



Periodic Review Pend Oreille Mine

**1382 Pend Oreille Mines Road, Metaline Falls,
Pend Oreille County
Facility Site ID: 15428546, Cleanup Site ID: 2194**

Toxics Cleanup Program, Eastern Region

Washington State Department of Ecology
Spokane, Washington

September 2023

Document Information

This document is available on the Department of Ecology's [Pend Oreille Mine cleanup site page](#).¹

Related Information

- Facility Site ID: 15428546
- Cleanup Site ID: 2194

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¹ <https://apps.ecology.wa.gov/cleanupsearch/site/2194>

² <https://ecology.wa.gov/About-us/Who-we-are/Our-Programs/Toxics-Cleanup>

³ <https://ecology.wa.gov/About-us/Accountability-transparency/Our-website/Accessibility>

Department of Ecology's Regional Offices

Map of Counties Served



Southwest Region 360-407-6300	Northwest Region 206-594-0000	Central Region 509-575-2490	Eastern Region 509-329-3400
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Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

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Introduction

The Washington State Department of Ecology (Ecology) reviewed post-cleanup site conditions and monitoring data to ensure human health and the environment are being protected at the Pend Oreille Mine cleanup site (Site). Site cleanup was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

Cleanup activities at this Site were completed under a consent decree. Residual concentrations of metals that exceeded MTCA cleanup levels remain on the property. The MTCA cleanup levels for soil and groundwater are established under [WAC 173-340-740](https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-740)⁴ and [WAC 173-340-720](https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-720),⁵ respectively.

Ecology determined institutional controls in the form of a restrictive covenant would be required as part of the cleanup action for the Site. [WAC 173-340-420\(2\)](https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-420(2))⁶ requires Ecology to conduct a periodic review of certain sites every five years. For this Site, a periodic review is required because institutional controls and financial assurance are part of the remedy.

When evaluating whether human health and the environment are being protected, Ecology must consider the following factors (WAC 173-340-420(4)):

- a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the site
- b) New scientific information for individual hazardous substances or mixtures present at the site
- c) New applicable state and federal laws for hazardous substances present at the site
- d) Current and projected site and resource uses
- e) The availability and practicability of more permanent remedies
- f) The availability of improved analytical techniques to evaluate compliance with cleanup levels

Ecology publishes a notice of all periodic reviews in the *Site Register* and provides an opportunity for public comment.

⁴ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-740>

⁵ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-720>

⁶ <https://app.leg.wa.gov/wac/default.aspx?cite=173-340-420>

Summary of Site Conditions

Site description and history

The Pend Oreille Mine is an underground lead-zinc mine. The Pend Oreille Mine is operated by Teck Washington Incorporated (Teck WA). Prior to Teck WA's ownership, mine tailings were discharged directly into the Pend Oreille River from 1952 until 1967. Tailings are a fine-grained material produced during ore processing and metal extraction. Between 1967 and 1977, mine tailings were disposed of in three areas at the Site. These disposal areas were called Tailings Disposal Facilities (TDFs) 1, 2, and 3.

TDF-1 and TDF-2 cover approximately 18 and 9 acres, respectively. They are northwest of the Pend Oreille Mine Golf Course and east of the Pend Oreille River. TDF-1 and TDF-2 are on Pend Oreille Mine property, now owned by Teck WA, and are no longer active. TDF-1 and TDF-2 were the focus of the cleanup, though Teck is also in the process of closing the mine and TDF-3 in coordination with Ecology. The original footprint of TDF-3 is about 20 acres and lies under the approximately 78-acre permitted tailings facility, now also referred to as TDF-3. The facility is now managed as part of the permitted mine; closure of TDF-3 will be addressed under a separate approved plan that is not part of this cleanup or a focus of this periodic review.

