

GROUND WATER QUALITY DISCHARGE PERMIT UGW510004
STATEMENT OF BASIS
September 2015

Royal Street Landfill:
Olson/Neihart Tailings Relocation

U.S. Bureau of Reclamation
Jordanelle Reservoir
Bonneville Unit: Central Utah Project

I. Description of Facility and Background Information

On March 12, 1990 the U.S. Bureau of Reclamation (USBR) applied for a ground water discharge permit for the Royal Street Landfill to be constructed in the SE1/4 of the SE1/4, of Section 24, Township 2 South, Range 4 East, Wasatch County, Utah. The landfill was constructed for the permanent disposal of mine tailings from the Olson/Neihart Reservoir and associated spillage, located approximately one mile southeast of the proposed landfill site. The tailings, originally from the nearby Mayflower Mine, were relocated to prevent them from inundation by the Jordanelle Reservoir.

II. Previous Permits

Ground Water Discharge Permit UGW510004 was issued to USBR on June 13, 1990. Subsequent renewals of the permit were issued on November 8, 1993, July 13, 1999, April 14, 2005 and July 2010. This will be the fifth renewal of the permit.

III. Permit Modifications

This permit revision includes only minor changes from the previous issued permit. The previous permit issuance granted the USBR's request to leave 15 feet of water in the leachate collection system. Results of Hydrologic Evaluation of Landfill Performance (HELP) modeling using as-built construction specifications demonstrated that 15 feet of additional head will not contribute to failure or increased leakage of leachate through the clay liner under the leachate collection system. The purpose of the additional head is to facilitate anaerobic conditions to prevent metals from becoming mobile after the tailings have been dewatered.

IV. Basis for Specific Permit Conditions

1. Ground Water Classification – ground water in the shallow alluvial aquifer has been classified as Class IA Pristine Ground Water based on a total dissolved solids (TDS) concentration of 461 mg/l from monitoring well MW-1A, located approximately 50 feet west, and upgradient of the landfill site. In addition, no parameters had concentrations above Utah Ground Water Quality Standards.

2. Background Ground Water Quality - background ground water quality has been determined by analytical results of six (6) quarterly samples collected from monitoring wells MW-1A, MW-2E, MW-3B, and MW-4A (Table 1). Monitoring well MW-1A is located hydraulically upgradient of the Royal Street landfill site, and monitoring wells MW-2E, MW-3B, and MW-4A are located hydraulically downgradient of the Royal Street landfill. No industrial development has been located upgradient of monitoring well MW-1.

Table 1: Background ^(a) Ground Water Quality (mg/l)

| Parameter | MW-1A Upgradient | MW-2E Downgradient | MW-3B Downgradient | MW-4A Downgradient |
|------------|-----------------------|-----------------------|-----------------------|-----------------------|
| pH (units) | 7.09 | 7.09 | 7.09 | 7.09 |
| Nitrate | 0.1341 | 0.7492 | 1.4258 | 0.4966 |
| Arsenic | 0.005 ^(b) | 0.005 ^(b) | 0.0051 | 0.0053 |
| Barium | 0.1046 | 0.0967 | 0.0860 | 0.1143 |
| Cadmium | 0.0041 | 0.004 ^(b) | 0.004 ^(b) | 0.0041 |
| Chromium | 0.0127 | 0.0072 | 0.007 ^(b) | 0.007 ^(b) |
| Copper | 0.0756 | 0.0549 | 0.0686 | 0.0457 |
| Lead | 0.005 ^(b) | 0.0089 | 0.0060 | 0.0079 |
| Mercury | 0.0002 ^(b) | 0.0003 | 0.0002 ^(b) | 0.0003 |
| Selenium | 0.002 ^(b) | 0.0021 | 0.002 ^(b) | 0.002 ^(b) |
| Silver | 0.0064 | 0.0045 | 0.0043 | 0.0043 |
| Zinc | 0.0189 | 0.0221 | 0.0841 | 0.0811 |
| TDS | 461 | 366 | 304 | 370 |

(a) Background equals mean concentration.

