

March 14, 2024

Mr. Eric Krueger
MT Department of Environmental Quality
Petroleum Tank Cleanup Section
Martel Building Ste 3B, 220 West Lamme St.
Bozeman, MT 59715
Eric.Krueger@mt.gov

Re: **Groundwater Monitoring Work Plan 34824** for the Petroleum Release at the Former Amoco Bulk Plant, Polson, MT, Facility ID 60-15070 (TID 30841), Release 4542, Work Plan ID 34824.

Dear Mr. Krueger:

Enclosed for your review is the **Groundwater Monitoring Work Plan 34824** for the Petroleum Release at the Former Amoco Bulk Plant, located at 2nd Street East, in Polson, Montana. Please review and comment accordingly.

Please call or email me at mmorris@wcec.com, if you have any additional questions or concerns regarding this work plan.

Sincerely,



Myles Morris, PG
Senior Project Manager

ec: Marshall & Betty Bjork; mbjork23@gmail.com

Groundwater Monitoring Work Plan 34824

Former Amoco Bulk Plant

2nd Street East

Polson, MT 59860

Facility ID# 60-15070, Release# 4542, Work Plan ID# 34824

Prepared for:

Marshall Bjork

P.O. Box 264

Big Arm, MT 59910

Prepared by:

West Central Environmental Consultants, Inc.

1030 South Ave. W.

Missoula, MT 59801

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WCEC Project No. 07-5763-70

WCEC

West Central Environmental Consultants, Inc.

Nationwide Services

www.wcec.com

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Estimated Costs

PTRCB Groundwater Monitoring & Sampling Unit Cost Worksheet

1.0 Introduction

West Central Environmental Consultants (WCEC) has prepared this Groundwater Monitoring Work Plan for the Former Amoco Bulk Plant facility (Facility ID# 60-15070, Release# 4542) located at 2nd Street East in Polson, MT [Figure 1]. Additional corrective actions were requested by the Montana Department of Environmental Quality (MTDEQ) in correspondence dated February 13, 2024. The purpose of the scope of work included in this Work Plan is to continue compliance monitoring of petroleum concentrations in groundwater related to Release# 4542.

1.1 Site Location

The Former Amoco Bulk Plant facility is located at 2nd Street East in Polson, Lake County, Montana. A site location map is provided as Figure 1. The Public Land Survey System (PLSS) description for the site is the NE/4, NE/4, Section 9, T22N, R20W. The approximate geographic coordinates are N 47.68854°, W 114.16016°. Township, range, and section information was obtained using the United States Geological Survey (USGS) Polson, Montana 1:24,000 Quadrangle. The site is located within the Finley Point-Frontal Flathead Lake Hydrologic Unit (5th Code).

1.2 Site Geology

The surficial geology in the vicinity of the site is dominated by varved glacio-lacustrine sequences deposited during the Pleistocene glaciation. These deposits consist primarily of very fine-grained silts and clays with relatively low permeability. The varved lake sediments in the area are approximately 30 feet thick and are generally characterized as being homogeneous. They are frequently interspersed with micro-fractures containing more coarse-grained silts and sands, which provide an element of heterogeneity to the overall clayey silt formation. Although the micro-fractures have a random orientation pattern, they appear to be semi-continuous laterally and are important preferential pathways for the transport of water and contaminants into the subsurface based on field observations and data collected throughout the remedial activities completed at the site. Sediments below 30 feet are typically interbedded sands and silts with higher transmissivity values than the upper clayey silt zone [Eide, 2003].

The uppermost bedrock units in the vicinity of Polson are Pre-Cambrian rocks of the Proterozoic Belt Supergroup. The Belt Supergroup exposures in the area are further classified as the Wallace Formation, the Ravalli Group, and the Pritchard Formation, all of which are dominated by argillites [Boettcher, 1982]. Most wells in the local area are completed near the contact between the overlaying glacial deposits and lower Belt rocks at approximately 80 feet below ground surface (bgs). Depth to shallow groundwater at the site varies

seasonally from near the surface during wet periods to approximately 20 feet bgs when the lake sediments dry out. The inferred groundwater flow direction is to the north-northwest towards Flathead Lake. Localized gradients are also present in the hydrogeologic framework of the clayey silt formation, with micro-fractures and other preferential pathways that may not follow the overall north-northwest flow direction.