TDF-1 sits below TDF-2 on a hillside that slopes generally to the west toward the Pend Oreille River at about a 30 percent fall. The topography steepens as it nears the river. Groundwater flows generally west-northwest across the Site and downgradient toward the Pend Oreille River, though flow direction varies slightly depending on season. Two creeks flow from the Site into the river; Creek #2 is the result of water diversion ditches along the north and south perimeter of TDF-1 combined with water from a decant tower. The decant tower drains the wetland that sits at TDF-1. Creek #2 flows northwest into the Pend Oreille River.

Teck Cominco American Incorporated (parent company of Teck WA) entered into a legal agreement with Ecology in 2005 to complete a remedial investigation (RI) and feasibility study (FS) of certain areas near the Pend Oreille Mine. The RI/FS report was finalized in 2010. Ecology finalized the cleanup action plan, which identified the cleanup actions for the Site, in 2011. A legal agreement between Ecology and Teck WA was signed in 2011 that required Teck WA to implement the cleanup action plan.

A vicinity map is in Appendix A, and a Site plan is in Appendix B.

Site investigations

The first phase of the tailings facility characterization began in July 2005 and included completion and sampling of test pits, borings, and monitoring wells. It also included surface water sampling, slope stability analyses, wildlife and vegetation surveys, hydraulic testing, and sediment sampling. The preliminary characterization indicated the tailings piles exceeded screening criteria for metals, and there were impacts to groundwater that potentially discharged to surface water in the Pend Oreille River.

Additional investigation was completed in 2008 and 2009 to further characterize downgradient groundwater impacts and collect geotechnical information for design of the cover systems. The RI found that groundwater beneath and downgradient of the tailing facilities had been affected by the tailings disposal, with concentrations of copper, iron, manganese, and zinc exceeding MTCA cleanup levels to protect surface water.

Cleanup actions

Using information from the RI/FS, Ecology wrote the Cleanup Action Plan in 2011 that identified the preferred cleanup options. The consent decree formalized the agreement between Ecology and Teck WA to complete the cleanup.

The cleanup actions for TDF-1 and TDF-2 are as follows:

- Regrade the piles to remove steep slopes and minimize erosion
- Compact their surfaces
- Place protective covers over the piles to prevent stormwater from carrying contaminants to groundwater and to restrict access by plants or animals
- Revegetate the surface soil placed over the protective cover
- Manage stormwater runoff

The cleanup action plan also required that Teck WA maintain TDF-1 and TDF-2 to ensure that the cleanup remains protective of human health and the environment. Visual inspections of the caps are completed monthly.

In 2017, a subsidence feature was discovered on the surface cover of TDF-1 during routine inspections. Additional investigation determined the sinkhole was in the vicinity of a buried and capped decant tower, a portion of which had collapsed. The decant tower was filled with bentonite and waste rock to reinforce the subsurface structure and prevent additional cave-in, and the cap was restored above it.

Cleanup standards

Cleanup standards include cleanup levels, the location where these cleanup levels must be met (point of compliance), and any other regulatory requirements that apply to the Site.

[WAC 173-340-704](https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-704)⁷ states MTCA Method A may be used to establish cleanup levels at sites that have few hazardous substances, are undergoing a routine cleanup action, and where numerical standards are available for all indicator hazardous substances in the media for which the Method A cleanup level is being used. Method B may be used at any site and is the most common method for setting cleanup levels when sites are contaminated with substances not listed under Method A. Method C cleanup levels may be used to set soil and air cleanup levels at industrial sites.

⁷ <https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-704>

Ecology determined MTCA Method B cleanup levels were appropriate for contaminants at this Site and set levels to be protective of drinking water, surface water, and ecological receptors. Where MTCA Method B cleanup levels were below background concentrations of metals, the cleanup level was set equal to the background concentration. Table 1 outlines the cleanup levels and evaluation levels set for the Site in soil and groundwater. Evaluation levels are used for comparison to determine whether the condition of the cap or overall groundwater quality has changed significantly, but evaluation levels are not considered cleanup levels and are not used to estimate overall Site risk.

