]	**Figure 3.6-5** **Rev. 2**
TOTAL COUNT: 43211 hrs	DATE: 7/17/2008	KET Wind Rose (15 Meters / 49.2 Feet)

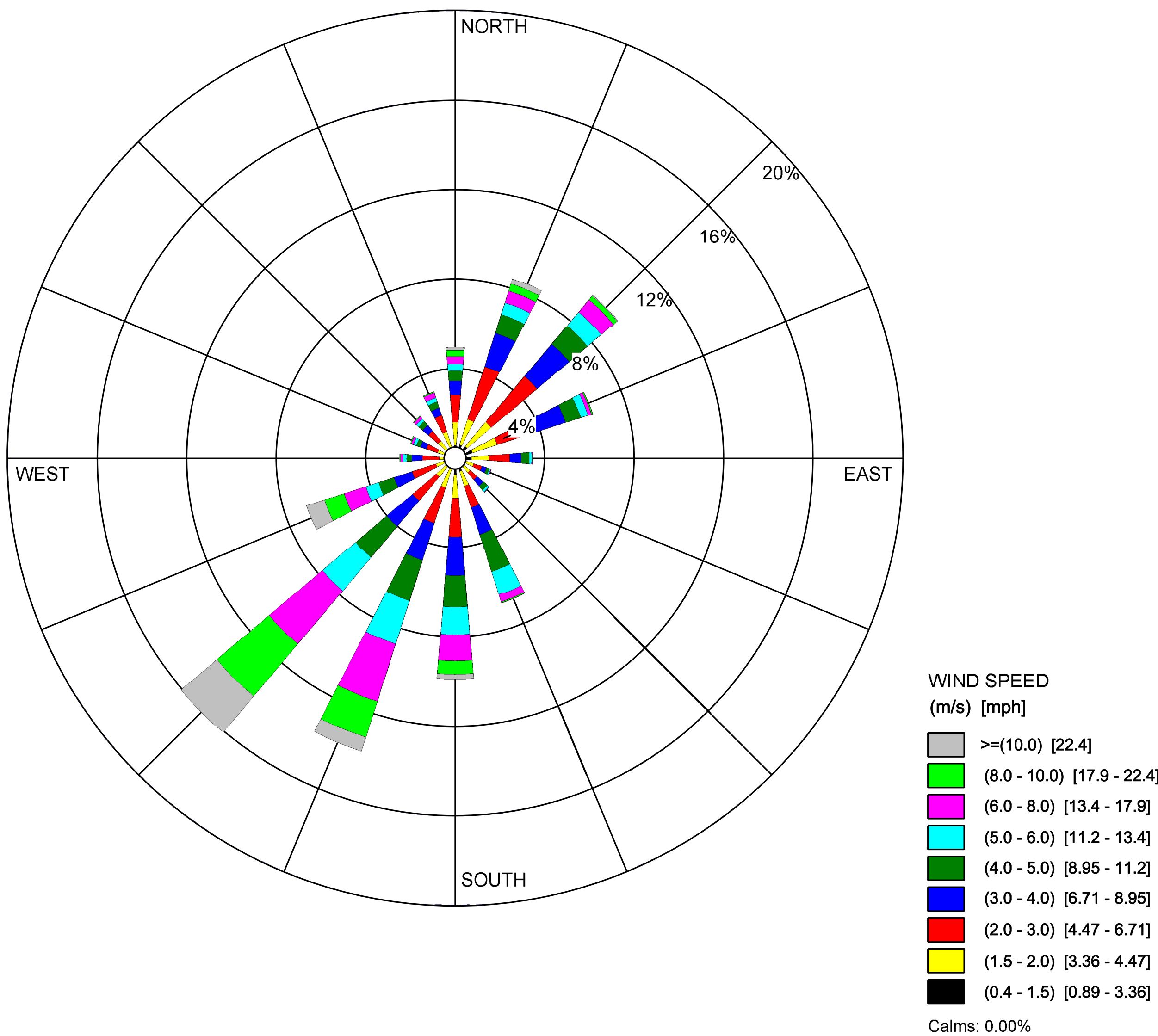
EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

WIND ROSE PLOT:

Station #EBRID

DISPLAY:

Wind Speed Direction (blowing from)