2.0 Site History

The site is located on Montana Rail Link (MRL) lease property, and was operated as a bulk petroleum fuel storage and dispensing facility by Standard Oil from 1931 until 1978. In 1978, Bjork Distributors acquired the lease property and continued to use the facility as a bulk petroleum operation. The bulk plant consisted of four horizontal aboveground storage tanks (ASTs) as follows: One 8,000 gallon gasoline AST, one 8,000 gallon heating oil AST, one 17,000 gallon bulk oil AST, and one 17,000 gallon diesel AST [Figure 2]. The tanks were all constructed of bare steel. A bulk loading rack/dock was located along 2nd Street East for loading and unloading of transport trucks. All piping was aboveground and was within a concrete containment basin after 1978. All tanks, piping, equipment, and buildings were removed from the facility in 1998.

In January 2006, a soil boring investigation associated with a release at the neighboring Former Unocal facility (also leased by Bjork Distributors) found petroleum contamination at the soil/groundwater interface on the Former Amoco lease property. The contamination encountered in these boreholes was considered to be partially attributable to contaminant migration from the shallow source area located on the Unocal lease property by way of groundwater/capillary fringe transport and soil smear. After reviewing the results of the initial soil boring investigation, the MTDEQ requested that an additional soil boring investigation be conducted to delineate the horizontal extent of contamination resulting from the Former Unocal release, and to identify any additional source areas located downgradient on the Former Amoco property.

2.1 Soil Boring Investigation

A total of nine soil borings were completed at the site to depths varying from 20 to 24 feet bgs during the second soil boring investigation in December 2006. Surficial soil contamination, consisting primarily of diesel range contaminants, was encountered in boreholes completed on the Former Amoco lease property between the former railroad spur lines. Analytical results from these boreholes indicated that there was a source area originating from the Former Amoco Bulk Plant location. It also appeared that contaminants migrating downgradient from the Former Unocal facility could be commingling with contaminants which originated at the Former Amoco facility.

Based on the results of the soil boring investigations, WCEC notified Marcile Sigler from the MTDEQ of a suspected release at the Former Amoco facility. Upon notification, Marcile Sigler initiated a 24-Hour Release Report for the Former Amoco facility. A 30-day Release Report was also prepared and submitted to the MTDEQ.

The two soil boring investigations conducted in 2006 found that soil contaminants were present at the highest concentrations in soils to the east of the former storage and dispensing equipment, between the former railroad spur lines. Based on the extent and magnitude of impacts to soils at the site, the MTDEQ

requested that an excavation be conducted at the Former Amoco facility to remove all accessible contaminated soils. An excavation of contaminated soils surrounding the former bulk petroleum storage and dispensing equipment on the Former Unocal property was to be performed at the same time.

2.2 Remedial Excavation

The remedial excavation activities were completed during the week of August 4, 2008. The onsite project manager used a combination of field observations and data collected during the soil boring investigations to direct the excavation contractor in removing impacted soils. Contaminated soils were loaded directly into dump trucks for disposal at a one-time landfarm for petroleum contaminated soils located approximately 3 miles from Polson, Montana. Soils that did not exhibit hydrocarbon impacts were stockpiled at the site for use as backfill material.

The boundary of the 2008 excavation area is displayed Figure 2. The excavation was advanced horizontally and vertically until field screening indicated that petroleum contamination was no longer present. The maximum depth reached during the excavation was approximately 15 feet bgs. Static groundwater was not encountered. Approximately 1,600 cubic yards of contaminated soil were removed and delivered to the one-time landfarm. Soil confirmation sampling of the sidewalls and pit bottom was conducted to quantify any residual soil contamination. All of the soil confirmation samples returned results below the applicable MTDEQ Risk-Based Screening Levels (RBSLs) for all volatile petroleum hydrocarbon (VPH) and extractable petroleum hydrocarbon (EPH) constituents [WCEC, 2008].