Table 1. Cleanup levels and evaluation levels for soil and groundwater contaminants

Contaminant	Soil cleanup/evaluation level (mg/kg)	Groundwater cleanup/evaluation level (µg/L)
Arsenic	9	5*
Cadmium	1	0.58*
Chromium	NA	100*
Copper	22	25.7*
Iron	NA	300
Lead	50	9.34*
Mercury	0.1	2*
Manganese	NA	50
Selenium	0.8*	NA
Zinc	86	296.96*

µg/L = micrograms per liter

mg/kg = milligrams per kilogram

NA = Contaminant cleanup level or evaluation level was not developed for the listed media

* = indicates a level against which detected values are screened to evaluate Site conditions; not a Site cleanup level

The point of compliance is the area where the cleanup levels must be attained. For soil cleanup levels based on the protection of ecological receptors, as they are for this Site, the point of compliance is established as soils throughout the biologically active zone, which is assumed to extend to six feet below ground surface.

Because the tailings facilities will remain in place, a conditional point of compliance was approved for groundwater. The Site's conditional point of compliance for groundwater was established at the monitoring wells downgradient of TDF-1.

Groundwater monitoring

Groundwater monitoring is completed annually at four Site wells—one upgradient of TDF-2, and three downgradient of TDF-1. The water levels in piezometers installed in TDF-1 and TDF-2

are required to be monitored quarterly, but Teck WA undertakes monitoring of these piezometers as part of the monthly inspection for a more detailed record of water level changes over time.

Groundwater samples are tested for the metals listed above. Two wells downgradient of TDF-1 continue to have detections of manganese at concentrations exceeding the Site cleanup levels (MW-302 and MW-303). The cleanup level for manganese (50 micrograms per liter [$\mu\text{g/L}$]) is the secondary maximum contaminant level (MCL) set by the National Secondary Drinking Water Regulations, which is based on aesthetic quality of drinking water. Groundwater quality at MW-303 has not exceeded the MTCA Method B formula value of 750 $\mu\text{g/L}$, which is based on protection of human health. Groundwater quality at MW-302 continues to exceed this value.

Appendix C contains a time series plot showing the manganese concentrations at Site wells since compliance monitoring began.

Surface water monitoring

Surface water is sampled at SW-1 and SW-2 where the stormwater system discharges at the start of Creek #2. Surface water is sampled for the dissolved concentrations of the metals in Table 1 and for total suspended solids. Surface water discharged from the wetland and the French drain system above TDF-1 flows year-round and comprises the water collected at surface water sampling point SW-1. Metals concentrations from this sampling point are consistently below Site cleanup levels and Site evaluation levels. Surface water discharged from the stormwater conveyance system on TDF-2 flows rarely and has only been flowing enough to be sampled at SW-2 three times since compliance monitoring began in 2013. On each occasion, samples from SW-2 exceeded the evaluation level for zinc. Since this discharge is rare, and as such it is difficult to determine how long water has been stored in the conveyance system prior to discharge, these exceedances of the evaluation levels are not considered representative of Site discharges to surface water.

Low-permeability cover system

TDF-1 and TDF-2 have low-permeability cover systems to prevent human or ecological direct contact with mine tailings, reduce infiltration of rainwater through the tailings piles, and ensure that the slopes are stable. The cover systems are visually inspected monthly and surveyed as needed. The last survey was completed in 2023.

Environmental covenant

Ecology determined institutional controls would be required as part of the cleanup action to document the remaining contamination, protect the cleanup action, and protect human health and the environment. An institutional control in the form of an [environmental covenant](https://apps.ecology.wa.gov/cleanupsearch/document/3478)⁸

⁸ <https://apps.ecology.wa.gov/cleanupsearch/document/3478>

(Covenant) was required by the legal agreement that Ecology and Teck WA signed in 2011. The Covenant has not yet been filed, as the activities on the Site are closely regulated under the mine's other permitting, and it is likely that the eventual Covenant will cover TDF-3 in addition to TDF-1 and TDF-2. TDF-3 is regulated under Ecology's Hazardous Waste Program and has not yet been closed.