(b) Equals method detection limit for the reported analytical method.

mg/l Milligrams per liter

TDS Total dissolved solids

3. Best Available Technology - the landfill has been designed and constructed by USBR to prevent infiltration of precipitation and runoff and thereby prevent the formation and discharge of leachates to ground water. Computer simulation results from HELP modeling has been used to demonstrate this “no-discharge” design. The leachate collection system will be operated and maintained to provide free drainage in the landfill above the maximum 15-foot water depth. Any leachates collected in the leachate collection manhole will be analyzed and the leachate depth will be managed in an appropriate manner to prevent discharge to ground water.
4. Compliance Monitoring - compliance ground water quality monitoring will be conducted using ground water protection levels for downgradient monitoring wells MW-2E, MW-3B, and MW-4A (Table 2). Any exceedance of protection levels shall constitute noncompliance. Out-of-Compliance status has not been confirmed for any monitoring wells during the previous permit term.

**Table 2: Ground Water Protection Levels (mg/l)
Downgradient Monitoring Wells**

| Parameter | MW-2E | MW-3B | MW-4A |
|------------|-----------------------|-----------------------|-----------------------|
| pH (units) | 6.5-8.5 | 6.5-8.5 | 6.5-8.5 |
| Nitrate | 1.00 ^(a) | 2.206 ^(b) | 1.00 ^(a) |
| Arsenic | 0.005 ^(a) | 0.005 ^(a) | 0.005 ^(a) |
| Barium | 0.2 ^(a) | 0.2 ^(a) | 0.282 ^(b) |
| Cadmium | 0.0005 ^(a) | 0.0005 ^(a) | 0.0005 ^(a) |
| Chromium | 0.01 ^(a) | 0.01 ^(a) | 0.01 ^(a) |
| Copper | 0.2395 ^(b) | 0.1908 ^(b) | 0.172 ^(b) |
| Lead | 0.0120 ^(b) | 0.0141 ^(b) | 0.015 ^(d) |
| Mercury | 0.0002 ^(a) | 0.0002 ^(a) | 0.0002 ^(a) |
| Selenium | 0.005 ^(a) | 0.005 ^(a) | 0.005 ^(a) |
| Silver | 0.01 ^(a) | 0.01 ^(a) | 0.01 ^(a) |
| Zinc | 0.500 ^(a) | 0.500 ^(a) | 0.500 ^(a) |
| TDS | 550 ^(b) | 410 ^(b) | 474 ^(c) |

- (a) Equals 0.1 x Ground Water Quality Standard.
- (b) Equals Mean + 2 Standard Deviations
- (c) Equals 1.25 x Background
- (d) Equals Ground Water Quality Standard

Compliance monitoring will be conducted on a semi-annual basis and will include water level measurements where practical (report dry if no water is present), ground water sampling and analysis of upgradient and downgradient wells, and sampling and analysis of the leachate collection manhole. Visual observation of the manhole shall be conducted annually.

Sample analysis will be conducted by State-certified laboratories using approved methods. Analytes include field measurements of pH, temperature, and specific conductance, the compliance parameters in Table 2, and major ion species to help determine the geochemical signature of ground water. Any water occurring in the leachate collection manhole above the 15 feet depth requirement will be sampled in accordance with the same criteria and land applied to the tailings cover system.

Other post-closure inspections will be conducted to determine general conditions of the landfill including: condition of the cap, surface drainage, access, and monitoring well surface casings.

5. Non-Compliance Status – USBR will evaluate ground water monitoring data to determine probable-out-of-compliance or out-of-compliance status in accordance with the permit procedures. This includes Director notification, accelerated monitoring, and a Source and Contamination Assessment Study Plan.

6. Reporting Requirements – the permit specifies reporting requirements for semi-annual compliance monitoring, and the results of other post-closure monitoring. The reporting schedule may also be modified by the Director.

Related References

A Hydrogeologic Evaluation of the Proposed Jordanelle Reservoir, Uintex Corporation, USBR Contract No. 2-07-40-S3080, February, 9, 1987, Table C2.

Evaluation Study: Geology and Mineral Potential Park City - Jordanelle - Park Imperial Area, Summit & Wasatch Counties, Utah, M.C. Godbe III, November 1, 1986, pp.30-31, and Map D 36U-448.

Geologic Map of the Heber Quadrangle, Wasatch and Summit Counties, Utah, U.S. Geological Survey, Map GQ-852, 1970.

Hazardous Waste Assessment for the Mayflower Site, Delft Geotechnics and Bingham Engineering, December, 1988, Volume 5, Table C-3A.

Water Resources of the Park City Area, Utah with Emphasis on Ground Water, Utah Department of Natural Resources, Tech. Pub. No. 85, 1986, Table 14.