2.3 Monitoring Well Installation

In order to quantify impacts to groundwater, provide groundwater flow direction and gradient data, and to further assess contaminant origin and migration at the site, six groundwater monitoring wells (MW1A-MW6A) were installed on December 4 and 5, 2008 [WCEC, 2009]. Monitoring well locations were determined previously by WCEC and MTDEQ personnel during an onsite meeting. Wells were sited outside the excavation boundaries in native soils to provide an accurate representation of the groundwater potentiometric surface. HazTech Drilling, Inc., of Billings, Montana was contracted to install the groundwater monitoring wells. An additional six groundwater monitoring wells (MW1U-MW6U) were installed at the Former Unocal facility on December 3 and 4, 2008. Wells from both sites were monitored simultaneously to delineate the commingling groundwater contaminant plume present at both sites.

Following the monitoring well installation, wells were developed using a baffle pump and disposable polyethylene hosing to remove approximately 20 well volumes. Casing elevations were surveyed by WCEC's professional engineer to the specifications outlined in the MTDEQ *Technical Guidance Document #2* using

Global Positioning System (GPS), total station, and transit level equipment. The North American Vertical Datum of 1988 (NAVD 88) referenced to a local United States Geological Survey (USGS) benchmark was used to determine casing elevations.

2.4 Additional Soil Boring Investigation

A total of six groundwater monitoring events were completed between December 2008 and March 2010. The cumulative groundwater analytical results indicated the presence of a soil contaminant mass which had not been encountered during the previous investigations at the facility. Monitoring well MW5A produced trace amounts of free product during the June 2009 monitoring event and total extractable hydrocarbons (TEH) contaminant levels found in MW2A and MW6A during the September 2009 event also suggested the presence of free product. EPH groundwater contaminant concentrations remained high during the March 2010 monitoring event with monitoring wells MW4A and MW6A returning TEH results that were over 60 times the regulatory limit. The MTDEQ requested an additional soil investigation to identify the source for these dissolved and free phase groundwater constituents at the facility.

WCEC conducted an additional soil boring investigation at the site on March 23 through March 25, 2010. A total of 20 soil borings were completed at the site to depths up to 24 feet bgs. Groundwater was encountered at approximately 15 feet bgs in each borehole during the investigation. For complete details of the additional soil boring investigation, refer to the *March 2010 Soil Boring Investigation Report* submitted to the MTDEQ on May 7, 2010 [WCEC, 2010].

Three to four soil samples were collected from each borehole depending on photoionization detector (PID) soil screening results and the depth of the soil/groundwater interface. Of the 75 samples submitted for laboratory analysis, 18 exceeded the RBSL for benzene and 15 exceeded the EPH screening limit of 200 mg/kg. In addition, the BH38 11-13' sample exceeded the RBSLs for C₉-C₁₈ aliphatics and C₁₁-C₂₂ aromatics.

2.5 Additional Monitoring Well Installation

In order to define the extent and magnitude of the groundwater plume beneath and downgradient of the facility, nine groundwater monitoring wells (MW7A-MW15A) were installed on March 22 and 23, 2011 [WCEC, 2011]. Boland Drilling Company, of Great Falls, Montana was contracted to install the groundwater monitoring wells. Monitoring well locations were determined by WCEC and MTDEQ personnel during an onsite meeting. The monitoring wells were sited outside the excavation boundary in strategic locations to fully encompass the lateral and downgradient edges of the groundwater plume. All nine monitoring wells were completed in native soils which should provide a more accurate representation of the groundwater potentiometric surface.

Monitoring well locations are shown on Figure 2. Soils encountered in the well borings consisted predominately of varved glacio-lacustrine silts and clays. Soil cuttings from the monitoring well boreholes were continuously screened for the presence of petroleum hydrocarbons using a PID, visual, and olfactory observations during monitoring well installation. If soils containing petroleum hydrocarbons were encountered in the monitoring well boring, WCEC personnel collected a soil sample from the interval which represented the worst case impacts. Of the total nine monitoring well borings, only one (MW14) contained a soil interval with sufficient hydrocarbon impacts to qualify for submission to the analytical laboratory. The MW14A boring 8 to 10 feet bgs interval exhibited weathered hydrocarbon odor and staining. All of the constituents of concern present in the MW14A 8' sample were below the applicable MTDEQ RBSLs for soil [WCEC, 2011].