The eventual Covenant will impose the following limitations on Site use:

1. No groundwater may be taken from the parcel, except for purposes related to the Remedial Action, such as groundwater monitoring.
2. The Owner shall maintain components of the Remedial Action installed on this parcel in accordance with the maintenance requirements of the Operations and Maintenance Plan, prepared in accordance with requirements of Exhibit C to the Consent Decree filed on April 25, 2011, in *State of Washington, Department of Ecology v. Teck Washington Incorporated*, Pend Oreille County Superior Court No. 11-2-00083-1 as now written and hereafter amended.
3. The Owner shall maintain a suitable barrier that restricts unauthorized access to the cover system as described in the Operations and Maintenance Plan, prepared in accordance with requirements of Exhibit C to the Consent Decree filed on April 25, 2011, in *State of Washington, Department of Ecology v. Teck Washington Incorporated*, Pend Oreille County Superior Court No. 11-2-00083-1 as now written and hereafter amended.
4. Any activity on the parcel that may result in the release or exposure to the environment of a hazardous substance that remains on the parcel as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval from Ecology. Such activities include, but are not limited to, the following: drilling or digging; placing any objects or using any equipment that deforms or stresses the ground surface beyond its load-bearing capability; or bulldozing or earthwork.
5. Any activity on the parcel that may interfere with the integrity of the Remedial Action and the resultant continued protection of human health and the environment is prohibited.
6. The Owner must give thirty (30) days advance written notice to Ecology of the Owner's intent to convey any interest in the parcel. No conveyance of title, easement, lease, or other interest in the parcel shall be consummated by the Owner without adequate and complete provision for continued monitoring, operation, and maintenance of the Remedial Action. The Owner must include in any instrument conveying any interest in the parcel notice of this Restrictive Covenant.
7. The Owner must restrict leases to uses and activities consistent with the Restrictive Covenant and notify all lessees of the restrictions on the use of the parcel.
8. The Owner must notify and obtain approval from Ecology prior to any use of the parcel that is inconsistent with the terms of this Restrictive Covenant. Ecology may approve any inconsistent use only after public notice and comment.

9. The Owner shall allow authorized representatives of Ecology the right to enter the parcel at reasonable times for the purpose of evaluating the Remedial Action, to take samples, to inspect the Remedial Action conducted at the parcel, and to inspect records that are related to the Remedial Action. Except in an emergency, Ecology shall notify the Owner of its intention to enter the parcel at least 48 hours before entry.
10. The Owner of the parcel reserves the right under WAC 173-340-440 to record an instrument that provides that this Restrictive Covenant shall no longer limit use of the parcel or be of any further force or effect. However, such an instrument may be recorded only if Ecology, after public notice and opportunity for comment, concurs.

Periodic Review

Effectiveness of completed cleanup actions

During the Site visit Ecology conducted on August 10, 2023, the cap appeared in good condition, the vegetation appeared healthy, and the Site is actively monitored by Pend Oreille Mine staff. A small wetland area exists on the back side of TDF-1, which is drained year-round by a decant tower. Stormwater runoff from TDF-2 and the hill above TDF-1 is conveyed through a French drain and discharged at the toe of TDF-1. During the site visit, standing water was visible in the northernmost catch basin to the French drain, suggesting that the drain was plugged or blocked.

The Site is operating as an active mine, but access to TDF-1 and TDF-2 is restricted. A photo log is in Appendix D.

Direct contact

The cleanup actions were intended to eliminate exposure to contaminated soil and groundwater at the Site. Exposure pathways to contaminated soils by ingestion and direct contact were reduced by installing a surface cap and stormwater infiltration/conveyance systems. The cap appears to be in satisfactory condition, and no repair, maintenance, or contingency actions are required at this time.

Protection of surface water and groundwater

Soils with metals at concentrations exceeding MTCA Method B cleanup levels remain at the Site; however, most of the contaminated soil source material has been contained by the cap system, and infiltration through the tailings is controlled. Surface water is consistently below cleanup levels; surface water routed from TDF-2 very rarely flows out at SW-2, but has exceeded the evaluation criteria for zinc during each sampling event (3 events in the last 10 years). However, all other metals are below cleanup levels or evaluation levels at SW-2, and the discharge from this location is minimal compared to discharge at SW-1, which runs year-

round. If SW-2 begins to flow enough to be sampled, the water quality at this location may require additional analysis to ensure that the discharges are protective of surface water.

