# 2024 Bennett Road Landfill Hydrogeologic Characterization Work Plan, Revised

*Prepared for*
Elmore County

October 2024

Parametrix

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October 22, 2024

Parametrix No. 553-7443-006

Brent Copes REHS/RS
Central District Health Department
Environmental Health Specialist Senior
Community & Environmental Health

Re: Bennett Road Landfill Groundwater Monitoring Plan, Revised

Dear Mr. Copes:

The Groundwater Monitoring Plan has been prepared by Parametrix on behalf of Elmore County for the Bennett Road Landfill. The Groundwater Monitoring Plan is comprised of the 2024 Bennett Road Landfill Hydrogeologic Characterization Work Plan (plan) with an attached Sampling and Analysis Plan (SAP). This plan meets federal and state requirements for a Groundwater Monitoring Plan and is provided in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.06, Idaho Statutes §39-7409 through §39-74), and Federal Regulation 40, Code of Federal Regulations (CFR) 258 under the regulatory supervision of the Idaho Department of Environmental Quality (IDEQ).

The required publication of the draft plan was completed on September 18, 2024, and proof of publication was provided to IDEQ on October 4, 2024, pursuant to Idaho Code 39-7411(6). No public comments were received. IDEQ provided comment on October 11, 2024.

The plan and attached SAP have been revised to address IDEQ's comments. A summary of IDEQ's comments and Parametrix's responses is attached to this cover letter.

Sincerely,

Parametrix

Tiffany Neier, Project Manager

Shira DeGrood, PG, Lead Geologist

cc: Project File
Matthew Beeter, Solid Waste Program Manager, Idaho Department of Environmental Quality
Deb Ireland, Landfill Supervisor, Elmore County
Al Hofer, Elmore County Commissioner

Attachments: *Comment/Response Form, 2024 Bennett Road Landfill Hydrogeologic Characterization Work Plan*
*2024 Bennett Road Landfill Hydrogeologic Characterization Work Plan, Revised*

Parametrix

| Comment/Response Form | | Project Number: 553-7443-006 |
|---|---|---|
| | | Project Name: Bennett Road Landfill |
| **Document Name and Date** | 2024 Bennett Road Landfill Hydrogeologic Characterization Work Plan; August 2, 2024 | |
| **Reviewer(s)** | Fritz Durham, IDEQ; Rebecca Blankenau, IDEQ | |

| Comment No. | Comment | Reviewer | Response |
|---|---|---|---|
| 1 | In the last meeting with Parametrix (August 15, 2024) I asked them to confirm their USGS data for groundwater elevations with a concern about the dates of the well gauging/transducer data from USGS – were they within days of each other or months. The Work Plan states that USGS measured groundwater elevations in the Facility supply well and three other wells located to the west and southwest in November 2023. The Work Plan reports a south-southwest flow direction was calculated from these elevation data. Based on the reported data, the locations of the two proposed downgradient monitoring wells are acceptable. | Fritz Durham | Parametrix appreciates the comment and is proceeding with installation of the two proposed downgradient monitoring wells. |
| 2 | The GMP included an IDWR Well Driller's Report for the Facility supply well. The Facility supply well was installed in 1989 and is reportedly located north of the landfill. The Well Driller's Report for the well states it was installed by air-rotary drilling, is 610 feet deep, cased to 47 feet (the top of solid/competent basalt) and is an open hole boring. No static water level is reported, and no lithology is reported below 67 feet. The Report states that no returns (cuttings) were obtained from 67 to 610 feet, which usually indicates significant fractures or open spaces in the subsurface that prevent the drill cuttings from being blown up and out of the boring during drilling. | Fritz Durham | Parametrix appreciates the summary and interpretation of local lithology. |

| Comment No. | Comment | Reviewer | Response |
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| 3 | The GMP proposes to use three wells at the BRL for the monitoring well network: the two proposed wells as downgradient wells and the Facility supply well as an upgradient well. The quality of water samples collected from the Facility supply well would appear to be acceptable (collected from a tap after significant pumping – see bullet below); of concern is whether valid groundwater elevation data can be obtained from the Facility supply well. The GMP states that "Static groundwater levels will be measured during each sampling event in the monitoring wells. Water levels will also be measured in the Facility Supply Well at the time of sampling; however, this may not be a true static water level due to the utilization by the facility." This item needs to be addressed with a statement of how accurate groundwater elevation data will be obtained from well. Without an accurate groundwater elevation at this well, a groundwater flow direction cannot be calculated for the BRL. | Fritz Durham | Parametrix will collect data on the Facility supply well to assess recovery time from pumping conditions. The Facility operators have stated that pumping does not occur from this well when the Facility is closed on Sundays.<br><br>Parametrix proposes to verify stability of the water level by using a transducer to collect water level measurements over a 1-week time period. This information will be used to determine the drawdown and recovery rate for the Facility supply well and will inform the process for future sampling events.<br><br>Section 3.2 of the SAP (Appendix C) has been revised to provide the above information. |
| 4 | Low flow purging is generally conducted on a monitoring well with the pump set in the middle or top of the well's screened interval such that samples are obtained by pulling groundwater (at a low flow rate) into the pump from the aquifer just outside of the screen to avoid mixing with the standing water in the well and collect a sample representative of "fresh" water in the aquifer. The Facility supply well is an open hole boring with unknown aquifer(s) location/elevation, with the pump likely set near the bottom of the well. The proposed low flow sampling would collect only standing water from the base of the well and not represent fresh water pulled from the aquifer. The Facility supply well should be gauged to collect the groundwater elevation, the bottom of the well should be determined, an estimated volume of standing water in the well boring calculated, and three to five volumes of water removed from the well prior to sample collection. This will likely require a significantly higher pump rate than the proposed 500 milliliters per minute. | Fritz Durham | Parametrix will attempt to measure and document the Facility Supply Well pump intake depth and total depth. Measurements may be infeasible depending on the size of the pump. Removal of the pump is not recommended due to potential for damage to the pump or well. Section 3.2 of the SAP has been updated to include discussion of assessing these items.<br><br>Removal of three to five well volumes is not feasible for the size and water column at this well. Water level was 432 feet below ground surface (bgs) in 2023 and the well was drilled to a total depth of 610 feet (see well log in Appendix A of the Work Plan). Assuming the well remains at 8.5-inch diameter for the entire depth, one well volume is equivalent to approximately 525 gallons.<br><br>Parametrix understands that more information is needed to determine drawdown, recovery rates, and effect on groundwater parameters prior to considering use of water obtained from the current pump in the Facility Supply Well as background. Parametrix proposes to perform pilot testing in 2025 to develop an appropriate protocol for sample collection methods. The pilot testing would assess pumping rates, typical water usage, hydraulic properties of the well, and changes in chemical concentrations with low-flow or other pumping protocols. |
| 5 | Turbidity as a field parameter for groundwater purging can be deleted. | Fritz Durham | Parametrix acknowledges that this is not a required parameter but plans to collect this data. This additional data may be used during statistical evaluations. |

| Comment No. | Comment | Reviewer | Response |
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| 6 | For the sample analyses, chloride, total dissolved solids (TDS), and possibly nitrate are reasonable indicators of potential landfill leachate impact. The other proposed inorganic indicator parameters listed for analyses are not necessary. | Fritz Durham | Parametrix acknowledges that these analytes are not required parameters but plans to collect this data for a minimum of eight baseline characterization sampling events. This additional data may be used during the statistical evaluations. |
| 7 | In section 3.1, the monitoring schedule has outlined the first eight quarterly sampling events to establish background. Please details about the monitoring frequency after the background sampling has been completed. | Rebecca Blankenau | The long-term groundwater monitoring frequency will be evaluated following the background characterization assessment, which will be performed following the initial eight quarterly sampling events. Following a statistical evaluation of this background data, Parametrix will provide a report with findings of the background characterization and recommendations for updates to the sampling program. This approach will allow for determination of site-specific performance standards that will best meet monitoring goals.<br><br>Evaluation of this background data will include use of multiple statistical tests, following the methods described in 40 CFR 258.53(g). Statistical evaluation may include methods for updating background data by performance of outlier tests, distribution tests, seasonality tests, and trend analysis; calculation of upper prediction limits and control charts; and use of verification resampling.<br><br>Recommendations for updates to the sample program may include proposed changes to the frequency of groundwater monitoring, the statistical evaluation methodology (e.g. interwell or intrawell evaluation), and performance standards.<br><br>Sections 1.0, 3.0, and 4.0 have been revised to clarify. |
| 8 | The details of the statistical evaluation is included in section 4.1.3 of the SAP. No specific statistical method has been chosen. The statistical methods used to evaluate the groundwater sample data must be specified, 40 CFR 258.53(g). When selecting a statistical method, consideration should be taken on performance standards, 40 CFR 258.53(h). Please include details of the statistical method selected to evaluate the groundwater well data including any retesting method that may be implemented. | Rebecca Blankenau | As described in response to Comment 7, Parametrix proposes to assess the data using multiple statistical tests, following the methods described in 40 CFR 258.53(g). The tests will be performed after 8 quarters of data are available. This will allow for determination of site-specific performance standards that will best meet monitoring goals.<br><br>Section 4.1.3 of the SAP (Appendix C) has been updated to clarify.<br><br>In addition, since the wells are new, any detection of volatile organic compounds (VOCs) in the quarterly monitoring shall be evaluated. Resampling may be performed to confirm the data. This information has been moved from Section 4.2 to Section 4.1.4 to clarify. |

| Comment No. | Comment | Reviewer | Response |
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| 9 | In section 4.1.3, eight sampling events will be collected for each groundwater monitoring well in the network. No details were provided about the background data evaluation prior to conducting compliance statistical analyses. Please provide details regarding the evaluation of the background data. After establishing background, the background should be updated periodically based on the March 2009 EPA Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance (EPA Unified Guidance). Please provide details about the process for updating background. | Rebecca Blankenau | An updated SAP will be provided following initial background characterization sampling for the first eight quarters. An evaluation of the background data will be provided in the updated SAP. Please see responses to Comments 7 and 8 for additional details.<br>Sections 1.0, 3.0, and 4.0 have been revised to clarify. |
| 10 | In section 4.1.4, potential groundwater impacts are only associated with leachate. However, landfill gas intrusion has the potential to also impact groundwater. Please ensure any potential landfill impacts are considered when monitoring the groundwater. | Rebecca Blankenau | It is unlikely that landfill gas would vertically migrate hundreds of feet and into a confined aquifer. However, the following measures are being taken:<br>Landfill gas probes will be installed and monitored, as described in the Operations Plan.<br>Groundwater monitoring will include assessment of VOCs, which are associated with landfill gas. Section 4.1.4 of the SAP has been revised to clarify that, during the first eight quarters of background characterization, detection of VOCs in the quarterly monitoring shall be evaluated and resampling may be performed to confirm the data. |
| 11 | In section 4.1.4, the definition of a statistically significant increase (SSI) has not been included in the SAP. Please include details on how an SSI will be identified, including how retesting will be utilized in identifying SSIs if retesting is implemented in the statistical methodology. | Rebecca Blankenau | Performance standards, including details on SSIs, will be provided as part of the background characterization. Please see responses to Comments 7 and 8 for additional details. Section 4.0 has been updated to clarify. |
| 12 | Included in section 4.1.4 is information about identifying an alternative source other than the landfill that could have caused an SSI. Alternative source demonstrations listed are error in sampling, analysis, statistical evaluation, or natural variation. Please provide detail on how these alternative source demonstrations will be evaluated to determine if an error occurred. | Rebecca Blankenau | Performance standards, including details on SSIs, will be provided as part of the background characterization. Please see responses to Comments 7 and 8 for additional details. Section 4.0 has been updated to clarify. |
| 13 | In Appendix A Standard Operating Procedure Groundwater Sampling, procedures numbered 3 and 4 will be recorded on field sampling data sheet. Please include a template of the field sampling data sheet in this SAP and provide a list of field sampling information that will be recorded on the field sampling data sheet. | Rebecca Blankenau | The Standard Operating Procedure for Groundwater Sampling has been updated to include a field data sheet. |

# 2024 Bennett Road Landfill Hydrogeologic Characterization Work Plan, Revised

*Prepared for*

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# Citation

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Hydrogeologic Characterization Work Plan, Revised.
Prepared for Elmore County by Parametrix, Boise, Idaho.
October 2024.

# Certification

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.


Shira DeGrood

10/21/2024

Prepared by Shira DeGrood, PG

Checked by Michael Brady, LG, LHG

Approved by Tiffany Neier, PE

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## TABLES



## FIGURES



## APPENDICES

# Acronyms and Abbreviations

| | |
|---|---|
| BRL | Bennett Road Landfill |
| C&D | construction and demolition |
| CFR | Code of Federal Regulations |
| County | Elmore County |
| ft amsl | feet above mean sea level |
| ft bgs | feet below ground surface |
| IDAPA | Idaho Administrative Code |
| IDEQ | Idaho Department of Environmental Quality |
| IDWR | Idaho Department of Water Resources |
| MSW | municipal solid waste |
| NAD83 | North American Datum of 1983 |
| NAVD88 | North American Vertical Datum of 1988 |
| POC | point of compliance |
| QA/QC | quality assurance and quality control |
| USGS | United States Geological Survey |

# 1. General Information

Elmore County (County) owns and operates the Bennett Road Landfill (BRL) in accordance with Idaho Administrative Code (IDAPA) 58.01.06, Idaho Solid Waste Facilities Act (§39-7410), Federal Regulation 40, Code of Federal Regulations (CFR) 258.51, and 40 CFR 257.24 under the regulatory supervision of the Idaho Department of Environmental Quality (IDEQ).

The BRL is located at 6100 SE County Landfill Road in Mountain Home, Idaho (Figure 1), and encompasses a transfer station, unlined municipal solid waste (MSW) landfill (Cell 1), and a construction and demolition (C&D) landfill. Figure 2 displays the details of the facility.

The County currently accepts less than approximately 20 tons of MSW per day into Cell 1 and is currently exempt from the requirements of subparts D and E of 40 CFR 258. The County is planning for the facility to accept a greater amount of in-County waste and a smaller amount of out-of-County waste that would put the waste acceptance over the small community exemption of 20 tons per day/ 7,300 tons per year. The County is currently designing a new expansion, Cell 2, which will be lined. To support the greater amount of waste acceptance, Parametrix was retained to develop a hydrogeologic characterization work plan to satisfy the Groundwater Monitoring Application of IDAPA 58 and requirements of subpart E of 40 CFR 258.

# 2. Physical Setting

The BRL is located in central Elmore County, approximately 5 miles southeast of Mountain Home, Idaho. The BRL is located within the western Snake River basin. The basin is a broad downwarped structural basin developed by migration of the Yellowstone hot spot. The basin is bounded by low mountain ranges such as the Mount Bennett Hills, located approximately 14 miles northeast of the BRL. The Snake River is located approximately 10 miles to the south and flows northwest towards the Columbia River. Several smaller creeks, such as Bennett Creek, flow from Bennett Mountain south towards the Snake River. The West Tributary of Dry Creek has several ephemeral branches that cross the BRL facility boundary flowing from the north southwesterly towards the Snake River.

The elevation of the BRL is approximately 3,200 feet above mean sea level (ft amsl) and the area surrounding the landfill is entirely flat. The land slopes gently from north to south towards the Snake River which is at an elevation of approximately 2,500 ft amsl south of the BRL.

## 2.1 Soils

Soils in the area of the BRL are mapped as Colthorp-Kunaton complex, 0 to 8% slopes (NRCS 2024) which are described as stony silt loams and silty clay loams overlying duripan. The parent material is mixed alluvium or loess over basalt bedrock. The loam soils are generally well drained, less than 18 inches thick, and overly a 5- to 16-inch thick duripan.

Test pits excavated adjacent to the proposed landfill footprint indicated bedrock or duripan near the surface at the southeast corner of Cell 1 (Parametrix 2016). Approximate test pit locations are provided in Figure 2. Soils encountered in three test pits east of Cell 2 ranged from clay to clayey silt. The sandy silts were observed to consistently have a slightly higher proportion of silt in their lower portions. The uppermost Unit 1 had approximately 50% silt and 50% sand, and the underlying Unit 2 had approximately 60% silt and 40% sand. Permeability of the surficial soils based on four undisturbed samples ranged from 4.1 to 7.4 x $10^{-04}$ centimeters per second.

# 2.2 Geology

## 2.2.1 Regional Geology

A series of northwest trending normal faults are mapped throughout the western Snake River basin (Malde et al 1963, Lewis et al 2012). None of the faults mapped in the vicinity of the BRL are Quaternary in age (USGS 2014, Algermissen 1990).

The Quaternary Bruneau Formation of the Idaho Group (Parliman 1983, Lewis et al 2012, Malde et al 1963) is mapped at land surface at the BRL. The Bruneau Formation has a total thickness of up to 800 feet and consists primarily of basaltic lava flows and sedimentary deposits including some fan deposits and consolidated detrital material. The volcanic rocks of the Bruneau Formation were extruded from vents between the Snake River and the Mount Bennett Hills, filling canyons eroded into the Snake River basin area. The basalts are a series of discontinuous flows that are more permeable at their top and bottom than in the centers, and are described as vesicular olivine basalt, dark gray to black, weathering to reddish gray-brown. Well-developed columnar jointing is present throughout, and the fractured and vesicular nature of the Bruneau Formation basalts cause them to have high permeabilities (Ralston and Chapman 1968).

Within the Bruneau Formation, fan deposits consist primarily of coarse sands derived from decayed granitic rocks and consolidated detrital material consists primarily of low permeability massive white-weathering lakebed deposits of fine silt, clay, diatomite, and minor amounts of sand.

The Glenns Ferry Formation lies underneath the Bruneau Formation and is characterized by thick intertonguing deposits of lake and stream sediments including darker colored clay/shale deposits.

## 2.2.2 Local Geology

### 2.2.2.1 Data Sources

Available information on local geology and depth to groundwater includes facility-specific sources of information and well logs from the Idaho Department of Water Resources (IDWR 2024b). Available bore logs, well logs, and test pit descriptions are provided in Appendix A and locations are depicted in Figure 2.

Local geology data sources:

- Five borings (BH-1 through BH-5) advanced to depths of 18.5 to 32.5 feet below ground surface (ft bgs) as part of the 2016 Arid Design Demonstration (Parametrix 2016).
- Boring BH-6, advanced to a depth of 60 ft bgs and was completed as a monitoring well as part of the 2016 Arid Design Demonstration (Parametrix 2016).
- Ten test pits (TP88-1 through TP88-10) excavated to depths of up to 20 ft bgs in 1998. Located within, north, and east of the BRL.
- Three test pits (TP-1 through TP-3) excavated to depths of 6 to 8 ft bgs located east of the Cell 2 location as part of the 2016 Arid Design Demonstration (Parametrix 2016).
- The Facility Supply Well, 04S-07E-14AAA1 was drilled to 610 ft bgs in 1989. The United States Geological Survey (USGS) currently measures groundwater elevations at this well semiannually as part of the Mountain Home Plateau Hydrologic Investigation (IDWR 2024a; USGS 2024a).
- The House wells (04S-07E-13AAD1 through 04S-07E-13AAD4) are four historical domestic boreholes/wells drilled between 1965 and 1969 on the parcel currently owned by Elmore County. The well logs include subsurface information up to 2,045 ft bgs near the facility.

#### 2.2.2.2 Summary of Geologic Observations

Depth to bedrock ranged from 8 ft bgs near the southern boundary of proposed Cell 2 (BH-5) and 22.5 (BH-2). The soils consisted of sandy silts (ML) with some intermittent zones of lightly to moderately cemented material. The shallow soils generally consist of nonplastic sandy silt, ranging in thickness from 8.5 to 22.5 feet, overlying basalt rock, although slightly plastic clay was observed in one test pit (TP-1) at a depth of 5 to 6 ft bgs.

The Facility Supply Well was drilled to a depth of 610 ft bgs and encountered clay down to 20 ft bgs, then gray basalt to 67 ft bgs. The remainder of this boring lost all drill cutting returns/circulation using the air rotary and was interpreted to be basalt by the driller.

The well logs for the House wells show the subsurface geology is comprised of basalt of the Bruneau Formation down to approximately 504 to 590 ft bgs prior to encountering the Glenns Ferry Formation. The upper portion of the Glenns Ferry Formation consists of blue shale/clay and black-gray sand down with interflows of basalt to at least 2,045 ft bgs.

## 2.3 Hydrogeology

### 2.3.1 Regional Hydrogeology

A perched groundwater system is present in the Mountain Home area west of the BRL, with depths to groundwater of 10 to 200 ft bgs (IDWR 1994). The perched aquifer occurs mostly in Quaternary Alluvium sands, silts and clays, but also may be present within the Bruneau Formation basalts. The eastern limit of the perched aquifer is mapped approximately 2 miles west of the BRL (Parliman 1983, Norton et al 1982).

The regional aquifer is present within the Bruneau Formation basalts at approximate elevations of approximately 2,800 ft amsl in the vicinity of the BRL (IDRW 1994, Ralston and Chapman 1968). The Bruneau Formation is described as being the primary aquifer in the area with groundwater encountered in the interflow zone and thin sand beds immediately below the basalt. The aquifer has yields ranging from 10 to 3,500 gallons per minute. Regional groundwater flow in the vicinity of the BRL generally follows the slope of the topography and is toward the south-southwest from the Mount Bennett Hills area toward the Snake River (Ralston and Chapman 1968, Parliman 1983).

Geothermal water is present below the regional aquifer. Often the geothermal water has a higher hydraulic head and therefore discharges deep groundwater to the regional aquifer (Lindholm 1996).

The BRL is located adjacent to and within the Mountain Home Groundwater Management Area established in 1982 by the Idaho Department of Water Resources (Norton et al 1982, Castelin 1988). This area has been subject to declining water levels due to withdrawals for irrigation and domestic use (IDWR 1994, IDWR 2004).

#### 2.3.1.1 Water Level Declines

The USGS has been tracking water level declines in the Mountain Home Groundwater Management Area and has been measuring water levels at several wells. Water levels declined 33 feet between 1989 and 2010 at Well 04S-07E-17CAB1 and declined 47 feet between 1989 and 2023 at Well 04S-07E-18AAA1. Both wells are located approximately 3 miles west of the BRL (USGS 2024b). Assuming that water level declines remain similar, the projected rate of water level decline is approximately 1.5 feet per year. The regional aquifer is confined and water level declines are extreme due to the low recharge rate of the aquifer, excess water uses, and declining pressure heads.

#### 2.3.1.2 Specific Capacity Data

Specific capacity data is limited, as few well logs provide well testing information. Well 04S-07E-16BBB1, completed within the Bruneau Formation, had a drawdown of 22 feet when 3,200 gallons per minute of groundwater was extracted for 6 hours. This is equivalent to a specific capacity of 145 gallons per minute per foot of drawdown. The USGS identified that the specific capacity for wells within Township 4 South, Range 7 East ranges from 7 to 360 gallons per minute per foot of drawdown (Young 1977).

### 2.3.2 Local Hydrogeology

Groundwater was not encountered in Well BH-6, which is screened in the top of the Bruneau Formation basalt from 40 to 60 ft bgs. The USGS is currently measuring groundwater levels in the Facility Supply Well (04S-07E-14AAA1) as part of the regional water level decline evaluation. The Facility Supply Well is completed down to 610 ft bgs within the Bruneau Formation. The depth to groundwater was measured in March 2023 and November 2023 at 432.52 ft bgs and 432.37 ft bgs (2,737.55 and 2,767.70 ft amsl), respectively (USGS 2024a). There is no record of the static water level in the well log at the time of drilling in 1990. Based on the regional study, static water levels in the Facility Supply Well are anticipated to have been 40 to 50 feet higher in elevation at the time of drilling.

Warm water and clay were encountered at depths greater than 1,800 ft bgs in the House wells, drilled on the eastern portion of the County-owned parcel. Temperatures were reported at approximately 110 to 120° Fahrenheit in clays (present beginning at 1,805 ft bgs in Well 04S-07E-13AAD3) and hot mud was encountered near the bottom of Well 04S-07E-13AAD2.

# 3. Current Hydrogeologic Understanding

Parametrix developed two hydrogeologic cross sections (A-A' and B-B') in the vicinity of the BRL based on available well logs and confirmed locations. Well logs used in this assessment are provided in Appendix A. The location of wells and cross-section lines are displayed on Figure 3 and the cross sections are shown in Figure 4 (A-A') and Figure 5 (B-B').

## 3.1 Data Sources

A well log database search was conducted using the Idaho Department of Water Resources (IDWR) website (IDWR 2024b) and the USGS National Water Information System Mapper (USGS 2024b) to identify wells in the vicinity of the BRL. Wells included in the cross section were limited to locations where a well/borehole log and the well location coordinates could be confirmed.

Wells were identified using the USGS standard methodology for Idaho using township, range, section, and quarter-quarter and followed standard methods for Idaho, as described in USGS Water Resources Investigations Report 83-4062 (Parliman 1983).

There are a limited number of wells in the immediate vicinity of the BRL, see Table 1. Most wells are located several miles west and northwest of the BRL. Therefore, the cross sections extend several miles from the BRL.

Table 1. Summary of Assessed Wells

| Well Identifier | Approximate Distance from BRL (miles) | Owner | Year of Installation | Depth to Water at Time of Drilling (ft bgs) | Drilled Depth (ft bgs) |
|---|---|---|---|---|---|
| 04S-07E-14AAA1 | At Facility | Elmore County | 1989 | None | 610 |
| BH-6 | At Facility | Elmore County | 2016 | None | 60 |
| 04S-07E-13AAD1 | 1.0 | House | 1967 | 423 | 635 |
| 04S-07E-13AAD2 | 1.0 | House | 1967 | 437 | 1,840 |
| 04S-07E-13AAD3 | 1.0 | House | 1969 | 427 | 2,045 |
| 04S-07E-13AAD4 | 1.0 | House | 1965 | None | 81 |
| 04S-07E-33AAA1 | 3.3 | Bergh | 1997 | 440 | 540 |
| 05S-07E-03ADB1 | 3.9 | Fleming | 1967 | 441 | 592 |
| 04S-07E-18AAA1 | 4.1 | Grofsema | 1966 | 305 | 685 |
| 04S-07E-17CAB1 | 3.8 | K.Kon Construction | 2003 | 338 | 491 |
| 04S-07E-16BBB1 | 3.1 | BBKY Corporation | 1968 | 314 | 569 |
| 04S-07E-09DCC1 | 2.6 | Groefsema | 1962 | 350 | 862 |
| 04S-08E-14AAA1 | 5.7 | Ballard | 1964 | 416 | 583 |
| 04S-07E-28BBA1 | 3.4 | Olson | 2014 | 416 | 735 |
| 04S-07E-17CCD1 | 4.0 | Data not available | | | |

BRL = Bennet Road Landfill; ft bgs = feet below ground surface

## 3.2 Hydrostratigraphy

Cross sections are presented in Figures 4 and 5. Figure 3 displays the location of the cross sections and location of wells utilized. Cross section A-A' incorporates the area from the BRL to the southwest, along the regional groundwater gradient. Cross section B-B' incorporates the areas to the west and east of the BRL, generally cross-gradient to the regional groundwater gradient.

The cross sections show the subsurface geology below the BRL is comprised of shallow silt overburden (which may include Bruneau Formation sedimentary deposits) overlying black basalt. The silts are up to approximately 20 feet thick below the BRL. The basalt is the volcanic members of the Bruneau Formation. Yellow clays and sands may be present as thin lenses within the basalt layers. Sedimentary formations including sands, clays, sandstone, and shale of the Glenns Ferry Formation are present underlying the Bruneau Formation.

In the vicinity of the BRL and to the west, the bottom of the Bruneau Formation basalts was observed at depths between approximately 500 and 600 ft bgs. The House wells to the immediate east of the BRL encountered the Glenns Ferry Formation at depths ranging from 504 to 590 ft bgs. The Facility Supply Well did not report encountering the Glenns Ferry Formation down to 600 ft bgs; however, this may be due to loss of returns.

The regional aquifer below the facility occurs within the bottom of the Bruneau Formation and just above fine-grained materials of the Glenns Ferry Formation.