Following the monitoring well installation, wells were developed using a downhole electric purge pump to remove approximately 20 well volumes. Casing elevations were surveyed by WCEC's professional engineer to the specifications outlined in the MTDEQ *Technical Guidance Document #2* using Global Positioning System (GPS), total station, and transit level equipment. The North American Vertical Datum of 1988 (NAVD 88) referenced to a local USGS benchmark was used to determine casing elevations.

Two semiannual groundwater monitoring events were completed following the March 2011 monitoring well installations. Samples from monitoring wells MW5A and MW6A exceeded the RBSLs during the March 2011 monitoring event. Samples from monitoring wells MW2A, MW4A, MW6A, and MW14A exhibited RBSL exceedances during the September 2011 monitoring event and monitoring well MW4A contained free product with a thickness of 0.07 feet. VPH groundwater constituent concentrations at the site remained relatively low with the exception of source well MW6A, which continued to exceed the RBSLs for benzene and TPH. EPH groundwater constituent concentrations have consistently been elevated throughout the duration of site groundwater monitoring.

2.6 Laser-Induced Fluorescence (LIF) Investigation

WCEC conducted an LIF investigation at the Former Amoco Bulk Plant between May 6 and May 9, 2014 [WCEC, 2014]. A total of 51 LIF boreholes and 3 dual-tube boreholes were emplaced during the investigation. From June 11 to June 16, 2014, WCEC completed a separate LIF investigation at the neighboring Morton's Cardtrol Bulk Plant which included the advancement of 38 LIF boreholes and 3 dual-tube boreholes. Both of the investigations progressed onto the Former Unocal Bulk Plant release site as necessary to fully delineate the light non-aqueous phase liquid (LNAPL) plume(s). As a result of these comprehensive investigations, the extent and magnitude of LNAPL in the vicinity of the Former Amoco Bulk Plant was adequately characterized, both horizontally and vertically.

In general, the intensity of LIF signal response across the investigation area correlated with historical soil and groundwater investigation data. Zones with high LIF signal response were near monitoring wells that have had free product accumulations in the past (MW4A, MW5A, and MW6A). Additionally, areas previously defined as not having petroleum impacts through step-out soil borings and monitoring well installations returned non-detect or relatively low LIF signal responses during the investigation. The vertical extent of the LNAPL plume body ranged from depths of 3 feet bgs in source area locations to depths greater than 25 feet bgs. The majority of the LNAPL responses were clustered between 5 to 20 feet bgs. The most intense signal responses were found between 10 to 15 feet bgs. The vertical LNAPL distribution correlated with seasonal fluctuations in groundwater elevation which vary from near the surface to approximately 20 feet bgs [Table 1].

The overall shape of the LNAPL plume body defined during the May 2014 LIF investigation was semi-continuous, with several intermittent LNAPL bearing units of varying thicknesses extending laterally that may or may not have been interconnected. Thickness of individual LNAPL units ranged from less than 1 inch up to a maximum of approximately 5 feet. Typical LNAPL bearing units were relatively thin (0.5 to 1 feet thick) and separated by clean intervals. Borehole LIF19 contained the thickest continuous LNAPL signal response from 3 to 19 feet bgs.

The data obtained from the May 2014 LIF investigation was input into three dimensional kriging calculations to create a 3D *Integrated Site Visualization™* (ISV) of the extent and magnitude of the LNAPL plume body [WCEC, 2014]. The LNAPL plume was then analyzed in the context of a multiple lines of evidence approach which included historical and current analytical data and site-specific hydrogeological principals to derive an advanced conceptual site model (CSM). Based on the results of this comprehensive analysis, WCEC recommended that further remedial excavation be conducted at the facility to remove hydrocarbon impacted soils defined during the LIF investigation that were contributing to the free phase product accumulations and significant dissolved phase groundwater constituent concentrations noted in MW4A, MW5A, and MW6A.