Institutional controls

Institutional controls in the form of a Covenant will be implemented at the Site following closure of TDF-3 and the mine. The Covenant will prohibit activities that would result in the release of contaminants contained as part of the cleanup action and prohibit any use of the property that is inconsistent with the Covenant, unless approved by Ecology in advance. This Covenant will ensure that the long-term integrity of the cleanup action is protected.

New scientific information for individual hazardous substances or mixtures present at the Site

There is no new relevant scientific information for the hazardous substances remaining at the Site.

New applicable state and federal laws for hazardous substances present at the Site

There are no new applicable or relevant state or federal laws for hazardous substances remaining at the Site.

Current and projected Site and resource uses

The Site is used for industrial purposes and is regulated under a permit issued by Ecology's Hazardous Waste Program. The current Site use is not likely to have a negative impact on the protectiveness of the cleanup action. When the mine is closed, Ecology will oversee the process, and it will be completed to maintain the protectiveness of this cleanup action.

Availability and practicability of more permanent remedies

The remedy implemented included containing hazardous substances, and it continues to be protective of human health and the environment. While more permanent remedies may be available, they are still not practicable at this Site due to the size and nature of the TDFs.

Availability of improved analytical techniques to evaluate compliance with cleanup levels

The analytical methods used at the time of the cleanup action were capable of detection below the selected MTCA cleanup levels. The presence of improved analytical techniques does not affect decisions or recommendations made for the Site.

Conclusions

- The cleanup actions completed at the Site are protective of human health and the environment.
- Soil cleanup levels have not been met at the Site; however, the cleanup action is determined to comply with cleanup standards under WAC 173-340-740(6)(f), since the long-term integrity of the containment system is ensured and the requirements for containment technologies have been met.
- Groundwater compliance monitoring at the Site indicates manganese continues to exceed the Site cleanup level based on aesthetic quality in two downgradient wells (MW-302 and MW-303). One well (MW-302) continues to contain manganese concentrations exceeding the MTCA Method B formula value to protect human health.
- Access and land use at the property are controlled under the existing permitting at the Site and Ecology's Hazardous Waste Program oversight. Once the mine and TDF-3 have been closed, an environmental covenant will be placed on the property to protect human health and the environment from exposure to hazardous substances and ensure the integrity of the cleanup action.
- The water diversion system above TDF-1 should be cleared of any clogs or vegetation to ensure water is being drained from the wetland area and around TDF-1 in the most efficient way possible.

Based on this periodic review, Ecology has determined the requirements of the cleanup action plan, the compliance monitoring plan, and the operations and maintenance plan are being followed. No additional cleanup actions are required by the property owner at this time. The property owner is responsible for continuing to inspect the Site and maintain the cap to ensure the integrity of the cleanup action is maintained.

Next review

Ecology will schedule the next review for the Site five years from the date of this periodic review. If additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years after those activities are completed.

References

AECOM. *Exploration and Repair Memorandum, Tailings Disposal Facility No. 1 (TDF-1), Surface Cover Sinkhole, Pend Oreille Mine, Washington*. September 14, 2017.