In House Well 04-07E-13AAD2, which was advanced to 1,840 ft bgs, hot mud was reported at the bottom of the borehole, suggesting the presence of geothermal water at deeper depths within the Glenn Springs Formation. Clay with an approximate temperature of 110 to 120° Fahrenheit was present in Well 04-07E-13AAD3 at depths greater than 1,805 ft bgs. As discussed above, geothermal groundwater typically has a higher head than the regional aquifers and discharges upward.

## 3.3 Gradient

The USGS measured groundwater levels in the Facility Supply Well (04S-07E-14AAA1) and in three additional wells located to the west and southwest of the facility in 2023, including Wells 04S-07E-18AAA1, 04S-07E-17CCD1, and 4S-07E-28BBA1 (USGS 2024b). Measured groundwater elevations for these four wells in November 2023 are provided in Figure 3. Local groundwater flow in November 2023 was to the south-southwest at a gradient of 0.0059 feet per foot (31.3 feet per mile) between wells 04S-07E-14AAA1 and 04S-07E-28BBA1. This flow direction and gradient is consistent with previously published groundwater gradients published in 1968 and 1983, provided in Appendix B (Ralston and Chapman 1968, Parliman 1983).

# 4. Proposed Monitoring Well Network

As discussed above, the first groundwater below the BRL is generally encountered between 500 and 600 ft bgs within the Bruneau Formation. There is potential for perched groundwater shallower than the regional aquifer. However, for the purposes of this work plan the wells to be completed will target the regional aquifer system. The gradient within the regional aquifer is to the south-southwest. New monitoring wells will be positioned downgradient of Cell 1 and the future phase Cell 2.

## 4.1 Well Locations

Parametrix proposes installation of two point of compliance (POC) wells. Proposed locations are provided in Figure 2. MW-1 is proposed to be approximately 400 feet southwest and directly downgradient of Cell 1. MW-2 is proposed to be approximately 350 feet south of Cell 1 and 425 feet southwest directly downgradient of Cell 2.

The current Facility Supply Well is proposed to be used as an upgradient background sample. Figure 2 displays the location of the Facility Supply Well with respect to Cells 1 and 2 and POC wells MW-1 and MW-2. As noted, the Facility Supply Well is upgradient of the BRL operations and should not be impacted by historical land use at the facility. The sample collection location will be a faucet that is connected to the system; the target sampling faucet will be determined prior to the initial sampling event.

It is unknown if any of the House Wells 04-07E-13AAD1 through -13AAD4 remain present. Of these four wells, 04-07E-13AAD3, completed to 2,045 ft bgs northeast of the BRL in 1969, is most likely to still be present. There are no records that the well was properly decommissioned. If the well remains, it is another potential upgradient well that could possibly be utilized to further evaluate background conditions in the vicinity of the BRL.

## 4.2 Depths

The downgradient POC wells will be installed to anticipated total depths of 600 ft bgs. Figures 4 and 5 show the Regional Aquifer is present at this depth and is likely to have a higher hydraulic head when encountered. The Regional Aquifer appears to occur within the interflow zones of the Bruneau Formation and sand beds immediately below occurring near the top of the Glenns Ferry Formation. The anticipated depth to groundwater in the completed wells will be around 450 ft bgs, or elevation 2,750 ft amsl. The wells will be designed to account for anticipated water level declines during the life of the BRL, an anticipated decrease of 45 feet over 30 years.

# 5. Drilling and Construction

The hydrogeologic investigation includes installation of two monitoring wells. Each well will be constructed by an Idaho State licensed driller using air-rotary, dual-rotary drilling, or equivalent approved techniques for a 4-inch-diameter monitoring well completion. Drilling and construction of monitoring wells will be conducted in accordance with IDAPA 37.03.09.

## 5.1 Start Card

The licensed well driller will apply for and receive a drilling permit (start card) prior to proceeding with drilling.

## 5.2 Borehole Advancement

Open borehole drilling will be utilized to reach target drilling depths for the two proposed monitoring wells. A telescoping method using air-rotary techniques is proposed for each well using the following strategy:

1. A 12-inch-diameter borehole will be advanced from ground surface to the top of bedrock (approximately 20 ft bgs). A 12-inch temporary casing will be installed from ground surface to top of bedrock.
2. A 10-inch diameter borehole will be advanced from top of bedrock to the bottom of the borehole. If warranted by drilling conditions, the drillers may step down to an 8-inch diameter drill at depth.

Potable water may be utilized to assist with drilling through the basalt layers. Drill cuttings are flushed from the borehole using water and air in the annular space of the borehole outside of the drill string.

Drill cuttings will be stockpiled adjacent to the borehole, except for samples collected for logging by the field geologist. Drill cutting samples will be collected and stored in zip lock bags labelled with the collection depth. Drill cuttings will be collected at a frequency of 5-foot intervals within water bearing zones and approximately 10-foot intervals in nonwater bearing zones.

The cuttings, discussions with the driller, water levels, and air and water pressure readings will be utilized to log changes in geologic conditions. The field geologist will observe drilling and prepare a boring log documenting field observations and well construction details. Field observations will include:

- Drill penetration rate and quality.
- Lithology, color, fracture density, presence/degree of vesicles, weathering, size, angularity, texture, and mineralization.
- Observation of moisture (i.e., damp, moist, wet) as allowed by the drilling conditions and methods.

If a damp or moist zone is observed, the field geologist may direct the driller to halt drilling and provide access for a manual water level measurement. Drilling may be paused for up to 30 minutes to observe groundwater recharge. If potential recharge is encountered, additional testing will be completed by either pumping or conducting an air-lift test.

The borehole will be completed at approximately 60 feet below the depth of first water encountered.

## 5.3 Well Construction

The monitoring wells will be constructed in accordance with standards provided in IDAPA 37.03.09, Well Construction Standards Rule. Each well will be completed with a sufficient screen to account for potential water level declines over the lifetime of the landfill. The wells will be constructed with 4-inch diameter schedule 80 PVC screens and risers. The screened interval will be packed with silica sand and a bentonite seal will be placed above the pack up to the land surface. The well will be completed with an aboveground lockable monument with three protective bollards. Due to the declining water levels in the aquifer, longer screens will be constructed to ensure the wells can be utilized for the life of the landfill.

Once the well has been constructed, the licensed driller will submit a well driller's report to IDWR.

## 5.4 Decontamination

Drilling equipment (rods, bits, drill rig, casing, etc.) will be steam cleaned with a high-pressure washer prior to drilling at each location. All drilling equipment that enters the borehole will be steam cleaned with high-pressure water between wells to prevent cross contamination.

## 5.5 Survey

Each of the monitoring points will be surveyed under the supervision of an Idaho State licensed professional land surveyor. The survey will be conducted in IDWR geospatial data standards North American Vertical Datum of 1988 (NAVD88) and North American Datum of 1983 (NAD83) as follows:

- Measurements will be taken at the north side of the top of PVC well casing (well cap/plug removed), the top of the north side of the steel monument, and ground elevation.
- Vertical accuracy will be 0.01 feet or less.
- Horizontal accuracy will be 0.1 feet or less.
- The survey will include measurements of at least two nearby benchmarks and two existing wells to the project datum to demonstrate precision, accuracy, and consistency with prior surveys.
- The survey will include documentation of survey quality assurance, including repeat measurements (closed loop) to demonstrate internal consistency, and documentation of the name, location, accuracy, and precision of the benchmark(s) used in the survey.

## 5.6 Well Development and Production Rate Testing

Each newly constructed well will be developed by the driller in accordance with IDAPA 37.03.09 25 to remove suspended fines and to promote hydraulic connection with the aquifer. Well development will be performed using surge and bail/pump techniques. If mud rotary is employed, drilling mud will first be pumped out of the well. Water and sediment from the well development will be discharged to the ground of the BRL.

During well development, the well production rate will be determined by operating the pump at sufficient duration to establish production rates.

## 5.7 Dedicated Pump Installation

Each well will be equipped with a dedicated sampling pump, tubing, and wellhead fittings. A high-pressure bladder pump will be installed in each monitoring well (QED Well Wizard or equivalent). Pump selection will be based on well completion and water depth at each well.

## 5.8 Plans and Specifications

Draft plans and specifications have been developed for the work. These will be finalized upon approval of the hydrogeologic work plan. The plans and specifications detail the licensed well driller requirements for construction of the new monitoring wells in accordance with IDAPA 37.03.09 25, well development and testing.

# 6. Hydraulic Testing

Hydraulic testing will be completed at MW-1 and MW-2. The testing will consist of pumping at a constant rate for approximately 1 to 4 hours followed by shutting off the pump and measurement of recovery. Water levels will be monitored using a combination of pressure transducers and manual measurements.

## 6.1 Transducers

Pressure transducers will be used to continuously monitor water levels in selected wells during the hydraulic testing. Serial numbers for the pressure transducer, type of transducer, and well identification will be recorded on field forms. Following deployment of the transducer, the depth of deployment will be recorded on the field form. The water level should be allowed to equilibrate for 5 minutes and then a manual measurement of the water level will be completed and documented on the field form.

## 6.2 Manual Measurements

Depth to water will be manually measured in wells to confirm transducer data (for those wells instrumented with pressure transducers). Depths to water will be measured using a water level probe to the nearest one hundredth of a foot (i.e. 0.01 feet).

## 6.3 Testing procedures

Pumping tests will be conducted to assess aquifer properties. Flow rates will be determined based upon well performance during development. A gas generator or electrical cords will be used to power the pump. Water-level measurements will be taken at various time intervals during the pumping test and recovery. Typically, this is completed every minute for the first 10 minutes, every 5 minutes up to 30 minutes, and every 10 minutes up to 1 hour. After testing for 1 hour, measurements will be collected every hour until completion of the test. Similarly, measurements will be recorded for recovery following shutting the pump off.

The total volume of water removed from the pumping well will also be regularly recorded along with depth to water. Observation wells completed in the same aquifer will be manually measured hourly during the pump test and recovery.

## 6.4 Analysis

Hydraulic testing data will be analyzed to determine aquifer parameters such as hydraulic conductivity by a licensed hydrogeologist. This data will be used in evaluation of flow rates below the BRL resulting from variations in the groundwater gradient.

# 7. Water Quality Testing

Sampling and quality assurance and quality control (QA/QC) procedures will be conducted consistent with procedures documented in the Groundwater Sampling and Analysis Plan (Appendix C). Groundwater will be analyzed for the analytical and field parameters summarized below:

- Laboratory Analytics – Metals and volatile organic compounds specified in Appendix I of 40 CFR part 258 and additional cations/anions that may be indicators of leachate.
- Field Parameters – Temperature, pH, specific conductivity, dissolved oxygen, oxidation-reduction potential, visual color, and turbidity.

# 8. Reporting

A summary well installation report will be completed documenting the results of the investigation. The reports will summarize and interpret the following information:

- Geology and hydrogeology below the BRL.
- Preliminary groundwater gradients below the BRL.
- Updated hydrogeologic cross sections below the BRL.
- Well log, drilling, and construction information.
- Well survey information.
- Well hydraulic testing results, hydraulic conductivity evaluation.

Additional reporting following groundwater monitoring is described in detail in the Groundwater Sampling and Analysis Plan (Appendix B).

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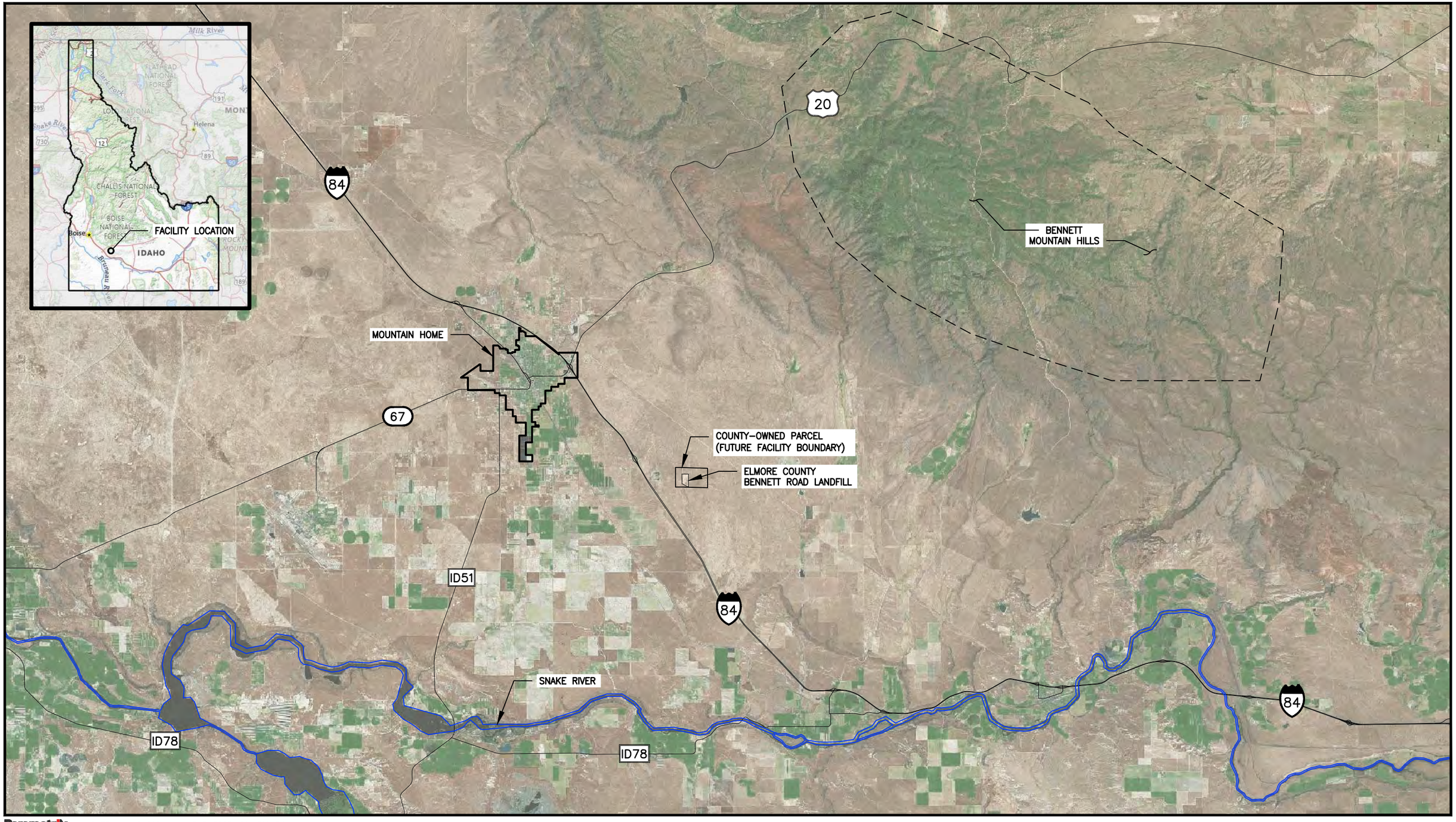
# Figures




Parametrix DATE: July 12, 2024 FILE: PS07443006T02-FIG_1

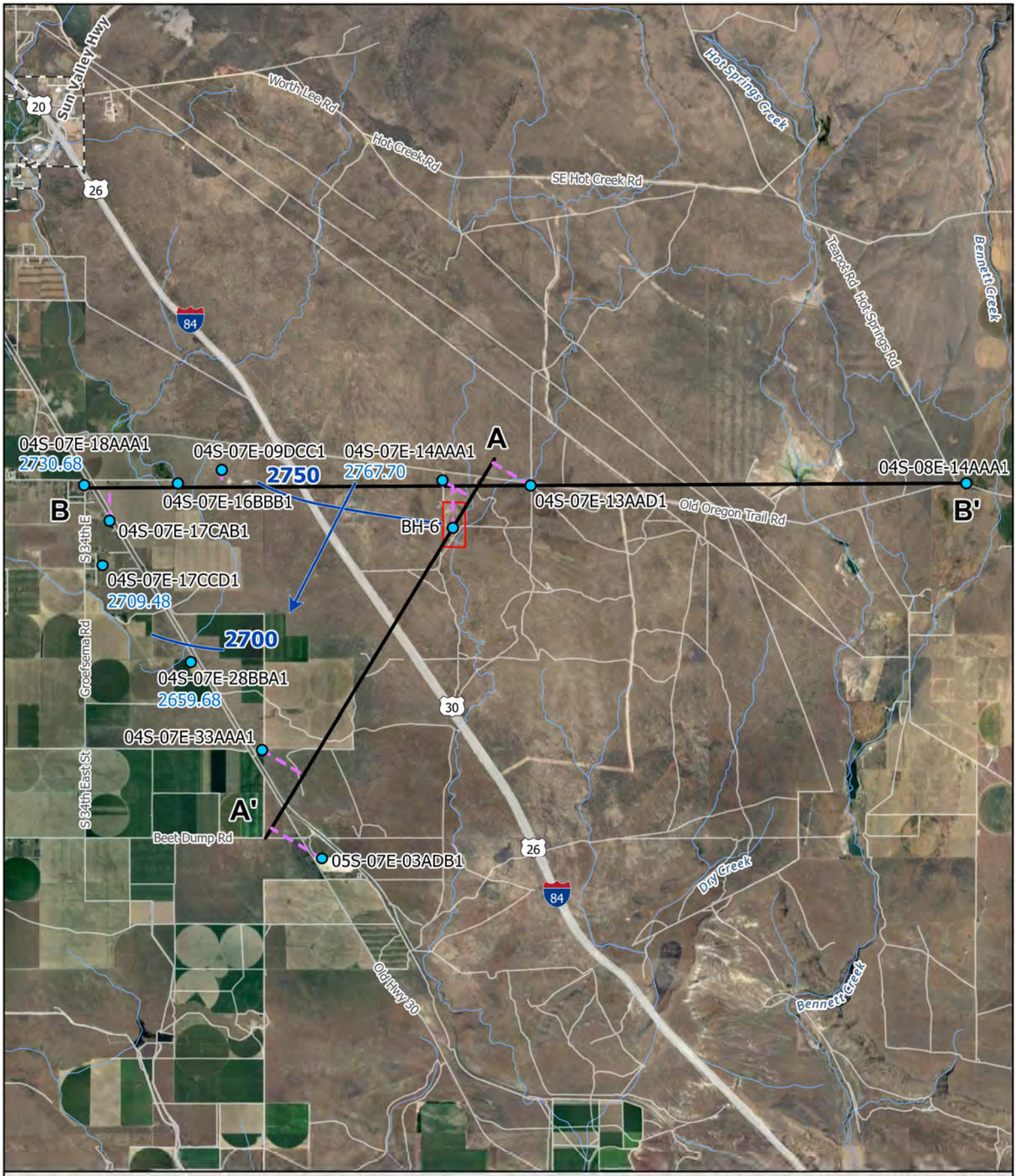
0 N 10,000
VERTICAL: 1" = 10,000'

**FIGURE 1. SITE VICINITY**
**BENNETT ROAD LANDFILL HYDROGEOLOGIC CHARACTERIZATION WORK PLAN**


Parametrix DATE: August 1, 2024 FILE: PSO7443006T02-FIG_2

0 N 500
1 INCH = 500 FT.

**FIGURE 2. FACILITY PLAN**
**BENNETT ROAD LANDFILL HYDROGEOLOGIC CHARACTERIZATION WORK PLAN**



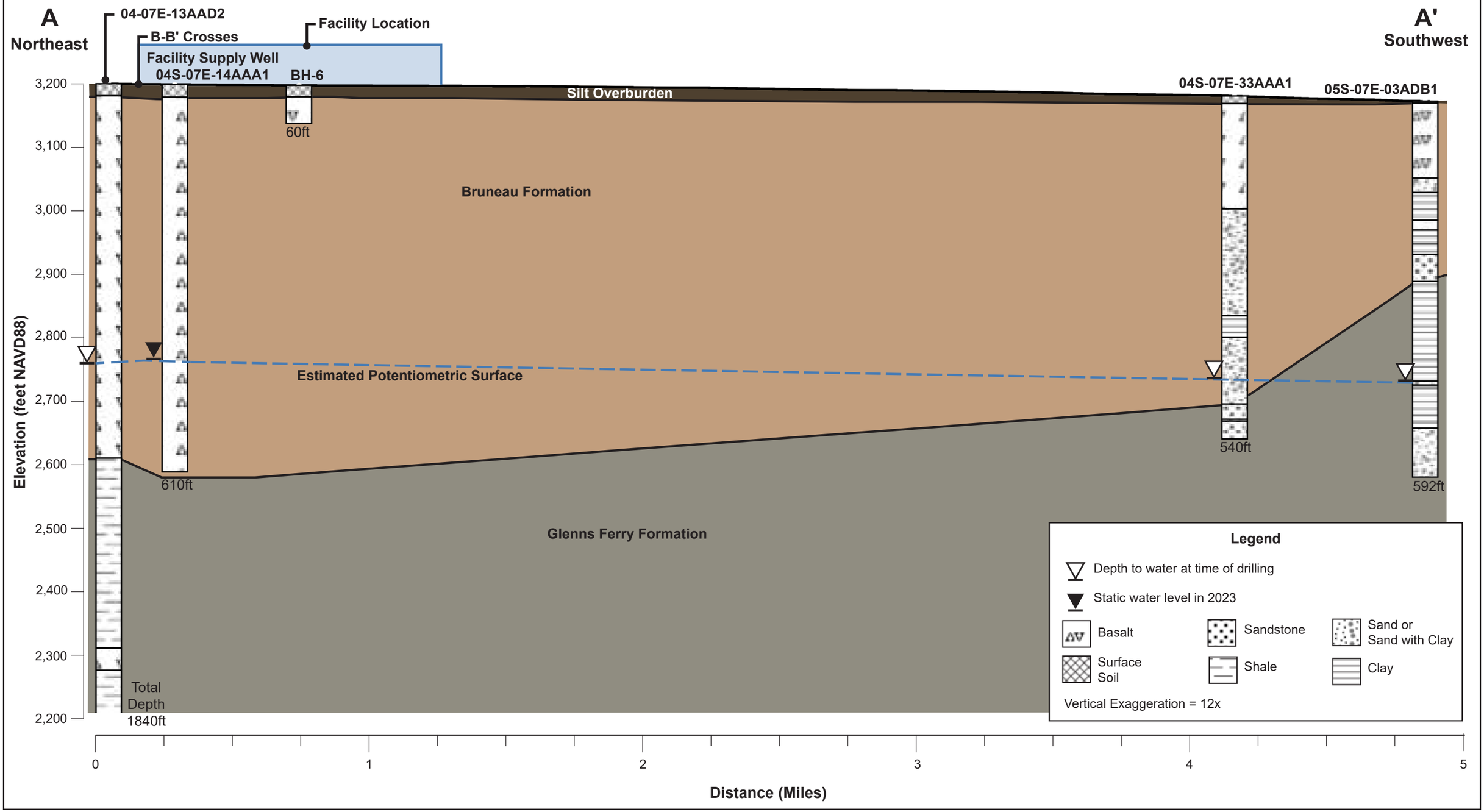

Date: 7/24/2024
Sources:
PCS: NAD 1983 2011 StatePlane Idaho West FIPS 1103 Ft US
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Cross-Section Line
Projection Line
Regional Well Location
Current Facility Boundary
Groundwater Elevation Contour (feet amsl)
Groundwater Flow Direction
2659.68 Groundwater Elevation in November 2023 (USGS 2024b)

0 0.25 0.5 1 Miles

**Figure 3. Regional Well Locations and Groundwater Elevations**
Bennett Road Landfill Hydrogeologic Characterization Work Plan

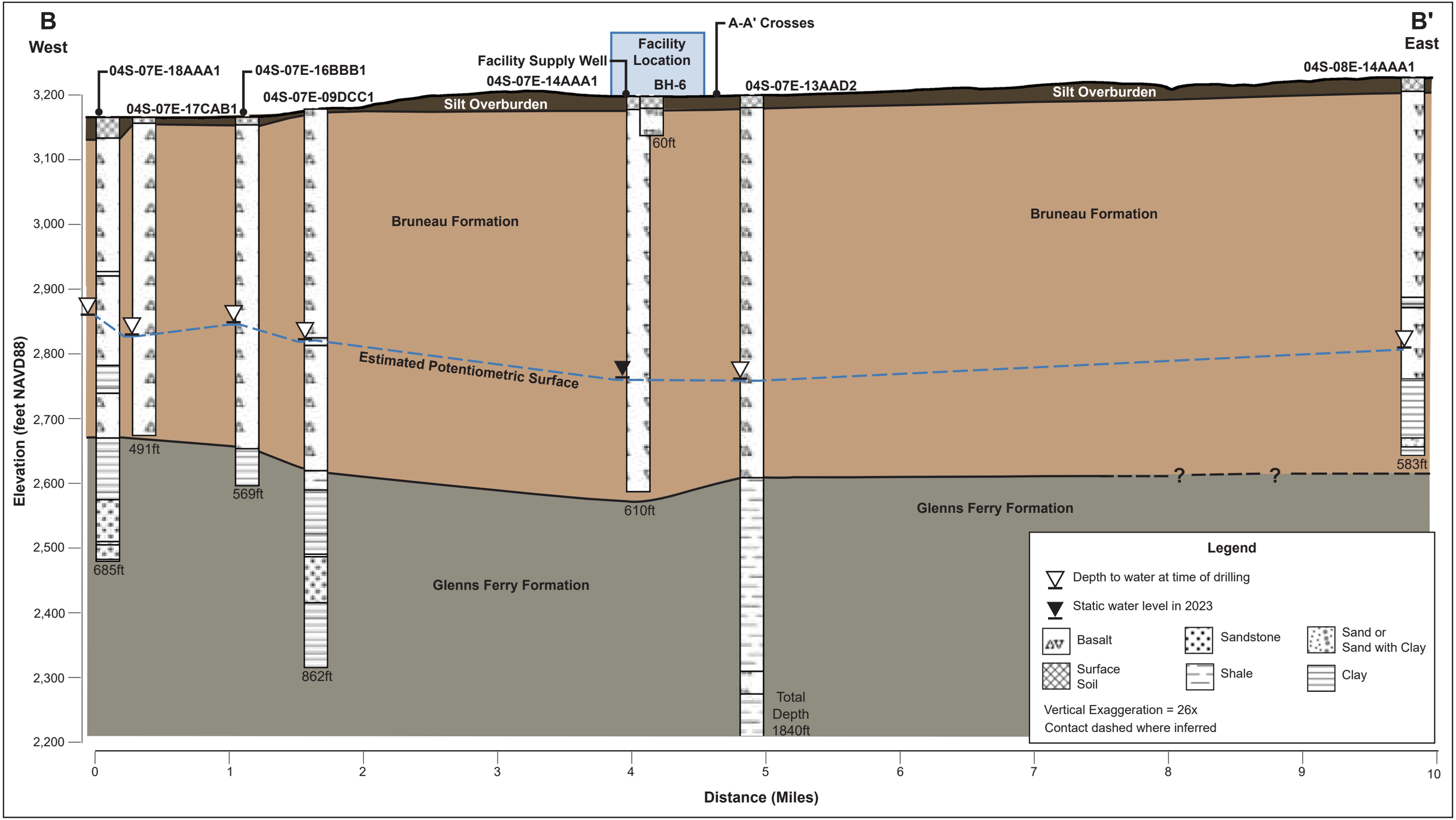
Elmore County, ID




Parametrix

**FIGURE 4. CROSS SECTION A-A'**

**BENNETT ROAD LANDFILL HYDROGEOLOGIC CHARACTERIZATION WORK PLAN**




Parametrix

**FIGURE 5. CROSS SECTION B-B'**

**BENNETT ROAD LANDFILL HYDROGEOLOGIC CHARACTERIZATION WORK PLAN**

# Appendix A

## Monitoring Well, Borehole, and Test Pit Logs

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

**METHOD: Hollow-Stem Auger**
**DATE LOGGED: 11/12/2015**
**LOGGED BY: Ryan VanLeuven, PE**

**LATITUDE: 43.076519°**
**LONGITUDE: -115.574414°** by Client

# BORING NO. B-1

AMERICAN GEO TECHNICS

**GROUNDWATER:**

**Groundwater not encountered on 11/12/2015**

| DEPTH (ft) | TYPE - No. | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | LAB DATA LL (%) | LAB DATA PI (%) | LAB DATA MC (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SS-1 | 46 | 1-4-6-12 | | Sandy Silt (ML)- (NATIVE) | | | | CME-75; Automatic Hammer SPT per ASTM D1586; NWJ rods; Driller: Haz-Tech Drilling |
| | | SS-2 | 71 | 10-10-10-9 | | Light particle cementation noted from 2.5' to 4.5'. | | | | Boring located on relatively flat terrain with about 50% grass vegetation ground cover. |
| 5 | | ST-3 | 100 | | | 53% fines; 47% fine to medium sand; trace of gravel; light brown. | NV | NP | 9 | ST-3; crowd pressures from 300 to 1000 psi, difficult ST removal after pushing. |
| | | | | | | Gradual layer transition. | | | | |
| | | SS-4 | 75 | 17-37-43-41 | | Sandy Silt (ML)- About 61% non-plastic fines; about 39% fine to medium sand; trace of gravel; light brown. | | | | |
| 10 | | ST-5 | 100 | | | Moderate particle cementation noted from 7.5' to 9.5'. | | | 16 | ST-5; crowd pressures from 500 to 1000 psi, difficult ST removal after pushing. |
| | | SS-6 | 100 | 18-37-42-50/6" | | Light particle cementation noted from 12.5' to 14.5'. | | | | |
| 15 | | ST-7 | 100 | | | | | | | ST-7; crowd pressures from 500 to 1000 psi, difficult ST removal after pushing. |
| | | SS-8 | 100 | 18-24-21-50/0" | | Sandy Silt with Gravel (ML)- About 40% non-plastic fines; about 40% fine to coarse, subangular to angular sand; about 20% moderately hard, angular basalt gravel to 1". | | | | Slight auger grinding and slower drilling from 18.0' to 20.0'. |
| 20 | SS-9 | CR-10 | 89 (50) | | | Basalt Rock- | | | | Switch to HQ core at 20.0'. SS-9; SS sampler bouncing on rock. |
| | | CR-11 | 88 (37) | | | Dark gray, moderately hard, medium vesicularity, moderately high to vertical discontinuity angles, moderately rough to rough joint faces, closely to moderately spaced fractures. Driller notes void in rock from 24.5' to 25.0'. | | | | |
| 25 | | CR-12 | 100 (88) | | | as above, except medium to low vesicularity, moderately to widely spaced fractures. | | | | |
| 30 | | | | | | Bottom of Boring at 31.5 ft on 11/12/2015. | | | | Backfilled hole with bentonite chips. |