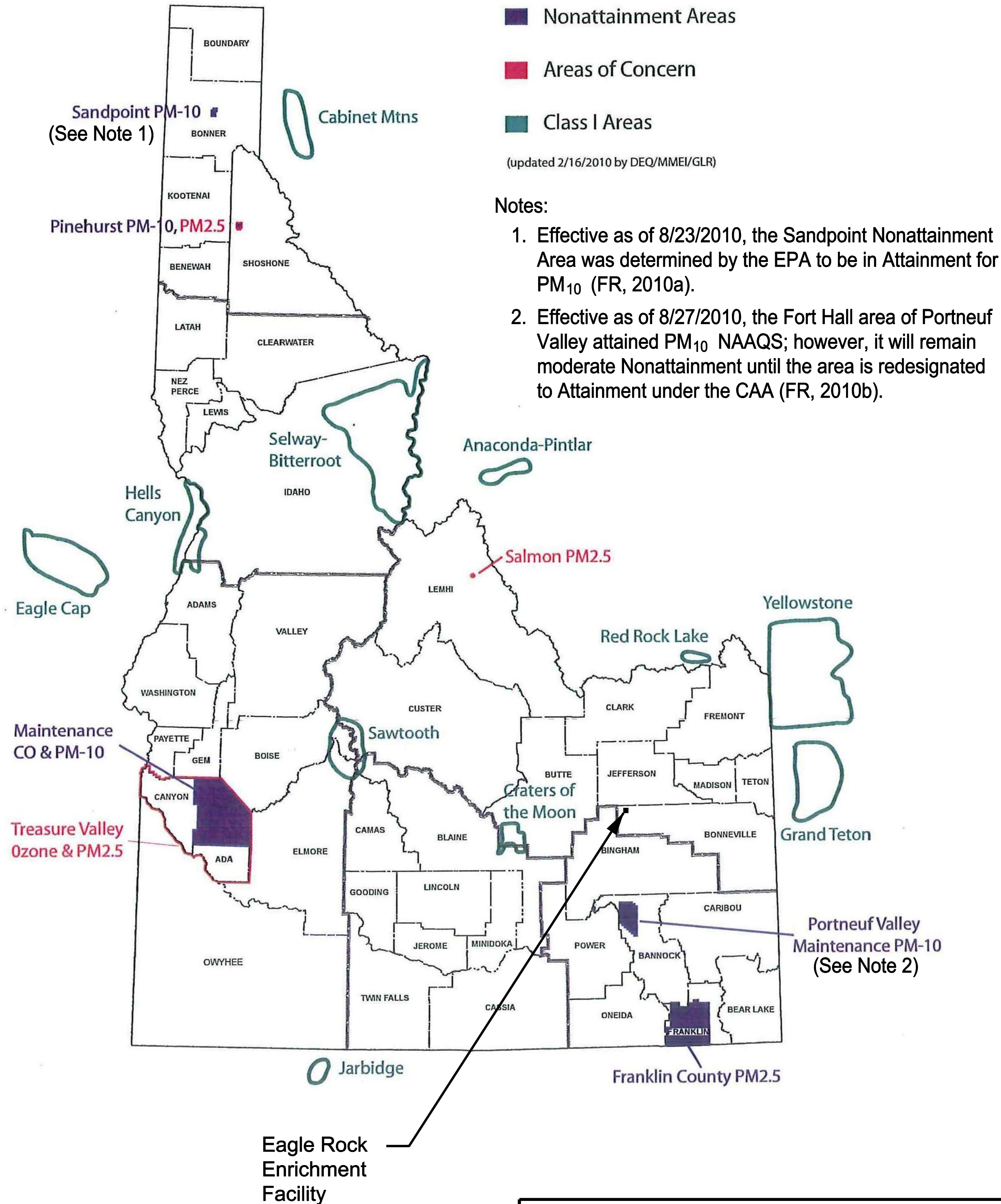
DATA PERIOD:

2003, 2004, 2005, 2006, 2007

Jan 1 - Dec 31 (00:00-23:00)

CALM WINDS: 0.00 %	AVG. WIND SPEED: (4.18 m/s) [9.35 mph]	**Figure 3.6-6** **Rev. 2**
TOTAL COUNT: 43211 hrs	DATE: 7/15/2008	EBR Wind Rose (10 Meters/32.8 Feet)

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT



Notes:

1. Effective as of 8/23/2010, the Sandpoint Nonattainment Area was determined by the EPA to be in Attainment for PM_{10} (FR, 2010a).
2. Effective as of 8/27/2010, the Fort Hall area of Portneuf Valley attained PM_{10} NAAQS; however, it will remain moderate Nonattainment until the area is redesignated to Attainment under the CAA (FR, 2010b).