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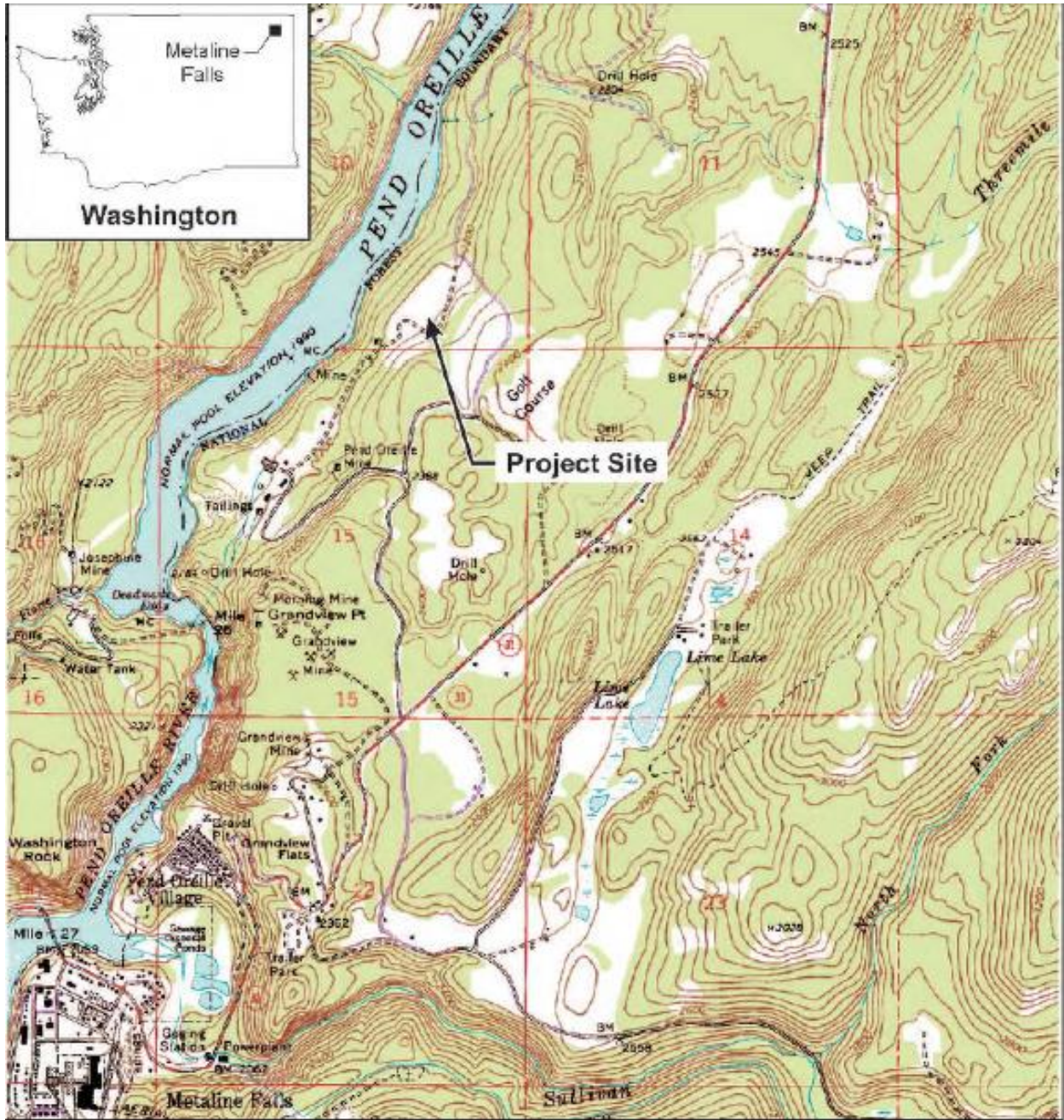
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URS. *Compliance Monitoring Plan, Tailings Disposal Facilities 1 & 2, Cleanup Action Implementation, Pend Oreille Mine*. March 6, 2013.