**Photo 1: Boring B-1, sample SS-2 at 2.5 feet**
**Sandy Silt (ML)**


**Photo 2: Boring B-1, sample SS-6 at 12.5 feet**
**Sandy Silt (ML)**


**Photo 3: Boring B-1, Rock Coring from 20.0 to 29.5 feet**

**Basalt Rock**


**Photo 4: Boring B-1, Rock Coring from 29.5 to 31.5 feet**

**Basalt Rock**

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

**METHOD: Hollow-Stem Auger**
**DATE LOGGED: 11/12/2015**
**LOGGED BY: Ryan VanLeuven, PE**

**LATITUDE: 43.075839°**
**LONGITUDE: -115.575514°** by Client

# BORING NO. B-2

AMERICAN GEO TECHNICS

**GROUNDWATER:**

**Groundwater not encountered on 11/12/2015**

| DEPTH (ft) | TYPE - No. | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS |
|---|---|---|---|---|---|---|---|
| | | SS-13 | 54 | 1-7-16-15 | | Sandy Silt (ML)- (NATIVE)<br>About 50% non-plastic fines; about 50% fine to medium sand; moist; light brown. | CME-75;<br>Automatic Hammer SPT per ASTM D1586;<br>NWJ rods;<br>Driller: Haz-Tech Drilling |
| | | SS-14 | 54 | 17-15-11-6 | | Light particle cementation noted from 4.0' to 4.5'. | Boring located on relatively flat terrain with about 20% grass vegetation ground cover. |
| 5 | | ST-15 | 100 | | | | ST-15; crowd pressures from 400 to 950 psi. |
| | | SS-16 | 71 | 23-35-33-38 | | Gradual layer transition.<br>Sandy Silt (ML)-<br>About 60% non-plastic fines; about 40% fine to medium sand; slightly moist; light brown. | |
| 10 | | ST-17 | 100 | | | Moderate particle cementation noted from 8.0' to 9.5'. | ST-17; crowd pressures from 650 to 1000 psi. |
| | | SS-18 | 78 | 19-26-50/6" | | Light particle cementation noted from 12.5' to 14.5'. | |
| 15 | | ST-19 | 100 | | | | ST-19; crowd pressures from 400 to 1000 psi. |
| | | SS-20 | 83 | 6-6-38-40 | | | |
| 20 | | SS-21 | 67 | 14-43-50/6" | | Sandy Silt with Gravel (ML)-<br>About 40% non-plastic fines; about 40% fine to coarse, subangular to angular sand; about 20% moderately hard, angular basalt gravel to 1"; slightly moist; brown. | Slight auger grinding from 19.4' to 22.5'. |
| | SS-22 | | | | | Silty Sand (SM)-<br>About 80% fine to coarse, subangular to angular sand; about 20% non-plastic fines; light particle cementation; slightly moist; tan. | SS-22; SS sampler bouncing on rock.<br>Switch to HQ core at 22.5'. |
| 25 | | CR-23 | 100 (63) | | | Basalt Rock<br>Highly fragmented from 22.5' to 23.0'.<br>Dark gray, moderately hard, medium vesicularity, low to moderately high discontinuity angles, moderately rough to rough joint faces, moderately spaced fractures.<br>Possible rouble zone or void from 27.0' to 27.5', little recovery. | |
| 30 | | CR-24 | 88 (56) | | | As above, except:<br>widely spaced fractures from 28.5' to 32.0',<br>low vesicularity from 30.2' to 33.5'. | |
| | | CR-25 | 100 (80) | | | As above, except:<br>medium vesicularity from 33.5' to 36.0',<br>moderately spaced fractures from 32.0' to 36.0',<br>low to vertical discontinuity angles. | |



*(Continued Next Page)*

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# BORING NO. B-2

**GROUNDWATER:**

**Groundwater not encountered on 11/12/2015**

| DEPTH (ft) | TYPE - No. | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | Bottom of Boring at 36.0 ft on 11/12/2015. | Backfilled hole with bentonite chips. |


**Photo 1: Boring B-2, sample SS-14 at 2.5 feet**
**Sandy Silt (ML)**


**Photo 2: Boring B-2, sample SS-18 at 12.5 feet**
**Sandy Silt (ML)**


**Photo 3: Boring B-2, Rock Coring from 22.5 to 33.3 feet**

**Basalt Rock**


**Photo 4: Boring B-2, Rock Coring from 33.3 to 36.0 feet**

**Basalt Rock**

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

**METHOD: Hollow-Stem Auger**
**DATE LOGGED: 11/12/2015**
**LOGGED BY: Ryan VanLeuven, PE**

**LATITUDE: 43.07515°**
**LONGITUDE: -115.574406°** by Client

# BORING NO. B-3

AMERICAN GEO TECHNICS

**GROUNDWATER:**

**Groundwater not encountered on 11/12/2015**

| DEPTH (ft) | TYPE - No. | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS |
|---|---|---|---|---|---|---|---|
| | | SS-26 | 63 | 1-1-1-1 | | Sandy Silt (ML)- (NATIVE)<br>About 50% non-plastic fines; about 50% fine to medium sand; moist; light brown. | CME-75;<br>Automatic Hammer SPT per ASTM D1586;<br>NWJ rods;<br>Driller: Haz-Tech Drilling |
| | | SS-27 | 75 | 6-12-30-24 | | | Boring located on relatively flat terrain with about 15% grass vegetation ground cover. |
| 5 | | ST-28 | 100 | | | Gradual layer transition.<br>Sandy Silt (ML)-<br>About 60% non-plastic fines; about 40% fine to medium sand; slightly moist; light brown. | ST-28; crowd pressures to 1000 psi. |
| | | SS-29 | 92 | 16-23-28-29 | | Very light particle cementation noted from 7.5' to 9.5'. | |
| 10 | | ST-30 | 100 | | | | ST-29; crowd pressures from 750 to 1000 psi. |
| | | SS-31 | 75 | 8-16-15-25/2" | | Moderate particle cementation noted from 13.2' to 14.2'. | SS-31; basalt gravel in tip of SS sampler, SS bouncing during driving. |
| 15 | | OSS-32 | 100 | 11-16-17 | | Silty Sand with Gravel (SM)-<br>About 60% fine to coarse, subangular to angular sand; about 20% non-plastic fines; about 20% moderately hard, subangular to angular basalt gravel to 1.5"; slightly moist; tan. | OSS-32; 2 rings recovered. |
| | SS-33 | CR-34 | 100 (0) | | | Basalt Rock-<br>Dark gray, moderately hard, medium vesicularity, high to vertical discontinuity angles, moderately rough to rough joint faces, very closely spaced fractures. | SS-33; SS sampler bouncing on rock, basalt in tip of sampler. |
| 20 | | CR-35 | 100 (43) | | | As above, except:<br>closely to widely spaced fractures. | Switch to HQ core at 17.5'. |
| 25 | | CR-36 | 100 (85) | | | As above, except:<br>low vesicularity. | |
| | | | | | | Bottom of Boring at 29.5 ft on 11/12/2015. | Backfilled hole with bentonite chips. |


**Photo 1: Boring B-3, sample SS-26 at 0.0 feet**
**Sandy Silt (ML)**


**Photo 2: Boring B-3, sample SS-29 at 7.5 feet**
**Sandy Silt (ML)**


**Photo 3: Boring B-3, Rock Coring from 17.5 to 26.5 feet**

**Basalt Rock**


**Photo 4: Boring B-3, Rock Coring from 26.5 to 29.5 feet**

**Basalt Rock**

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# BORING NO. B-4

**METHOD: Hollow-Stem Auger**
**DATE LOGGED: 11/13/2015**
**LOGGED BY: Ryan VanLeuven, PE**

**GROUNDWATER:**

**Groundwater not encountered on 11/13/2015**

**LATITUDE: 43.074458°**
**LONGITUDE: -115.575511°** by Client

| DEPTH (ft) | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS |
|---|---|---|---|---|---|---|
| | SS-37 | 71 | 2-2-9-22 | | Sandy Silt (ML)- (NATIVE)<br>About 50% non-plastic fines; about 50% fine to medium sand; moist; light brown. | CME-75;<br>Automatic Hammer SPT per ASTM D1586;<br>NWJ rods;<br>Driller: Haz-Tech Drilling |
| | SS-38 | 54 | 11-15-13-16 | | | Boring located on relatively flat terrain with about 30% grass vegetation ground cover. |
| 5 | ST-39 | 100 | | | Gradual layer transition.<br>Sandy Silt (ML)-<br>About 60% non-plastic fines; about 40% fine to medium sand; slightly moist; light brown. | ST-39; crowd pressures from 700 to 1000 psi. |
| | SS-40 | 94 | 9-18-36 | | | OSS-40; 2 rings recovered. |
| 10 | ST-41 | 100 | | | | ST-41; crowd pressures to 1000 psi. |
| | OSS-42 | 82 | 13-30-50/5" | | | OSS-42; 2 rings recovered. |
| 15 | SS-43 | 67 | 31-50/6" | | trace of basalt gravel from 15.9' to 16.0'. | SS-43; SS sampler bouncing on rock.<br>Switch to HQ core at 16.0'. |
| | CR-44 | 100 (93) | | | Basalt Rock-<br>Dark gray, moderately hard, medium vesicularity from 16.0' to 25.2' then low vesicularity from 18.5' to 25.2', horizontal to moderately high discontinuity angles, moderately rough to rough joint faces, moderately spaced fractures. | |
| 20 | CR-45 | 100 (82) | | | As above, except:<br>medium vesicularity from 25.2' to 26.0'. | |
| 25 | | | | | Bottom of Boring at 26.0 ft on 11/13/2015. | Backfilled hole with bentonite chips. |


**Photo 1: Boring B-4, sample SS-38 at 2.5 feet**
**Sandy Silt (ML)**


**Photo 2: Boring B-4, sample SS-43 at 15.0 feet**
**Sandy Silt (ML)**

**Photo 3: Boring B-4, Rock Coring from 16.0 to 26.0 feet**

**Basalt Rock**

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# BORING NO. B-5

**METHOD: Hollow-Stem Auger**
**DATE LOGGED: 11/13/2015**
**LOGGED BY: Ryan VanLeuven, PE**

**GROUNDWATER:**

**Groundwater not encountered on 11/13/2015**

**LATITUDE: 43.073778°**
**LONGITUDE: -115.574403°** by Client

| DEPTH (ft) | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS |
|---|---|---|---|---|---|---|
| | SS-46 | 63 | 1-4-6-9 | | Sandy Silt (ML)- (NATIVE)<br>About 50% non-plastic fines; about 50% fine to medium sand; moist; light brown. | CME-75;<br>Automatic Hammer SPT per ASTM D1586;<br>NWJ rods;<br>Driller: Haz-Tech Drilling<br><br>Boring located on relatively flat terrain with about 40% grass vegetation ground cover.<br><br>OSS-47; 2 rings recovered.<br><br>ST-48; crowd pressures from 600 to 1000 psi.<br>Switch to HQ core at 8.5'. |
| | OSS-47 | 89 | 12-17-23 | | | |
| 5 | ST-48 | 100 | | | | |
| | SS-49 | 100 | | | Poorly Graded Sand with Silt and Gravel (SP-SM)-<br>About 60% fine to coarse, subangular to angular sand; about 30% medium hard, subangular to angular basalt gravel to 1"; about 10% non-plastic fines; slightly moist; tan to gray. | |
| 10 | CR-50 | 100 (38) | | | Basalt Rock-<br><br>Some soil infilling of fractures from 9.8' to 10.5'.<br>Dark gray, moderately hard, medium vesicularity except low vesicularity from 12.0" to 14.5', horizontal to low discontinuity angles, moderately rough to rough joint faces, moderately spaced fractures. | |
| | CR-51 | 100 (95) | | | Some soil infilling of fractures from 12.0' to 17.5'. | |
| 15 | CR-52 | 100 (63) | | | As above, except:<br>low to vertical discontinuity angles;<br>widely spaced fractures. | |
| | | | | | Bottom of Boring at 19.5 ft on 11/13/2015. | Backfilled hole with bentonite chips. |


**Photo 1: Boring B-5, sample SS-46 at 0.0 feet**
**Sandy Silt (ML)**


**Photo 2: Boring B-5, sample SS-49 at 7.5 feet**
**Poorly Graded Sand with Silt and Gravel (SP-SM)**


**Photo 3: Boring B-5, Rock Coring from 8.5 to 17.5 feet**

**Basalt Rock**


**Photo 4: Boring B-5, Rock Coring from 17.5 to 19.5 feet**

**Basalt Rock**

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# TEST PIT NO. TP-1

**METHOD: John Deere 310 SG**
**DATE LOGGED: 4/11/2016**
**LOGGED BY: Ryan VanLeuven, PE**

**GROUNDWATER:**

**Groundwater not encountered on 4/11/2016**

**LATITUDE: 43.077381095°**
**LONGITUDE: -115.573312808°** by Hand Held GPS

| DEPTH (ft) | TYPE - No. | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | LAB DATA LL (%) | LAB DATA PI (%) | LAB DATA MC (%) | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | Lean Clay (CL)- | | | | Very stiff digging from about 2.0' to 7.5. |
| 5 | BK-58 | | 93% fines; 7% fine to medium sand; dark brown. | 46 | 29 | 13 | |
| | | | Lean Clay with Sand (ML)- About 80% non-plastic fines; about 20% fine to medium sand; trace of gravel; slightly moist; light brown. | | | | Stiff digging from about 7.5' to BOH. |
| 10 | BK-59 | | | | | | |
| | | | Bottom of Test Pit at 12.0 ft on 4/11/2016. | | | | |

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# TEST PIT NO. TP-2

**METHOD: John Deere 310 SG**
**DATE LOGGED: 4/11/2016**
**LOGGED BY: Ryan VanLeuven, PE**

**GROUNDWATER:**

**Groundwater not encountered on 4/11/2016**

**LATITUDE: 43.076662095°**
**LONGITUDE: -115.572458524°** by Hand Held GPS

| DEPTH (ft) | TYPE - No. | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | LAB DATA LL (%) | LAB DATA PI (%) | LAB DATA MC (%) | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | Silty Clay with Sand (CL-ML)- | | | | Stiff digging from about 2.0' to BOH. |
| | BK-56 | | 78% fines;<br>22% fine to medium sand;<br>light brown. | 27 | 6 | 13 | |
| 5 | | | | | | | |
| 10 | BK-57 | | | | | | |

Bottom of Test Pit at 12.0 ft on 4/11/2016.

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# TEST PIT NO. TP-3

**METHOD: John Deere 310 SG**
**DATE LOGGED: 4/11/2016**
**LOGGED BY: Ryan VanLeuven, PE**

**GROUNDWATER:**

**Groundwater not encountered on 4/11/2016**

**LATITUDE: 43.075944772°**
**LONGITUDE: -115.573253045°** by Hand Held GPS

| DEPTH (ft) | TYPE - No. | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | LAB DATA LL (%) | LAB DATA PI (%) | LAB DATA MC (%) | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | Silt with Sand (ML)- | | | | Stiff digging from about 2.0' to BOH. |
| 5 | BK-54 | | 85% fines;<br>15% fine to medium sand;<br>light brown. | 26 | 4 | 8 | |
| 10 | BK-55 | | | | | | |
| | | | Bottom of Test Pit at 12.0 ft on 4/11/2016. | | | | |

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

444060

# WELL NO. B-6

**METHOD: Hollow-Stem Auger**
**DATE LOGGED: 4/11/2016**
**LOGGED BY: Ryan VanLeuven, PE**

**GROUNDWATER:**

**Groundwater not encountered on 4/11/2016**

**LATITUDE: 43.07514254°**
**LONGITUDE: -115.576275559°** by Client

AMERICAN GEO TECHNICS

| DEPTH (ft) | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS | WELL DIAGRAM |
|---|---|---|---|---|---|---|---|
| | | | | | Sandy Silt (ML)- (NATIVE)<br>About 50% non-plastic fines; about 50% fine to medium sand; trace of gravel; light brown. | CME-85;<br>Automatic Hammer SPT per ASTM D1586;<br>NWJ rods;<br>Driller: Haz-Tech Drilling<br><br>Boring located on relatively flat terrain with about 50% grass vegetation ground cover.<br><br>GW reading on 5/11/2016: no measurable GW present in observation well. | About 3' of pipe rise above ground surface, encased in locked vault. Concrete from ground surface to about 3.0' |
| | SS-60 | 67 | 6-6-4 | | | | |
| 5 | SS-61 | 100 | 4-5-13 | | Light particle cementation noted from 5.0' to 6.5'. | | |
| | SS-62 | 89 | 9-14-13 | | | | |
| 10 | SS-63 | 100 | 18-17-14 | | Gradual layer transition.<br>Sandy Silt (ML)-<br>About 60% non-plastic fines; about 40% fine to medium sand; trace of gravel; slightly moist; light brown. | | |
| | SS-64 | 89 | 3-13-16 | | Moderate particle cementation noted from 10.0' to 11.5'. | | |
| 15 | SS-65 | 100 | 18-21-29 | | | SS-65; small basalt gravel in tip of SS sampler. | |
| | | | | | Basalt Rock- | Hard auger grinding and slow drilling from 17.0' to 20.0'. | |
| 20 | CR-66 | 100 (90) | | | Dark gray, moderately hard, low to medium vesicularity, horizontal to moderately high discontinuity angles, moderately rough to rough joint faces, closely to moderately spaced fractures. | Switch to HQ coring at 20.0'.<br><br>Core return water gray from 20.0' to 36.0'. No core water return 36.0' to 60.0'. | Bentonite Chips |
| 25 | CR-67 | 100 (77) | | | Dark gray except red-gray from 27.0' to 30.0', moderately hard, low to medium vesicularity, horizontal to low discontinuity angles, moderately rough to rough joint faces, very close to closely spaced fractures. Highly fractured from 27.5' to 28.0' and 29.0' to 29.5'. | | |
| 30 | CR-68 | 100 (67) | | | Dark gray to red-gray, moderately hard, medium vesicularity, horizontal to high discontinuity angles, moderately rough to rough joint faces, very close to closely spaced fractures. Highly fractured from 32.5' to 34.0'. | | |



*(Continued Next Page)*

**PROJECT: Mountain Home Landfill**
**LOCATION: Elmore County, Idaho**

# WELL NO. B-6

**GROUNDWATER:**

**Groundwater not encountered on 4/11/2016**

AMERICAN GEO TECHNICS

| DEPTH (ft) | TYPE - No. | RECOVERY % (RQD) | BLOW COUNTS | LITHOLOGY | MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) | REMARKS | WELL DIAGRAM |
|---|---|---|---|---|---|---|---|
| 40 | CR-69 | 100 (77) | | | Dark gray, moderately hard, medium vesicularity, horizontal to high discontinuity angles, moderately rough to rough joint faces, very close to closely spaced fractures. | | |
| | CR-70 | 100 (55) | | | Dark gray, moderately hard, low to medium vesicularity, horizontal to high discontinuity angles, moderately rough to rough joint faces, very close to closely spaced fractures. | | |
| 45 | CR-71 | 87 (60) | | | Dark gray except red-gray from 49.0' to 50.0', moderately hard, low to medium vesicularity, horizontal to high discontinuity angles, moderately rough to rough joint faces, very close to moderately spaced fractures.<br>Driller notes void or cinders from 49.0' to 50.0'. | | |
| 50 | CR-72 | 80 (23) | | | Driller notes voids or cinders from 53.5' to 60.0', little recovery. | | Slotted pipe backfilled with sand from 40.0' to 60.0' |
| 55 | CR-73 | 60 (0) | | | | | |
| 60 | | | | | Bottom of Well at 60.0 ft on 4/11/2016. | | Cap on bottom of pipe |

**Appendix 6**

United States Department of Agriculture

Soil Conservation Service

3160 Elder Street
Suite A
Boise, Idaho 83705

Subject: Bennett Rd. Landfill Site

Date: March 23, 1988

To: Roy Fowler, DC
Mountain Home FO
Idaho

File code: 430

On March 22, 1988 we made deep test hole examination of the proposed Elmore County Sanitary Landfill along Bennett Road just northeast of Mountain Home. Attached is a sketch map of the area showing approximate property lines and rough locations of the test pits.

Generally the test holes showed no restrictive or limiting layers for landfill use except as stated below. These pits were dug to depths of 18 to 20 plus feet. The following excavations showed limiting layers:

Test pit #3- A strong indurated duripan was incurred at a depth of 18 inches and continued to more than 5 feet. This material was extremely hard to dig and would be a problem in operation of the landfill. Digging was not continued below 7 feet.

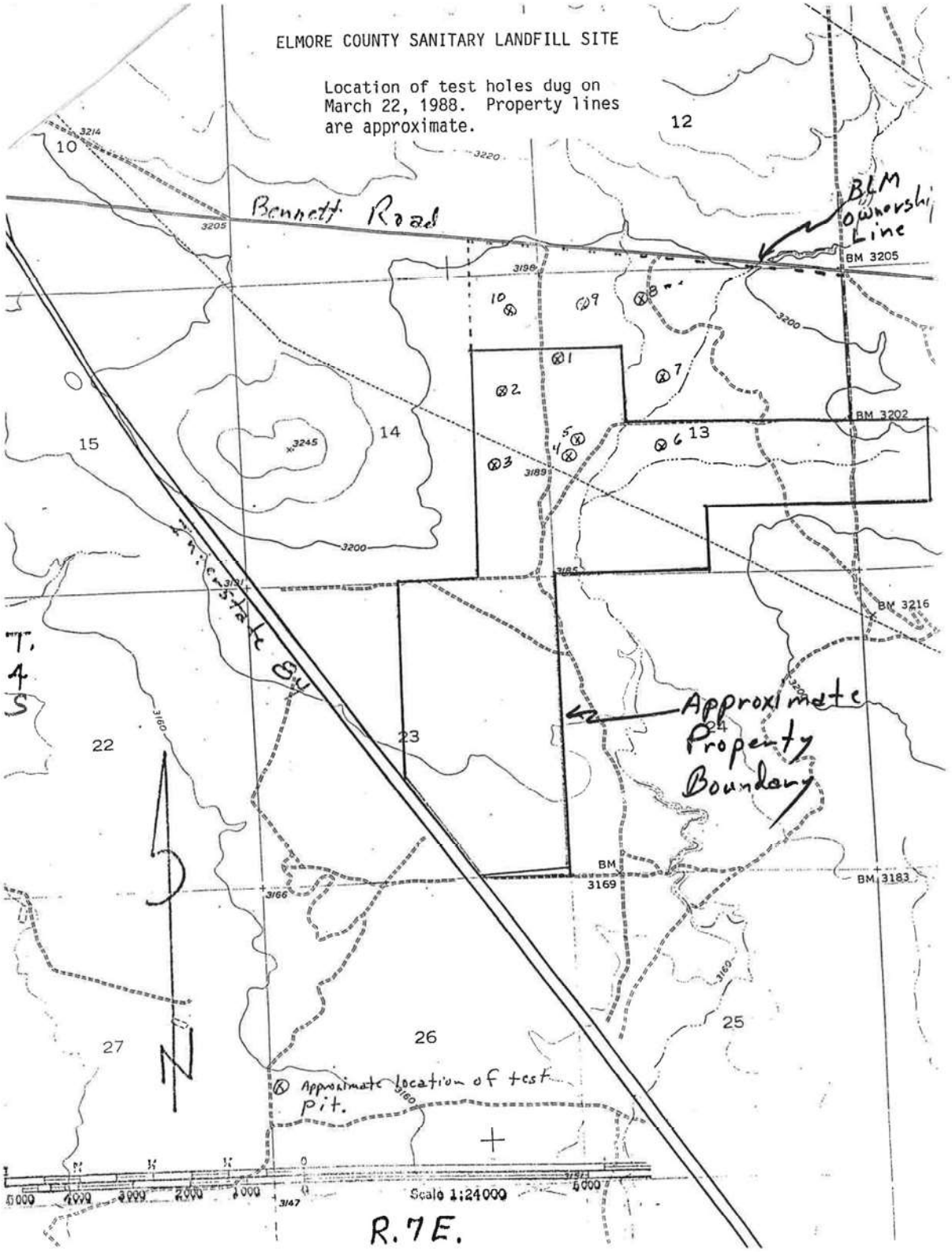
Test pit #4- Bedrock was encountered in this pit at a depth of 7'6". Digging was discontinued. Another test pit about 100 feet northeast, pit #5, showed no bedrock within 20 feet in depth.

As a result of the observation of these test pits I conclude that this to be a suitable landfill site from the standpoint of soil conditions from Bennett Road south to where the power line crosses the property. There are no visible signs of high water table or other limiting features in the soil profiles.

I have more detailed profile information on the test pits should you need it.