Source: IDEQ, 2010

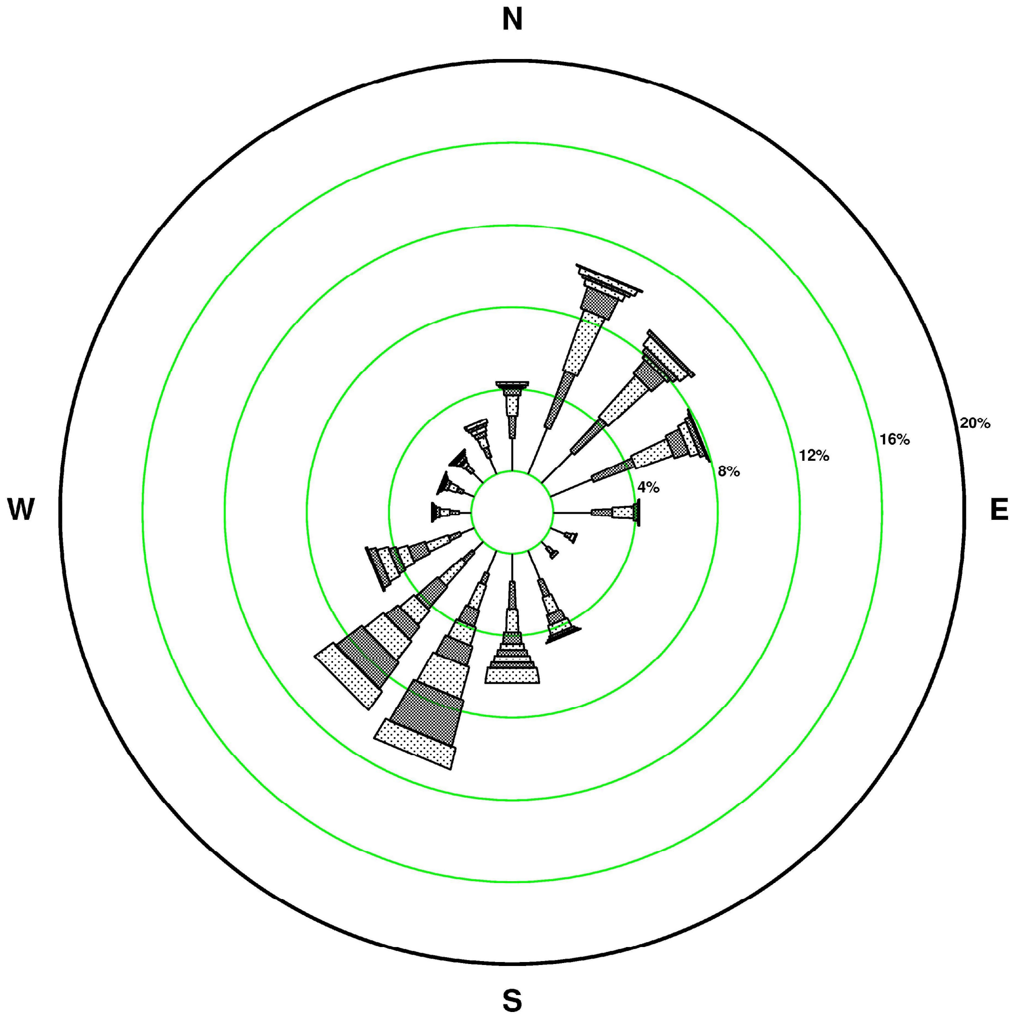
Figure 3.6-7 **Rev. 3**

Map of Idaho Highlighting Nonattainment and Maintenance Areas, Areas of Concern and PSD Class I Areas

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

EBR JAN 2003 – 2007

10-METER/33-FEET WIND DATA



STABILITY CLASS ALL

CALM WINDS 15.52%

NOTE: Frequencies indicate direction from which the wind is blowing.

WIND SPEED (MPS) [MPH-Approximate]