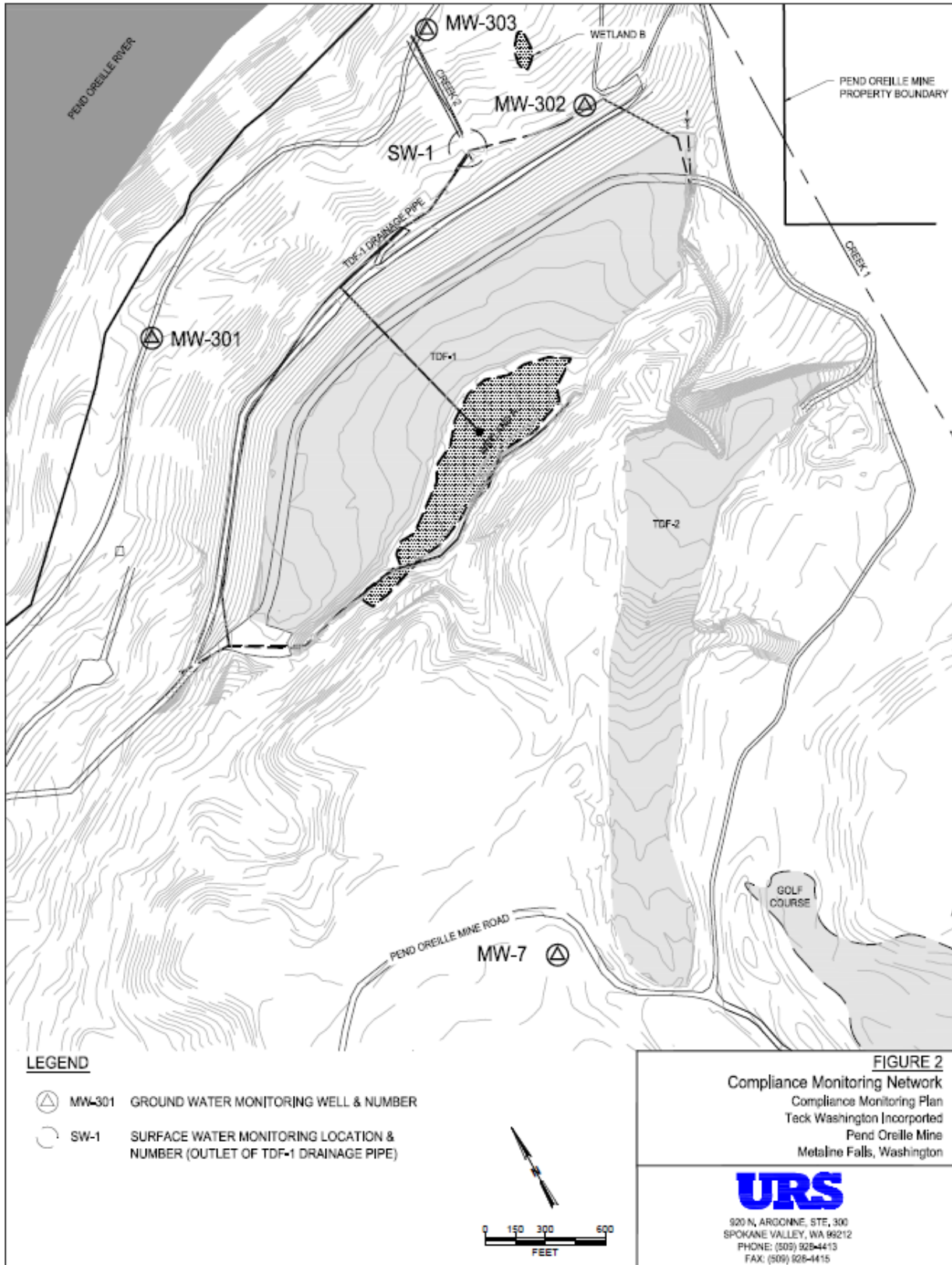
Appendix A. Vicinity Map



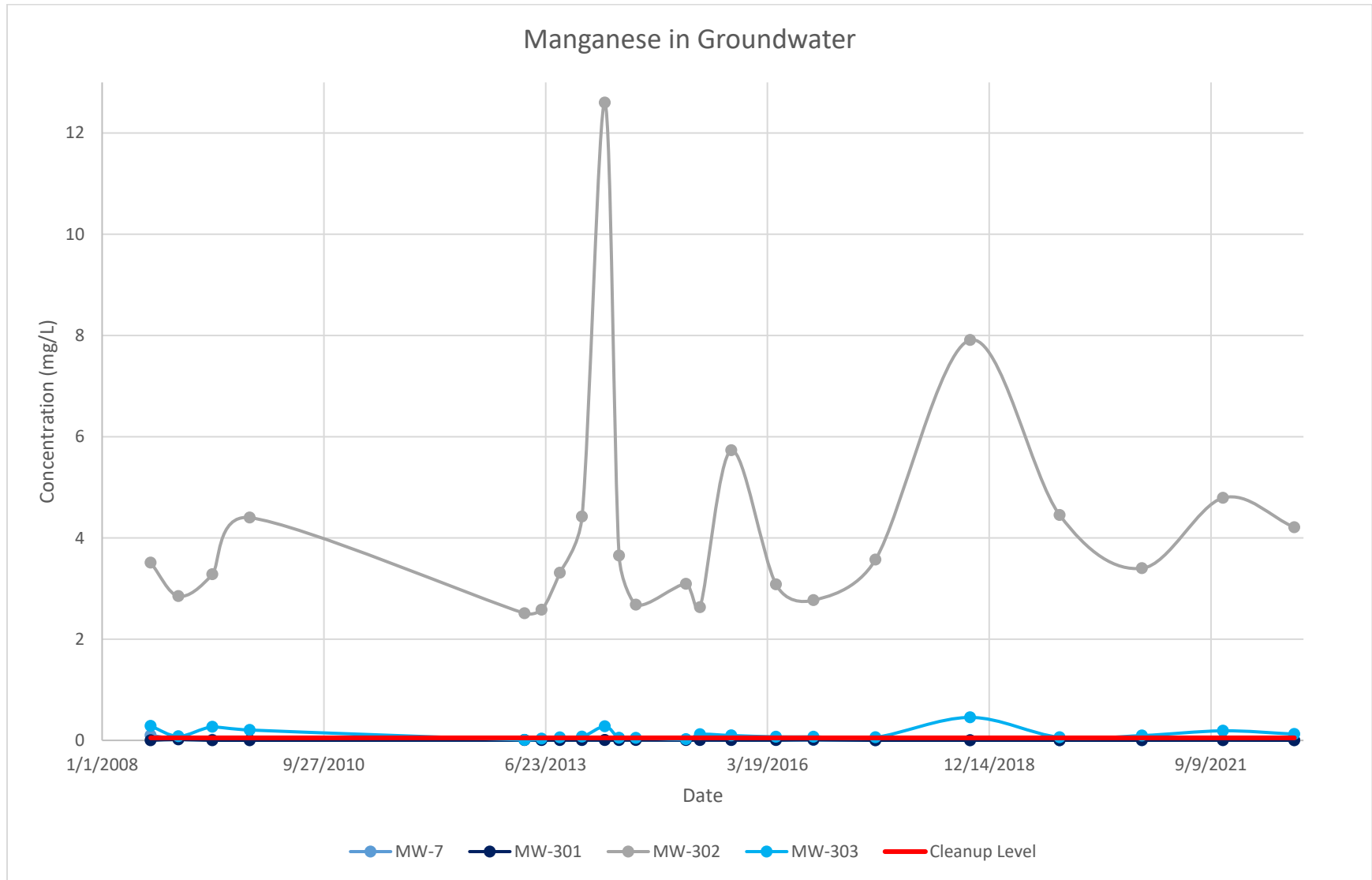
SOURCE: 7.5-minute USGS topographic quadrangles, Metaline Falls and Boundary Dam, Washington, 1966



Appendix B. Site Plan



Appendix C. Time Series Plot



Appendix D. Photo Log

Photo 1: Locked gate and signage on entrance to TDF-1



Photo 2: The cap over TDF-1



Photo 3: French drain and catch basin on TDF-1



Photo 4: French drain catch basin with standing water and vegetation



Photo 5: Decant tower 1 in the wetland of TDF-1



Photo 6: Upper section of TDF-1 with piezometers visible



Photo 7: Lower section of the cap on TDF-2



Photo 8: Drainage ditch 2A coming off TDF-2



Photo 9: MW-301 as a representative Site monitoring well