Harley R. Noe
Area Soil Scientist

attach


ELMORE COUNTY SANITARY LANDFILL SITE
Location of test holes dug on March 22, 1988. Property lines are approximate.
Bennett Road
BLM ownership Line
BM 3205
BM 3202
BM 3216
BM 3169
BM 3183
Approximate Property Boundary
Approximate location of test pit.
T. 4 S.
R. 7 E.
Scale 1:24000
10
11
12
13
14
15
22
23
24
25
26
27

Form 238-7
6/89

307313
04S-07E-14AAA1

SEP 27 1989
Department of Water Resources

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

# WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

USE TYPEWRITER OR BALLPOINT PEN

## 1. WELL OWNER

Name Elmore County Landfill

Address 160 S. 3rd East Mt. Home

Owner's Permit No. 61-89-Z-020

## 2. NATURE OF WORK

☑ New well ☐ Deepened ☐ Replacement
☐ Well diameter increase
☐ Abandoned (describe abandonment procedures such as materials, plug depths, etc. in lithologic log)

## 3. PROPOSED USE

☑ Domestic ☐ Irrigation ☐ Test ☐ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other _____ (specify type)

## 4. METHOD DRILLED

☑ Rotary ☑ Air ☐ Hydraulic ☐ Reverse rotary
☐ Cable ☐ Dug ☐ Other _____

## 5. WELL CONSTRUCTION

Casing schedule: ☑ Steel ☐ Concrete ☐ Other _____

| Thickness | Diameter | From | To |
|---|---|---|---|
| .250 inches | 8 5/8 inches | + 1 feet | 47 feet |
| _____ inches | _____ inches | _____ feet | _____ feet |
| _____ inches | _____ inches | _____ feet | _____ feet |
| _____ inches | _____ inches | _____ feet | _____ feet |

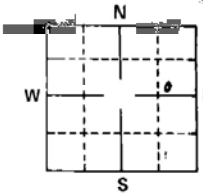
Was casing drive shoe used? ☐ Yes ☑ No
Was a packer or seal used? ☐ Yes ☑ No
Perforated? ☐ Yes ☑ No
How perforated? ☐ Factory ☐ Knife ☐ Torch ☐ Gun
Size of perforation _____ inches by _____ inches

| Number | From | To |
|---|---|---|
| _____ perforations | _____ feet | _____ feet |
| _____ perforations | _____ feet | _____ feet |
| _____ perforations | _____ feet | _____ feet |

Well screen installed? ☐ Yes ☑ No
Manufacturer's name _____
Type _____ Model No. _____
Diameter ____ Slot size ____ Set from _____ feet to _____ feet
Diameter ____ Slot size ____ Set from _____ feet to _____ feet
Gravel packed? ☐ Yes ☑ No ☐ Size of gravel _____
Placed from _____ feet to _____ feet
Surface seal depth 47 Material used in seal: ☐ Cement grout
☑ Bentonite ☐ Puddling clay ☐ _____
Sealing procedure used: ☐ Slurry pit ☐ Temp. surface casing
☑ Overbore to seal depth
Method of joining casing: ☐ Threaded ☑ Welded ☐ Solvent Weld
☐ Cemented between strata
Describe access port _____

## 6. LOCATION OF WELL

Sketch map location must agree with written location.




Subdivision Name _____
Lot No. _____ Block No. _____
County Elmore
SE ¼ NE ¼ Sec. 14, T. 4 ☐ N ☑ S, R. 7 ☑ E ☐ W

## 7. WATER LEVEL

Static water level NA feet below land surface.
Flowing? ☐ Yes ☑ No G.P.M. flow _____
Artesian closed-in pressure _____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature _____ °F. Quality _____
*Describe artesian or temperature zones below.*

## 8. WELL TEST DATA

☐ Pump ☐ Bailer ☑ Air ☐ Other _____

| Discharge G.P.M. | Pumping Level | Hours Pumped |
|---|---|---|
| 0 | | |

## 9. LITHOLOGIC LOG

022038

| Bore Diam. | Depth From | Depth To | Material | Water Yes | Water No |
|---|---|---|---|---|---|
| 10" | 0 | 3 | Top soil | | X |
| 10" | 3 | 20 | soft w/ clay | | X |
| 10" | 20 | 40 | gray lava + cinders (broken) | | X |
| 10-6" | 40 | 65 | solid gray lava | | X |
| 6" | 65 | 607 | Fractured lava | | X |
| 6" | 607 | | (Lost return in broken | | X |
| 6" | | 610 | gray lava) | | X |

RECEIVED
SEP 26 1989
Department of Water Resources

RECEIVED
SEP 27 1989
Department of Water Resources
Western Regional Office

MICROFILMED
JUN 13 1990

## 10.

Work started Aug 7, 1989 finished Aug 16, 1989

## 11. DRILLERS CERTIFICATION

OL

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Hiddleston Drilling Firm No. 35
Address Mt. Home, Id Date Aug 21, 1989
Signed by (Firm Official) Mark S Hiddleston
and
(Operator) Mark S Hiddleston

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

393132
04S-07E-13AAD1

RECEIVED
MAR 6 1967
Department of Reclamation

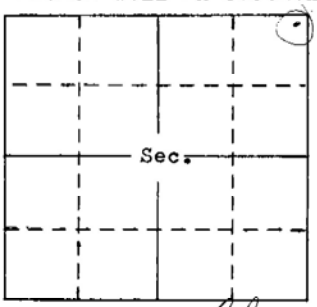
# REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:
Name Charles House
Address

Owner's Permit No.
NATURE OF WORK (check): Replacement well ☐
New well ☐ Deepened ☐ Abandoned ☐
Water is to be used for:
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☑
Dug ☐ Other
(explain)
CASING SCHEDULE: Threaded ☐ Welded ☑
16 "Diam. from 0 ft. to 26 ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: Material:
Steel ☐ concrete ☐ wood ☐ other ☐
(explain)
PERFORATED? Yes ☐ No ☐ Type of perforator used:
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.
CONSTRUCTION: Well gravel packed? Yes ☐
No. ☐ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth? ft. Material used in seal:
Did any strata contain unusable water? Yes ☐
No. ☐ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☐ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section




LOCATION OF WELL: County Elmore
NE¼ NE¼ Sec. 13 T. 4S N/S R. 7E E/W B.M.

Size of drilled hole: 16 Total depth of well: 304 Standing water level below ground: 123 Temp.° Fahr. ° Test delivery: 38 gpm or cfs Pump? ☒ Bail ☐
Size of pump and motor used to make test:
Length of time of test: Hrs. Min.
Drawdown: ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing?
Yes ☐ No ☐

| DEPTH FROM FEET | DEPTH TO FEET | MATERIAL 104300 | WATER YES OR NO |
|---|---|---|---|
| 0 | 440 | Lava rock | |
| 440 | 504 | Broken lava cinders | |
| ~~504~~ | ~~635~~ | Some small cinders | |
| 504 | 635 | blue chalk | |
| | | Hole drilled to 635 8" diameter then reamed to 16" to 304 | |
| | | Rock from 440 to 504 was very broken. | |
| | | Rock from about 480 to 504 very hard | |

Work started:
Work finished:
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: Wayne Stevens
Address: 3704 Hawthorne Boise
Signed by:
License No. 324 Date:

Use other side for additional remarks

USGS

401280
04S-07E-13AAD2

# REPORT OF WELL DRILLER
State of Idaho

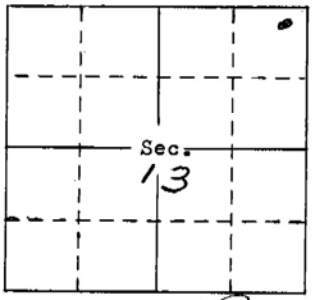
Received 20-68 Department of Reclamation

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER
Name Charles House
Address Boise, Idaho

Owner's Permit No. 628326
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for:
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other (explain)
CASING SCHEDULE: Threaded __ Welded __
36" "Diam. from 0 ft. to 41' ft.
20" "Diam. from 0 ft. to 540' ft.
16" "Diam. from 0 ft. to 889' ft.
13" "Diam. from 676' ft. to 1272' ft.
Thickness of casing 667 to 1361 Material:
Steel ☒ concrete ☐ wood ☐ other ☐
(explain)
PERFORATED? Yes ☐ No ☒ Type of perforator used:
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.
CONSTRUCTION: Well gravel packed? Yes ☐
No. ☒ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth? ft. Material used in seal:
Did any strata contain unusable water? Yes ☐
No. ☒ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☒ No. ☐
Cemented in place? Yes ☐ No ☒

Locate well in section




LOCATION OF WELL: County Elmore
NE ¼ NE ¼ Sec. 13 T. 4S N/S R. 7 E/W

Size of drilled hole: Total depth of well: 1840 Standing water level below ground: 421 Temp. Fahr. ° Test delivery: gpm or cfs Pump? ☐ Bail ☐
Size of pump and motor used to make test: no test
Length of time of test: Hrs. Min.
Drawdown: ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing?
Yes ☐ No ☒

104299

| DEPTH FEET FROM | DEPTH FEET TO | MATERIAL | WATER YES OR NO |
|---|---|---|---|
| 0 | 19 | top soil | no |
| 19 | 227 | black lava & Basalt Head | no |
| 227 | 245 | loose gritty stringers lava | no |
| 245 | 330 | black basalt | no |
| 330 | 365 | big cavity | no |
| 365 | 417 | black basalt | no |
| 417 | 580 | lava & fissure | no |
| 580 | 590 | Andesite - estate. 417' showing | yes |
| 590 | 889 | blue shale | no |
| 889 | 934 | Gray & black basalt | no |
| 934 | 1272 | Blue shale | no |
| 1272 | 1350 | Red & black basalt (MAGNETIC) | no |
| 1350 | 1355 | Black sand SMALL AMOUNT WATER | no |
| 1355 | 1840 | Blue shale | no |
| | | NEAR THE BOTTOM OF THE WELL HOT MUD WAS ENCOUNTERED WITH VERY LITTLE WATER | |

Work started: May, 1967
Work finished: not finished
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: Deep Well Drilling
Address: Twin Falls, Idaho
Signed by:
License No. 133 Date: May

Use other side for additional remarks

replaced

61

422807
04S-07E-13AAD3

6

RECEIVED
MAR 24 1969
Department of Reclamation

RECEIVED
APR 1 1969
Department of Reclamation

# REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:
Name Shorty House
Address

Owner's Permit No. ~~03 Repl~~ G-28326
NATURE OF WORK (check): Replacement well ☐
New well ☐ Deepened ☐ Abandoned ☑
Water is to be used for:

METHOD OF CONSTRUCTION: Rotary ☐ Cable ☑
Dug ☐ Other (explain)

CASING SCHEDULE: Threaded ☑ Welded ☑
6 "Diam. from +2 ft. to 1902 ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: 1/4". Material:
Steel ☑ concrete ☐ wood ☐ other ☐

PERFORATED? Yes ☐ No ☑ Type of perforator used: (explain)

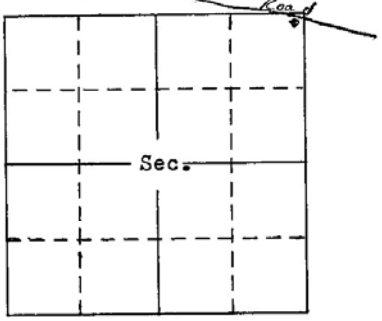
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☑
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

CONSTRUCTION: Well gravel packed? Yes ☐
No. ☑ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth? ft. Material used in seal:

Did any strata contain unusable water? Yes ☐
No. ☑ Type of water:
Depth of strata ft. Method of sealing strata off:

Surface casing used? Yes ☐ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section




LOCATION OF WELL: County Elmore
NE ¼ NE ¼ Sec. 13 T. 4 ~~N~~/S R. 7 E/~~W~~

Size of drilled hole: 6" Total depth of well: 2045' Standing water level below ground: 427 Temp. Fahr. ° Test delivery: gpm or cfs Pump? ☐ Bail ☐
Size of pump and motor used to make test:

Length of time of test: NONE Hrs. Min.
Drawdown: ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing?
Yes ☐ No ☐

| DEPTH FROM FEET | DEPTH TO FEET | MATERIAL | WATER ~~YES~~ OR NO |
|---|---|---|---|
| 1365 | 1800 | cleanout clay & bitrite | |
| 1800 | 1905 | flook rock | |
| 1905 | 2034 | fluegren clay | |
| 2034 | 2043 | sandrock | |
| 2043 | 2045 | "fluerlay "stinky" | |

Work started: Jan 10-69
Work finished: Feb 24-69

Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: Dale C Gilbert
Address: Box 993 Wendell, Idaho
Signed by: Dale C Gilbert
License No. 17 Date: March 4-69

Use other side for additional remarks

61

OVER USGS

I Did this Drilling for mr. Dean Rogers Gooding, Idaho and he said that permit was in Chorly Hause' name and that you had permit no. & location of well on file

This well is located approx. 7 mi South East of mt. Home on Bennet road.

The 6" pipe has a thick fitrite seal from 13.65' to 1800

Dear mr. Johnson:

In regards to your letter dated march 24, 1969.

Im sorry about not putting enough information on log but will try to give you information you want.

1 = I didnt put thermometer in cuttings recovered by boler but by feeling by hand the clay was approx 110° to 120° the rock was cool.

2 = To my knowledge I think mr. Rogers is undecided at this time

3 = There was a steel plate welded on top of casing when I left well

4 = I dont believe water in well is seepage, because after running 6" pipe I filled well to top with water and replaced it as I drilled and boled and at about 1925' water level dropped to 427 and I couldnt fill it back up by hauling water with truck and 1000 gallon water tank.
Under ordinary drilling and boleing S.W.L. remained at 427 ft I bold well every 5 or 6 ft with 4½" I.D bole 40 ft long.

If you need any further information please write me

Very Truly Yours,

Dale E Gilbert

399839
04S-07E-13AAD4

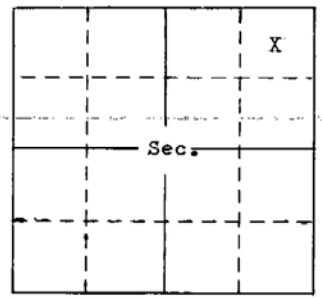
RECEIVED
JUN 20 1967
Department of Reclamation

# REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:
Name CHAS. R. HOUSE
Address 2523 Inglewood Road,
Boise, Idaho
Owner's Permit No. G-28326
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for: Irrigation
METHOD OF CONSTRUCTION: Rotary ☒ Cable ☐
Dug ☐ Other ____ (explain)
CASING SCHEDULE: Threaded ☐ Welded ☐
____"Diam. from ____ ft. to ____ ft.
____"Diam. from ____ ft. to ____ ft.
____"Diam. from ____ ft. to ____ ft.
____"Diam. from ____ ft. to ____ ft.
Thickness of casing: ____ Material:
Steel ☐ concrete ☐ wood ☐ other ☐ (explain)
PERFORATED? Yes ☐ No ☐ Type of perforator used: ____
Size of perforations: ____" by ____"
____perforations from ____ ft. to ____ ft.
____perforations from ____ ft. to ____ ft.
____perforations from ____ ft. to ____ ft.
____perforations from ____ ft. to ____ ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ Set from ____ ft. to ____ ft.
Diam. ____ Slot size ____ Set from ____ ft. to ____ ft.
CONSTRUCTION: Well gravel packed? Yes ☐ No. ☐ size of gravel ____ Gravel placed from ____ ft. to ____ ft. Surface seal provided? Yes ☐ No ☐ To what depth? ____ ft. Material used in seal: ____
Did any strata contain unusable water? Yes ☒ No. ☐ Type of water: ____
Depth of strata ____ ft. Method of sealing strata off: ____
Surface casing used? Yes ☐ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section




LOCATION OF WELL: County Elmore
NE ¼ NE ¼ Sec. 13 T. 4 N/S R. 7 E/W

Size of drilled hole: 9-7/8" Total depth of well: 81' Standing water level below ground: ____ Temp. Fahr. ____ ° Test delivery: ____ gpm or ____ cfs Pump? ☐ Bail ☐
Size of pump and motor used to make test: ____
Length of time of test: ____ Hrs. ____ Min.
Drawdown: ____ ft. Artesian pressure: ft. above land surface ____ Give flow ____ cfs or ____ gpm. Shutoff pressure: ____
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing? Yes ☐ No ☐

| DEPTH FROM FEET | DEPTH TO FEET | MATERIAL 104302 | WATER YES OR NO |
|---|---|---|---|
| 0 | 2 | Soil, dark | No |
| 2 | 6 | Clay, yellow | no |
| 6 | 8 | Clay, yellow, hard | no |
| 8 | 10 | Sand, black | no |
| 10 | 14 | Clay, brown | no |
| 14 | 18 | Sand, brown, fine | no |
| 18 | 22 | Clay, yellow | no |
| 22 | 45 | Lava, black | no |
| 45 | 49 | Lava, black with red streaks | no |
| 49 | 65 | Lava, black | no |
| 65 | 73 | Lava, red and brown | no |
| 73 | 81 | Lava | no |
| | | This well started with a 9-7/8" test hole. Lost circulation several times starting at 29', but was able to regain circulation until 81' was reached. Lost circulation at this point and was never able to regain it. Agreement made with customer to move off hole and customer was going to get a cable tool rig on the job. | |

Work started: Jan 12, 1965
Work finished: Feb. 2, 1965
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: Levi Jorgensen for B. & M. Equip. Co.
Address: P.O. Box 220, Caldwell, Idaho
Signed by: [signature]
License No. 221 Date: Feb. 5, 1965

Use other side for additional remarks

USGS

Form 238-7
3/95

# IDAHO DEPARTMENT OF WATER RESOURCES
# WELL DRILLER'S REPORT

66527

307103
04S-07E-33AAA1

Use Typewriter or Ballpoint Pen

| Office Use Only |
|---|
| Inspected by _____ |
| Twp____ Rge____ Sec ____ |
| ____1/4 ____1/4 ____1/4 |
| Lat: : : Long: : : |

D0000092

**1. DRILLING PERMIT NO.** _____
Other IDWR No. 61-97-W-0028-000

**2. OWNER:**
Name Dave & Stephanie Bergh
Address Rt. 1 Box 814
City Mtn Home State Id Zip 83647

**3. LOCATION OF WELL by legal description:**
Sketch map location must agree with written location.

N / W / E / S

Twp. 4 North ☐ or South ☒
Rge. 7 East ☒ or West ☐
Sec. 33, ____ 10 acres 1/4 NE 40 acres 1/4 NE 160 acres 1/4
Gov't Lot ____ County Elmore
Lat: : : Long: : :
Address of Well Site off Highway 30 past Clover Rd. City Mtn. Home
(Give at least name of road + Distance to Road or Landmark)

Lt. _____ Blk. _____ Sub. Name _____

**4. USE:**
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other _____

**5. TYPE OF WORK** check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other _____

**6. DRILL METHOD**
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other _____

**7. SEALING PROCEDURES**

| SEAL/FILTER PACK Material | From | To | AMOUNT Sacks or Pounds | METHOD |
|---|---|---|---|---|
| Bentonite | 0 | 18 | 300# | Overcore |
| | | | | |
| | | | | |

Was drive shoe used? ☒Y ☐ N Shoe Depth(s) _____
Was drive shoe seal tested? ☐Y ☒N How? _____

**8. CASING/LINER:**

| Diameter | From | To | Gauge | Material | Casing | Liner | Welded | Threaded |
|---|---|---|---|---|---|---|---|---|
| 8 3/8 | 4 | 18' | 250 | Steel | ☒ | ☐ | ☐ | ☐ |
| 6 5/8 | 2 | 530 | 250 | Steel | ☒ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |

Length of Headpipe _____ Length of Tailpipe _____

**9. PERFORATIONS/SCREENS**
☐ Perforations Method _____
☐ Screens Screen Type _____

| From | To | Slot Size | Number | Diameter | Material | Casing | Liner |
|---|---|---|---|---|---|---|---|
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |

**10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:**
440 ft. below ground Artesian pressure _____ lb.
Depth flow encountered _____ ft. Describe access port or control devices: _____

**11. WELL TESTS:**
☐ Pump ☐ Bailer ☑ Air ☐ Flowing Artesian

| Yield gal./min. | Drawdown | Pumping Level | Time |
|---|---|---|---|
| 23 | | | 4hrs |
| | | | |
| | | | |

Water Temp. _____ Bottom hole temp. _____
Water Quality test or comments: _____
Depth first Water Encountered _____

**12. LITHOLOGIC LOG:** (Describe repairs or abandonment)

| Bore Dia. | From | To | Remarks: Lithology, Water Quality & Temperature | Water Y | Water N |
|---|---|---|---|---|---|
| 12" | 0 | 3 | Top Soil | | |
| 12" | 3 | 10 | Clayey Brown Soil | | |
| 12" | 10 | 12 | Sandy Gravel | | |
| 12" | 12 | 14 | Broken Lava | | |
| 12" | 14 | 26 | Gray Lava | | |
| 12" | 26 | 29 | Brown Cinders | | |
| 12" | 29 | 34 | Gray Lava | | |
| 12" | 34 | 44 | Brown Cinder | | |
| 12" | 44 | | Gray Lava/ Soft-med | | |
| 12" | | 110 | Spoatic/ return | | |
| 12" | 110 | 131 | Brown Cinders/Clay & Black Cinder | | |
| 12" | 131 | 153 | Gray Broleen Lava Soft | | |
| 12" | 153 | 160 | Brown Cinder | | |
| 12" | 160 | 170 | Gray Lava Soft | | |
| 12" | 170 | 178 | Browncinders | | |
| 8" | 178 | 220 | Sand & Gravel | | |
| 6" | 220 | 235 | Cemented sand & Gravel & Clay | | |
| 6" | 235 | 238 | Tan Clay | | |
| 6" | 238 | 254 | Cemented Sand & Gravel | | |
| 6" | 254 | 278 | Sand & Gravel & Clay | | |
| 6" | 278 | 293 | Tan Sandy Clay | | |
| 6" | 293 | 306 | Fine Sand & Gravel | | |
| 6" | 306 | 310 | Cemented Sand | | |
| 6" | 310 | 314 | Clay | | |
| 6" | 314 | 346 | Sand & Small Gravel | | |
| 6" | 346 | 360 | Tan Sandy Clay | | |
| 6" | 360 | 378 | Tan Clay | | |
| 6" | 378 | 380 | Tan Clay | | |
| 6" | 380 | 485 | Sand & Gravel | | |
| 6" | 485 | 509 | Blue Sandstone & Clay | | |
| 6" | 509 | 512 | Blue Sand & Clay | x | |
| 6" | 512 | 540 | Sandstone with Sand | x | |

RECEIVED
JUL 31 1997
Department of Water Resources

RECEIVED
JUL 25 1997
WATER RESOURCES
WESTERN REGION

Completed Depth 532 (Measurable)
Date: Started 6/16/97 Completed 7/18/97

**13. DRILLER'S CERTIFICATION**
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name Hiddleston & Son, Inc. Firm No. 35
Firm Official Mark S Hiddleston Date 7/22/97
and
Supervisor or Operator _____ Date _____
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

FLEMING

400742
05S-07E-03ADB1

RECEIVED
AUG 22 1967
Department of Reclamation

# REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER: Name HOWARD K FLEMING
Address Realestate
Mtn Home Idaho
Owner's Permit No. G33606
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for: Irr.

METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other ____ (explain)

CASING SCHEDULE: Threaded ☐ Welded ☐
____"Diam. from ____ ft. to ____ ft.
____"Diam. from ____ ft. to ____ ft.
____"Diam. from ____ ft. to ____ ft.
____"Diam. from ____ ft. to ____ ft.
Thickness of casing: ____ Material:
Steel ☒ concrete ☐ wood ☐ other ☐

PERFORATED? Yes ☐ No ☐ Type of perforator used: ____ (explain)

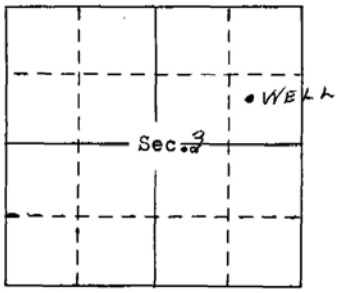
Size of perforations: ____" by ____"
____perforations from ____ ft. to ____ ft.
____perforations from ____ ft. to ____ ft.
____perforations from ____ ft. to ____ ft.
____perforations from ____ ft. to ____ ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ Set from ____ ft. to ____ ft.
Diam. ____ Slot size ____ Set from ____ ft. to ____ ft.

CONSTRUCTION: Well gravel packed? Yes ☐ No. ☐ size of gravel ____ Gravel placed from ____ ft. to ____ ft. Surface seal provided? Yes ☐ No ☐ To what depth? ____ ft. Material used in seal: ____

Did any strata contain unusable water? Yes ☐
No. ☒ Type of water: ____
Depth of strata ____ ft. Method of sealing strata off: ____

Surface casing used? Yes ☐ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section




LOCATION OF WELL: County ELMORE
SE ¼ NE ¼ Sec. 3 T. 5 S R. 7 E

Use other side for additional remarks

Size of drilled hole: 8 Total depth of well: 592 Standing water level below ground: 441 Temp. Fahr. ____ ° Test delivery: ____ gpm or ____ cfs Pump? ☐ Bail ☐
Size of pump and motor used to make test: ____

Length of time of test: ____ Hrs. ____ Min.
Drawdown: ____ ft. Artesian pressure: ft. above land surface ____ Give flow ____ cfs or ____ gpm. Shutoff pressure: ____
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing?
Yes ☐ No ☐

104278

| DEPTH FROM FEET | DEPTH TO FEET | MATERIAL | WATER YES OR NO |
|---|---|---|---|
| 0 | 3 | Top Soil | |
| 3 | 54 | Gray Lava | |
| 54 | 82 | Brown Lava | |
| 82 | 121 | Gray Lava | |
| 121 | 144 | Brown Sand Rock | |
| 144 | 187 | Sandy Clay | |
| 187 | 203 | Gray Lava | |
| 203 | 241 | Sandy Clay | |
| 241 | 284 | Brown Sand Rock | |
| 284 | 397 | Blue Clay | |
| 397 | 441 | Blue Sandy Clay | |
| 441 | 447 | Blue Sand | Yes |
| 447 | 468 | Blue Clay | No |
| 468 | 515 | Blue Clay (Cave 4) | No |
| 515 | 592 | Blue Sand | Yes |

Well Was Not Tested

Work started: 1-12-66
Work finished: 2-4-67

Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge:
Name: Bit Home Well Drillers
Address: 315 5E
Signed by: B H Farley
License No. 297 Date: 8-14-67

USGS

400864
04S-07E-18AAA1

RECEIVED
MAY 24 1967
Department of Reclamation

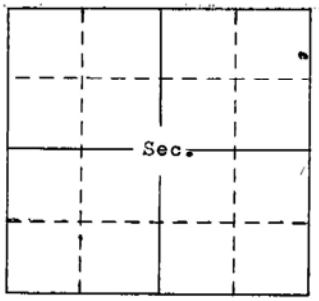
# REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:
Name ~~Harvey~~ Grofsema
Address Mountain Home, Idaho

Owner's Permit No. 59-2259 = (52-82)
NATURE OF WORK (check): Replacement well ☐
New well ☐ Deepened ☐ Abandoned ☐
Water is to be used for:
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other
(explain)
CASING SCHEDULE: Threaded — Welded —
22 "Diam. from 0 ft. to 54 ft.
~~36~~ "Diam. from ft. to ft.
18 "Diam. from 364 ft. to 427 ft.
16 "Diam. from 415 ft. to 525 ft.
Thickness of casing: .312 Material:
Steel ☒ concrete ☐ wood ☐ other ☐
(explain)
PERFORATED? Yes ☒ No ☐ Type of perforator used:
Size of perforations: 1/4 " by ~~2 1/2~~ "
~~485~~ perforations from ~~505~~ ft. to ft.
2700 perforations from 415 ft. to ~~505~~ ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☐
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.
CONSTRUCTION: Well gravel packed? Yes ☐
No. ☐ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☐ No ☐ To what depth? ft. Material used in seal:
Did any strata contain unusable water? Yes ☐
No. ☐ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☐ No. ☐
Cemented in place? Yes ☐ No ☐

Locate well in section




LOCATION OF WELL: County Elmore
NE ¼ NE ¼ Sec. 18 T. 4 ~~N~~ S R. 7 E/~~W~~

Size of drilled hole: 20" Total depth of well: 685 Standing water level below ground: 305 Temp. Fahr. ° Test delivery: gpm or cfs Pump? ☐ Bail ☐
Size of pump and motor used to make test:
Length of time of test: Hrs. Min.
Drawdown: ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing? Yes ☐ No ☐

104296

| DEPTH FROM FEET | DEPTH TO FEET | MATERIAL | WATER YES OR NO |
|---|---|---|---|
| 0 | 32 | Top Soil | |
| 32 | 45 | Gray Lava Broken | |
| 45 | 118 | Gray Lava Solid | |
| 118 | 122 | Broken Lava loose Rock | |
| 122 | 144 | Brown Lava | |
| 144 | 154 | Gray Lava | |
| 154 | 161 | Porous Lava & Cinders | |
| 161 | 194 | Gray Lava | |
| 194 | 212 | Broken Lava & Clay | |
| 212 | 238 | Hard Lava Blue | |
| 238 | 245 | Red clay | |
| 245 | 305 | Hard Gray Lava | |
| 305 | 340 | Black Lava Some Water | Yes |
| 340 | 383 | Black & Red Lava | Yes |
| 383 | 426 | Brown Sandy Clay | |
| 426 | 470 | Black Lava & Cinders | |
| 470 | 495 | Black Lava Hard | |
| 495 | 505 | White Clay | |
| 505 | 525 | Green Clay | |
| 525 | 545 | Brown Clay | |
| 545 | 590 | White Clay | |
| 590 | 655 | Sandstone | |
| 655 | 660 | Fine Gravel | Yes |
| 660 | 682 | Brown Sandstone | |
| 682 | 685 | White Clay | |

Work started: Jan. 10, 1966
Work finished: Aug. 25, 1966
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: Paul Vollmer & Son
Address: Aberdeen, Idaho
Signed by: Paul Vollmer Jr
License No. 171 Date: Sept 16, 1966

Use other side for additional remarks

1965

376268
04S-07E-17CAB1

For 6/02 PARTMENT OF WATER RESOURCES

# WELL DRILLER'S REPORT

Office Use Only
Well ID No. 805416
Inspected by
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

**1. WELL TAG NO. D** 0029655
DRILLING PERMIT NO.
Water Right or Injection Well No.

**2. OWNER:**
Name K. Kon Construction
Address 10440 Hwy 95
City Payette State Id Zip 83661

**3. LOCATION OF WELL by legal description:**
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 4 North ☐ or South ☒
Rge. 7 East ☒ or West ☐
Sec. 17, NW 1/4 (10 acres) NW 1/4 (40 acres) ____ 1/4 (160 acres)
Gov't Lot ____ County Elmore
Lat: : : Long: :
Address of Well Site 2785 Garza Dr
(Give at least name of road + Distance to Road or Landmark) City Mt Home
Lt. ____ Blk. ____ Sub. Name

**4. USE:**
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

**5. TYPE OF WORK** check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other

**6. DRILL METHOD:**
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other

**7. SEALING PROCEDURES**

| Seal Material | From | To | Weight / Volume | Seal Placement Method |
|---|---|---|---|---|
| Bentonite | 0 | 60 | 1250# | over bore |

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s)
Was drive shoe seal tested? ☐ Y ☒ N How?

**8. CASING/LINER:**

| Diameter | From | To | Gauge | Material | Casing | Liner | Welded | Threaded |
|---|---|---|---|---|---|---|---|---|
| 6" | +2 | 60 | 250 | Steel | ☒ | ☐ | ☒ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |

Length of Headpipe Length of Tailpipe
Packer ☐ Y ☐ N Type

**9. PERFORATIONS/SCREENS PACKER TYPE**
Perforation Method
Screen Type & Method of Installation open

| From | To | Slot Size | Number | Diameter | Material | Casing | Liner |
|---|---|---|---|---|---|---|---|
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |
| | | | | | | ☐ | ☐ |

**10. FILTER PACK**

| Filler Material | From | To | Weight / Volume | Placement Method |
|---|---|---|---|---|
| | | | | |
| | | | | |

**11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:**
338 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices:
well cap

**12. WELL TESTS:**
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

| Yield gal./min. | Drawdown | Pumping Level | Time |
|---|---|---|---|
| | Lost returns | | |

Water Temp. Bottom hole temp.
Water Quality test or comments:
Depth first Water Encounter

**13. LITHOLOGIC LOG:** (Describe repairs or abandonment)

| Bore Dia. | From | To | Remarks: Lithology, Water Quality & Temperature | Water Y | Water N |
|---|---|---|---|---|---|
| 10 | 0 | 3 | top soil | | |
| " | 3 | 9 | clay | | |
| " | 9 | 21 | broken Lava | | |
| " | 21 | 60 | Soft Lava | | |
| 6 | 60 | 190 | Soft Lava | | |
| " | 190 | 193 | cinders | | |
| " | 193 | 200 | Lava | | |
| " | 200 | 220 | Soft Lava | | |
| " | 220 | 260 | medium Lava | | |
| " | 260 | 300 | hard Lava | | |
| " | 300 | 491 | Soft Lava | | |

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WATER RESOURCES
WESTERN REGION

Completed Depth 491' (Measurable)
Date: Started 8-26-03 Completed 8-27-03

**14. DRILLER'S CERTIFICATION**
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name ABC Well Drilling Firm No. 621
Principal Driller Andy Payne Date 8-28-03
and
Driller or Operator II ANDY PAYNE Date 8-28-03
Operator I Date
Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

FORWARD WHITE COPY TO WATER RESOURCES

400814
04S-07E-16BBB1

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MAY 23 1968
Department of Reclamation

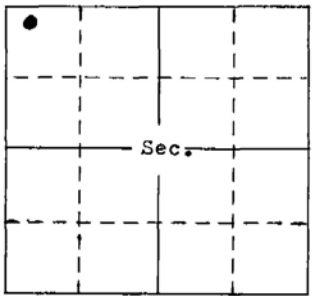
# REPORT OF WELL DRILLER
State of Idaho

State law requires that this report shall be filed with the State Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:
Name BEKY Corporation
Address Mountain Home, Idaho

Owner's Permit No. 61-7021
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for: Irrigation
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other ☐ (explain)
CASING SCHEDULE: Threaded ☐ Welded ☐
20 "Diam. from 0 ft. to 12 ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: ¼ inch Material:
Steel ☒ concrete ☐ wood ☐ other ☐ (explain)
PERFORATED? Yes ☐ No ☒ Type of perforator used:
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes ☐ No ☒
Manufacturer's name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.
CONSTRUCTION: Well gravel packed? Yes ☐
No. ☒ size of gravel Gravel placed from ft. to ft. Surface seal provided? Yes ☒ No ☐ To what depth? 12 ft. Material used in seal: Cement
Did any strata contain unusable water? Yes ☐
No. ☒ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☒ No. ☐
Cemented in place? Yes ☒ No ☐

Locate well in section




LOCATION OF WELL: County Elmore
NW ¼ NW ¼ Sec. 16 T. 4S N/S R. 7 E/W

Size of drilled hole: 20 inches Total depth of well: 569 feet Standing water level below ground: 314 feet Temp. Fahr. 50 ° Test delivery: 3200 gpm or cfs Pump? ☒ Bail ☐
Size of pump and motor used to make test: 14" bowls; 12" column and 350 hp motor
Length of time of test: 6 Hrs. Min.
Drawdown: 22 ft. Artesian pressure: ft. above land surface none Give flow cfs or gpm. Shutoff pressure: none
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☒ Does well leak around casing?
Yes ☐ No ☒

104295

| DEPTH FROM FEET | DEPTH TO FEET | MATERIAL | WATER YES OR NO |
|---|---|---|---|
| 0 | 4 | Topsoil | |
| 4 | 12 | Boulders | |
| 12 | 39 | Gray Lava | |
| 39 | 54 | Brown Lava | |
| 54 | 96 | Red Lava | |
| 96 | 124 | Red Cinders | |
| 124 | 138 | Brown Lava | |
| 138 | 166 | Gray Lava | |
| 166 | 187 | Red Lava | |
| 187 | 208 | Brown Lava | |
| 208 | 219 | Gray Lava | |
| 219 | 247 | Open Ground | |
| 247 | 278 | Gray Lava | |
| 278 | 294 | Brown Lava | |
| 294 | 311 | Gray Lava | |
| 311 | 318 | Cinders | yes |
| 318 | 332 | Red Lava | |
| 332 | 357 | Cinders | yes |
| 357 | 384 | Red Lava | |
| 384 | 390 | Gray Lava | |
| 390 | 402 | Cinders | yes |
| 402 | 405 | Gray Lava | |
| 405 | 429 | Cinders and Clay | |
| 429 | 458 | Cinders | yes |
| 458 | 491 | Gray Lava (Hard) | |
| 491 | 512 | Cinders | yes |
| 512 | 569 | Gray Clay | |

Work started: 1-29-68
Work finished: 4-18-68
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: B.B. Gailey
Address: 905 N 10th E, Mtn Home, Idaho
Signed by: B.B. Gailey
License No. 89 Date: 5-14-68

Use other side for additional remarks

61

USGS

424838
04S-07E-09DCC1

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APR 11 1962
Department

# WELL LOG AND REPORT OF THE STATE RECLAMATION ENGINEER OF IDAHO

Permit No. G-29700 Well No. _____ County ELMORE

Owner HARVEY GROEFSEMA

Address S.E. MT. HOME, IDAHO

Driller HENRY L. JOHNSON DRILLING & PUMP CO.

Address 2211 NO. 26th, BOISE, IDAHO P.O. BOX 5042

Well location SW ¼ SE ¼ Sec. 9, T. 4 N/S, R. 7 E/W

Size of drilled hole 20"

Total depth of well 862 Ft.

Locate well in section

| | |
|---|---|
| NW¼ | NE¼ |
| SW¼ | SE¼ |

Give depth to standing water from the ground 350 Water temp. _____ °Fahr.

On "Pumping Test" delivery was 1350 g.p.m. or _____ c.f.s. Drawdown was 90 feet.

Size of pump and motor used to make test 12" Bowls

Length of time of test _____ hours _____ minutes.

If flowing well, give flow _____ c.f.s. or _____ g.p.m. and of shut off pressure _____

If flowing well, described control works _____ (TYPE AND SIZE OF VALVE, ETC.)

Water will be used for IRRRIGATION Weight of casing per lineal foot 33.38

Thickness of casing .250 Casing material pipe (STEEL, CONCRETE, WOOD, ETC.)

Diameter, length and location of casing 633 Ft. FROM SURFACE DOWN TO (CASING 18" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER; CASING OVER 18" IN DIAMETER, GIVE OUTSIDE DIAMETER)

## CASING RECORD

| Diam. Casing | From Feet | To Feet | Length | Remarks—seals, grouting, etc. |
|---|---|---|---|---|
| 12" | Surface | 630 | 630' | |
| 8" | 665 | 775 | 100' | |
| | | | | |
| | | | | |
| | | | | |

Number and size of perforations none located _____ feet to _____ feet from ground

_____ _____ _____

_____ _____ _____

Date of commencement of well About June 27/61 Date of completion of well March 12, 1962

SWSE S. 9 4S 7E

G-1

## WELL LOG

| From Feet | To Feet | Type of Material | Water-bearing Formation Ans. Yes or No | Casing Perforated Ans. Yes or No |
|---|---|---|---|---|
| 0 | 40 | hard lava | | |
| 40 | 42 | open dry crevice | | |
| 42 | 50 | hard lava | | |
| 50 | 60 | soft rock | | |
| 60 | 81 | hard lava, tools run off, bit battered. crevice at 858 trickle of water at 82 | | |
| 81 | 90 | softer rock | | |
| 90 | 96 | red cinders | | |
| 96 | 103 | rock 7 brown clay, firm | | |
| 103 | 125 | hard lava | | |
| 125 | 129 | cinders cavey | | |
| 129 | 133 | hard basalt | | |
| 133 | 141 | brocken rock & cinders cavey | | |
| 141 | 144 | crevice, bad hole | | |
| 144 | 176 | hard lava, shot hole at 155 | | |
| 176 | 178 | broken rock | | |
| 178 | 202 | medium lava | | |
| 202 | 206 | extra hard lava | | |
| 206 | 208 | crevice, lost water | | |
| 208 | 211 | broken rock & crevice | | |
| 211 | 220 | medium basalt, holding water | | |
| 220 | 222 | soft streak, lost water | | |
| 222 | 227 | soft & hard streaks, wont hold water | | |
| 227 | 232 | hard & soft streaks, holding water again | | |
| 232 | 234 | red cinders | | |
| 234 | 255 | hard lava, very rough going | | |
| 255 | 262 | cinders & broken rock | | |
| 262 | 280 | broken rock lost water & cuttings | | |
| 280 | 297 | firm lava | | |
| 297 | 303 | picked up drillings pomous rock, water at 387 | | |
| 303 | 307 | soft material, lost water | | |
| 307 | 325 | hole very bad, shooting every 6 Ft. | | |
| 325 | 335 | medium lava | | |
| 335 | 348 | very hard lava, bit batters | | |
| | | If more space is required use Sheet No. 2 | | |

### WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed Henry J. Thomas

By _____

License No. 24

Dated _____, 19____

098950

SHEET NO. 2

Well Owner H. Groefsema

Well Driller JOHNSON DRILLING

Well Location ELMORE COUNTY
4S 7E Sec. 17
SW SE

WELL LOG

| From Feet | To Feet | Type of Material | Water-bearing Formation Ans. Yes or No | Casing Perforated Ans. Yes or No |
|---|---|---|---|---|
| 348 | 351 | medium lava | | |
| 351 | 353 | broken rock, water | | |
| 353 | 365 | yellow clay | | |
| 365 | 401 | hard lava with soft streaks | | |
| 401 | 405 | cinders | | |
| 405 | 445 | very hard grey lava | | |
| 445 | 448 | black lava some water coming in | | |
| 448 | 455 | red rock | | |
| 455 | 475 | broken rock, water bearing | | |
| 475 | | tested well Sept 29-61 set bowls at 430' 800GPM | | |
| 475 | 482 | lost cuttings more water coming in | | |
| 482 | 508 | hard & soft layers very few cutting more water | | |
| 508 | 512 | broken rock water bearing | | |
| 512 | 558 | firm black lava | | |
| 558 | 588 | blue shale | | |
| 588 | 590 | grey soft clay | | |
| 590 | 628 | soft grey sticky clay caving | | |
| 628 | 645 | very hard | | |
| 645 | 687 | medium firm clay | | |
| 687 | 691 | pea & larger gravel | | |
| 691 | 752 | hard sand stone with 1 to 2' thick layers of clay | | |
| 752 | 765 | brown sticky clay cavey | | |
| 765 | 772 | grey clay and chalk cavey | | |
| 772 | 775 | unable to hold open, set 100 Ft. 8" liner shoe on each end | | |
| 775 | 835 | layers of sand stone and clay | | |
| 835 | 862 | sticky clay bottomed hole | | |
| | | | | |
| | to | 475 Ft. 20" hole | | |
| | | 475 to 630 16" hole | | |
| | | 630 to 775 12" hole | | |
| | | 775 to 862 8" hole(bottom) | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | USNS | | |
| | | | | |
| | | | | |
| | | SW SE 8 9 4S 7E | | |
| | | | | |

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Well Log Form 1
4/59 2 M

424833
04S-08E-14AAA1

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Department of Reclamation

# WELL LOG AND REPORT OF THE STATE RECLAMATION ENGINEER OF IDAHO

Permit No. _____ Well No. I County Elmore

Owner Ballard

Address Boise, Idaho

Driller Huston Drillers

Address Box 489 Caldwell Idaho

Well location NE ¼ NE ¼ Sec. 14, T. 4S N/S, R. 8e E/W

Size of drilled hole 24" 20in I35 I6in [illegible] I2 in.

I15 I3 in. Total depth of well 583

Locate well in section

| | |
|---|---|
| NW¼ | NE¼ |
| SW¼ | SE¼ |

Give depth to standing water from the ground 416 Water temp. 48 °Fahr.

On "Pumping Test" delivery was None g.p.m. or _____ c.f.s. Drawdown was _____ feet.

Size of pump and motor used to make test I2 in. Bowls 350 Diesel

Length of time of test 3 hr.s hours _____ minutes.

If flowing well, give flow _____ c.f.s. or _____ g.p.m. and of shut off pressure _____

If flowing well, described control works _____

Water will be used for _____ (TYPE AND SIZE OF VALVE, ETC.) Weight of casing per lineal foot 42lb.

Thickness of casing 250 wall Casing material steel (STEEL, CONCRETE, WOOD, ETC.)

Diameter, length and location of casing 343 ft. I6 in. 28 ft. I4 250 Liner (CASING 12" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER; CASING OVER 12" IN DIAMETER, GIVE OUTSIDE DIAMETER)

0 to 343 465 to 493 I4 in liner

## CASING RECORD

| Diam. Casing | From Feet | To Feet | Length | Remarks—seals, grouting, etc. |
|---|---|---|---|---|
| I6 | 0 | 343 | | |
| I4 | 465 | 493 | | Torch Perforated 26 ft. |
| | | | | |
| | | | | |

Number and size of perforations _____ located _____ feet to _____ feet from ground

_____ _____ _____

_____ _____ _____

Date of commencement of well May I9 64 Date of completion of well Oct. I964

NENE S.14 4S 8E

61

## WELL LOG

| From Feet | To Feet | Type of Material | Water-bearing Formation Ans. Yes or No | Casing Perforated Ans. Yes or No |
|---|---|---|---|---|
| 0 | 21 | Light Red Soil | | |
| 21 | 68 | grey lava | | |
| 68 | 84 | red lava | | |
| 84 | 96 | red cinders | | |
| 96 | 210 | grey lava | | |
| 210 | 305 | red cinders with small gravel and clay | | |
| 305 | 339 | black cinders | | |
| 339 | 355 | hard yellow clay | | |
| 355 | 463 | black lava | yes | |
| 463 | 465 | broken lava | yes | |
| 465 | 480 | clay bolders some soft clay | yes | yes |
| 480 | 556 | yellow clay | no | |
| 556 | 570 | large crevice with coarse sand | yes | |
| 570 | 583 | yellow clay | no | |
| | | | | |
| | | | | |
| | | | | |
| | | If more space is required use Sheet No. 2 | | |

## WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed Huston Drillers

By Guy F Daly

License No. 186

Dated Jan. 12, 19 65.

439977
04S-07E-28BBA1

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Form 238-7
6/07

# IDAHO DEPARTMENT OF WATER RESOURCES
## WELL DRILLER'S REPORT

1. WELL TAG NO. D 0067519
Drilling Permit No. 968010-874069
Water right or injection well # _____
2. OWNER: Dave Olson Page 1 of 2
Name Dave Olson
Address 8813 Old Hwy 30
City Mountain Home State ID Zip 83647

3. WELL LOCATION:
Twp. 4 North ☐ or South ☒ Rge. 7 East ☒ or West ☐
Sec. 28 ____ 1/4 (Tenths) NW 1/4 (40 acres) NW 1/4 (10 acres)
Gov't Lot _____ County Elmore
Lat. 43 ° 03.201 (Deg. and Decimal minutes)
Long. 115 ° 38.054 (Deg. and Decimal minutes)
Address of Well Site 8813 Old Hwy 52
(Give or post name of road - Distance to Road or Landmark) City Mtn. Home
Lot. _____ Blk. _____ Sub. Name _____

4. USE:
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☐ Other _____

5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other _____

6. DRILL METHOD:
☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other _____

7. SEALING PROCEDURES:

| Seal material | From (ft) | To (ft) | Quantity (lbs or ft³) | Placement method/procedure |
|---|---|---|---|---|
| Bentonite | 0 | 62' | 1,550 lbs | Poured |
| | | | | |

8. CASING/LINER:

| Diameter (nominal) | From (ft) | To (ft) | Gauge/ Schedule | Material | Casing | Liner | Threaded | Welded |
|---|---|---|---|---|---|---|---|---|
| 6" | +2' | 714' | .250 | Steel | ☒ | ☐ | ☐ | ☒ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 714 ft.

9. PERFORATIONS/SCREENS:
Perforations ☐ Y ☒ N Method _____
Manufactured screen ☐ Y ☒ N Type _____
Method of installation _____

| From (ft) | To (ft) | Slot size | Number/ft | Diameter (nominal) | Material | Gauge or Schedule |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

Length of Headpipe _____ Length of Tailpipe _____
Packer ☐ Y ☒ N Type _____

10. FILTER PACK:

| Filter Material | From (ft) | To (ft) | Quantity (lbs or ft³) | Placement method |
|---|---|---|---|---|
| 10/20 Silica | | | | |
| Sand | 716' | 720' | 50 lbs. | Poured |

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) _____
Describe control device _____

12. STATIC WATER LEVEL and WELL TESTS:
Depth first water encountered (ft) 416 ft. Static water level (ft) 416 ft.
Water temp. (°F) 72° Bottom hole temp. (°F) _____
Describe access port Well Cap

Well test:

| Drawdown (feet) | Discharge or yield (gpm) | Test duration (minutes) |
|---|---|---|
| - | 50 gpm | 3 hrs. |
| | | |

Test method: Pump ☐ ☐ Bailer ☐ ☐ Air ☒ ☐ Flowing artesian ☐ ☐

Water quality test or comments: _____

13. LITHOLOGIC LOG and/or repairs or abandonment:

| Bore Dia. (in) | From (ft) | To (ft) | Remarks, lithology or description of repairs or abandonment, water temp. | Water Y | Water N |
|---|---|---|---|---|---|
| 10" | 0 | 1' | Top Soil | | X |
| 10" | 1' | 4' | Clay | | X |
| 10" | 4' | 15' | Lava | | X |
| 10" | 15' | 21' | Cinders | | X |
| 10" | 21' | 37' | Lava | | X |
| 10" | 37' | 44' | Cinders | | X |
| 10" | 44' | 55' | Lava | | X |
| 10" | 55' | 57' | Void / No Return | | X |
| 10" | 57' | 62' | Lava / No Return | | X |
| 8" | 62' | 135' | Lava / No Return | | X |
| 8" | 135' | 147' | Cinders / No Return | | X |
| 8" | 147' | 330' | Lava / No Return | | X |
| 8" | 330' | 334' | Clay | | X |
| 8" | 334' | 348' | Sand & Gravel | | X |
| 8" | 348' | 354' | Clay | | X |
| 8" | 354' | 393' | Sand & Gravel | | X |
| 8" | 393' | 405' | Clay | | X |
| 6" | 405' | 439' | Sand & Gravel | X | |
| 6" | 439' | 443' | Clay | | X |
| 6" | 443' | 496' | Black Gravel & White Sand | X | |
| 6" | 496' | 500' | Clay | | X |
| 6" | 500' | 550' | Black Gravel & Sand | X | |
| 6" | 550' | 553' | Clay | | X |
| 6" | 553' | 587' | Black Gravel | X | |
| 6" | 587' | 603' | Clay | | X |
| 6" | 603' | 616' | Fine Black Sand | X | |
| 6" | 616' | 619' | Clay | | X |
| 6" | 619' | 636' | Fine Black Sand | X | |
| 6" | 636' | 640' | Clay | | X |
| 6" | 640' | 654' | Fine Black Sand | X | |
| 6" | 654' | 656' | Baked Clay | | X |
| | | | Continued on Pg 2 | | |

Completed Depth (Measurable): 716 ft.
Date Started 10/28/2014 Date Completed: 12/8/2014

14. DRILLER'S CERTIFICATION:
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Post Drilling Inc. Co. No. 670
*Principal Driller _____ Date 12/10/2014
*Driller _____ Date 12/10/2014
*Operator II _____ Date _____
Operator I _____ Date _____

* Signature of Principal Driller and rig operator are required.

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WATER RESOURCES
WESTERN REGION

Form 238-7
6/07

# IDAHO DEPARTMENT OF WATER RESOURCES
# WELL DRILLER'S REPORT

**1. WELL TAG NO. D** 0067519
Drilling Permit No. 968010-874069
Water right or injection well #

**2. OWNER:** Dave Olson Page 2 of 2
Name Dave Olson
Address 8813 Old Hwy 30
City Mountain Home State ID Zip 83647

**3.WELL LOCATION:**
Twp. 4 North ☐ or South ☒ Rge. 7 East ☒ or West ☐
Sec. 28 10 acres 1/4 NW 40 acres 1/4 NW 160 acres 1/4
Gov't Lot County Elmore
Lat 43 ° 03.201 (Deg. and Decimal minutes)
Long. 115 ° 38.054 (Deg. and Decimal minutes)
Address of Well Site 8813 Old Hwy 52
(Give at least name of road + distance to Road or Landmark) City Mtn. Home
Lot. Blk. Sub. Name

**4. USE:**
☒ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☐ Other

**5. TYPE OF WORK:**
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other

**6. DRILL METHOD:**
☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other

**7. SEALING PROCEDURES:**

| Seal material | From (ft) | To (ft) | Quantity (lbs or ft³) | Placement method/procedure |
|---|---|---|---|---|
| | | | | |
| | | | | |

**8. CASING/LINER:**

| Diameter (nominal) | From (ft) | To (ft) | Gauge/ Schedule | Material | Casing | Liner | Threaded | Welded |
|---|---|---|---|---|---|---|---|---|
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |
| | | | | | ☐ | ☐ | ☐ | ☐ |

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s)

**9. PERFORATIONS/SCREENS:**
Perforations ☐ Y ☐ N Method
Manufactured screen ☐ Y ☐ N Type
Method of installation

| From (ft) | To (ft) | Slot size | Number/ft | Diameter (nominal) | Material | Gauge or Schedule |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

Length of Headpipe Length of Tailpipe
Packer ☐ Y ☐ N Type

**10.FILTER PACK:**

| Filter Material | From (ft) | To (ft) | Quantity (lbs or ft³) | Placement method |
|---|---|---|---|---|
| | | | | |
| | | | | |

**11. FLOWING ARTESIAN:**
Flowing Artesian? ☐ Y ☐ N Artesian Pressure (PSIG)
Describe control device

**12. STATIC WATER LEVEL and WELL TESTS:**
Depth first water encountered (ft) Static water level (ft)
Water temp. (°F) Bottom hole temp. (°F)
Describe access port

**Well test:**

| Drawdown (feet) | Discharge or yield (gpm) | Test duration (minutes) |
|---|---|---|
| | | |
| | | |

**Test method:** Pump ☐ Bailer ☐ Air ☐ Flowing artesian ☐

Water quality test or comments:

**13. LITHOLOGIC LOG and/or repairs or abandonment:**

| Bore Dia. (in) | From (ft) | To (ft) | Remarks, lithology or description of repairs or abandonment, water temp. | Water Y | Water N |
|---|---|---|---|---|---|
| 6" | 656' | 664' | Fine Black Sand | X | |
| 6" | 664' | 670' | Baked Clay | | X |
| 6" | 670' | 675' | Fine Black Sand | X | |
| 6" | 675' | 678' | Baked Clay | | X |
| 6" | 678' | 684' | Fine Black Sand | X | |
| 6" | 684' | 687' | Baked Clay | | X |
| 6" | 687' | 695' | Fine Black Sand | X | |
| 6" | 695' | 704' | Baked Clay | | X |
| 6" | 704' | 713' | Fine Black Sand | X | |
| 6" | 713' | 718' | Clay | | X |
| 6" | 718' | 735' | Fine Black Sand | X | |

RECEIVED
JAN 08 2015
WATER RESOURCES
WESTERN REGION

Completed Depth (Measurable) 716 ft.
Date Started: 10/28/2014 Date Completed: 12/8/2014

**14. DRILLER'S CERTIFICATION:**
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Post Drilling Inc. Co. No. 670
*Principal Driller Date 12/10/2014
*Driller Date 12/10/2014
*Operator II Date
Operator I Date

* Signature of Principal Driller and rig operator are required

# Appendix B

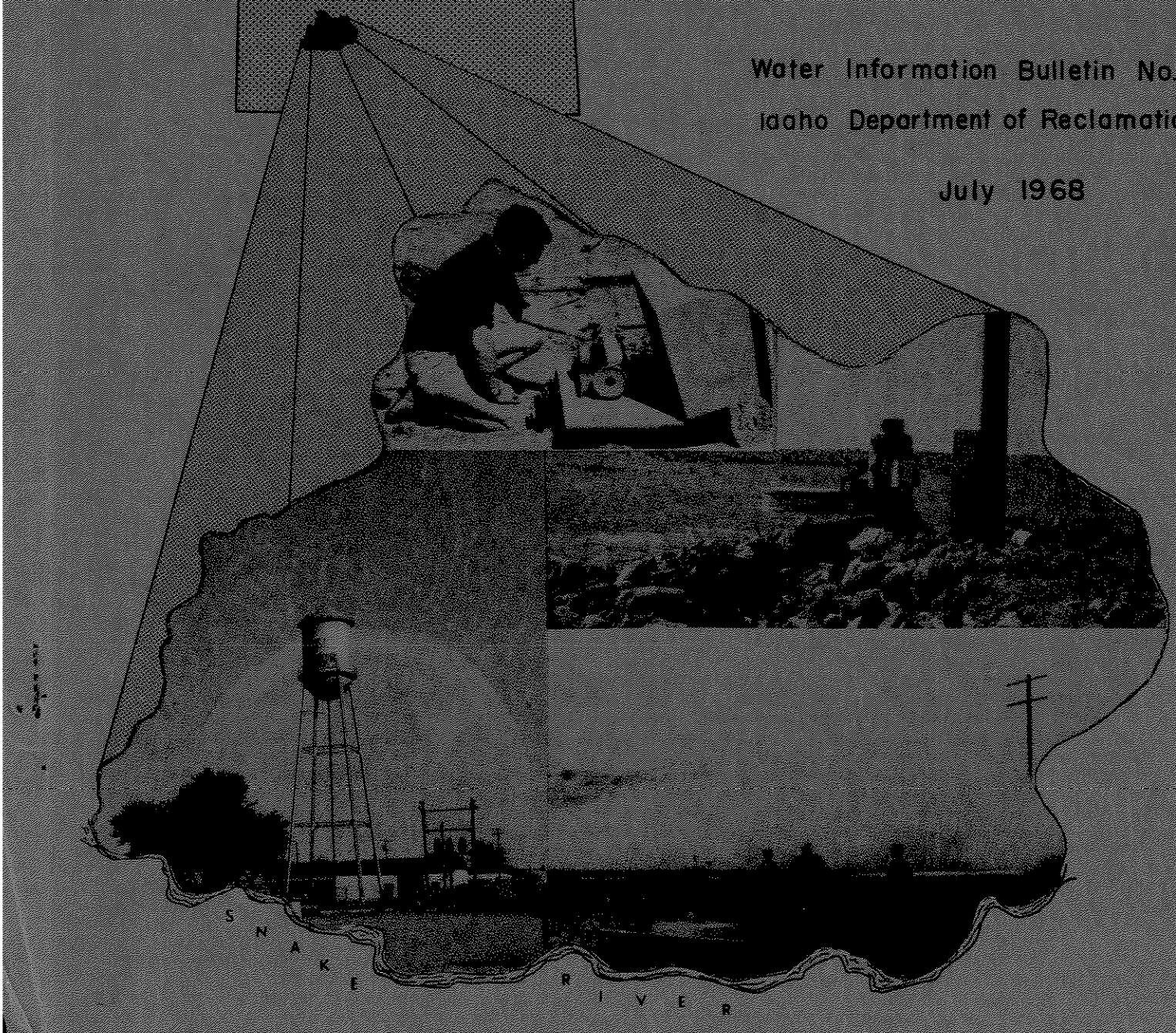
## Historical Groundwater Flow Gradient Maps

# GROUND WATER RESOURCE OF THE MOUNTAIN HOME AREA, ELMORE COUNTY, IDAHO

Water Information Bulletin No. 4

Idaho Department of Reclamation

July 1968



WATER INFORMATION BULLETIN NO. 4

# GROUND-WATER RESOURCE OF THE MOUNTAIN HOME AREA, ELMORE COUNTY, IDAHO

by

Dale R. Ralston Hydrologist

and

Sherl L. Chapman Geologist

Prepared and Published by

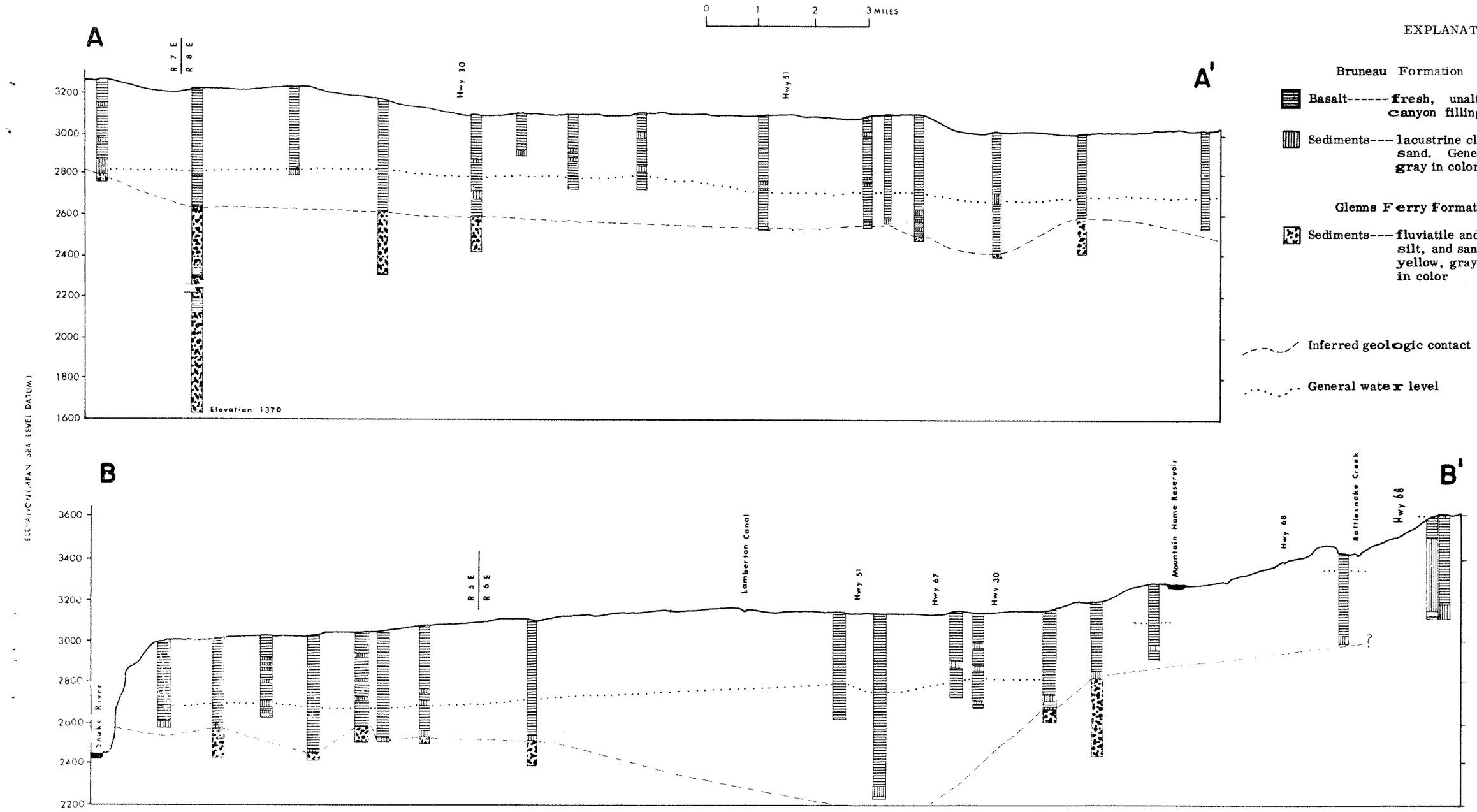
Idaho Department of Reclamation

R. Keith Higginson

State Reclamation Engineer

JULY 1968

Figure 4.-- Generalized Geologic Cross Sections




EXPLANATION

**Bruneau Formation**

Basalt------fresh, unaltered flows of canyon filling basalt

Sediments---lacustrine clay, silt, and fine sand. Generally tan to light gray in color

**Glenns Ferry Formation**

Sediments---fluviatile and lacustrine clay, silt, and sand. Variegated yellow, gray, and olive green in color

Inferred geologic contact

General water level

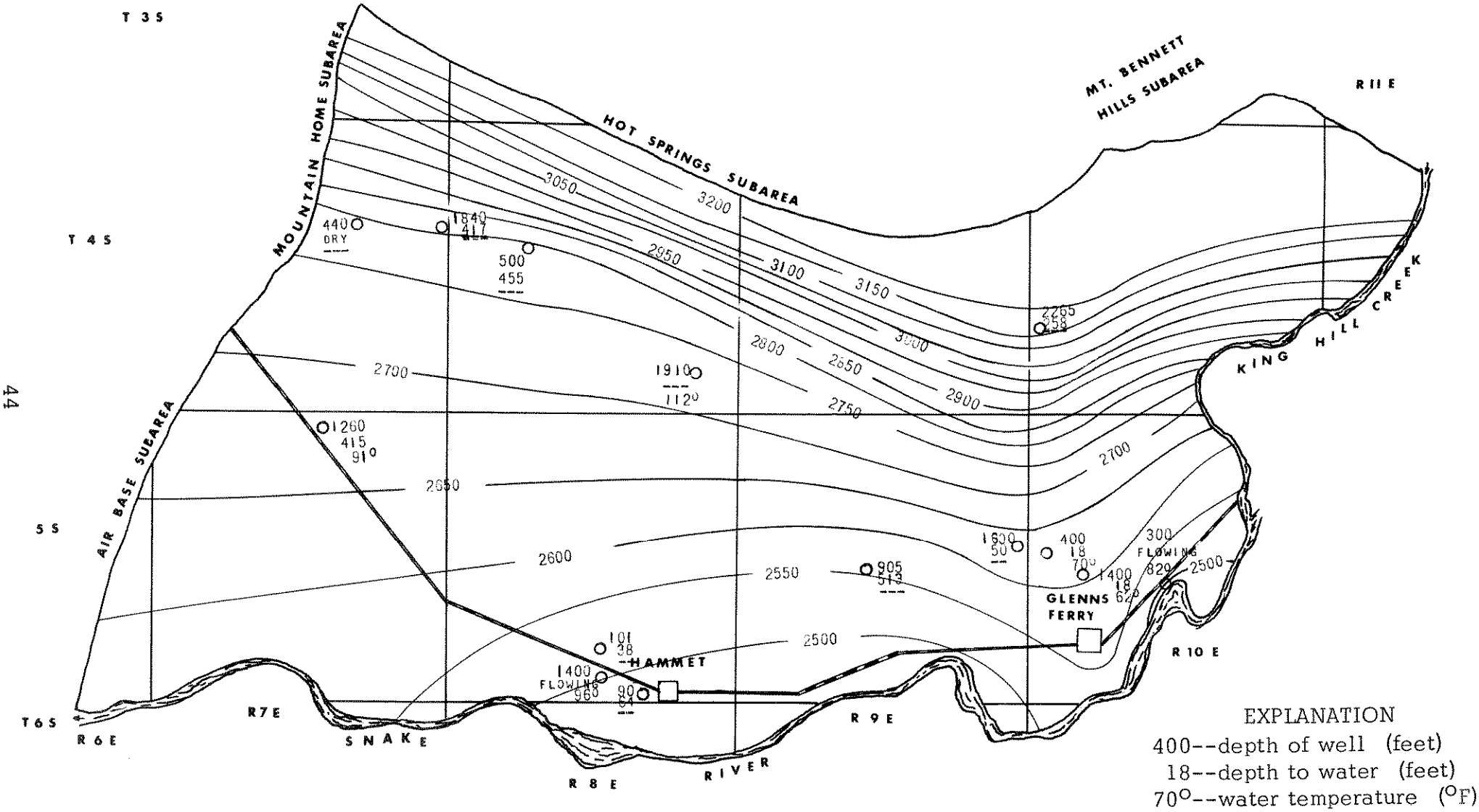



Figure 11.--Contours of water level elevation for the Glenns Ferry subarea and the location, depth, depth to water, and water temperature of most of the wells

# GROUND-WATER QUALITY IN THE WESTERN SNAKE RIVER BASIN, SWAN FALLS TO GLENNS FERRY, IDAHO

By D. J. Parliman

---

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 83-4062

Prepared in cooperation with the
IDAHO DEPARTMENT OF WATER RESOURCES

Boise, Idaho
October 1983

UNITED STATES DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

---

For additional information, write to:

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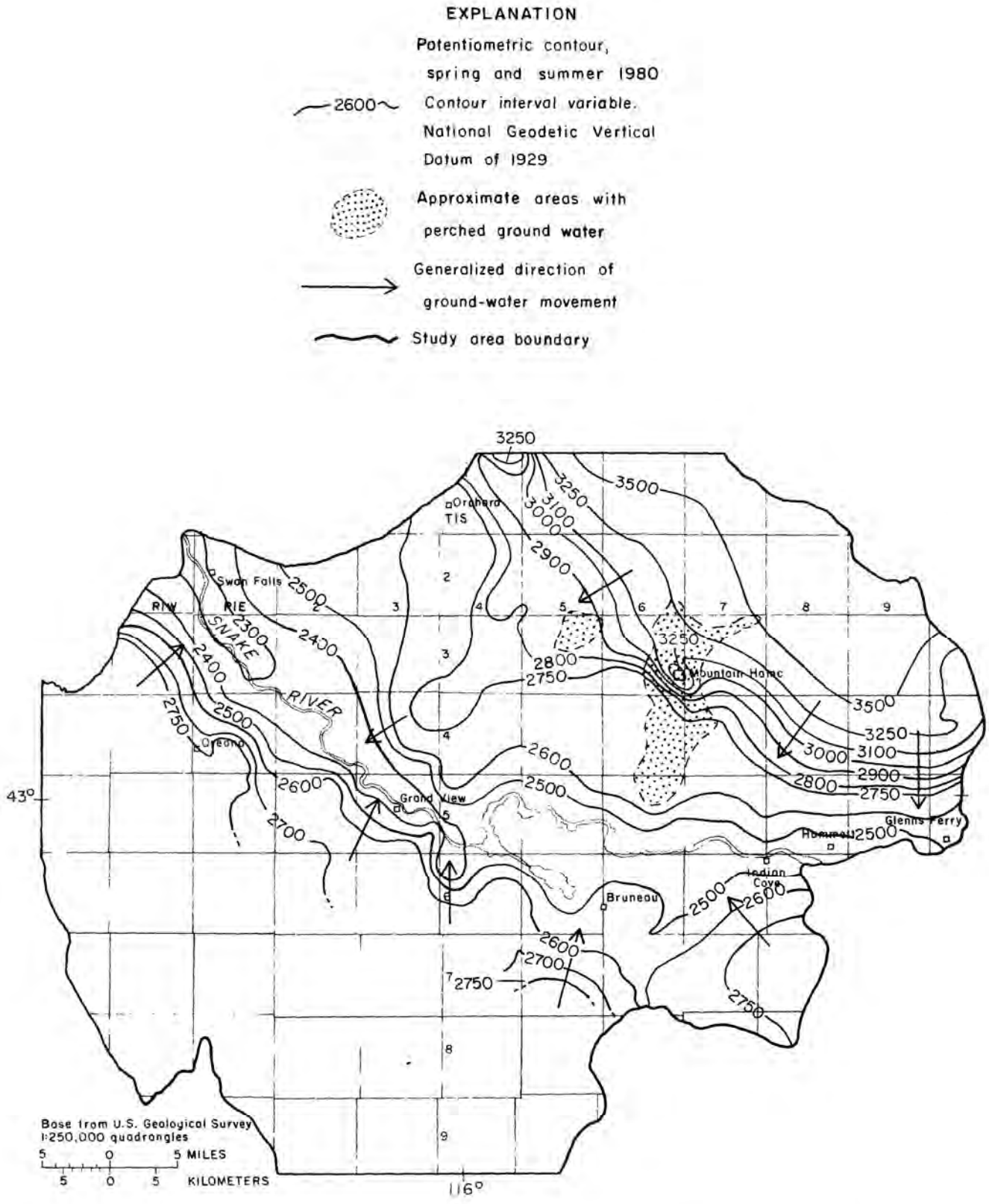


**Figure 5. -- Contours on the potentiometric surface, 1980, and generalized direction of ground-water movement.**

# Appendix C

## Groundwater Sampling and Analysis Plan

# 2024 Bennett Road Landfill Groundwater Sampling and Analysis Plan

*Prepared for*
Elmore County

October 2024

Parametrix

# 2024 Bennett Road Landfill Groundwater Sampling and Analysis Plan

*Prepared for*

Elmore County
150 S 4th E Street
Mountain Home, ID 83647

*Prepared by*

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October 2024 | 553-7443-006

# Citation

Parametrix. 2024. 2024 Bennett Road Landfill Groundwater Sampling and Analysis Plan. Prepared for Elmore County by Parametrix, Boise, Idaho. October 2024.

# Certification

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional hydrogeologist licensed to practice as such, is affixed below.


Shira DeGrood

10/21/2024

Prepared by Shira DeGrood, PG

Approved by Tiffany Neier, PE

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# Contents



## TABLES



## APPENDICES

# Acronyms and Abbreviations

| | |
|---|---|
| ASTM | American Society of Testing and Materials |
| BRL | Bennett Road Landfill |
| CFR | Code of Federal Regulations |
| EPA | Environmental Protection Agency |
| IDAPA | Idaho Administrative Code |
| IDEQ | Idaho Department of Environmental Quality |
| MCLs | maximum contaminant levels |
| QAPP | Quality Assurance Project Plan |
| SAP | Sampling and Analysis Plan |
| SOP | standard operating procedure |
| Subtitle D | Federal Regulation 40, CFR Part 258, Solid Waste Disposal Facility Criteria |
| SWFA | Idaho Solid Waste Facilities Act |
| VOC | volatile organic compound |

# 1. Introduction

This groundwater sampling and analysis plan (SAP) describes the proposed groundwater monitoring program for the Bennett Road Landfill (BRL) in Elmore County, Idaho. The facility is located approximately 6 miles southeast of Mountain Home along I-84. The address of the landfill is 6100 SE County Landfill Road, Mountain Home, Idaho, 83647. The groundwater monitoring program is designed to meet the applicable federal and state regulations and additional criteria established by the Idaho Department of Environmental Quality (IDEQ). The groundwater monitoring program meets federal regulations for municipal waste landfills (Federal Regulation 40, Code of Federal Regulations [CFR] Part 258, Solid Waste Disposal Facility Criteria [Subtitle D] and the Idaho Solid Waste Facilities Act [SWFA; §39-7410]). This groundwater monitoring program does not include procedures for leachate and underdrain monitoring or for surface water monitoring.

This SAP includes procedures for background characterization sampling and subsequent long-term groundwater monitoring. Following completion of at least eight quarters of groundwater monitoring, a background characterization assessment will be performed and the results provided in a data report. Proposed updates to the sampling program following background characterization would also be provided in data reports and implemented with approval from IDEQ. This approach will allow for determination of site-specific performance standards that will best meet monitoring goals.

# 2. Groundwater Monitoring Locations

Two point of compliance wells are proposed for installation downgradient of current Cell 1 and future Cell 2 of the BRL. The proposed monitoring wells will be installed into the uppermost aquifer below the facility and appropriately placed to detect potential impacts from leachate that may enter the underlying groundwater system.

Cell 2 will be constructed with a leachate collection system and the leachate may be monitored once Cell 2 construction is complete. Analytical data on leachate may be assessed to determine likely indicator parameters for future groundwater statistical assessment.

Well 04S-07E-14AAA1 is the Facility Supply Well and is located upgradient of Cells 1 and 2. It is installed into the regional shallow aquifer below the facility and appropriately placed to provide background information on groundwater conditions prior to migration under Cells 1 and 2. The sample collection location will be a faucet that is connected to the system; the target sampling faucet will be determined prior to the initial sampling event. Additional wells such as House Well 04-07E-13AAD3 may also be present upgradient, northeast of the facility on the County-owned parcel and completed in the regional shallow aquifer. If this well is intact, it may also be added to the monitoring well network for background water quality monitoring.

# 3. Sampling and Analysis

This section describes the monitoring schedule and procedures for water level measurements, sample collection, laboratory test parameters, and quality assurance. Samples will be collected for purposes of background characterization for at least eight quarters. Following background characterization, updates to the monitoring schedule, test parameters, and associated procedures may be recommended to meet Facility-specific monitoring goals.

## 3.1 Monitoring Schedule

Groundwater monitoring will be conducted quarterly for the first eight sampling events to determine background conditions for statistical analysis. Once background conditions have been established, future monitoring events will be compared to the background conditions for the statistical evaluation, either interwell or intrawell comparisons, following regulations provided in 40 CFR Subpart D and guidance provided in the U.S. Environmental Protection Agency's (EPA's) Unified Guidance (2009) and IDEQ's Statistical Guidance for Determining Background Ground Water Quality and Degradation (2014).

## 3.2 Water Level Measurements

Static groundwater levels will be measured during each sampling event in the monitoring wells. Water levels will also be measured in the Facility Supply Well prior to the start of sampling. The pump will be off in the Facility Supply Well for a sufficient amount of time prior to measuring water level to allow for water level recovery to a static water level. If any House well (Wells 04-07E-13AAD1 through -13AAD4) is present, static water levels will also be measured at this location.

Prior to the first groundwater monitoring event, the recovery time for the Facility Supply Well will be assessed by placing a pressure transducer in the well and measuring water level drawdown and recovery. The transducer will remain in place for approximately one week. Water level data during pumping and non-pumping conditions will be used for determining required recovery time for future events. Measurements of the Facility Supply Well pump intake depth and total depth may also be collected, depending on access. Further investigation of drawdown rates may be performed in conjunction with collection of groundwater samples at this well, as described in the following subsections.

Depth to groundwater will be measured in accordance with the standard operating procedure (SOP) for Static Water Level Measurement, presented in Appendix A. Water levels will be measured to the nearest 0.01 foot using an electronic water level indicator. Water levels will be measured before, during, and after purging to assess drawdown effects at each well.

## 3.3 Sample Collection Procedures

Dedicated submersible groundwater sampling pumps will be installed in MW-1 and MW-2. The wells will be purged using a low-flow purging technique in accordance with the SOP for Groundwater Sampling (Appendix A). Groundwater stabilization parameters will include temperature, pH, specific conductivity, visual color, and visual turbidity. Samples will be collected when field parameters stabilize in accordance with the SOP for Groundwater Sampling presented in Appendix A.

The Facility Supply Well has a dedicated submersible groundwater pump. Water from this well will likely be accessed through an adjacent exterior faucet. As part of the baseline characterization, a series of samples will be collected under different purge/sample conditions using the currently installed pump. Drawdown and recovery of groundwater elevations will also be assessed during well purging by installing a transducer in the well. Assessed purge conditions are expected to include, but are not limited to, the following. Parameters included in the groundwater elevation assessment will be updated after initial data collection:

- Standard low-flow purging, as described in the SOP for Groundwater Sampling (Appendix A).
- Drawdown of water level to pump intake depth and recovery to 1/2-length of water column.
- Removal of one well volume followed by standard low-flow purging.

Following each purge condition, a groundwater sample will be collected and analyzed following procedures described in Section 3.4. Water level and analytical data will be assessed and an SOP for long-term sampling of the Facility Supply Well will be developed. If a House well is present, a SOP will be established to allow sampling of the well.

## 3.4 Test Parameters

Samples will be tested in the field for the following parameters. Samples to be tested for dissolved metals will be field-filtered through 0.45-micron disposable filters.

- Temperature
- pH
- Specific conductivity
- Dissolved oxygen (DO)
- Oxidation-Reduction Potential (ORP)
- Turbidity

All laboratory analyses will be performed by an EPA-certified laboratory that will provide sample bottles with the appropriate preservatives. Analyses will be performed in accordance with standard EPA analysis methods (EPA Publication Number SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods [EPA 1996]).

Detection monitoring parameters for groundwater will include those summarized in Table 1. Parameters for groundwater analysis will include those metals and volatile organic compounds (VOCs) specified in Appendix I of 40 CFR part 258 and additional cations/anions that may be indicators of leachate.

Required sample containers, preparation, preservatives, and holding times for the test methods will be as specified in the RCRA Technical Enforcement Guidance Document (EPA 1986), and Standard Methods for the Examination of Waste and Wastewater (APHA et al. 1989) and are specified in the quality assurance project plan (QAPP, presented in Appendix B).

Table 1. Detection Monitoring Parameters for Groundwater Samples

| Parameters Required by Subtitle D (Appendix I) | | |
|---|---|---|
| **Metal Constituents[1,2]** | | |
| Antimony | Arsenic | Barium |
| Beryllium | Cadmium | Chromium |
| Cobalt | Copper | Lead |
| Nickel | Selenium | Silver |
| Thallium | Vanadium | Zinc |
| **Organic Constituents[3]** | | |
| Acetone | Acrylonitrile | Benzene |
| Bromochloromethane | Bromodichloromethane | Bromoform |
| Carbon disulfide | Carbon tetrachloride | Chlorobenzene |
| Chloroethane | Chloroform | Dibromochloromethane |
| 1,2-Dibromo-3-chloropropane | 1,2-Dibromoethane | 1,2-Dichlorobenzene |

| Parameters Required by Subtitle D (Appendix I) | | |
|---|---|---|
| 1,4-Dichlorobenzene | Trans-1,4-Dichloro-2-butene | 1,1-Dichloroethane |
| 1,2-Dichloroethane | 1,1-Dichloroethene | Cis-1,2-Dichloroethene |
| Trans-1,2-Dichloroethylene | 1,2-Dichloropropane | Cis-1,3-Dichloropropene |
| Trans-1,3-Dichloropropene | Ethylbenzene | 2-Hexanone |
| Bromomethane | Methyl chloride | Dibromomethane |
| Dichloromethane | 2-Butanone | Methyl iodide |
| 4-Methyl-2-pentanone | Styrene | 1,1,1,2-Tetrachloroethane |
| 1,1,2,2-Tetrachloroethane | Tetrachloroethene | Toluene |
| 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | Trichloroethene |
| Trichlorofluoromethane | 1,2,3-Trichloropropane | Vinyl acetate |
| Vinyl chloride | Xylenes | |
| **Additional Inorganic Indicator Parameters[2,4]** | | |
| Chloride | Nitrate | Calcium |
| Sulfate | Magnesium | Sodium |
| Potassium | Bicarbonate alkalinity | |

Samples will not be field-filtered prior to laboratory analysis.
Metals will be tested by U.S. Environmental Protection Agency (EPA) Method 6010 or 7000 series or equivalent.
Organic constituents will be tested by EPA Method 8260 or equivalent.
Additional constituents will be tested by Standard Method 2320 and EPA Method 9056A or equivalent.

## 3.5 Field Documentation

A field sampling data sheet is included in the SOP for Groundwater Sampling (Appendix A). A data sheet will be filled out for each well during each sample event. This sampling sheet contains information regarding Facility and well conditions, sampling and purging procedures, and field measurements. At a minimum, the following information will be documented:

- Purging information (e.g. date, start time, location identifier).
- Well-specific information (e.g., total depth, top of screen).
- Depth to groundwater.
- Field parameter measurements (temperature, pH, specific conductivity, DO, ORP, turbidity).
- Sample and purged water observations (e.g., odor, color).
- Time of sample collection.

# 4. Data Analysis and Reporting

This section describes the data evaluation procedures and data reporting procedures for the groundwater monitoring program. Following completion of at least eight quarters of groundwater monitoring, a background characterization assessment will be performed. Proposed updates to the data evaluation procedures will be provided as part of the background characterization assessment and implemented with approval from IDEQ. This approach will allow for determination of site-specific performance standards that will best meet monitoring goals.

## 4.1 Data Evaluation

### 4.1.1 Quality Assurance/Quality Control Evaluation

Procedures for quality assurance/quality control evaluation of the data are presented in the QAPP (Appendix B).

### 4.1.2 Comparison to Groundwater Quality Criteria

The groundwater data will be compared to applicable state and federal groundwater quality criteria. Applicable criteria are federal maximum contaminant levels (MCLs), Idaho Regulations for Public Drinking Water Supplies (Idaho Administrative Code [IDAPA] 58.01.08), and Idaho Groundwater Quality Standards (IDAPA 58.01.11).

Performance standards will be developed as part of this effort in compliance with 40 CFR 258.53(h) after completion of the background characterization assessment, described in further detail in the following subsections. In addition, during the background characterization assessment, any detection of VOCs in the quarterly monitoring shall be compared to the above applicable groundwater quality criteria. Resampling may be performed to confirm detections of VOC data.

### 4.1.3 Statistical Evaluation of Data for Background Characterization

The statistical evaluation program will be developed in accordance with Subtitle D (Section 258.53[g]) and using guidance provided in Statistical Guidance for Determining Background Ground Water Quality and Degradation (IDEQ 2014); American Society of Testing and Materials (ASTM) standard D6312-17 Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities (ASTM 2017); and Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities (EPA 2009).

Background characterization will include at least eight quarters of groundwater elevation, field parameters, and analytical data collected from MW-1, MW-2, the Facility Supply Well, and other wells (if present). A background characterization assessment will be performed to determine the appropriate long-term statistical evaluation methods for this Facility. The assessment will include use of multiple statistical tests, following the methods described in 40 CFR 258.53(g) and may include outlier tests, distribution tests, seasonality tests, trend analysis, and other tests as deemed appropriate based on initial results. Statistical evaluation may also include calculation of upper prediction limits, control charts, and use of verification resampling. This initial statistical evaluation will be used to assess if an interwell or an intrawell determination is appropriate for this Facility. Background characterization will be updated as appropriate as the groundwater monitoring program continues. Recommendations for the long-term monitoring program, associated statistical methods, and performance standards (as described in 40 CFR 258.53[h]) will be provided in the data reports described below.

### 4.1.4 Required Actions Following Findings of Statistically Significant Increases in Constituent Levels

A background characterization assessment, including statistical analysis, will be performed following background characterization sampling. Performance standards will be developed as part of this effort in compliance with 40 CFR 258.53(h). During the background characterization sampling, any detection of VOCs shall be evaluated following applicable state and federal criteria. Resampling may be performed to confirm the data.

Once statistical baselines are established, the following procedures will be followed by the owner or operator in the event that a statistically significant increase over previous data is detected for one or more constituents, as required under Subtitle D (Section 258.54(c)). Within 14 days of this finding, a notice must be placed in the operating record. If it cannot be demonstrated that a source other than the landfill caused the contamination or that the statistically significant increase results from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality; an assessment monitoring program as described in Subtitle D (Section 258.55) must be initiated.

## 4.2 Data Reports

Data reports during the background characterization phase will be transmitted to the Central District Health Department and IDEQ quarterly. Data reports will consist of a table summarizing the data for that monitoring event and a discussion of the data results. The report will include the field forms, laboratory data package, chain-of-custody forms, data tables, trilinear diagrams, a potentiometric surface map, and a data validation report. An annual report will be completed each year which will include the quarterly monitoring parameters as well as time series plots, upcoming changes at the BRL, and recommendations for adjustments to the monitoring plan.

After completion of background characterization sampling (a minimum of eight sampling events), a background characterization assessment will be performed and described in a data report, as described in Section 4.1. Performance standards and recommendations for updates to the groundwater monitoring program will also be provided in this data report. This approach will allow for determination of site-specific performance standards that will best meet monitoring goals. Additional recommendations for adjustments to the groundwater monitoring program may also be provided in subsequent annual reports.

# 5. References

APHA (American Public Health Association), American Water Works Association, and Water Pollution Control Federation. 1989. Standard Methods for the Examination of Waste and Wastewater. 17th edition.

ASTM (American Society of Testing and Materials). 2017. ASTM D6312-17. Provisional Standard Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs.

EPA (U.S. Environmental Protection Agency) 1986. RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

EPA. 1996. Test Methods for Evaluating Solid Waste - Chemical/Physical Methods (SW-846). Third edition.

EPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance, EPA 530/R-09-007. March 2009.

IDEQ (Idaho Department of Environmental Quality). 2014. Statistical Guidance for Determining Background Ground Water Quality and Degradation. March 2014.

# Appendix A

## Standard Operating Procedures and Checklists

# APPENDIX A
# Table of Contents

# Standard Operating Procedure
# Static Water Level Measurement

## Objective

The objective of this standard operating procedure is to describe a method for collecting a static water level measurement. Measurements will be made from groundwater monitoring wells accurate to the nearest 0.01 foot from a standard reference point on the well casing.

## Materials

The following materials are required for the collection of static water level measurements:

- Well keys.
- Electronic water-level indicator.
- Weighted steel tape.
- Paper towels.
- Deionized water.
- Health and safety equipment.

## Procedure

The following steps will be taken during the collection of a static water level measurements:

1. Unlock and open well. Verify well integrity.
2. Lower electronic water level indicator to the water surface.
3. When the sounder indicates that the indicator probe has contacted water, raise and lower the probe to verify exact point at which measurement should be taken.
4. Measure the depth to water, to the nearest 0.01 foot, from the reference point (notch or mark on well casing).
5. Record the measurement, to the nearest 0.01 foot, in the field notebook or on the Sampling Field Data Sheet.
6. Measure total well depth to the nearest 0.1 foot using water level indicator.
7. Replace well cap and close and lock protective well casing.

## Decontamination

The following steps will be taken during decontamination of down-hole measuring equipment:

1. While winding the equipment up from the well, thoroughly rinse with deionized water.
2. Remove excess water from the equipment with clean paper towels prior to rewinding equipment on the reel.

## Notes

Measurements will be made under appropriate health and safety procedures.

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# Standard Operating Procedure
# Groundwater Sampling

## Objective

The objective of this standard operating procedure is to describe methods for the collection of groundwater samples from monitoring wells. Groundwater sample collection procedures include equipment cleaning, water elevation measurements, well purging, and sampling.

## Materials

The following materials will be used for collection of groundwater samples:

- Sample containers.
- Specific conductivity, pH, temperature meter, and probes.
- Electronic water-level indicator.
- Pump controller.
- Filters for dissolved metals, as needed.

Prior to the sampling event, all equipment which will be placed in the well or come in contact with the groundwater sample will be disassembled and cleaned using the procedure described in the Standard Operating Procedure Decontamination section.

## Procedures

1. Record data collected during purge and sampling on the Groundwater Sampling Field Data Sheet, provided at the end of this SOP.
2. Prior to purging a monitoring well, measure the depth to water using the method described in the Standard Operating Procedure Static Water Level Measurement section.
3. Unlock well and remove cover.
4. Measure initial water level from reference point to the nearest 0.01 foot. Reconfirm measurement and record on field sampling data sheet.
5. Start pumping well at 100 to 500 milliliters per minute (ml/min) using dedicated pump. Record on field sampling data sheet.
6. Monitor indicator parameters (pH, specific conductivity, and temperature) every 3 to 5 minutes during purging of well and record on field sampling data sheet. Additional indicator parameters may include oxidation-reduction potential, dissolved oxygen, and turbidity. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized within the following bounds for three consecutive readings:
    1.1. Temperature (3%).
    2.2. pH (±0.1 units).
    3.3. Specific conductance (3%) .
    4.4. Oxidation-reduction potential (±10 millivolts).

5.5. Dissolved oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized).

6.6. Turbidity (visually stable or 10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized).

7. Collect samples using dedicated discharge hose directly into prelabeled sample containers at a flow rate between 100 and 500 ml/min. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. Volatile organic compound (VOC) samples should be collected so that no headspace exists to prevent air from remaining in the bottle; after capping, invert and tap the container to ensure no air bubbles are present. Field-filter samples to be tested for dissolved metals through a 0.45-micron membrane filter immediately before filling sample containers.
8. Close and lock well.
9. Dispose of purge water on the ground surface.
10. After purging is complete, begin sample collection. When a pump is used for sampling, operate with as little fluctuation in pumping rates as possible to minimize turbulence and aeration of the pump effluent. Samples will be collected in the following order to minimize volatilization:
    a. Volatiles.
    b. Inorganics.
    c. Metals.
11. Fill sample containers for volatile samples so that no headspace exists. After capping, invert the container and tap to verify that no air bubbles are present. For parameters other than volatile organic compounds, fill the sample container to within 2–5 cm of the top, in a manner to minimize aeration. When sampling for dissolved metals, filter the sample using a peristaltic pump and in-line disposable 0.45-micron filter.
12. Label all sample containers at the time of sampling. Sample labels will include the following information:
    a. Project name and number.
    b. Sample station.
    c. Sample number.
    d. Date and time of sample collection.
    e. Sampler's initials.
    f. Analyses requested.
13. Store all samples at approximately 4°C for transport to the laboratory under chain-of-custody procedures. Samples that will be analyzed for volatile organic compounds will not be placed in direct contact with ice. Upon completion of sampling, the well will be locked and secured.

# Decontamination

During field sampling, all equipment surfaces placed in well or in contact with groundwater samples will be cleaned before purging and sampling the next well. The equipment will be cleaned using the method described in the Standard Operating Procedure Decontamination section.

# Groundwater Sampling Field Data Sheet

Well #:_____

| | | | |
|---|---|---|---|
| **Project Number:** | 553-7443-006 | **Date:** | |
| **Project Name:** | Bennett Road Landfill | **Company Name:** | |
| **Project Address:** | 6100 SE County Landfill Road | **Sampled By:** | |

**Casing Diameter:** 2″ _ 4″ _ 6″ _____ Other _____

| | | | |
|---|---|---|---|
| **Initial Depth to Water (feet):** | | **Purge Rate Measurement Method:** | |
| **Depth of Well (feet):** | | **Date Purged:** | |
| **Top of Screen (feet)** | | **Purge Time (from/to):** | |
| **Reference Point (surveyor's notch, etc.):** | | **Time Sampled:** | |

| TIME (2400 hr) | DEPTH TO WATER (ft) | TEMP °C | pH (units) | Ec (µmhos/ cm 25°C) | ORP (mv) | DO (mg/L) | TURBIDITY (visual or NTUs) | PUMP SETTING |
|---|---|---|---|---|---|---|---|---|
| Initial | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Stabilization Criteria | | 3% | ± 0.1 | 3% | ± 10 mv | 10%, or 3 <0.5 | 10%, or 3 <5.0 | |

**Purge Equipment:** **Flow Rate:**

| | | | |
|---|---|---|---|
| **Laboratory:** | | **Date Sent to Lab:** | |
| **Shipment Method** | | **Field QC Sample Number:** | |

**Remarks:**

**Signature:** _____

# Standard Operating Procedure
# Decontamination

## Objective

The objective of this standard operating procedure is to describe decontamination procedures to be followed during the performance of field activities.

## Materials

The following materials are required for performance of equipment decontamination:

- Scrub brush.
- Alconox® or equivalent soap.
- Deionized water.
- Water tubs.
- Health and safety equipment.

## Procedures

The following steps will be taken during decontamination of equipment and materials which may affect sample quality:

1. Scrub with non-phosphate detergent.
2. Rinse thoroughly with deionized water.

## Notes

- Decontamination wastes will be disposed of according to project-specific considerations.

Decontamination will be performed under Level D health and safety procedures. Site-specific conditions may require additional health and safety precautions.

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# Groundwater Monitoring Procedures Checklist

## Two Weeks Prior To Sampling Event

1. Check equipment and sampling kits 2 weeks before scheduled sampling:
    a. Does the kit contain everything on the checklist? If not, order or purchase.
    b. Are pH buffers or conductivity standard past their expiration date? If so, order new solution.
    c. Is pH fill solution within 1 inch of fill hole? If not, add KCl.
    d. Go through calibration (Step 3) and correct any problems if a probe will not calibrate properly.
    e. Make sure all other equipment is operating properly.
2. Order sample containers from laboratory. **See Quality Assurance Project Plan (QAPP) for Sample Container Request** Forms**.**

## One Week Prior To Sampling Event

1. Print sample labels and field data sheets.
2. Check samples containers, affix labels, separate bottles into groups for each location.

## Day Of Sampling

1. Calibrate pH/Conductivity Meter (instructions provided for Corning Checkmate):
    a. Rinse pH probe with deionized water, insert into pH 7 solution, and press “cal.”
    b. When readout goes to 7.00, rinse again, insert into pH 4 solution, and press “cal” again.
    c. When readout goes to 4.00, rinse tip thoroughly, replace rubber cap filled with pH 7 buffer, and slide rubber sleeve to cover vent hole.
    d. Attach conductivity probe to meter and press “cal.”
    e. When readout goes to zero, insert probe into 1413 µmhos/cm conductivity standard, making sure the silver bands are covered without air bubbles in the sleeve, and press “cal” again. **Note: don’t place probe directly into large supply bottle because you may contaminate it. Just pour what you need into a smaller container and close the large bottle immediately.**
    f. When readout stabilizes at 1413 µmhos/cm, remove sleeve and rinse probe and sleeve with deionized water.
    g. Press “mode” twice to turn off meter.
2. Measure static water level. **See Standard Operating Procedure Static Water Level Monitoring** section**.**
3. Purge well. **See Standard Operating Procedure Groundwater Sampling** section**.**
4. Collect groundwater samples. **See Standard Operating Procedure Groundwater Sampling** section**.**

5. Collect duplicate sample (to be tested for all parameters):
    a. Select one groundwater location where duplicate sample will be collected.
    b. Prepare an extra set of sample containers for all parameters and label them with the sample number and suffix-D (e.g., M5-D).
    c. Align sample bottles and duplicate bottles by parameter.
    d. Collect sample for volatile organic compounds (VOCs) then collect duplicate for VOCs. Continue in this manner until all sample bottles are filled.
    e. Field filter the duplicate sample for dissolved metals using the same tubing and filter as the corresponding sample (see No. 6 below for field filtration procedures).
6. Field filter samples for dissolved metals analysis:

    Dedicated Pump

    a. Place 0.45 micron disposable cartridge filter in-line with dedicated discharge hose.
    b. Collect sample directly into the labeled sample container.
7. Complete chain-of-custody form:
    a. Indicate sample locations, date and time of sampling, and required analyses.
    b. Indicate by bottle and analytical group whether samples were preserved or field-filtered.
    c. Sign and date.
8. Prepare samples for shipment to laboratory in a cooler:
    a. Tape drain plug of cooler shut on inside and outside.
    b. If samples are to be shipped, place each sample bottle in a separate sealed plastic bag and place back in the cooler on ice.
    c. Seal chain-of-custody forms inside a plastic bag and tape to the inside of the cooler lid.
    d. Place at least two custody seals across the lid and body of the cooler.

# Groundwater Monitoring Equipment Checklist

## Instruments

Water level indicator

pH/conductivity/temperature meter

conductivity standard

pH buffers

Operation manual

Landfill and well keys

Bailers, if needed

Rope, if needed

5-gallon bucket to measure purge volume, if required

Cup to collect water for pH/conductivity/temperature measurements

Sample bottles (provided by laboratory)

Plastic tape for sample bottle labels

Cooler and ice

Gloves

Paper towels

Waterproof pens and pencils

Field book

Extra 9-volt battery

Self-sealing freezer bags

Knife

Plastic sheeting

Deionized Water

Tygon tubing

Peristaltic pump

0.45 micron filters

Sampling and Analysis Plan (SAP)

Pump controller

Generator

## Forms

Sampling Field Data Sheets

Chain-of-Custody

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# Appendix B

## Bennett Road Landfill Quality Assurance Project Plan

# 2024 Bennett Road Landfill Quality Assurance Project Plan

*Prepared for*
Elmore County

July 2024

Parametrix

# 2024 Bennett Road Landfill Quality Assurance Project Plan

*Prepared for*

Elmore County
150 S 4th E Street
Mountain Home, ID 83647

*Prepared by*

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July 2024 | 553-7443-006

# Citation

Parametrix. 2024. 2024 Bennett Road Landfill Quality Assurance Project Plan . Prepared for Elmore County by Parametrix, Boise, Idaho. July 2024.

# Certification

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.


Shira DeGrood

10/21/2024

Prepared by Shira DeGrood, PG

Checked by Michael Brady, LG, LHG

Lisa A. Gilbert

Approved by Lisa Gilbert, LG, LHG

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# Contents (continued)



## TABLES

# Acronyms and Abbreviations

| | |
|---|---|
| BRL | Bennett Road Landfill |
| CFR | Code of Federal Regulations |
| CLP | Contract Laboratory Program |
| DI | deionized |
| DQIs | data quality indicators |
| DQOs | data quality objectives |
| EPA | U.S. Environmental Protection Agency |
| HAZWOPER | Hazardous Waste Operation and Emergency Response |
| IDAPA | Idaho Administrative Code |
| LCS | laboratory control sample |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| QA | quality assurance |
| QAPP | quality assurance project plan |
| RPD | relative percent difference |
| SOPs | standard operating procedures |
| Subtitle D | Federal Regulation 40, CFR Part 258, Solid Waste Disposal Facility Criteria |

# 1. Introduction

The purpose of this quality assurance project plan (QAPP) is to establish a system of quality and performance checks pertaining to collection of groundwater and surface water samples, laboratory analysis of samples, and reporting of results for the Bennett Road Landfill (BRL). This QAPP describes procedures to be used for sample collection and analysis and defines the data quality objectives (DQOs) and criteria for the project. Parametrix prepared this QAPP in accordance with the U.S. Environmental Protection Agency (EPA) requirements contained in the following:

- QA/R-5, EPA Requirements for Quality Assurance Project Plans (EPA 2001a).
- QA/G-5, EPA Guidance for Quality Assurance Project Plans (EPA 2002).

# 2. Project Management

## 2.1 Project Organization

Specific project quality assurance (QA) responsibilities for the BRL groundwater monitoring project are described in Table 2-1.

Table 2-1. Quality Assurance Responsibilities, BRL Groundwater Monitoring Project

| Personnel | Responsibilities |
|---|---|
| Project Manager<br>Parametrix<br>(206) 394-3700-6200 | Coordinate field program and project-agency interaction with Elmore County. Oversee technical team performance to ensure successful accomplishment of the technical and quality assurance (QA) project objectives; review QA needs and approve QA corrective action where necessary. |
| Landfill Manager<br>Elmore County Landfill<br>Deb Ireland<br>208-943-1476 - mobile<br>208-943-1474 - office | Ensure that all field sampling and handling procedures are followed and documented; ensure that field QA objectives are met; coordinate and participate in the field sampling activities; report to the Project QA Officer any discrepancies or deviations from the QAPP. |
| Project QA Officer<br>Parametrix<br>(206) 394-3700 | Direct implementation of QAPP, provide technical QA assistance, prepare QA Reports for the Project Manager, evaluate laboratory data, perform QA/quality control (QC), and prepare data validation reports. |
| Laboratory QA Officer<br>Selected laboratory | Ensure that all laboratory QA objectives are met and data package QA/QC deliverables from the laboratory are correctly documented and reported. |
| Central District Health Department<br>Brent Copes, REHS/RS<br>Environmental Health Specialist Senior<br>Community & Environmental Health<br>208-580-6004 – office<br>208-860-5469 - mobile<br>BCopes@cdh.idaho.gov - email | Agency review and approval of groundwater monitoring plan and quarterly and annual reports. |

## 2.2 Project Description

This QAPP addresses the groundwater monitoring program for the BRL in Elmore County, Idaho. The facility is located approximately 6 miles southeast of Mountain Home along I-84. The address of the landfill is 6100 SE County Landfill Road, Mountain Home, Idaho, 83647.

## 2.3 Background

The groundwater monitoring approach is designed to meet the applicable federal and state regulations. The monitoring program will meet federal and state regulations for municipal waste landfills (Federal Regulation 40, Code of Federal Regulations [CFR] Part 258, Solid Waste Disposal Facility Criteria [Subtitle D], Idaho Administrative Code [IDAPA] 58.01.06, and the Idaho Solid Waste Facilities Act [§39-7410]).

# 2.4 Quality Objectives and Criteria

## 2.4.1 Data Quality Objectives

DQOs were developed according to EPA's DQOs Process (EPA 2000) to provide data of known and appropriate quality. The DQO process is a seven-step planning approach to develop sampling designs for data collection activities that support decision-making. It provides a systematic procedure for defining the criteria that a data collection design should satisfy. The DQOs for the project are shown in Table 2-2.

Table 2-2. Sampling DQOs

| Data Quality Objective (DQO) | Description |
|---|---|
| State the Problem | Meet state and federal requirements for groundwater monitoring at municipals landfills to determine whether potential contaminants from the landfill are affecting groundwater quality. |
| Identify the Decisions | Are the contaminant levels above applicable groundwater quality criteria?<br>Are contaminant levels increasing in detection monitoring wells? |
| Identify the Inputs to the Decisions | Analytical results (What are the detected concentrations? Are they above background levels? Were quality assurance/quality control [QA/QC] criteria met?). |
| Define the Study Boundaries | The landfill property boundaries and (possibly) downgradient areas. |
| Develop a Decision Rule | Results will be compared to Federal maximum contaminant levels (MCLs, from EPA Drinking Water Regulations), Idaho Regulations for Public Drinking Water Supplies, and Idaho Groundwater Quality Standards.<br>Results will be compared to intrawell upper prediction limits (UPLs). |
| Specify Tolerable Limits on Decision Errors | The tolerable limits of uncertainty regarding the extent of contamination at the subject properties will be based on professional judgment.<br>Tolerable limits on analytical results are determined by the QA/QC criteria defined in this QAPP. |
| Optimize the Design | Develop defensible groundwater monitoring locations, analytical procedures, and data analysis procedures to provide an early warning of groundwater contamination.<br>Obtain appropriate qualitative limits for monitoring parameters so results can be compared to groundwater quality criteria. |

## 2.4.2 Data Quality Indicators

Data quality and usability are evaluated in terms of performance criteria. Performance and acceptance criteria are expressed in terms of data quality indicators (DQIs). The principal indicators of data quality are precision, accuracy, bias, sensitivity, completeness, comparability, and representativeness. Table 2-3 provides a description of project DQIs.

Table 2-3. General Description of DQIs

| Data Quality Indicator (DQI) | Description |
|---|---|
| Precision | A measure of agreement among repeated measurements of the same property under identical conditions. Usually assessed as a relative percent difference (RPD) between duplicate measurements. RPD guidelines for laboratory duplicate analyses are contained in the standard operating procedures (SOPs) for each analytical method and will be obtained from the laboratory for validation purposes. |
| Accuracy | A measure of the overall agreement of a measurement to a known value. Analytical accuracy is assessed as percent recovery from matrix spike or reference material measurements. Percent recovery guidelines are contained in laboratory SOPs for each analytical method. |
| Bias | The systematic or persistent distortion of a measurement process that causes error in one direction. Usually assessed with reference material or matrix spike measurements. Bias as reported by the laboratory will be used to assess data validity. |
| Sensitivity | The capability of a method or instrument to meet prescribed reporting limits. Assessed by comparison with risk-based reporting limits, method reporting limits, instrument reporting limits, or laboratory quantitation limits, as appropriate. In general, reporting limits for the analytical methods used will be at or below applicable criteria. |
| Completeness | A measurement of the amount of valid data needed to be obtained for a task. Assessed by comparing the amount of valid results to the total results set. Project requirements for completeness are 90%. |
| Comparability | A qualitative term that expresses the measure of confidence that one data set can be compared to another. Assessed by comparing sample collection and handling methods, sample preparation and analytical procedures, holding times, reporting units, and other QA protocols. To ensure comparability of data collected for the BRL to previous data, standard collection and measurement techniques will be used. |
| Representativeness | A qualitative term that expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sample point, or environmental condition. To ensure representativeness, the sampling design will incorporate sufficient samples so that contamination is detected, if present. Additionally, all sampling procedures detailed in this QAPP will be followed. |

## 2.5 Special Training and Certification

All personnel conducting sampling activities on the project facility must be 40-hour Hazardous Waste Operation and Emergency Response (HAZWOPER) trained per 29CFR 1910.120 and be current with their annual 8-hour refresher course.

All personnel working at the project facility will be briefed on potential site hazards, health and safety procedures, and sampling procedures. Following completion of this training, all personnel will be required to sign an acknowledgment form verifying that they have completed the task-specific training.

## 2.6 Sampling Documentation and Records

Sampling and sample handling records to be used for groundwater and surface water sampling are listed in Table 2-4.

Table 2-4. Sampling and Sample Handling Records

| Record | Use | Responsibility/Requirements |
|---|---|---|
| Field Notebook | Record significant events and observations. | Maintained by field sampler/geologist; must be bound; all entries must be factual, detailed, objective; and entries must be signed and dated. |
| Sampling Field Data Sheet | Provide a record of each sample collected. | Completed, dated, and signed by sampler; maintained in project file. |
| Sample Label | Accompanies sample; contains specific sample identification information. | Completed and attached to sample container by sampler. |
| Chain-of-Custody Form | Provides a record of each sample number, date of collection/transport, sample matrix, analytical parameters for which samples are to be analyzed. Documents chain-of-custody for sample handing. | Completed by sampler at time of sampling/ transport; copies distributed to laboratory project file. Documented by sample number. Original accompanies sample. A copy is retained by the Project QA Officer. |
| Chain-of-Custody Seal | Seals sample shipment container (e.g., cooler) to prevent tampering or sample transference. Individual samples do not require custody seals, unless they are to be archived, before going to the lab for possible analysis at a later date. | Completed, signed, and applied by sampler at time samples are transported. |
| Sampling Container Request | Documents number of samples, analytical parameters, sampling dates. | Prepared by field coordinator and distributed to analytical laboratory prior to each sampling event. |

### 2.6.1 Field Logs and Forms

A bound field notebook will be maintained to provide daily records of significant events and observations that occur during field investigations. Pages of the field notebook are not to be removed, destroyed, or thrown away. Sampling Field Data Sheets will be used to document collection of each sample. All field logs and forms will be retained in the project files.

All entries are to be made in ink, signed, and dated. Corrections will be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside. The correction will be initialed and dated. Most corrected errors will require a footnote explaining the correction. If an error made on a document is assigned to one person, that individual may make corrections simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on a document should be corrected by the person who made the entry.

### 2.6.2 Photographs

All photographs taken of field activities will be documented with the following information noted in the field notebook:

- Date, time, and location of photograph taken.
- Description of photograph taken.
- Reasons photograph was taken.
- Viewing direction.

Digital photographs will be reviewed in the field to assess quality and the need to retake the photograph. For nondigital photographs, the photographer will review the photographs or slides when they return from developing, and compare them to the log, to assure that the log and the photographs match.

# 3. Data Generation and Acquisition

## 3.1 Sampling Design

Groundwater samples will be collected from upgradient and downgradient wells. The monitoring wells are installed into the uppermost monitorable aquifer below the facility and are appropriately placed to detect potential impacts from leachate that may enter the underlying groundwater system.

## 3.2 Sampling Methods

Samples will be collected from groundwater wells at the facility. Sample locations and procedures for sample collection are specified in standard operating procedures in the groundwater sampling and analysis plan.

The following Table 3-1 provides a summary of sample analyses and specifications for containers, preservation, and holding times.

**Table 3-1. Sample Containers, Preparation, Preservatives, and Holding Times for Groundwater Samples**

| Sample Container | Container Size | Preservation and Handling | Analyses | Holding Times [1,2,3] |
|---|---|---|---|---|
| Glass vials; Teflon-lined silicon septum caps | (3) 40 ml | Fill leaving NO AIR SPACE, keep in dark on ice (4°C) | Volatile organics | 7 days; 14 days if preserved |
| Glass or plastic bottle | 500–1000 ml | $HNO_3$ to pH < 2 | Metals, unfiltered | 6 months |
| Plastic bottle | 500 ml | Keep on ice (4°C) | Chloride/Sulfate/ Nitrate/ Bicarbonate Alkalinity | 28 days 7 days 48 hours 14 days |
| Plastic or glass beaker | | In field | pH, temperature, specific conductivity | 28 days |

[1] APHA-AWWA-WPCF. 1989. Standard Methods for the Examination of Waste and Wastewater, 17th edition.

[2] U.S. Environmental Protection Agency. 1983. Methods for Chemical Analysis of Water and Wastes.

[3] U.S. Environmental Protection Agency. 1996. Test Methods for Evaluating Solid Waste (SW-846), 3rd Edition.

## 3.3 Sample Handling and Custody

This section describes standard operating procedures for sample custody and the chain-of-custody procedures to be used for this project. These procedures ensure that the quality and integrity of the samples are maintained during their collection, transportation, storage, and analysis.

Sample documents will be carefully prepared so that sample identification and chain-of-custody can be maintained and sample disposition controlled. Sample identification documents will include:

- Field notebooks.
- Sampling Field Data Sheets.
- Sample labels.
- Chain-of-custody records.

### 3.3.1 Chain-of-Custody

The chain-of-custody procedures used for this program provide an accurate written or computerized record that can be used to trace the possession of each sample from the time each is collected until completion of all required analyses. A sample is in custody if it is in any of the following places:

- In someone's physical possession.
- In someone's view.
- In a secured container.
- In a designated secure area.

The following information will be provided on the chain-of-custody form:

- Sample identification numbers.
- Matrix type for each sample.
- Analytical methods to be performed for each sample.
- Number of containers for each sample.
- Sampling date and time for each sample.
- Names of all sampling personnel.
- Signatures and dates indicating the transfer of sample custody.

#### 3.3.1.1 Field Custody Procedures

The following field custody procedures will be followed:

- As few people as possible will handle the samples.
- Coolers or boxes containing cleaned sample bottles will be sealed with a custody tape seal during transport to the field or while in storage before use.
- The sample collector will be responsible for the care and custody of the samples collected until the samples are transferred or dispatched properly.
- The sample collector will record sample data on the sample collection form.
- The field coordinator will determine whether proper custody procedures were followed during the field work and will decide if additional samples are required.

#### 3.3.1.2 Laboratory Custody Procedures

A designated sample custodian will accept custody of the shipped samples and verify that the information on the sample labels matches the chain-of-custody records. Pertinent information on shipment, pickup, courier, and condition of the samples will be entered in the Remarks section of the chain-of-custody form. The custodian will enter the sample identification number data into a logbook, which is arranged by project code and station number.

The laboratory custodian will use the sample identification number or assign a unique laboratory number to each sample and then transfer the samples to the proper analyst or store them in the appropriate secure area. Sample control and custody at the laboratory through sample disposal will be conducted in accordance with standard laboratory procedures that maintain the sample integrity and security.

### 3.3.2 Transfer of Custody and Shipment

When samples are transferred, the person relinquishing the samples will sign the chain-of-custody record and record the date and time of transfer. The sample collector will sign the form in the first signature space.

Program documentation of sample custody will be verified by the Project QA Officer during regular review of the data validation package.

The following transfer of custody and shipment procedures will be followed:

- The coolers in which samples are packed must be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them will sign, date, and note the time on the chain-of-custody record to document sample custody transfer.
- Shipping containers will be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information will be entered in the Remarks section of the chain-of-custody record.
- All shipments will be accompanied by the chain-of-custody record identifying their contents. The original record will accompany the shipment. The other copies will be distributed as appropriate to the Project QA Officer and Project Manager.
- If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, a bill of lading will be used. Freight bills, postal services receipts, and bill of lading will be retained as part of the permanent documentation.

### 3.3.3 Sample Identification

Each sample will be labeled, chemically preserved (if required), and sealed immediately after collection. The labels will be filled out using waterproof ink and then firmly affixed to the sample containers and protected with clear, water-resistant tape.

The following information will be given on each sample label:

- Project name and number.
- Name of sampler.
- Date, time, and location of collection.
- Sample designation.
- Analysis required.
- Preservative, if any.

### 3.3.4 Sample Packaging and Shipping

The samples will be transported and handled in a manner that not only protects the integrity of the samples, but also prevents any detrimental effects due to the possible hazardous nature of the samples. Samples will routinely be shipped to the analytical laboratory within 24 hours of sample collection.

# 3.4 Analytical Methods

## 3.4.1 Analytical Methods and Quantitation Limits

Analytical methods and quantitation limits for the planned analyses are presented in Table 3-2. Quantitation limits will be below applicable groundwater quality criteria, if possible, using conventional analytical methods. Quality control checks and decision criteria for determining if an analysis is within quality control requirements will follow the quality control procedures and guidelines listed in SW-846 (EPA 1996).

Where appropriate, these procedures may be modified based on anticipated data uses and with recognition of validation requirements, to incorporate techniques familiar to the project laboratory. The laboratory will notify the Project QA Officer of any proposed procedural changes and document these changes in the cover letter with the data reports.

Matrix interferences may make achievement of the desired detection limits and associated quality control criteria impossible. In such instances, the laboratory must report to the Project QA Officer the reason for noncompliance with quality control criteria or elevated detection limits.

Table 3-2. Proposed Methods and Anticipated Quantitation Limits for Analysis of Groundwater

| Parameters: | Units | Analytical Method | Quantitation Limit (QL) | MCL | IDAPA |
|---|---|---|---|---|---|
| **Conventionals** | | | | | |
| Bicarbonate Alkalinity | mg/L | SM 2320B | 20 | | |
| Calcium | mg/L | 6010 | 0.5 | | |
| Magnesium | mg/L | 6010 | 0.5 | | |
| Sodium | mg/L | 6010 | 10 | | |
| Potassium | mg/L | 6010 | 0.5 | | |
| Nitrate | mg/L | EPA 9056A | 0.01 | 10 | 10 |
| Chloride | mg/L | EPA 9056A | 1 | 250 ** | 250 ** |
| Sulfate | mg/L | EPA 9056A | 2 | 250 ** | 250 ** |
| **Metals** | | | | | |
| Antimony | mg/L | 200.8 | 0.0002 | 0.006 | 0.006 |
| Arsenic | mg/L | 200.8 | 0.0002 | 0.01 | 0.05 |
| Barium | mg/L | 6010 | 0.006 | 2 | 2 |
| Beryllium | mg/L | 6010 | 0.001 | 0.004 | 0.004 |
| Cadmium | mg/L | 6010 | 0.009 | 0.005 | 0.005 |
| Chromium | mg/L | 6010 | 0.005 | 0.1 | 0.1 |
| Cobalt | mg/L | 6010 | 0.003 | | |
| Copper | mg/L | 6010 | 0.003 | 1.0 ** | 1.3 |
| Lead | mg/L | 200.8 | 0.0001 | 0.015*** | 0.015 |
| Nickel | mg/L | 6010 | 0.010 | | |
| Selenium | mg/L | 200.8 | 0.0005 | 0.05 | 0.05 |
| Silver | mg/L | 6010 | 0.003 | 0.1 ** | 0.1 ** |
| Thallium | mg/L | 200.8 | 0.0002 | 0.002 | 0.002 |
| Vanadium | mg/L | 6010 | 0.003 | | |

| Parameters: | Units | Analytical Method | Quantitation Limit (QL) | MCL | IDAPA |
|---|---|---|---|---|---|
| Zinc | mg/L | 6010 | 0.020 | 5 ** | 5 ** |
| **Volatile Organics** | | | | | |
| 1,1,1,2-Tetrachloroethane | µg/L | SW 8260D | 0.2 | | |
| 1,1,1-Trichloroethane | µg/L | SW 8260D | 0.2 | 200 | 200 |
| 1,1,2,2-Tetrachloroethane | µg/L | SW 8260D | 0.2 | | |
| 1,1,2-Trichloroethane | µg/L | SW 8260D | 0.2 | 5 | 5 |
| 1,1-Dichloroethane | µg/L | SW 8260D | 0.2 | | |
| 1,1-Dichloroethene | µg/L | SW 8260D | 0.2 | 7 | 7 |
| 1,2,3-Trichloropropane | µg/L | SW 8260D | 0.5 | | |
| 1,2-Dibromo-3-chloropropane | µg/L | SW 8260D | 0.5 | 0.2 | 0.2 |
| 1,2-Dibromoethane | µg/L | SW8260D | 0.2 | 0.05 | 0.05 |
| 1,2-Dichlorobenzene | µg/L | SW 8260D | 0.2 | 600 | 600 |
| 1,2-Dichloroethane (total) | µg/L | SW 8260D | 0.2 | 5 | 5 |
| 1,2-Dichloropropane | µg/L | SW 8260D | 0.2 | 5 | 5 |
| 1,4-Dichlorobenzene | µg/L | SW 8260D | 0.2 | 75 | 75 |
| 2-Butanone | µg/L | SW 8260D | 5.0 | | |
| 2-Hexanone | µg/L | SW 8260D | 5.0 | | |
| 4-Methyl-2-pentanone | µg/L | SW 8260D | 5.0 | | |
| Acetone | µg/L | SW 8260D | 5 | | |
| Acrylonitrile | µg/L | SW 8260D | 1.0 | | |
| Benzene | µg/L | SW 8260D | 0.2 | 5 | 5 |
| Bromochloromethane | µg/L | SW 8260D | 0.2 | | |
| Bromodichloromethane | µg/L | SW 8260D | 0.2 | 80 THM | 100 |
| Bromoform | µg/L | SW 8260D | 0.2 | 80 THM | 100 |
| Bromomethane | µg/L | SW 8260D | 1.0 | | |
| Carbon disulfide | µg/L | SW 8260D | 0.2 | | |
| Carbon tetrachloride | µg/L | SW 8260D | 0.2 | 5 | 5 |
| Chlorobenzene | µg/L | SW 8260D | 0.2 | 100 | 100 |
| Chloroethane | µg/L | SW 8260D | 0.2 | | |
| Chloroform | µg/L | SW 8260D | 0.2 | 80 THM | 2 |
| Chloromethane | µg/L | SW 8260D | 0.5 | | |
| cis-1,2-Dichloroethene | µg/L | SW 8260D | 0.2 | 70 | 70 |
| cis-1,3-Dichloropropene | µg/L | SW 8260D | 0.2 | | |
| Dibromochloromethane | µg/L | SW 8260D | 0.2 | 80 THM | 100 |
| Dibromomethane | µg/L | SW 8260D | 0.2 | | |
| Ethylbenzene | µg/L | SW 8260D | 0.2 | 700 | 700 |
| m,p-xylene | µg/L | SW 8260D | 0.4 | 10,000 XYL | 10,000 |
| Methyl Iodide | µg/L | SW 8260D | 1.0 | | |
| Methylene chloride | µg/L | SW 8260D | 1.0 | 5 | 5 |
| o-xylene | µg/L | SW 8260D | 0.2 | 10,000 XYL | 10,000 |
| Styrene | µg/L | SW 8260D | 0.2 | 100 | 100 |
| Tetrachloroethene | µg/L | SW 8260D | 0.2 | 5 | 5 |
| Toluene | µg/L | SW 8260D | 0.2 | 1,000 | 1,000 |

| Parameters: | Units | Analytical Method | Quantitation Limit (QL) | MCL | IDAPA |
|---|---|---|---|---|---|
| Trans-1,2-Dichloroethene | µg/L | SW 8260D | 0.2 | 100 | 100 |
| Trans-1,3-Dichloropropene | µg/L | SW 8260D | 0.2 | | |
| Trans-1,4-Dichloro-2-butene | µg/L | SW 8260D | 1.0 | | |
| Trichloroethene | µg/L | SW 8260D | 0.2 | 5 | 5 |
| Trichlorofluoromethane | µg/L | SW 8260D | 0.2 | | |
| Vinyl Acetate | µg/L | SW 8260D | 0.2 | | |
| Vinyl Chloride | µg/L | SW 8260D | 0.2 | 2 | 2 |

MCL = Federal Maximum Contaminant Level, EPA Drinking Water Regulations

IDAPA = Idaho Regulations for Public Drinking Water Systems (IDAPA 58.01.08) and Idaho Groundwater Quality Standards (IDAPA 58.01.11)

** = National Secondary Drinking Water Standard

*** = Action Level

XYL = Primary MCL for the sum of all xylenes

THM = Primary MCL for the sum of all trihalomethanes

### 3.4.2 Data Reporting

All laboratory data packages will contain the following information:

- Cover letter.
- Chain-of-custody forms.
- Summary of sample results.
- Summary of quality control (QC) results.

The information provided in the cover letter will include:

- Laboratory name, address, and telephone number.
- Date(s) of sample receipt and number of samples received.
- Detailed description of any problems encountered with QC, analysis, shipment or handling procedures.
- Identification of possible reasons for any QC criteria outside acceptance limits.
- Signature of laboratory representative and date certifying data results.

The minimum information to be presented for each sample for each parameter or parameters group will include:

- Client sample number and laboratory sample number.
- Sample matrix.
- Date of extraction/preparation and date/time of analysis.
- Dilution factors.
- Sample weights/volumes used in sample preparation/analysis.
- Identification of analytical instrument.
- Analytical method.

- Detection/quantitation limits.
- Definitions of any data qualifiers used.

The minimum QC summary information to be presented for each sample and for each parameter or parameter group will include:

- Surrogate standard recovery results.
- Matrix QC results (matrix spike/matrix spike duplicate, duplicate).
- Method blank results.
- Laboratory check standard results.

## 3.5 Quality Control

Quality control checks will consist of measurements performed in the field and laboratory. The analytical methods referenced in Section 3.4 specify routine methods required to evaluate data precision and accuracy and determine whether the data are within the quality control limits. Guidelines for minimum samples for field QA/QC sampling and laboratory analysis are summarized in Table 3-3.

Table 3-3. Guidelines for Minimum QA/QC Samples for Field Sampling and Laboratory Analysis of Water Samples

| Field | | | Laboratory | | | | |
|---|---|---|---|---|---|---|---|
| Field Replicate | Field Rinsate Blank [1] | Trip Blank [2] | Matrix Duplicate [3] | Matrix Spikes | Matrix Spike Duplicate [4] | Method Blanks | LCS [5] |
| 1 in 20 6 | 1 in 20 | 1 per cooler | 1 in 20 | 1 in 20 | 1 in 20 | 1 in 20 | 1 in 20 |

1 Field rinsate blanks are not required for dedicated or disposable equipment.
2 Trip Blank analyzed for volatile organic compounds only.
3 Matrix duplicate analyzed for metals.
4 Matrix spike duplicates analyzed for organic analyses.
5 LCS = Laboratory Control Sample.
6 All frequencies of 1 in 20 indicate 1 per batch, when the batch is less than 20.

### 3.5.1 Field QC Samples

The following quality control samples will be evaluated to verify accuracy and precision of laboratory results for this project. The frequency of quality control sample evaluation is also indicated by sample type but may be adjusted when the final sampling schedule is determined. The frequencies of quality control sample evaluation described here should be considered a minimum.

#### 3.5.1.1 Rinsate Blank

One rinsate blank will be analyzed for every 20 samples of a similar matrix (groundwater, surface water), or one per sampling event, whichever is greater. If the equipment used for sampling is dedicated equipment (not reused to obtain other samples), no rinsate blank is necessary.

Rinsate blanks will consist of deionized (DI) or distilled water (supplied by the analytical laboratory) poured over and/or through the sampling equipment after decontamination. Surfaces and materials exposed during actual sampling will be rinsed to evaluate the effectiveness of sampling equipment decontamination procedures and the potential for sample cross-contamination in the field.

#### 3.5.1.2 Trip Blank

There will be one trip blank in each cooler used to ship volatile organic samples to the laboratory. The trip blank will consist of a purged-free DI/distilled water blank supplied by the analytical laboratory. It will be transported to and from the field, then returned to the laboratory unopened and unaltered for analysis. The term "purged-free" water refers to DI/distilled water that has been boiled and capped in the laboratory.

#### 3.5.1.3 Transfer Blank

Transfer blanks will be performed and analyzed if the source of trip blank and rinsate blank contamination cannot be discovered. The transfer blank will consist of DI/distilled water (supplied by the analytical laboratory) transferred in the field into the appropriate sampling containers. The transfer blank will evaluate possible sample contamination from the field.

#### 3.5.1.4 Field Duplicate

A minimum of one field duplicate will be analyzed per 20 samples or one per sampling event (whichever is greater), to verify the precision of laboratory and/or sampling methodology.

### 3.5.2 Laboratory QC Samples

Specific procedures and frequencies for laboratory quality control are detailed by analytical method in the laboratory QA plan. A general description of the types of required laboratory QC samples is provided in the following sections.

#### 3.5.2.1 Method Blank

A minimum of one method blank will be analyzed per 20 samples or one per batch (whichever is greater), to assess possible laboratory contamination. Method blanks will contain all reagents and undergo all procedural steps used for analysis.

#### 3.5.2.2 Laboratory Control Sample

A minimum of one laboratory control sample (LCS) will be analyzed per 20 samples or one per sampling event (whichever is greater), to verify precision of laboratory equipment. The LCS will be a concentration within the calibration range at a different concentration than the standards used to establish the calibration curve. LCS analysis will follow EPA LCS guidelines established in SW-846 (EPA 1996).

#### 3.5.2.3 Matrix Spike

A minimum of one matrix spike (MS) will be analyzed per 20 samples or one per sampling event (whichever is greater), to monitor recoveries and to ensure that extraction and concentration levels are acceptable. The matrix spike will be analyzed on a separate water sample collected at a well or surface water station. The matrix spike will follow the matrix spike guidelines specified in the Contract Laboratory Program (CLP) statements of work (EPA 1993a, 1993b).

#### 3.5.2.4 Matrix Spike Duplicate

A minimum of one matrix spike duplicate (MSD) per 20 samples will be analyzed for volatile organics, or one per sampling event (whichever is greater), to provide information on the precision of chemical analysis. The matrix spike duplicate will be analyzed on a separate water sample collected

at the same sampling station from which the matrix spike is collected. MSDs (rather than matrix duplicates) are analyzed for organic analyses, because of the large number of undetected compounds. Comparing the MS and MSD provides better information on the quality of the data. The MSD will follow EPA MSD guidelines specified in SW-846 (EPA 1996).

#### 3.5.2.5 Matrix Duplicate

A minimum of one laboratory matrix duplicate will be analyzed per 20 samples, or one per sampling batch (whichever is greater), when samples are analyzed for metals or conventional parameters to provide information on the precision of chemical analysis. The matrix duplicate will follow EPA duplicate guidelines specified in SW-846 (EPA 1996).

## 3.6 Instrument Testing, Inspection, and Maintenance

### 3.6.1 Field Instruments

The field coordinator will arrange for field instrumentation preventive maintenance. Preventive maintenance on field instruments will be performed by qualified field technicians following the manufacturer's instructions and maintenance schedules. Maintenance will be documented in instrument log books with the date and initials of the individual performing the maintenance.

The field coordinator will routinely review and compare instrument calibration results against the preventive maintenance records to verify the effectiveness of the maintenance program. The field coordinator will track scheduling of maintenance required by the manufacturer.

### 3.6.2 Laboratory Instruments

The analytical laboratory manager is ultimately responsible for the care of the laboratory instruments. The manager may delegate the responsibility to the senior supervising chemists or technician qualified to perform routine maintenance, after demonstrating that personnel are trained in maintenance procedures for that laboratory section (wet chemistry, metals, and organics). Training of laboratory personnel on the routine care of laboratory equipment will be provided, at a minimum, during the initial installation of the equipment and, for new analysts, before initial use of the equipment.

Maintenance and other appropriate details will be documented in daily maintenance logbooks. The individual performing the maintenance procedures will date and sign each entry. At a minimum, the preventive maintenance schedules contained in the EPA methods and in the equipment manufacturer's instructions will be followed.

## 3.7 Instrument/Equipment Calibration and Frequency

### 3.7.1 Field Instruments

Field instruments will be calibrated according to manufacturer's instructions. All field instruments to be used will be calibrated on a daily basis. The following data will be recorded in the field notebook or on appropriate field forms:

- Date.
- Project number.
- Instrument make/model number.

- Calibration gas cylinder serial number (if applicable).
- Instrument response during calibration.

### 3.7.2 Laboratory Instruments

All instruments and equipment used during analysis will be operated, calibrated, and maintained according to manufacturer's guidelines and recommendations, and in accordance with procedures in the analytical method cited, as documented in the laboratory QA Plan. Properly trained personnel will operate, calibrate, and maintain laboratory instruments. Calibration blanks and check standards will be analyzed daily for each parameter to verify instrument performance and calibration before beginning sample analysis.

Where applicable, all calibration procedures will meet or exceed EPA CLP protocols (EPA 1993a, 1993b). Any variations from these procedures must be approved by the Project QA Officer before beginning sample analysis.

After the instruments are calibrated and standardized within acceptable limits, precision and accuracy will be evaluated by analyzing a QC check sample for each analysis performed that day. Acceptable performance of the QC check sample verifies the instrument performance on a daily basis. Analysis of a QC check standard is also required. QC check samples containing all analytes of interest will be either purchased commercially or prepared from pure standard materials independently from calibration standards. The QC check samples will be analyzed and evaluated according to the EPA method criteria.

Instrument performance check standards and calibration blank results will be recorded in a laboratory instrument log book, which will also contain evaluation parameters, benchmark criteria, and maintenance information. If the instrument log book does not provide maintenance information, a separate maintenance log book must be maintained for the instrument.

## 3.8 Inspection/Acceptance of Supplies and Consumables

Field supplies such as sample containers and trip/rinsate blank water shall be obtained from reputable suppliers and shall be certified analyte free. Records of certification shall be kept by the laboratory (for laboratory-supplied supplies) or by Parametrix in the project file. Sampling spoons and bowls shall be food-grade and shall be purchased new.

## 3.9 Nondirect Measurements

The need for nondirect measurements is not anticipated for the BRL. However, if the need does arise during task execution, the previously collected data will be evaluated to assess consistency with project DQOs and DQIs. Data from nondirect sources will be evaluated by the Project QA Officer prior to the data being used in analyses or in data reports.

## 3.10 Data Management

The objectives of data management are to ensure that large volumes of information and data are technically complete, accessible, and efficiently handled.

### 3.10.1 Field Data

The original field notebook, sampling data sheets, chain-of-custody forms, and field equipment calibration sheets will be stored in the project file. Photocopies of these documents should be prepared for working copies as needed.

### 3.10.2 Laboratory Data

The laboratory data reports will be archived in the project files. The electronic data will be incorporated into Excel spreadsheets and archived on electronic media and placed in the project file.

# 4. Assessment and Oversight

This section describes activities to be conducted to assess the effectiveness of project implementation and associated QA/QC activities. The purpose of the assessment is to ensure that the QAPP is properly implemented.

## 4.1 Assessments and Response Actions

A performance and system audit may be conducted at the discretion of the Project Manager. Audits will consist of direct observation of work being performed and inspection of field and laboratory equipment. The performance and system audits will also review the sample custody procedures in the field and laboratory.

If implemented, internal audits of both the field and laboratory activities will be conducted by the Project QA Officer. Audits will be unannounced to ensure a true representation of the technical and QA procedures employed.

Checklists for both field and laboratory audits will be based on National Enforcement Investigation Center (EPA 1984) Audit Checklists. The audits will be performed by persons having no direct responsibilities for the activities being performed.

The auditor or designee will prepare an audit report that includes findings, nonconformances, observations, recommended corrective action, and a schedule for completion of such action.

For each identified nonconformance, a corrective action report will be issued as part of the audit report to notify the individual responsible for implementing the recommended corrective action and its schedule for completion. If a field corrective action is required, the Project Manager will be notified. If a laboratory corrective action is required, the Project QA Officer will be notified. The audit will be distributed to the Project Manager.

Corrective actions may be needed for two categories of nonconformance:

- Deviations from the methods or QA requirements established in the QAPP.
- Equipment or analytical malfunctions.

During field operations and sampling procedures, the field sampler will be responsible for taking and reporting required corrective action. A description of any such action taken will be entered in the field notebook. If field conditions are such that conformance with the QAPP is not possible, the Project Manager will be consulted immediately. Any corrective action or field condition resulting in a major revision of the QAPP will be communicated to the Project Manager for review and concurrence.

During laboratory analysis, the Laboratory QA Officer will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet data quality goals outlined in the QAPP, corrective action will follow the guidelines in SW-846 (EPA 1996). If analytical conditions do not conform to this QAPP, the Project QA Officer will be notified as soon as possible so that additional corrective actions can be taken.

Corrective action reports will document response to any reported nonconformances. These reports may be generated from internal or external audits or from informal reviews of project activities. Corrective action reports will be reviewed for appropriateness of recommendations and actions by the Project QA Officer for QA matters, and the Project Manager for matters of technical approach.

## 4.2 Reports to Management

A QA data validation report will be prepared for all data packages. This QA report will summarize all relevant data quality information. The Project QA Officer will be responsible for data quality assessments and associated QA reports. Final task or investigative reports will contain a separate QA section summarizing data quality information.

# 5. Data Verification and Validation

Data verification is confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. Validation is confirmation by examination and provision of objective evidence that the particular requirement for a specific intended use has been fulfilled. Techniques for data verification and validation will be in accordance with the Guidance on Environmental Data Validation and Verification (EPA 2001b) and National Functional Guidelines (EPA 2020a, 2020b).

## 5.1 Data Review, Verification, And Validation

Analytical data will be reviewed by the Laboratory QA Officer to ensure that the QA/QC objectives for precision, accuracy, representativeness, completeness, and comparability have been met. These reviews will identify the occurrence of deficiencies in time to take corrective action. If the required QC objectives are not met after the corrective action is performed, the Project Manager will be notified by the laboratory before data submittal. The Project Manager and Project QA Officer will determine if additional corrective action should be taken, such as reanalysis, if applicable. All data packages provided by the laboratory must provide a summary of QC results adequate to enable reviewers to determine the quality of the data.

The Project QA Officer is responsible for conducting checks for internal consistency, transmittal errors, and for adherence to the QC elements. The Project QA Officer will review the data package submitted by the laboratory to ensure that documentation has been provided, appropriate QC checks have been performed, and that appropriate corrective actions have been taken. The Project QA Officer will then determine the potential effects of any deviations or corrective actions on the suitability of the data.

## 5.2 Verification and Validation Methods

The Project QA Officer will review the following:

- Chain-of-custody documentation.
- Holding times.
- Equipment/trip blank results.
- Field duplicate results.
- Method blank results.

A limited review (minimum 10%) of the following laboratory QC data results will be conducted:

- Laboratory MS/MSD and/or matrix duplicate results.
- Laboratory surrogate recoveries.
- Laboratory check samples.

If, based on this limited review, the QC data results indicate potential data quality problems, further evaluations will be conducted.

### 5.2.1 Precision

Precision measures the mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. QA/QC sample types that measure precision include field duplicates, MSD, and matrix duplicates. The estimate of precision of duplicate measurements is expressed as a RPD, which is calculated:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2) \div 2} \times 100$$

*Where* D1 = First sample value
D2 = Second sample value.

The RPDs will be routinely calculated and compared with DQOs.

### 5.2.2 Accuracy

Accuracy is assessed using the results of standard reference material, linear check samples, and MS analyses. It is normally expressed as a percent recovery, which is calculated:

$$\text{Percent Recovery} = \frac{\text{(Total Analyte Found - Analyte Originally Present) x 100}}{\text{Analyte Added}}$$

The percent recovery will be routinely calculated and checked against DQOs.

### 5.2.3 Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias will be assessed with field duplicate and laboratory matrix spike samples, similar to that described for accuracy. Bias measurements are usually carried out with a minimum frequency of 1 in 20, or one per batch of samples analyzed, under the same sampling episode.

### 5.2.4 Sensitivity

Sensitivity expresses the capability of a method or instrument for meeting prescribed measurement reporting limits. Sensitivity will be assessed by comparing data reporting limits with applicable cleanup criteria and analytical or instrument method reporting limits.

### 5.2.5 Completeness

The amount of valid data produced will be compared with the total analyses performed to assess the percent of completeness. Completeness will be routinely calculated and compared with the DQOs.

### 5.2.6 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data will be comparable with other measurement data for similar samples and sample conditions. Comparability of the data will be maintained by using consistent methods and units.

### 5.2.7 Representativeness

Sample locations and sampling procedures will have been chosen to maximize representativeness. A qualitative assessment (based on professional experience and judgment) will be made of sample data representativeness based on review of sampling records and QA audit of field activities.

## 5.3 Reconciliation and User Requirements

The Project QA Officer will prepare a technical memorandum for each data package describing the results of the data review and describing any qualifiers that were added to the data. The technical memorandum will include recommendations on whether additional actions such as resampling are necessary.

Corrective actions may be needed for two categories of nonconformance:

- Deviations from the methods or QA requirements established in the QAPP or groundwater monitoring plan.
- Equipment or analytical malfunctions.

During field operations and sampling procedures, the project field coordinator will be responsible for taking and reporting required corrective action. A description of any such action taken will be entered in the field notebook. If field conditions are such that conformance with the QAPP or the groundwater monitoring plan is not possible, the Project QA Officer will be consulted immediately. Any corrective action or field condition resulting in a major revision of the QAPP or groundwater monitoring plan will be communicated to the Project Manager for review and concurrence. This communication will be made before changes in the field activities whenever possible.

During laboratory analysis, the Laboratory QA Officer will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet data quality goals outlined in the QAPP, corrective action will follow the guidelines in SW-846 (EPA 1996). If analytical conditions do not conform with this QAPP, the Project QA Officer will be notified as soon as possible so that any additional corrective actions can be taken.

Corrective action reports will document response to any reported nonconformances. These reports may be generated from internal or external audits or from informal reviews of project activities.

Corrective action reports will be reviewed for appropriateness of recommendations and actions by the Project QA Officer for QA matters, and the Project Manager for matters of technical approach.

# 6. References

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