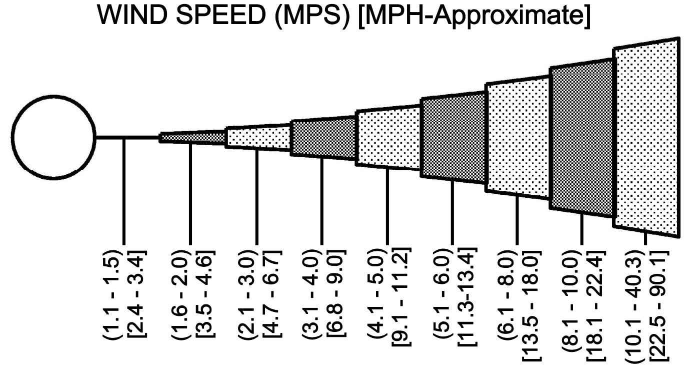


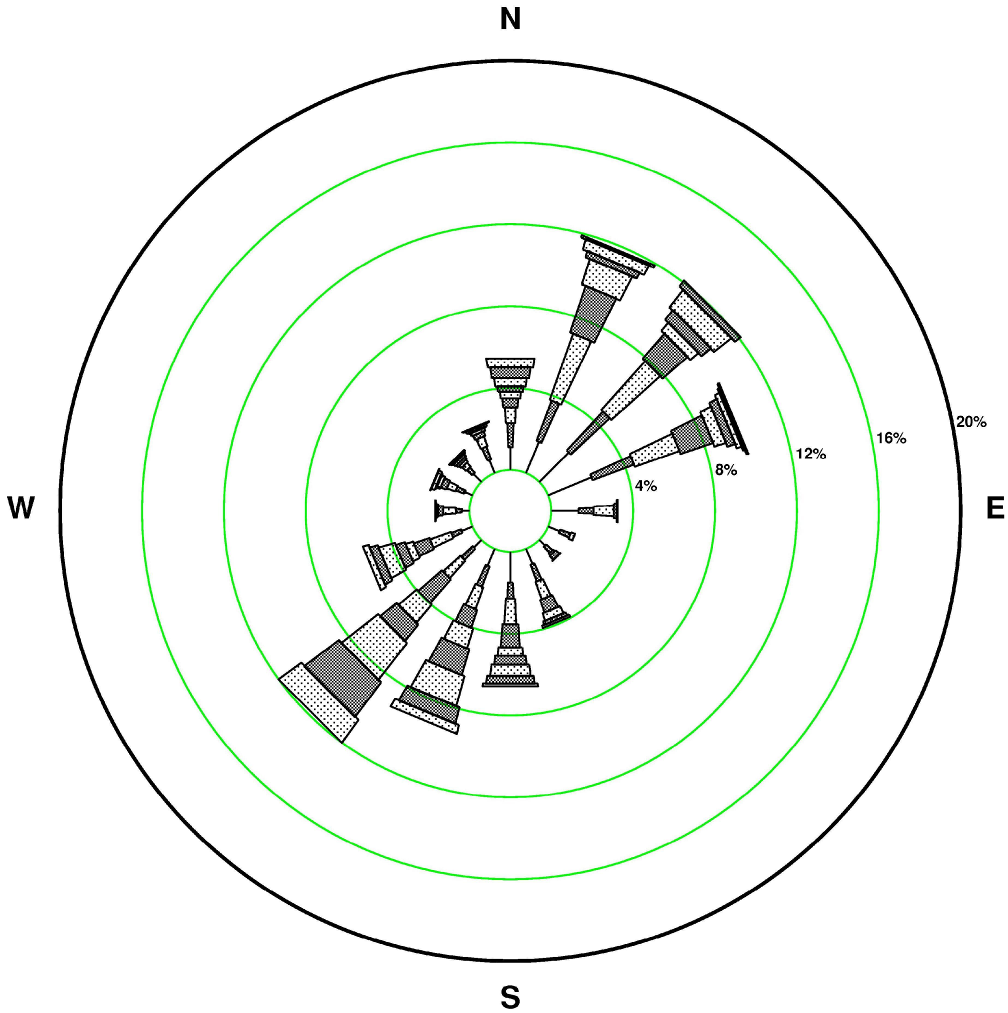
Figure 3.6-8 **Rev. 2**

EBR January Wind Rose (10 Meters/33 Feet)

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

EBR FEB 2003 – 2007

10-METER/33-FEET WIND DATA



STABILITY CLASS ALL

CALM WINDS 9.21%

NOTE: Frequencies indicate direction from which the wind is blowing.

WIND SPEED (MPS) [MPH-Approximate]