2.7 2018 Remedial Excavation

WCEC supervised an additional remedial excavation at the facility in September / October 2018 [WCEC, 2018]. Prior to initiating the 2018 excavation, WCEC's licensed monitoring well constructor properly abandoned any monitoring wells located within the proposed excavation footprint, including MW4A, MW5A, MW6A, and MW7A. Free phase petroleum was observed in MW4A, MW6A, and MW7A during the abandonment event, with product thicknesses of 0.70 feet, 0.46 feet, and 0.43 feet, respectively. Abandonment logs were prepared and submitted to the Montana Bureau of Mines & Geology (MBMG).

The remedial excavation targeted the LNAPL plume delineated during the 2014 LIF investigation [WCEC, 2014] which continued to contribute to groundwater concentrations exceeding RBSLs and accumulations of free petroleum in various site monitoring wells. The excavation was conducted during seasonal low groundwater conditions to allow for removal of smear zone impacts which extended to depths up to 19 feet bgs. No indications of groundwater were observed in the pit bottom of the excavation which extended to a maximum depth of approximately 20 feet bgs. A total of 6,314 cubic yards of petroleum impacted material was removed from the site during the remedial excavation [Figure 2]. 2,400 cubic yards of impacted soils were delivered to the Bjork One-Time Landfarm and 3,914 cubic yards were delivered to Treasure State Concrete for recycling as asphalt road base material. The confirmation sample analytical results provide evidence that removal of petroleum impacted soil generally achieved remedial objectives. Limited areas of residual impacts exceeding RBSLs were noted along the east sidewall of the excavation and adjacent to 2nd Street East [WCEC, 2018].

2.8 2022 Monitoring Well Installation

WCEC installed three additional groundwater monitoring wells (MW16A, MW17A, and MW18A) at the Former Amoco Bulk Plant facility on September 13, 2022 [Figure 2]. Soil samples were collected from the monitoring well borings for analysis of VPH, EPH, and lead scavengers constituents. Semiannual groundwater monitoring activities were completed on October 5 and 6, 2022, and March 28, 2023. Groundwater samples were collected from monitoring wells MW1A, MW2A, MW3A, MW14A, MW16A, MW17A, and MW18A for analysis of VPH and EPH. Groundwater samples from monitoring well MW16A were also analyzed for lead scavengers. The groundwater sample from MW14A exceeded RBSLs during the October 2022 monitoring event and an oily substance was observed on the sample tubing in monitoring well MW17A during the March 2023 event [WCEC, 2023].

3.0 Scope of Work

The scope of work requested by MTDEQ includes:

- Use the standardized Work Plan and Report formats found under the Guidance dropdown at the Petroleum Tank Cleanup Section (PTCS) webpage. Please submit a Petroleum Tank Release Compensation Board (PTRCB) Groundwater Monitoring and Sampling Unit Cost Worksheet (enclosed and available under the Forms and Worksheets tab at the PTRCB webpage).
- Propose a plan to monitor, gauge, and sample groundwater at Facility monitoring wells. Collect groundwater samples by low-flow sampling methodology according to DEQ's Groundwater Sampling Guidance found under the Guidance dropdown at the PTCS webpage.
- Analyze groundwater samples for petroleum constituents as required by the Montana Risk-Based Corrective Action Guidance for Petroleum Releases.
- Dispose of purge water according to the Disposal of Untreated Purge Water from Monitoring Wells flowchart found under the Guidance dropdown at the PTCS webpage.
- Validate all laboratory analytical data using DEQ's Data Validation Summary Form (DVSF) found under the Guidance dropdown at the PTCS webpage.
- Discuss ongoing WP tasks and results with DEQ's project manager, submit written agreed-upon WP modifications as required to complete the WP objectives.
- Prepare and submit an Interim Data Submittal (IDS) for each interim groundwater monitoring event. The IDS is expected to include the discussion, data, tables, and figures described in the Groundwater Monitoring Work Plan and Report Guidance for Petroleum Releases found under the Guidance dropdown at the PTCS webpage.
- Prepare and submit one Groundwater Monitoring Report detailing the method and results of all groundwater monitoring events completed under this WP. The Groundwater Monitoring Report is expected to include all format sections described in the Groundwater Monitoring Work Plan and Report Guidance for Petroleum Releases found under the Guidance dropdown at the PTCS webpage and the following:
 - Cumulative groundwater data tables.
 - Updated site features and potentiometric surface maps.
 - An updated Release Closure Plan (RCP).

- Append groundwater monitoring field forms, laboratory analytical data, completed DVSFs, and the updated RCP.

3.1 Groundwater Monitoring

Groundwater samples will be collected from monitoring wells MW2A, MW14A, MW16A, MW17A, and MW18A [Figure 2] on an annual basis during low groundwater conditions in 2024 and 2025. Well sampling will be conducted according to WCEC Standard Operating Procedures (SOPs) and MTDEQ Guidance for low-flow sampling using a peristaltic pump for purging and sample collection [MTDEQ, 2018a]. Groundwater quality parameter data (conductivity, pH, salinity, dissolved oxygen, temperature, turbidity, and ORP) will be acquired during well purging using a flow through cell attached to the peristaltic pump. Purge water will be handled according to the MTDEQ Purge Water Disposal Flowchart. Depth to water measurements will be recorded from all site wells to provide an accurate potentiometric surface plot, flow direction, and gradient.

Prior to sampling, monitoring well MW17A will be gauged with an oil-water interface probe accurate to 0.01 feet to determine the potential presence of light non-aqueous phase (LNAPL) in the well. If LNAPL is detected, the thickness will be recorded and an absorbent sock will be deployed in the well to collect and remove the accumulated product. The in-well absorbent sock may be left in place between annual monitoring events to prevent LNAPL accumulations to the maximum extent practicable and facilitate ongoing annual groundwater sample collection for compliance monitoring.

Groundwater quality parameter, purge, and stabilization data for each well will be recorded in the field using WCEC's Well Sampling Form. Sample collection will be completed following stabilization of groundwater quality parameters. Groundwater samples will be preserved with hydrochloric acid, packed on ice, and delivered to Energy Laboratories in Helena, Montana under chain of custody. All groundwater samples will be submitted for analysis of VPH and EPH constituents as outlined in MTDEQ guidance [MTDEQ, 2018b]. TEH fractions with PAHs analysis will be completed for any samples that exceed the EPH screen of 1,000 µg/L.

3.2 Report Preparation

After the first annual groundwater monitoring event in 2024, WCEC will prepare an Interim Data Submittal (IDS) for review by the MTDEQ. At the conclusion of two years of annual groundwater monitoring in 2024 and 2025, WCEC will submit a Groundwater Monitoring Report detailing the results of both of the annual groundwater monitoring events. Laboratory analytical data will be validated using the MTDEQ Data Validation Summary Form (DVSF) with a completed DVSF appended to each laboratory analytical report. The report will include the content, figures, cumulative data tables for groundwater, and appendices outlined in the Groundwater Monitoring Report format guidance, which includes preparing a Release Closure Plan (RCP).

Groundwater Monitoring Work Plan 34824

Former Amoco Bulk Plant

Polson, MT

A thorough discussion regarding the groundwater analytical results with recommendations for further corrective actions will also be presented in the RCP and the Groundwater Monitoring Report.

4.0 Estimated Costs & Project Timeline

The scope of work outlined in this work plan is tentatively scheduled to begin in September 2024, pending approval from the MTDEQ. The attached *PTRCB Groundwater Monitoring & Sampling Unit Cost Worksheet* details anticipated project costs to complete the MTDEQ required scope of work.

4.1 Planned Workflow & Cost Explanations

WCEC will complete the scope of work included in this work plan during two individual field events with completion and reporting milestones as follows:

Event 1 – Planned completion by September 30, 2024: First annual groundwater monitoring and sampling event.

Interim Data Submittal (IDS) – Planned completion by December 31, 2024: IDS for review by MTDEQ.

Event 2 – Planned completion by September 30, 2025: Second annual groundwater monitoring and sampling event.

Groundwater Monitoring Report – Planned submittal by December 31, 2025: Final report submittal to MTDEQ.

The deadlines listed above may be adjusted if delays are encountered obtaining the requisite approval of this Work Plan from MTDEQ.

5.0 References

Boettcher, A. J. (Boettcher, 1982). *Ground-water resources in the central part of the Flathead Indian Reservation, northwestern Montana*. Montana Bureau of Mines and Geology.

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Figures

Figure 1: Site Location Map

Figure 2: Site Details Map