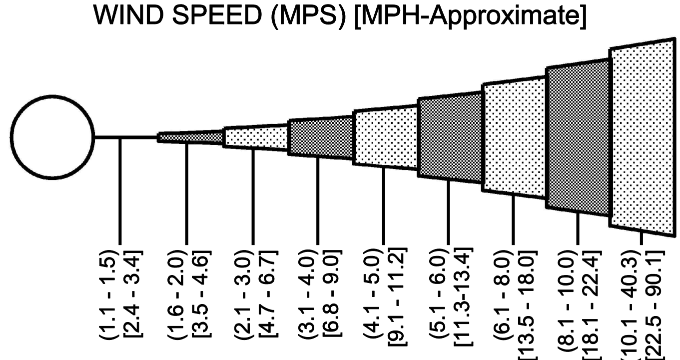


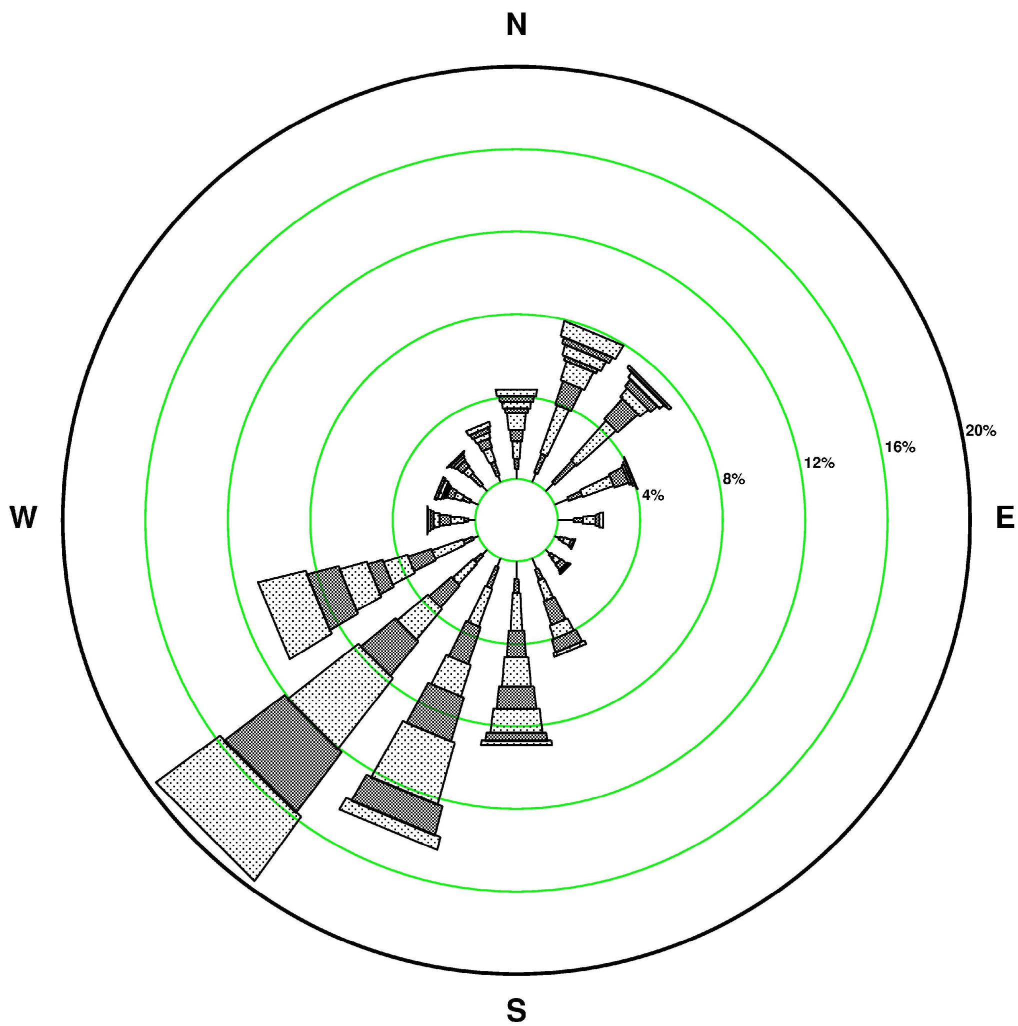
Figure 3.6-9 **Rev. 2**

EBR February Wind Rose (10 Meters/33 Feet)

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

EBR MAR 2003 – 2007

10-METER/33-FEET WIND DATA



STABILITY CLASS ALL

CALM WINDS 3.17%

NOTE: Frequencies indicate direction from which the wind is blowing.

WIND SPEED (MPS) [MPH-Approximate]

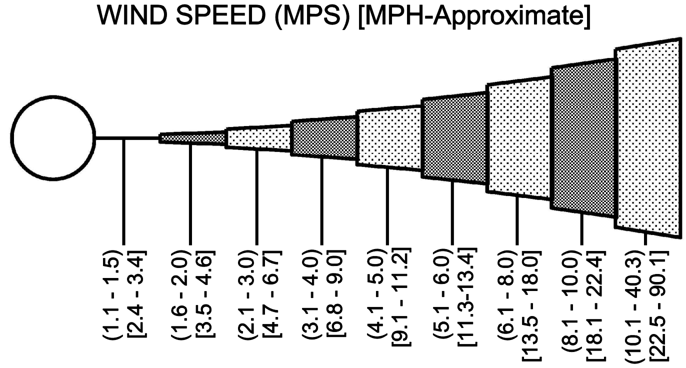


Figure 3.6-10 **Rev. 2**

EBR March Wind Rose (10 Meters/33 Feet)

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT