STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Eastern Region Office
4601 North Monroe St., Spokane, WA 99205-1295 • 509-329-3400

December 20, 2022

Bryce Robbert
Avista Utilities
1411 East Mission Avenue
Spokane, WA 99220-3727

Re: No Further Action opinion at the following contaminated Site:

Site Name:	Avista Corp Spokane Service Center
Site Address:	1411 E Mission Ave, Spokane
Cleanup Site ID:	3512
Facility/Site ID:	31739484
VCP Project ID:	EA0343

Dear Bryce Robbert:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your independent cleanup of the Avista Corp Spokane Service Center facility (Site). This letter provides our opinion and analysis. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70A.305 RCW[1].

Opinion

Ecology has determined that no further remedial action is necessary to clean up contamination at the Site.

This opinion depends on the continued performance and effectiveness of the post-cleanup controls and monitoring specified in this letter and in the environmental covenant in **Enclosure C**.

Ecology bases this opinion on an analysis of whether the remedial action meets the substantive requirements of MTCA and its implementing regulations, which are

[1] https://app.leg.wa.gov/RCW/default.aspx?cite=70A.305

specified in Chapter 70A.305 RCW and Chapter 173-340 WAC (collectively called "MTCA").

Description of the Site

This opinion applies to only the Site described as follows. The Site is defined by the nature and extent of contamination associated with the following releases:

- Heavy metals, polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons into the soil.
- PAHs and petroleum hydrocarbons into the groundwater.

Enclosure A includes a detailed description and diagram of the Site, as currently known to Ecology.

Please note that releases from multiple sites can affect a parcel of real property. At this time, Ecology has no information that other sites affect the parcel(s) associated with this Site.

Basis for the Opinion

Ecology bases this opinion on information in the documents listed in **Enclosure B**. You can request these documents by filing a records request.[2] For help making a request, contact the Public Records Officer at publicrecordsofficer@ecy.wa.gov or call (360) 407-6040. Before making a request, check whether the documents are available on the Site webpage[3].

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that **no further remedial action** is necessary to clean up contamination at the Site. Ecology bases its conclusion on the following analysis:

[2] https://ecology.wa.gov/About-us/Accountability-transparency/Public-records-requests
[3] https://apps.ecology.wa.gov/gsp/CleanupSiteDocuments.aspx?csid=3512

Characterizing the Site.

Ecology has determined your characterization of the Site is sufficient to establish cleanup standards and select a cleanup action. The Site is described above and in **Enclosure A.**

Site characterization began in 1994 during removal of the hydraulic lifts within the garage building. Approximately 19 tons of soil impacted with hydraulic oil were excavated to 8 feet below ground surface (bgs) and disposed offsite. Further investigation included 13 soil borings between 6 and 15 feet bgs in the pea gravel footing material and adjacent soils until native material or bedrock were encountered. Approximately 145 tons of soil were removed and disposed offsite, though some impacted soils and gravel were left in place to avoid compromising the garage structure. The extent of contaminated soil appeared limited to directly below the hydraulic lifts.

The garage building was demolished in 2018 and five test pits were excavated between 12 and 16 feet bgs within the footprint of the building. Soil samples were analyzed for petroleum hydrocarbons, metals, PAHs, and PCBs. Diesel- and oil-range petroleum hydrocarbons were detected from 3 to 12 feet bgs and exceeded MTCA soil cleanup levels between 9 and 10 feet bgs. PAHS were detected at similar depths and exceeded cleanup levels between 11 and 12 feet bgs. Metals were detected below cleanup levels, while PCBs were not detected in any samples.

Four groundwater monitoring wells were installed in 1996-1997 and a fifth was installed in 2017. Groundwater flows to the northwest, away from the Spokane River. Depth to groundwater underneath the former garage building is approximately 30 feet bgs, and ranges from approximately 10-37 feet bgs throughout the property. Groundwater analytical results indicate that PAHs exceeded the MTCA groundwater cleanup level in 2018, however a duplicate sample and all subsequent samples did not detect PAHs. Diesel- and oil-range hydrocarbons were detected below cleanup levels. Metals and PCBs have not been detected in groundwater during any sampling events.

Establishing cleanup standards.

Ecology has determined the cleanup levels and points of compliance you established for the Site meet the substantive requirements of MTCA.

For soil, the cleanup levels were established using MTCA Method A and are based on protection of groundwater. The land use is classified as light industrial (LI) by the City of Spokane, but cleanup levels for unrestricted land use were deemed appropriate due to proximity to the Spokane River. The point of compliance for soils is throughout the lateral and vertical extent of the Site. This is the standard point of compliance. The cleanup levels are as follows.

Contaminant	Cleanup Level (mg/kg)
Gasoline-range petroleum hydrocarbons	30
Diesel- and oil-range petroleum hydrocarbons	2000
PAHs	0.1
Arsenic	20
Cadmium	2
Chromium	19
Lead	250

mg/kg = milligrams per kilogram

For groundwater, the cleanup levels were established using MTCA Method A and are based on the protection of drinking water beneficial uses. For groundwater, the point of compliance is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the Site. This is the standard point of compliance. The cleanup levels are as follows:

Contaminant	Cleanup Level (µg/L)
Diesel- and oil-range petroleum hydrocarbons	500
PAHs	0.1

µg/L = micrograms per liter

Selecting the cleanup action.

Ecology has determined the cleanup action you selected for the Site meets the substantive requirements of MTCA:

- Excavation and offsite disposal of contaminated soil and debris to the maximum extent practicable
- Engineered controls to contain residual contaminated soil and prevent direct human contact
- Stormwater controls to reduce infiltration through residual contaminated soil
- Groundwater monitoring to demonstrate that residual contaminated soil does not cause an exceedance of groundwater cleanup levels
- Institutional controls to protect the remedial actions and restrict land use

Implementing the cleanup action.

Ecology has determined the cleanup you performed meets the cleanup standards established for the Site.

Approximately 3,792 tons of contaminated soil were excavated and disposed at Waste Management's Graham Road Facility near Medical Lake. Complete removal of deeper soil was not possible without impacting the structural integrity of nearby buildings and utility infrastructure. Confirmatory soil samples were collected to define the extent of residual contaminated soil between approximately 15 and 24 feet bgs.

A 40-mil thick light low-density polyethylene (LLDPE) geosynthetic liner was installed from 6 to 8.5 feet bgs to cap residual contaminated soils within the excavation bounds and divert stormwater away from the capped area. The liner was graded between 1-4 percent to assist with drainage. A drainage pipe trench was constructed to transfer stormwater into the existing onsite stormwater system. The excavation was backfilled with bedding sand and imported fill material and compacted.

Five groundwater monitoring wells were monitored quarterly from December 2019 through February 2021, with analytical results indicating that all samples met Method A groundwater cleanup levels.

Post-Cleanup Controls and Monitoring

Post-cleanup controls and monitoring are remedial actions performed to ensure compliance with cleanup standards. Ecology is issuing this No Further Action opinion based on the continued performance and effectiveness of the following post-cleanup remedial actions at the Site. Ecology may rescind this opinion if these remedial actions are not performed or do not effectively maintain the cleanup standards.

Compliance with institutional controls

Institutional controls prohibit or limit activities that may interfere with the integrity of engineered controls or result in exposure to contamination. The following site-specific institutional controls are needed at the Site:

- Restrict land use to purposes and activities consistent with the continued operation, maintenance, and monitoring of the remedial actions
- Protect and maintain the soil cap to ensure containment of contaminated soil and waste materials
- Maintain stormwater controls to minimize infiltration through contaminated soil and waste materials
- Provide notice to Ecology of annual inspection of all engineered controls and provide reasonable access to Ecology to evaluate the continued effectiveness of the remedial actions and enforce compliance with institutional controls

To implement the controls, you recorded an environmental covenant on the following parcel of real property in Spokane County:

- 35093.2006

Ecology approved the environmental covenant under recording number 7201723 (see **Enclosure C**)**.** To amend or terminate the covenant, you must request additional review under the VCP.[4]

Operation and maintenance of engineered controls

Engineered controls prevent or limit movement of, or exposure to, contamination. The Site needs the following engineered controls:

- Soil cap
- Stormwater drainage and infiltration

Ecology has determined the operation and maintenance plan you submitted for these engineered controls meets the substantive requirements of MTCA. This plan is included as **Enclosure D.**

Periodic review of post-cleanup conditions

Ecology will conduct periodic reviews of post-cleanup conditions at the Site to evaluate whether they remain protective of human health and the environment. Based on a periodic review, if Ecology determines the Site needs further remedial action, Ecology will rescind this opinion.

Listing of the Site

Based on this opinion, Ecology will initiate the process of removing the Site from our lists of hazardous waste sites, including the:

- Hazardous Sites List
- Confirmed and Suspected Contaminated Sites List.

[4] Toxics Cleanup Program Procedure 440C: https://apps.ecology.wa.gov/publications/SummaryPages/1509057.html

Limitations of the Opinion

Opinion does not settle liability with the state.

Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion does not:

- Resolve or alter a person's liability to the state.
- Protect liable persons from contribution claims by third parties.

To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70A.305.040(4).

Opinion does not constitute a determination of substantial equivalence.

To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you proposed will be substantially equivalent. Courts make that determination. *See* RCW 70A.305.080 and WAC 173-340-545.

State is immune from liability.

The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70A.305.180.

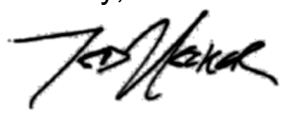
Termination of Agreement

Thank you for cleaning up the Site under the VCP. This opinion terminates the VCP Agreement governing VCP Project No. EA0343.

Contact Information

If you have any questions about this opinion or the termination of the VCP agreement, please contact me by phone at 509-342-5564 or e-mail at ted.uecker@ecy.wa.gov.

Sincerely,



Ted M. Uecker
ERO Toxics Cleanup Program

tmu:hg

Enclosures (4): A – Site Description and Diagrams
B – List of Site Documents
C – Environmental Covenant for Institutional Controls
D – Operation and Maintenance Plan

cc: Kathleen Falconer, Ecology KLF
Fiscal, VCP Fiscal Analyst (w/o encl)
TCP, Operating Budget Analyst (w/o encl)

Enclosure A

Description and Diagrams of the Site

Site Description

The Site is located northeast of downtown Spokane on the 19.62-acre Avista campus (tax parcel number 35093.2006), directly north of Mission Park. The Site is located approximately 400 feet west of the Spokane River, within the bounds of the Spokane Valley- Rathdrum Prairie Aquifer. Depth to groundwater ranges from 10 to 37 feet bgs, with the groundwater table below the former garage building at approximately 30 feet bgs. The Site has been used to service Avista's (formerly Washington Water Power) fleet since 1955, and is zoned Light Industrial (LI) by the City of Spokane.

The Site contains a garage building with eight main garage door bays, a high bay area to the north, and two garage door bays and an office to the south. The building contained sub-slab hydraulic lifts in Bays 1, 2, 5, and 7, and the high bay area contained portable hydraulic lifts above-grade. The garage building was demolished in summer 2018, followed by assessment and remediation activities.

Site History

In 1994, the hydraulic lifts were removed as part of an independent investigation and partial cleanup. Petroleum staining was observed in soils surrounding the lifts to a depth of approximately eight feet bgs. Approximately 19 tons of soil were excavated and disposed, but excavation was discontinued due to concern with the structural integrity of the garage building. Ecology was notified of the release, and a site hazard assessment was performed. Additional excavations, borings, and characterization were conducted during the installation of four new hydraulic lifts in 1995. In 1999, another lift was removed along with approximately four cubic yards of petroleum-contaminated soil.

Four groundwater monitoring wells were installed between 1996 and 1997, with a fifth well installed in 2017. During the 90s sampling events, groundwater was determined to flow southeast toward the Spokane River; however, the flow was determined to flow northwest during subsequent sampling in 2018.

Following demolition of the garage building, test pits were excavated, and soil samples were collected and analyzed for diesel- and oil-range petroleum hydrocarbons (DRPH and ORPH), RCRA 8 metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Results of this sampling confirmed the presence of DRPH, ORPH, and PAHs exceeding MTCA Method A Industrial cleanup levels.

Between August and October 2018, approximately 3,792 tons of potentially contaminated soil were excavated and disposed at Waste Management's Graham Road Facility near Medical Lake, WA. Confirmation samples indicated that contaminated soil remains underneath Bays 1, 2, 4, 5, and 7 at depths ranging from 15 to 24 feet bgs. Further soil

excavation could not be conducted due to the proximity to buildings and utility infrastructure. Residual contaminants include DRPH from 2,100 to 6,800 mg/kg, ORPH from 2,600 to 25,000 mg/kg, and PAHs with a toxic equivalency of 0.386 to 0.396 mg/kg. Following excavation, a low-density polyethylene (LDPE) liner was installed in the excavation between 6 and 8.5 feet bgs, graded to divert stormwater to an onsite management system.

Groundwater samples were collected from the five monitoring wells between August and October 2018, before and after excavation activities. All samples were analyzed for DRPH, ORPH, PAHs, and PCBs. PAHs were detected in wells MW-2, MW-3, and MW-4 at concentrations less than the cleanup level. The method reporting limit (MRL) for the combined concentrations of DRPH and ORPH were greater than the MTCA Method A cleanup level of 500 ug/L. All other analytes were non-detect. Depth to groundwater at the site ranges from 10-37 feet bgs.

In December 2019, GeoEngineers discovered that part of the geotextile liner was damaged during installation of a water line and stormwater drainage pipes. The liner was repaired the following month, and groundwater samples were collected biweekly during the interim to ensure that contaminants capped by the liner did not leach into groundwater.

Quarterly groundwater monitoring through February 2021 yielded no contaminants of concern exceeding the laboratory MRLs, but during several monitoring events the DRPH and ORPH MRLs exceeded the combined Method A cleanup level.

In April 2022, an environmental covenant was recorded with Spokane County to protect the engineered controls and restrict activities that would allow exposure to contaminated soil.

Sources: GeoEngineers, 2019-22; Spokane Environmental Solutions, 2020-2021

Site Diagrams

Legend

- Well ID and Approximate Location
- Former Monitoring Well
- Approximate Area of Repaired Liner
- Approximate 2018 Remedial Excavation Area (Capped Area)
- Approximate Parking Garage Structure Location

N

W E

S

150 0 150

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI, Spokane County GIS. Image from Google Earth.

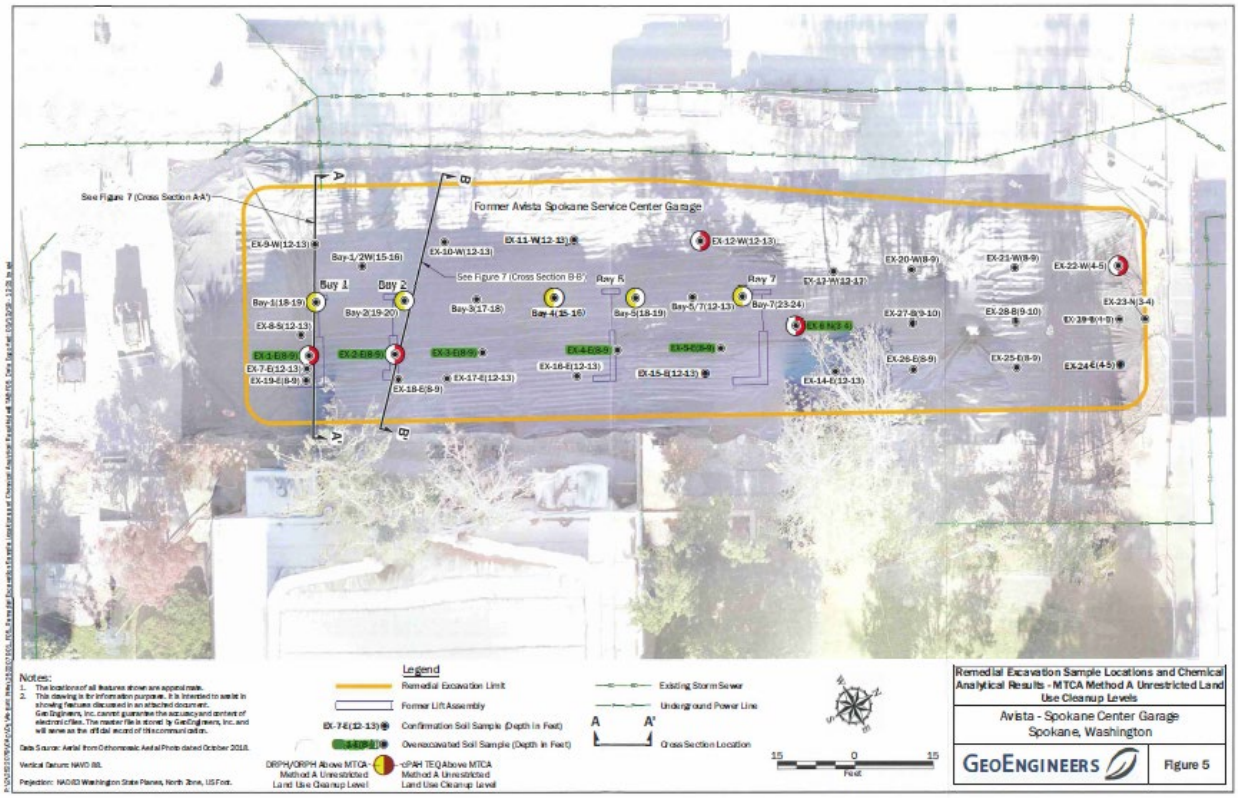
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Site Plan

Avista – Service Center Garage
Spokane, Washington

GeoEngineers

Figure 2


See Figure 7 (Cross Section A-A')
Former Avista Spokane Service Center Garage
See Figure 7 (Cross Section B-B')
Bay 1
Bay 2
Bay 5
Bay 7
EX-9-W(12-13)
Bay-1/2W(15-16)
EX-10-W(12-13)
EX-11-W(12-13)
EX-12-W(12-13)
EX-13-W(12-13)
EX-20-W(8-9)
EX-21-W(8-9)
EX-22-W(4-5)
Bay-1(18-19)
Bay-2(19-20)
Bay-3(17-18)
Bay-4(15-16)
Bay-5(18-19)
Bay-5/7(12-13)
Bay-7(23-24)
EX-8-S(12-13)
EX-1-E(8-9)
EX-2-E(8-9)
EX-3-E(8-9)
EX-4-E(8-9)
EX-5-E(8-9)
EX-6-N(3-4)
EX-7-E(12-13)
EX-19-E(8-9)
EX-16-E(12-13)
EX-17-E(12-13)
EX-18-E(8-9)
EX-15-E(12-13)
EX-14-E(12-13)
EX-26-E(8-9)
EX-27-E(9-10)
EX-28-E(9-10)
EX-25-E(8-9)
EX-24-E(4-5)
EX-23-N(3-4)
EX-29-E(4-5)
Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Source: Aerial from Orthomosaic Aerial Photo dated October 2018.
Vertical Datum: NAVD 88.
Projection: NAD83 Washington State Plane, North Zone, US Foot.
Legend
Remedial Excavation Limit
Former Lift Assembly
EX-7-E(12-13) Confirmation Soil Sample (Depth in Feet)
EX-1-E(8-9) Overexcavated Soil Sample (Depth in Feet)
DRPH/ORPH Above MTCA Method A Unrestricted Land Use Cleanup Level
cPAH TEQ Above MTCA Method A Unrestricted Land Use Cleanup Level
Existing Storm Sewer
Underground Power Line
A A' Cross Section Location
15 0 15
Feet
Remedial Excavation Sample Locations and Chemical Analytical Results - MTCA Method A Unrestricted Land Use Cleanup Levels
Avista - Spokane Center Garage
Spokane, Washington
GeoEngineers
Figure 5

Enclosure B

List of Site Documents

1. GeoEngineers, Operation and Maintenance Plan, October 20, 2022.
2. Ecology, Environmental Covenant 7201723 Recorded in Spokane County, April 26, 2022.
3. Spokane Environmental Solutions, Quarterly Groundwater Monitoring Report-February 2021, February 22, 2021.
4. Spokane Environmental Solutions, Quarterly Groundwater Monitoring Report-October 2020, November 24, 2020.
5. Spokane Environmental Solutions, Quarterly Groundwater Monitoring Report-July 2020, August 12, 2020
6. GeoEngineers, CSID No. 3512 Avista Service Center Garage Liner Repair and Groundwater Monitoring Report, February 14, 2020.
7. GeoEngineers, CSID No. 3512 Avista Service Center Garage Monitoring Well Installation and July 31, 2019 Groundwater Monitoring Report, September 13, 2019.
8. GeoEngineers, CSID No. 3512 Avista Service Center Garage Remedial Action, March 22, 2019.
9. Sheila Pachernegg, P.E., Hydraulic Lift Excavations Spokane Service Center, March 31, 1996.

Enclosure C

Environmental Covenant for Institutional Controls

7201723 04/26/2022 09:50:17 AM
Rec Fee: $217.50 Page 1 of 15
Covenant INGEO SYSTEMS INC
Spokane County Washington eRecorded

After Recording Return
Original Signed Covenant to:
Ted M. Uecker
Toxics Cleanup Program
Department of Ecology
4601 N. Monroe Street
Spokane, WA 99205

Environmental Covenant

Grantor:	Avista Corporation
Grantee:	State of Washington, Department of Ecology (hereafter "Ecology")
Brief Legal Description:	PTN OF BLOCK 3 AND ALL OF BLKS 14, 15, ROSS PK, VOL. "A", P. 141 AND PTN OF LOTS 3, 4, 5, 6, 7, & 8, THE SUBDIVISION OF BLOCK 4, ROSS PK, VOL. "E", P. 63 AND LOTS 1, 2, 3, 4, 5, 6, & 7, BLOCK 1, & LOTS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 & 14, BLOCK 2, ROBERT'S SUB OF BLOCK 16, ROSS PK, VOL. "K", P. 35; PTN LOTS 1 & 6, AND ALL OF LOTS 2, 3, 4, & 5, FORESTER'S SUB. OF BLOCK 17, ROSS PK, VOL, "B", P. 3, PTN OF LOTS 17 & 18, ROSS SUB OF BLOCK 18, ROSS PK, VOL. "B", p. 2
Tax Parcel No.:	35093.2006
Cross Reference:	N/A

RECITALS

a. This document is an environmental (restrictive) covenant (hereafter "Covenant") executed pursuant to the Model Toxics Control Act ("MTCA"), chapter 70A.305 RCW, and Uniform Environmental Covenants Act ("UECA"), chapter 64.70 RCW.

b. The Property that is the subject of this Covenant is part or all of a site commonly known as Avista Corp Spokane Service Center. The Property is legally described in Exhibit A, and illustrated in Exhibit B, both of which are attached (hereafter "Property"). If there are differences between these two Exhibits, the legal description in Exhibit A shall prevail.

c. The Property is the subject of remedial action conducted under MTCA. This Covenant is required because residual contamination remains on the Property after completion of remedial actions. Specifically, the following principal contaminants remain on the Property:

Medium	Principal Contaminants Present
Soil	Diesel- and oil-range petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs)

These contaminants are located in soil at depths ranging from 15 to 24 feet below ground surface in the area shown on Exhibit C as "Geosynthetic Liner Footprint," which is legally described in Exhibit D (the "Restricted Area"). Diesel-range petroleum hydrocarbons are present in the Restricted Area at concentrations of 2,100 to 6,800 milligrams per kilogram (mg/kg); oil-range petroleum hydrocarbons are present at concentrations of 2,600 to 25,000 mg/kg; and PAHs are present with a toxic equivalency of 0.386 to 0.396 mg/kg. These contaminants are contained beneath a low-density polyethylene liner (cap) installed between 6 and 8.5 feet below ground surface. Clean imported sand and soil backfill occur from the liner depth to the current surface grade.

Stormwater that infiltrates above the cap is diverted to a drainage pipe that conveys the water to a manhole connected to a stormwater infiltration basin on the Property, as shown on Exhibit C.

d. It is the purpose of this Covenant to restrict certain activities and uses of the Restricted Area to protect human health and the environment and the integrity of remedial actions conducted at the site. Records describing the extent of residual contamination and remedial actions conducted are available through Ecology, including the following:

1. Spokane Environmental Solutions, Quarterly Groundwater Monitoring Report- February 2021, February 22, 2021.
2. Spokane Environmental Solutions, Quarterly Groundwater Monitoring Report- October 2020, November 24, 2020.
3. Spokane Environmental Solutions, Quarterly Groundwater Monitoring Report- July 2020, August 12, 2020.
4. GeoEngineers, Inc., CSID No. 3512 Avista Service Center Garage Liner Repair and Groundwater Monitoring Report, February 14, 2020.
5. GeoEngineers, Inc., CSID No. 3512 Monitoring Well Installation and July 31, 2019 Groundwater Monitoring Report, September 13, 2019.
6. GeoEngineers, Inc., CSID No. 3512 Revised Avista Service Center Garage Remedial Action, August 9, 2019.

e. This Covenant grants Ecology certain rights under UECA and as specified in this Covenant. As a Holder of this Covenant under UECA, Ecology has an interest in real property. However, this is not an ownership interest which equates to liability under MTCA or the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 *et seq.* The rights of Ecology as an "agency" under UECA, other than its' right as a holder, are not an interest in real property.

COVENANT

Avista Corporation, as Grantor and fee simple owner of the Property, hereby grants to the Washington State Department of Ecology, and its successors and assignees, the following covenants. Furthermore, it is the intent of the Grantor that such covenants shall supersede any prior interests the GRANTOR has in the property and run with the land and be binding on all current and future owners of any portion of, or interest in, the Property.

Section 1. General Restrictions and Requirements.

The following general restrictions and requirements shall apply to the Restricted Area:

a. Interference with Remedial Action. The Grantor shall not engage in any activity on the Restricted Area that may impact or interfere with the remedial action and any operation, maintenance, inspection or monitoring of that remedial action without prior written approval from Ecology.

b. Protection of Human Health and the Environment. The Grantor shall not engage in any activity on the Restricted Area that may threaten continued protection of human health or the environment without prior written approval from Ecology. This includes, but is not limited to, any activity that results in the release of residual contamination that was contained as a part of the remedial action or that exacerbates or creates a new exposure to residual contamination remaining in the Restricted Area.

c. Continued Compliance Required. Grantor shall not convey any interest in any portion of the Restricted Area without providing for the continued adequate and complete operation, maintenance and monitoring of remedial actions and continued compliance with this Covenant.

d. Leases. Grantor shall restrict any lease for any portion of the Restricted Area to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Restricted Area.

e. Preservation of Reference Monuments. Grantor shall make a good faith effort to preserve any reference monuments and boundary markers used to define the areal extent of coverage of this Covenant. Should a monument or marker be damaged or destroyed, Grantor shall have it replaced by a licensed professional surveyor within 30 days of discovery of the damage or destruction.

Section 2. Specific Prohibitions and Requirements.

In addition to the general restrictions in Section 1 of this Covenant, the following additional specific restrictions and requirements shall apply.

a. Land use. The remedial action for the Property is based on a cleanup designed for industrial property. As such, the Property shall be used in perpetuity only for industrial uses, as that term is defined in the rules promulgated under Chapter 70A.305 RCW. Prohibited uses on the Property include but are not limited to residential uses, childcare facilities, K-12 public or private schools, parks, grazing of animals, growing of food crops, and non-industrial commercial uses.

b. Containment of soil. The remedial action for the Property is based on containing contaminated soil under a cap consisting of 40-mil-thick linear low-density polyethylene (LLDPE)

geosynthetic liner, with a layer of Mirafi 180N geotextile fabric beneath and over the geosynthetic. Clean imported backfill occurs from the liner depth of 6-8.5 feet below grade to the current surface grade. The cap is located as shown in Exhibit C. The primary purpose of this cap is to prevent direct contact with contaminated soils, and delineate the residual impacted soil from the clean native soil. The secondary purpose of the cap is to reduce the potential for remaining contamination in soil to leach to groundwater.

The following restrictions shall apply within the Restricted Area:

Any activity that will compromise the integrity of the cap, including drilling; digging; piercing the cap with sampling device, post, stake or similar device; grading; excavation; installation of underground utilities; removal of the cap; or application of loads in excess of the cap load bearing capacity, is prohibited without prior written approval by Ecology. Ecology acknowledges that Grantor intends in the future to seek Ecology's approval to construct a building over the cap. The Grantor shall report to Ecology within forty-eight (48) hours of the discovery of any damage to the cap. The Grantor shall repair any damage to the cap in accordance with the Avista Service Center Garage Operation and Maintenance Plan (GeoEngineers, 2021) and any future amendments approved in writing by Ecology ("Plan").

c. Inspection, Operation and Maintenance. The Grantor covenants and agrees that it shall inspect and maintain the cap, drainage pipe, manhole, and stormwater infiltration basin in accordance with the Plan. Grantor also shall report to Ecology its observations from the inspections in accordance with the Plan.

Section 3. Access.

a. The Grantor shall maintain clear access to all remedial action components necessary to construct, operate, inspect, monitor, and maintain the remedial action.

b. The Grantor freely and voluntarily grants Ecology and its authorized representatives, upon reasonable notice, the right to enter the Property at reasonable times to evaluate the effectiveness of this Covenant and associated remedial actions, and enforce compliance with this Covenant and those actions, including the right to take samples, inspect any remedial actions conducted on the Property, and to inspect related records.

c. No right of access or use by a third party to any portion of the Property is conveyed by this instrument.

Section 4. Notice Requirements.

a. Conveyance of Any Interest. The Grantor, when conveying any interest within the Restricted Area, including but not limited to title, easement, leases, and security or other interests, must:

i. Provide written notice to Ecology of the intended conveyance at least thirty (30) days in advance of the conveyance.

ii. Include in the conveying document a notice in substantially the following form, as well as a complete copy of this Covenant:

NOTICE: THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL COVENANT GRANTED TO THE WASHINGTON STATE DEPARTMENT OF ECOLOGY ON [DATE] AND RECORDED WITH THE SPOKANE COUNTY AUDITOR UNDER RECORDING NUMBER [RECORDING NUMBER]. USES AND ACTIVITIES ON THIS PROPERTY MUST COMPLY WITH THAT COVENANT, A COMPLETE COPY OF WHICH IS ATTACHED TO THIS DOCUMENT.

iii. Unless otherwise agreed to in writing by Ecology, provide Ecology with a complete copy of the executed document within thirty (30) days of the date of execution of such document.

b. Reporting Violations. Should the Grantor become aware of any violation of this Covenant, Grantor shall promptly report such violation in writing to Ecology.

c. Emergencies. For any emergency or significant change in site conditions due to Acts of Nature (for example, flood or fire) resulting in a violation of this Covenant, the Grantor is authorized to respond to such an event in accordance with state and federal law. The Grantor must notify Ecology in writing of the event and response actions planned or taken as soon as practical but no later than within 24 hours of the discovery of the event.

d. Notification procedure. Any required written notice, approval, reporting or other communication shall be personally delivered or sent by first class mail to the following persons. Any change in this contact information shall be submitted in writing to all parties to this Covenant. Upon mutual agreement of the parties to this Covenant, an alternative to personal delivery or first class mail, such as e-mail or other electronic means, may be used for these communications.

Darrell Soyars Environmental Compliance Manager Avista Corporation 1411 East Mission Avenue, MSC-21 Spokane, WA 99220 (509) 495-2860 darrell.soyars@avistacorp.com	Environmental Covenants Coordinator Washington State Department of Ecology Toxics Cleanup Program 4601 North Monroe Street Spokane, WA 99205

Section 5. Modification or Termination.

a. Grantor must provide written notice and obtain approval from Ecology at least sixty (60) days in advance of any proposed activity or use of the Restricted Area in a manner that is inconsistent with this Covenant. For any proposal that is inconsistent with this Covenant and permanently modifies an activity or use restriction at the site:

i. Ecology must issue a public notice and provide an opportunity for the public to comment on the proposal; and

ii. If Ecology approves of the proposal, the Covenant must be amended to reflect the change before the activity or use can proceed.

b. If the conditions at the site requiring a Covenant have changed or no longer exist, then the Grantor may submit a request to Ecology that this Covenant be amended or terminated. Any amendment or termination of this Covenant must follow the procedures in MTCA and UECA and any rules promulgated under these chapters.

Section 6. Enforcement and Construction.

a. This Covenant is being freely and voluntarily granted by the Grantor.

b. Within ten (10) days of execution of this Covenant, Grantor shall provide Ecology with an original signed Covenant and proof of recording and a copy of the Covenant and proof of recording to others required by RCW 64.70.070.

c. Ecology shall be entitled to enforce the terms of this Covenant by resort to specific performance or legal process. All remedies available in this Covenant shall be in addition to any and all remedies at law or in equity, including MTCA and UECA. Enforcement of the terms of this Covenant shall be at the discretion of Ecology, and any forbearance, delay or omission to exercise its rights under this Covenant in the event of a breach of any term of this Covenant is not a waiver by Ecology of that term or of any subsequent breach of that term, or any other term in this Covenant, or of any rights of Ecology under this Covenant.

d. The Grantor shall be responsible for all costs associated with implementation of this Covenant. Furthermore, the Grantor, upon request by Ecology, shall be obligated to pay for Ecology's costs to process a request for any modification or termination of this Covenant and any approval required by this Covenant.

e. This Covenant shall be liberally construed to meet the intent of MTCA and UECA.

f. The provisions of this Covenant shall be severable. If any provision in this Covenant or its application to any person or circumstance is held invalid, the remainder of this Covenant or its application to any person or circumstance is not affected and shall continue in full force and effect as though such void provision had not been contained herein.

g. A heading used at the beginning of any section or paragraph or exhibit of this Covenant may be used to aid in the interpretation of that section or paragraph or exhibit but does not override the specific requirements in that section or paragraph.

[SIGNATURES ON FOLLOWING PAGE]

The undersigned warrants that Grantor Avista Corporation holds the title to the Property and that he/she has authority to execute this Covenant.

EXECUTED this 28th day of MARCH, 2022

AVISTA CORPORATION

By: _____

Name: BRUCE F HOWARD

Title: SR. DIR., REAL ESTATE & ENV. AFFAIRS

CORPORATE ACKNOWLEDGMENT

STATE OF WASHINGTON
COUNTY OF SPOKANE } ss.

On this 28th day of March, 2022 I certify that Bruce F Howard personally appeared before me, acknowledged that **he/she** is the SR. Director RE & Env Affairs of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that **he/she** was authorized to execute said instrument for said corporation.

DEBBIE DEUBEL 166013 NOTARY PUBLIC COMMISSION EXPIRES 05-09-25 STATE OF WASHINGTON

Debbie Deubel
Notary Public in and for the State of Washington
Residing at Spokane County
My appointment expires 05-09-2025

DEBBIE DEUBEL 166013 NOTARY PUBLIC COMMISSION EXPIRES 05-09-25 STATE OF WASHINGTON

The Department of Ecology hereby accepts the status as GRANTEE and HOLDER of the above Environmental Covenant.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

By: Kathleen L. Falconer
Name: KATHLEEN L. FALCONER
Title: SECTION MANAGER Toxics Cleanup Program
Date: April 13, 2022

STATE ACKNOWLEDGMENT

STATE OF WASHINGTON
COUNTY OF Spokane } ss.

On this 13th day of April, 20__, I certify that Kathleen Falconer personally appeared before me, acknowledged that **he/she** is the section manager for Toxic Cleanup program of the state agency that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed, for the uses and purposes therein mentioned, and on oath stated that **he/she** was authorized to execute said instrument for said state agency.

AMANDA HIEBERT
COMMISSION EXPIRES
NOTARY
Comm No. 22004512
PUBLIC
01/31/2026
STATE OF WASHINGTON

Amanda Hiebert
Notary Public in and for the State of Washington
Residing at 1608 E. Jackson Ave. Spokane, WA 99207
My appointment expires 1-26-2026

Exhibit A

LEGAL DESCRIPTION OF PROPERTY

Those portions of the following:

Part of Block 3 and all of Blocks 14, 15, all in Ross Park, according to plat recorded in Volume "A" of Plats, Page 141;

ALSO part of Lots 3, 4, 5, 6, 7 and 8, The Subdivision Of Block 4, Ross Park, according to plat recorded in Volume "E" of Plats, Page 63;

ALSO Lots 1, 2, 3, 4, 5, 6 and 7, Block 1, and Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14, Block 2, Robert's Subdivision of Block 16, Ross Park, according to plat recorded in Volume "K" of Plats, Page 35;

ALSO part of Lots 1 and 6, and all of Lots 2, 3, 4 and 5 and the unnumbered portion lying Northeasterly of said Lots 3 and 4, Forster's Subdivision of Block 17, Ross Park, according to plat recorded in Volume "B" of Plats, Page 3;

ALSO part of Lots 17 and 18, Ross Subdivision of Block 18, Ross Park, according to plat recorded in Volume "B" of Plats, Page 2;

TOGETHER WITH part of vacated Lark Street lying adjacent to Ross Subdivision of Block 18, Ross Park;

TOGETHER WITH part of vacated Short Street lying within Forster's Subdivision of Block 17, Ross Park;

TOGETHER WITH vacated Vine Court lying within Robert's Subdivision of Block 16, Ross Park;

TOGETHER WITH part of vacated North Crescent Avenue lying South of New North Crescent Avenue;

TOGETHER WITH vacated Vine Street lying Southwesterly and adjoining Block 15, Ross Park;

TOGETHER WITH a part of the vacated alley and vacated Vine Street lying within the subdivision of Block 4, Ross Park, in the City of Spokane, Spokane County, Washington, being within the following described parcel:

Beginning at the most Easterly comer of said Block 14, Ross Park, a point on the Westerly line of Upriver Drive; thence South 44°49'11" West, along the Southeasterly line of Block 14, a distance of 303.58 feet (302 feet record); thence South 37°58'53" West, along the Southeasterly line of Block 15, a distance of 332.06 feet (332 feet record); thence South 31°05'31" West, along the Southeasterly line of Block 16, a distance of 332.15 feet (332 feet record); thence South 24°27'17" West, along the Southeasterly line of Block 17, a distance of 283.36 feet to the beginning of a

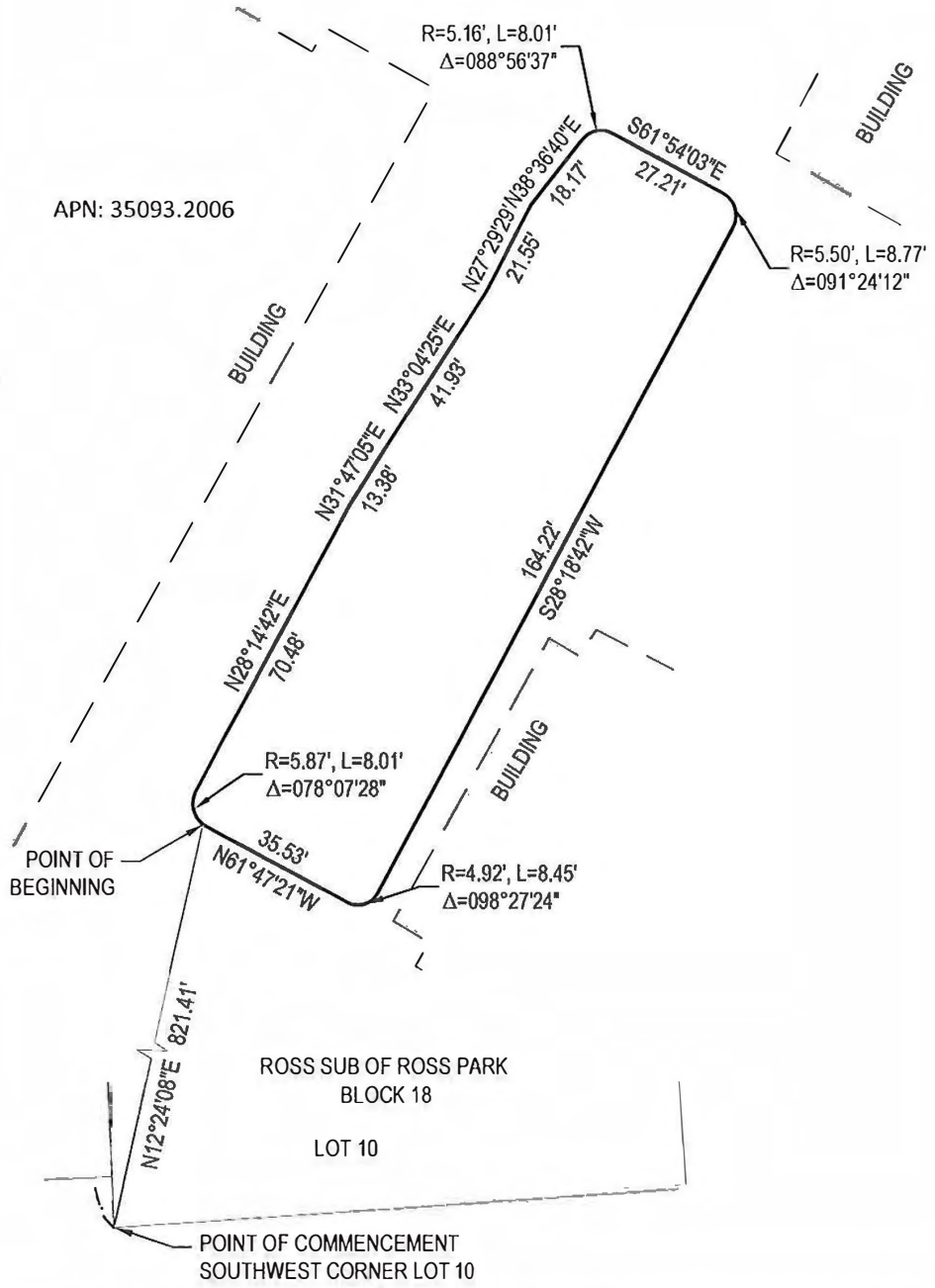
192.27 foot radius curve to the right; thence along said curve through a central angle of 24°48'36" a distance of 83.26 feet; thence South 49°15'58" West, a distance of 70.0 feet; thence leaving the Westerly line of Upriver Drive North 2°29'24" East, a distance of 71.15 feet to the beginning of a 100.00 foot radius curve to the left; thence along said curve through a central angle of 66°39'08" a distance of 116.33 feet; thence North 64°09'43" West, a distance of 148.83 feet to the beginning of a 288.18 foot radius curve to the left; thence along said curve through a central angle of 25°50'38" a distance of 129.99 feet to a point on the Easterly line of Perry Street; thence along the East line of Perry Street North 0°00'21" West, a distance of 836.08 feet to a point on the South line of relocated North Crescent Avenue; thence along relocated North Crescent Avenue North 89°54'10" East, a distance of 81.58 feet (82 feet record) to the beginning of a 746.30 foot radius curve to the left; thence along said curve through a central angle of 45°05'00", a distance of 587.23 feet; thence North 44°49'11" East, a distance of 260.21 feet to the most Northerly corner of said Block 14; thence South 41°46'22" East, along Block 14, a distance of 494.69 feet (495 feet record) to the Point of Beginning.

Exhibit B

PROPERTY MAP

EXHIBIT "B"

SCALE: 1"=40'



COFFMAN ENGINEERS
10 N. Post Street, Suite 500
Spokane, WA 99201
ph 509.328.2994
www.coffman.com

LOCATION:		PROJECT NO.
AVISTA GEO LINER		211412
CLIENT:	DATE:	SHEET NO:
GEOENGINEERS	12/21/21	1 OF 1

Exhibit C

MAP ILLUSTRATING LOCATION OF RESTRICTIONS

EXHIBIT "C"

SCALE:: N.T.S

COFFMAN ENGINEERS
10 N. Post Street, Suite 500
Spokane, WA 99201
ph 509.328.2994
www.coffman.com

LOCATION: AVISTA GEO LINER			PROJECT NO. 211412
CLIENT: GEOENGINEERS		DATE: 12/21/21	SHEET NO: 1 OF 1

Exhibit D

LEGAL DESCRIPTION OF AREA SUBJECT TO RESTRICTIONS

A portion of land in the Southwest corner of Section 9, Township 25 North, Range 43 East, Willamette Meridian City of Spokane, Spokane County, Washington being more particularly described as follows:

COMMENCING at the Southwest corner of Lot 10 in Ross Subdivision of Block 18 Per Plat Recorded in Volume B of Plats Page 2, the west line of said Block 18 has a bearing of North 2°28'59" West; Thence North 12°24'08" East a distance of 821.41 feet to the POINT OF BEGINNING.

Thence in a northerly direction with a non-tangent curve turning to the right with a radius of 5.87 feet, a chord bearing of North 12°39'10" West, a chord distance of 7.40 feet, a central angle of 78°07'28" and an arc length of 8.01 feet; thence North 28°14'42" East a distance of 70.48 feet; thence North 31°47'05" East a distance of 13.38 feet; thence North 33°04'25" East a distance of 41.93 feet; thence North 27°29'29" East a distance of 21.55 feet; thence North 38°36'40" East a distance of 18.17 feet; thence in a easterly direction with a nontangent curve turning to the right with a radius of 5.16 feet, a chord bearing of North 78°36'42" East, a chord distance of 7.23 feet, a central angle of 88°56'37" and an arc length of 8.01 feet; thence South 61°54'03" East a distance of 27.21 feet; thence in a southerly direction with a non-tangent curve turning to the right with a radius of 5.50 feet, a chord bearing of South 16°12'46" East, a chord distance of 7.87 feet, a central angle of 91°24'12" and an arc length of 8.77 feet; thence South 28°18'42" West a distance of 164.22 feet thence in a westerly direction with a non-tangent curve turning to the right with a radius of 4.92 feet, a chord bearing of South 71°02'21" West, a chord distance of 7.45 feet, a central angle of 98°27'24" and an arc length of 8.45 feet; thence North 61°47'21" West a distance of 35.53 feet to the POINT OF BEGINNING.

Containing ± 7616.13 S.F. of land more or less

Enclosure D

Operation and Maintenance Plan

CSID No. 3512 Avista Service Center Garage Operation and Maintenance Plan

Spokane Service Center Garage
1411 East Mission Avenue
Spokane, Washington

for
Avista Corporation

October 20, 2022

GeoEngineers
Earth Science + Technology

CSID No. 3512 Avista Service Center Garage Operation and Maintenance Plan

Spokane Service Center Garage
1411 East Mission Avenue
Spokane, Washington

for
Avista Corporation

October 20, 2022

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

CSID No. 3512 Avista Service Center Garage
Operation and Maintenance Plan

Spokane Service Center Garage
1411 East Mission Avenue
Spokane, Washington

File No. 2522-079-06

October 20, 2022

Prepared for:

Avista Corporation
1411 East Mission Avenue
Spokane, Washington 99252

Attention: Bryce Robbert

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Sydney J. Bronson, PE
Environmental Engineer

Bruce D. Williams
Environmental Principal

cc: Ted Uecker
Washington State Department of Ecology

JML:BDW:tjh

Table of Contents

1.0 INTRODUCTION

This Operations and Maintenance Plan (O&M Plan) addresses general operating procedures for monitoring and maintaining the integrity of the geosynthetic liner (cap) at the former Spokane Service Center Garage fleet maintenance building (Service Center Garage) on the Avista Corporation (Avista) Spokane campus located at 1411 East Mission Avenue in Spokane, Washington. This O&M Plan was prepared to supplement the remedial action performed at the site and submitted to Washington Department of Ecology (Ecology) under CSID Number 3512.

This O&M Plan is intended to fulfill the requirements found in the Model Toxics Control Act (MTCA) WAC 173-340-400. The elements of this O&M Plan will be implemented to monitor cap conditions and provide the procedures to respond to potential damage to the protective remedial cap or emergency situations. This plan includes (1) a description of the remedial cap system and post-remediation site conditions; (2) the parties responsible for monitoring and maintaining the implemented corrective action; (3) maintenance procedures; and (4) reporting requirements. The location of the site relative to surrounding properties is depicted on Vicinity Map, Figure 1 and the locations of existing site features are depicted on Site Plan, Figure 2.

2.0 SITE BACKGROUND AND REMDIAL ACTION DESCRIPTION

2.1. Service Center Garage

The Service Center Garage building was located on the Avista Spokane campus which resides on a 19.62-acre parcel in Spokane, Washington. The site is shown on Figure 2.

The Spokane River is located approximately 400 feet east of the former Service Center Garage building. Groundwater flows from southeast to northwest, away from the Spokane River, based on several groundwater monitoring events conducted between February 2018 and January 2020. The depth to groundwater beneath the former building is about 30 feet below ground surface (bgs).

The Service Center Garage building was used from 1955 to July 2018 to service fleet vehicles. The Service Center Garage building contained sub-slab hydraulic lifts for servicing line trucks in Bay 1, Bay 2, Bay 5 and Bay 7. The high bay area contained portable hydraulic lifts that were not located beneath the floor slab.

Avista demolished the Service Center Garage building in August 2018 and moved vehicle service operations to a new facility located in the northern area of the campus. The Service Center Garage building was located adjacent to the Auditorium/Cafeteria building as shown in Figure 2. Several canopies were located west of the Service Center Garage building and were demolished after completing demolition of the Service Center Garage building to make way for the current new parking structure.

Soil assessment and remedial excavation activities were conducted between August 31 and October 3, 2018 at the Service Center Garage building. Groundwater assessment activities that bracketed the soil assessment and remedial activities were conducted at the Service Center Garage on August 17, August 20, October 10 and November 20, 2018.

Contaminants of concern for the Service Center Garage site are diesel- and oil-range petroleum hydrocarbons (DRPH and ORPH) and polycyclic aromatic hydrocarbons (PAHs) in soil and groundwater. Groundwater was additionally tested for polychlorinated biphenyls (PCBs) but they were not detected and therefore are not a contaminant of concern.

Spokane Environmental Solutions (SES) excavated and disposed approximately 3,792 tons of contaminated soil from the Service Center Garage building remedial excavation at Waste Management's Graham Road Facility near Medical Lake, Washington. Complete removal of deeper contaminated soil could not be conducted without affecting the structural integrity of nearby buildings or utility infrastructure. Contaminated soil remained within the base of the remedial excavation at depths ranging from about 15 to 24 feet bgs.

ACF West installed a linear low-density polyethylene (LLDPE) liner cap in the excavation footprint to reduce the potential for remnant contamination in soil to leach to groundwater and was constructed to divert stormwater infiltration into a drainage pipe (GeoEngineers 2019). The liner LLDPE specifications are found in Appendix B. The south section of liner was placed at a 1 percent grade draining north from 6 feet to 8½ feet bgs to the drainage pipe collection trench. The north section of liner was placed a 4 percent grade draining south to the drainage pipe collection trench. The drainage pipe conveys infiltrated water at a 1.25 percent grade to a manhole that is connected to Avista's stormwater system. The liner excavation was backfilled with imported select fill and bedding sand.

On July 26, 2019, Avista installed replacement monitoring wells MW-1A and MW-5B outside of the parking structure construction area to avoid damaging the new wells (GeoEngineers 2019a).

During construction of a new parking garage near the capped area, Avista's construction contractor damaged the northern portions of the LLDPE liner while excavating to install a water line and stormwater drainage pipes. The damage to the liner compromised the remedial action conducted in 2018 by damaging the barrier controlling infiltration to the contaminated soil. The liner damage was discovered by Avista on December 6, 2019. In January 2020, the liner was excavated using a track hoe and soil was cleared from the liner using a vactor truck and pressurized water. The liner was repaired by placing a new section of liner in the excavation and welding the new section of liner to the portion of the liner that was intact (GeoEngineers 2020). The new utilities within the excavation penetrated the liner and were booted through the liner during the repair. The repaired section of liner has a modification to the grade, but the footprint is the similar and the liner will guide infiltrated water to the drain pipe connected to Avista's stormwater system. The repaired liner design and as-built diagram are shown in Figures 3 through 5.

After construction of the new parking garage near the capped area, Avista graded the Service Center Garage capped area. A thin layer of compost was placed over the capped area and sod was installed with an irrigation system (underground sprinklers).

3.0 RESPONSIBLE PARTIES

Avista will be financially responsible for maintenance and site security.

3.1. Contact Information

Table I lists the contact information for the site.

TABLE I. IMPORTANT CONTACT INFORMATION

Name	Role	Contact	Phone Number	Additional Information
Avista Corporation (Avista)	Responsible Party and Property Owner	Bryce Robbert	509.227.9722	Environmental Compliance Bryce.Robbert@avistacorp.com
GeoEngineers, Inc.	Staff Environmental Engineer	Joshua Lee, Project Manager	Office: 509.363.3125	jmlee@geoengineers.com
Washington State Department of Ecology (Ecology)	Regulatory Oversight	Ted Uecker, Site Manager	509.329.3484	Tuec461@ecy.wa.gov

4.0 PROTECTION MONITORING

Protection monitoring is required to verify that human health and the environment are protected during implementation of the remedial action. The remedial action include risks to the following receptors:

- Contractors, regulators and engineers (identified collectively as "workers") on site during construction and maintenance activities

Workers and the public are protected through the use of health and safety monitoring and measures.

4.1. Worker Health and Safety

Remediation-related construction activities were performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926). These regulations require protection of workers from exposure to contaminants and ensuring excavations are properly shored or sloped. During the remedial action, the contractor (Contractor) and engineer (Engineer) prepared and implemented a Health and Safety Plan (HASP) covering work activities and employees. All parties are responsible for their health and safety, although visitors can adopt either the Contractor's or Engineer's HASP for their own use. Within contaminated areas, workers must have current hazardous waste operations and emergency response (HAZWOPER) training. Contractors working within the former Service Center Garage area will conduct earthwork associated with known or potentially contaminated materials in accordance with the Contractor's HASP. The Contractor's HASP shall describe the procedures and precautions required for working near potentially unstable slopes and entering excavations.

5.0 MONITORING PROCEDURES AND SCHEDULE

The Service Center Garage long-term monitoring will include:

- Cap inspections to assess the integrity of the liner, drainage pipe and cover materials; and
- The condition of the stormwater infiltration features.

The table below summarizes the site inspection schedule.

Task	Frequency	Description
Cap Inspection	Annually	Inspect the capped area, drainage pipe and stormwater infiltration basins for damage and functionality.

5.1. Cap Inspection

Cap inspections will be conducted annually to assess the integrity of the cap. Since the cap material is covered in soil and sod, the cover material will be inspected to maintain the integrity of the liner. During the inspections, Avista's representative will document and photograph the capped area. The site is divided into three inspection areas as shown in Figure 6. Photographs of inspection areas are found in Figures 7 and 8. Inspection areas include:

- Cap area (Inspection Area 1);
- Manhole containing the drainage pipe (Inspection Area 2); and
- Infiltration basin where drained water from the cap discharges (Inspection Area 3).

The inspection form is included in Appendix A. The representative performing the inspection will document the following conditions:

- The health of the vegetated cover including documenting areas of apparent stressed or dead vegetation;
- Blockage or damage to drainage pipe located inside of the manhole. *Note that drainage pipe function can be observed during periods of inclement weather and/or snowmelt*;
- Puddles or other depressions indicating thin cover material and poor drainage;
- Indications of excessive runoff or erosion;
- Exposed or damaged LLDPE liner or geotextile separation fabric;
- Trees or brush of sufficient size such that their roots may puncture the LLDPE liner if allowed to grow; and
- Indications of slope instability (such as sloughing material) on the capped area.

If damage to the cap or one of the above conditions is observed, the inspector will make the notifications required in Section 7.0. Damage observed will be assessed, documented and photographed. Per the requirements in the pending environmental covenant, Avista will be responsible to repair the damage and document the repair to Ecology within 30 days.

5.2. Site Security

The Avista Mission Campus is a secure site (fenced with security guards at access points) that limits access. The Service Center Garage capped area is located within the secure campus and potential exposure to the contaminated soil is limited to those employees or contractors working within the capped area.

6.0 MAINTENANCE

Cap maintenance will be conducted by Avista's authorized contractors and will be performed as needed based on the inspection observations. Maintenance activities might include:

- Repairing the fencing or gates;
- Filling in low spots and covering exposed sections of the geosynthetic liner with select fill material covered with a thin layer of compost and sod and the liner is sloped to drain toward the drainage pipe trench;
- Repairing the LLDPE liner;
- Removing large plants and shrubs from the capped area in a manner that will not cause damage to the liner;
- Filling in animal burrows with sand, gravel and topsoil;
- Re-seeding areas of sparse vegetation; and
- Cleaning excessive sediment from the drainage pipe, manhole and infiltration basins.

Required repairs will be completed and reported to Ecology within 30 days of discovery. If damage to the liner is observed or suspected, Avista's contractor will uncover the section of damaged liner in a manner to minimize additional damage. A qualified contractor will remove the damaged section of liner and weld a new section of liner onto the damaged area. Welds and other liner repairs will be tested according to industry accepted quality assurance/quality control standards such as those included in the project specifications.

Backfill material over repaired sections of liner will consist of select fill, a thin layer of compost and sod. The soil cover will be graded to match the surrounding site elevations. Infiltrated precipitation will drain toward the drainage pipe trench and discharge to Avista's stormwater infiltration basins which are managed at the site.

Large trees and shrubs will be removed from the capped area using hand tools to avoid damaging the underlying geotextile and liner.

7.0 REPORTING

Long term monitoring and maintenance reporting will occur as specified in the pending environmental covenant. Ecology will be notified of planned development activities, earthwork, utility installation or any other activity that might disturb the capped area or increase the risk of contaminant exposure to human health and the environment as required in the pending environmental covenant. Avista will be responsible to provide the required reports and notifications listed below to Ecology:

Report	Frequency	Description
Cap Inspection Report	Annually	Report describing the observations from the cap inspections.
Cap Damage	As Needed	Damage to the cap or infiltration basins must be reported to Ecology within 48 hours of discovery.

8.0 REFERENCES

GeoEngineers, Inc. "CSID No. 3512 Revised Avista Service Center Garage Remedial Action," prepared for Avista Corporation. August 9, 2019.

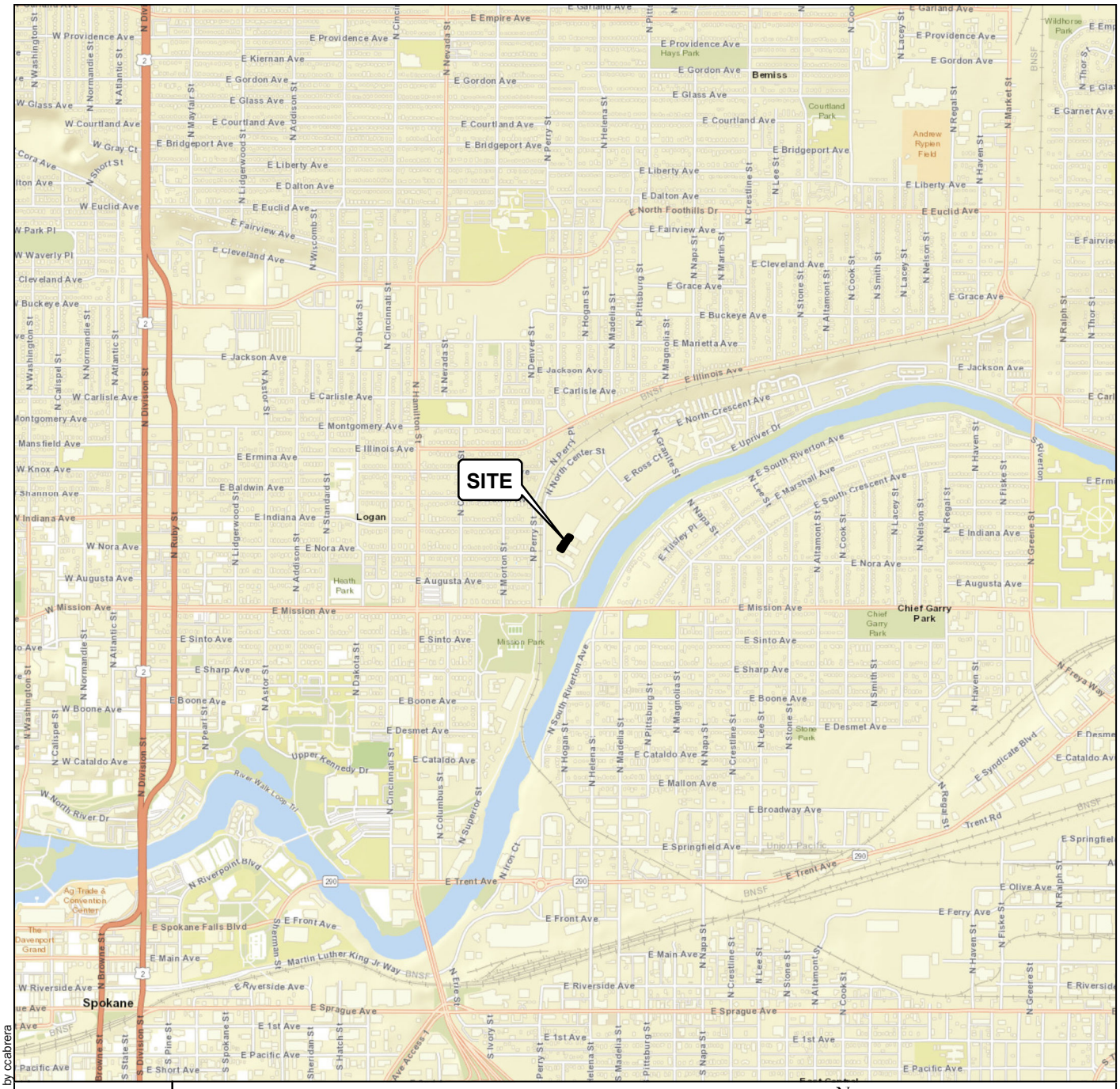
GeoEngineers, Inc. "CSID No. 3512 Monitoring Well Installation and July 31, 2019 Groundwater Monitoring Report." Prepared for Avista Corporation. September 13, 2019a.

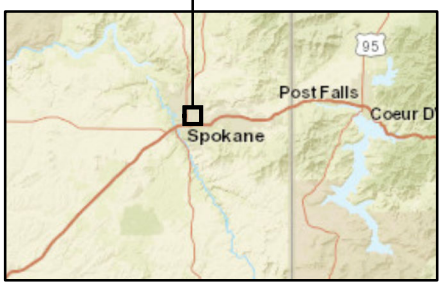
GeoEngineers, Inc. "CSID No. 3512 Avista Service Center Garage Liner Repair and Groundwater Monitoring Report," prepared for Avista Corporation. February 14, 2020.

Washington State Department of Ecology, 2007. Model Toxics Control Act (MTCA) Cleanup Regulations, Washington Administrative Code, Chapter 173-340. November 2007.

FIGURES

GeoEngineers





Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 11N

Vicinity Map

Avista – Service Center Garage
Spokane, Washington

GeoEngineers

Figure 1

P:\2\2522079\GIS\MXD\252207906_F01_VM.mxd Date Exported: 06/30/21 by ccabrera

Legend

- Well ID and Approximate Location
- Former Monitoring Well
- Approximate Area of Repaired Liner
- Approximate 2018 Remedial Excavation Area (Capped Area)
- Approximate Parking Garage Structure Location

N
W E
S

150 0 150

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI, Spokane County GIS. Image from Google Earth.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Site Plan

Avista – Service Center Garage
Spokane, Washington

GeoEngineers

Figure 2

P:\2\2522079\GIS\MXD\252207906_F02_SitePlan.mxd Date Exported: 07/20/21 by ccabrera

Geosynthetic and Repaired Liner Footprint (Total Area = 7,495.91 Ft^2)

Liner Seam

Fire Hydrant

Fire Hydrant Valve

See Figure 4 (Cross Section A-A')

Catch Basin

2-in Water Line

Approximate 1% Grade
Draining North

Former Avista Spokane Service Center Garage

Stormwater Pipe

See Figure 4
(Cross Section C-C')

See Figure 4 (Cross Section B-B')

Approximate 4% Grade
Draining South

1
F5

See Figure 5
(Pipe Trench Detail)

Approximate
Location of
Water Utility

Manhole

A

A'

B

B'

C

C'

1898

1895

1892

1889

1886

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial from Orthomosaic Aerial Photo dated October 2018.

Vertical Datum: NAVD 88.

Projection: NAD83 Washington State Planes, North Zone, US Foot.

Legend

- Geosynthetic Liner Footprint
- Old Geosynthetic Liner Footprint (Removed)
- Repaired Liner Footprint
- Approximate Location of Pipe Drain
- Liner Seam
- Sealed/Booted Liner Penetration
- Underground Power Line
- C C' Cross Section Location

N E S W

15 0 15
Feet

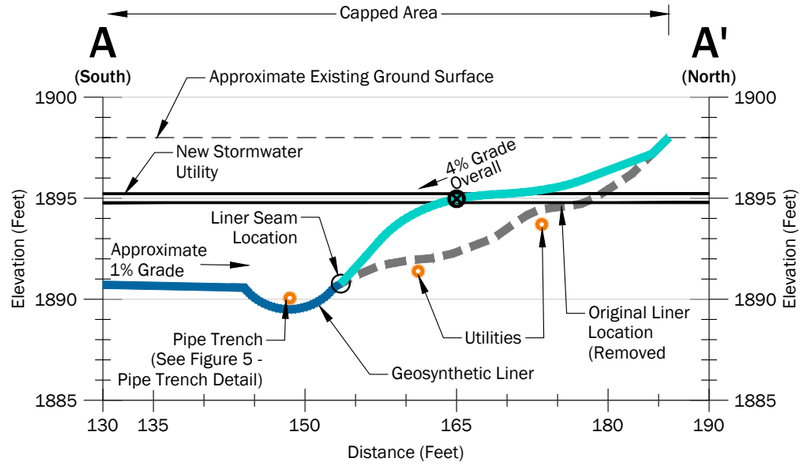
Site Plan - Geosynthetic Liner

Avista - Service Center Garage
Spokane, Washington

GeoEngineers

Figure 3

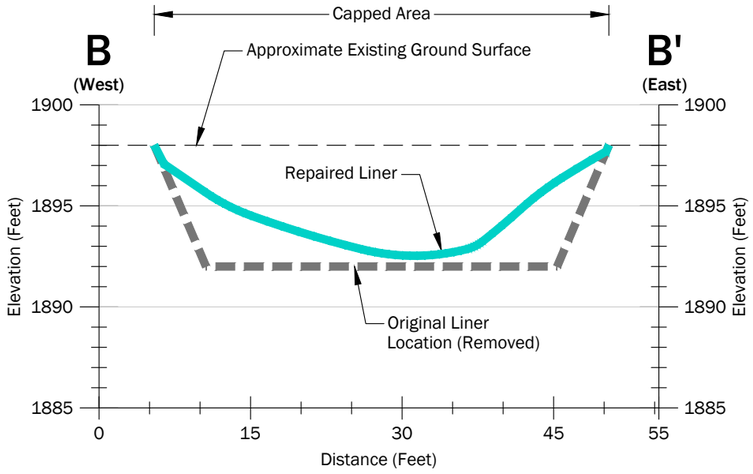
P:\2\25220779\CAD\06\Operation and Maintenance Plan\252207906_F03-F04_Site Plan and Sections.dwg TAB:F03 Date Exported: 07/01/21 - 8:29 by syi



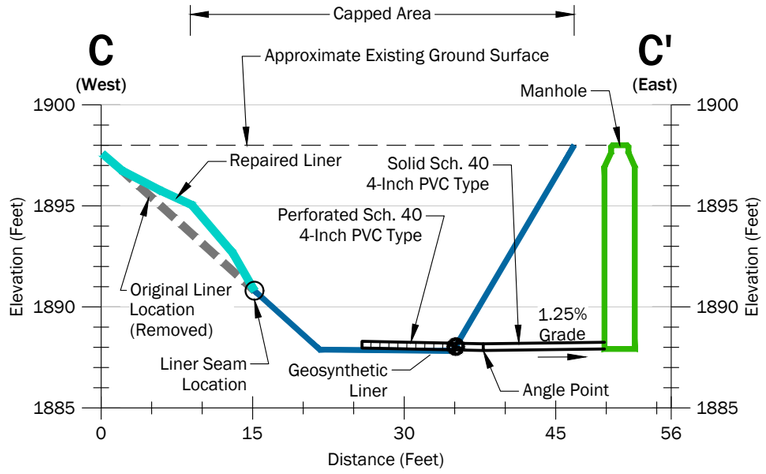
Legend

⊗ Sealed/Booted Liner Penetration

CROSS SECTION A-A' (A-A')
SCALE: F04



CROSS SECTION B-B' (B-B')
SCALE: F04



Legend

⊗ Sealed/Booted Liner Penetration

CROSS SECTION E-E' (C-C')
SCALE: F04

Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: NAVD 88, unless otherwise noted.

15 0 15
Horizontal Scale in Feet

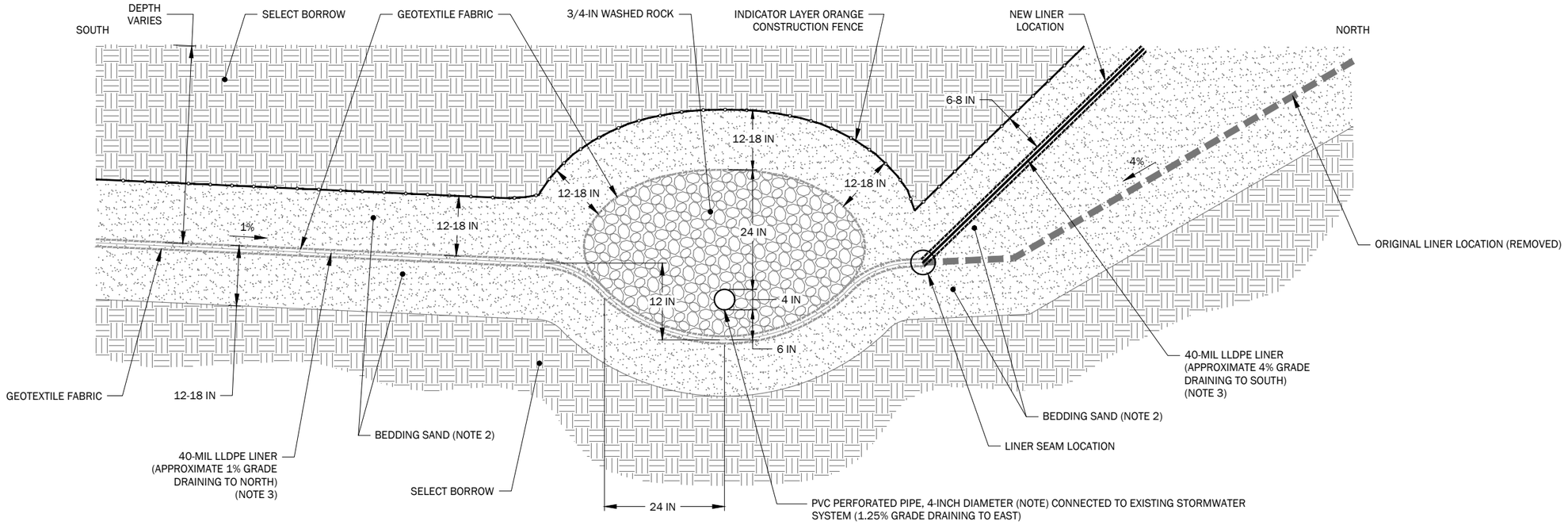
7.5 0 7.5
Vertical Scale in Feet
Vertical Exaggeration: 2X

Cross Sections A-A', B-B' and C-C'

Avista - Service Center Garage
Spokane, Washington

GeoEngineers

Figure 4



NOTES:

1. SOIL AND BACKFILL MATERIALS PLACED BENEATH THE GEOSYNTHETIC COVER WERE BE COMPACTED TO A FIRM AND UNYIELDING STATE WITH NO VISIBLE DEFLECTION.
2. BEDDING SAND CONSISTED OF MATERIAL MEETING WSDOT STANDARD SPECIFICATION 9-03.13.
3. 40-MIL LINEAR LOW-DENSITY POLYETHYLENE (LLDPE) LINER.
4. GEOTEXTILE FABRIC CONSISTED OF MIRAFI 180N.
5. IF LINER DRAIN DAMAGE IS OBSERVED, DRAIN WILL BE REPAIRED PER THIS PIPE TRENCH DETAIL.

PIPE TRENCH DETAIL 1
SCALE: NOT TO SCALE F5

Pipe Trench Detail

Avista - Service Center Garage
Spokane, Washington

GeoEngineers | **Figure 5**

Legend

- Approximate Inspection Area
- Approximate 2018 Remedial Excavation Area

N
W E
S

150 0 150

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI, Spokane County GIS. Image from Google Earth.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Site Plan and Inspection Areas

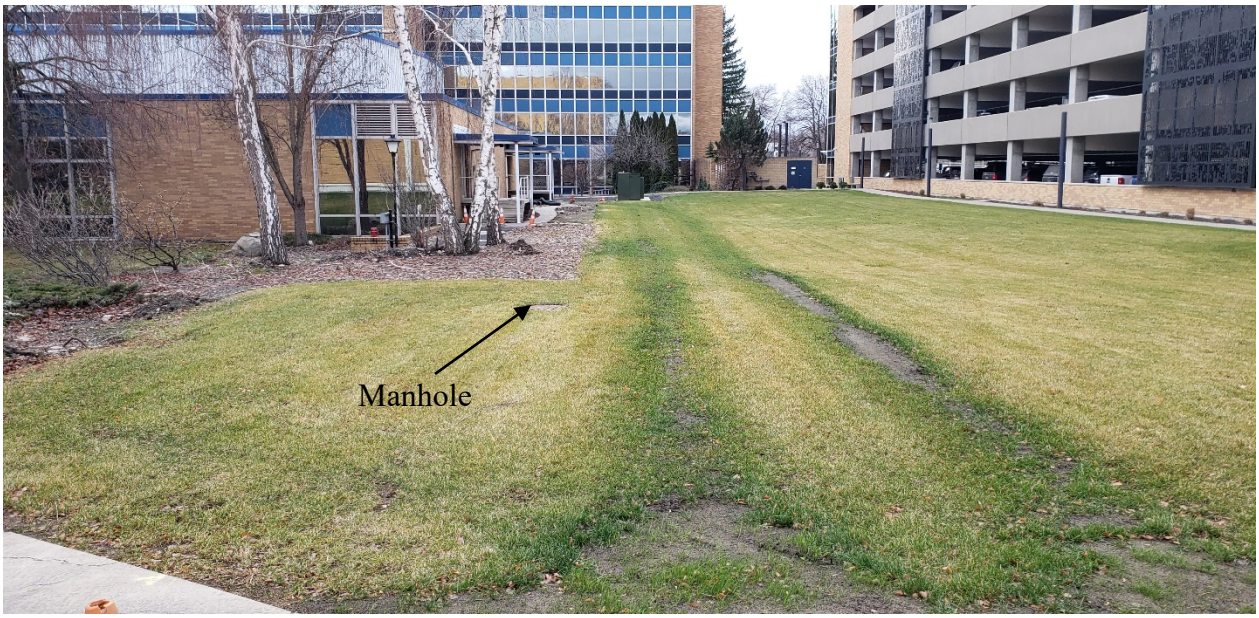
Avista – Service Center Garage
Spokane, Washington

GeoEngineers

Figure 6

P:\2\2522079\GIS\MXD\252207906_F06_SitePlan_InspectionAreas.mxd Date Exported: 12/13/21 by ccabrera

Photograph 1. Photo of the cap area (Inspection Area 1), looking northeast.



Photograph 2. Photo of manhole containing the drainage pipe (Inspection Area 2), looking south.

Inspection Area Photos	
Avista – Spokane Service Center Garage O&M Plan Spokane, Washington	
GeoEngineers	Figure 7

Photograph 3. Photo of the infiltration basin where drained water from the cap discharges (Inspection Area 3), looking north.

Inspection Area Photos	
Avista – Spokane Service Center Garage O&M Plan Spokane, Washington	
GeoEngineers	Figure 8

APPENDICES

GeoEngineers

APPENDIX A
Cap Inspection Form

Table A-1

Cap Monitoring and Maintenance Field Form

CSID No. 3512 Avista Spokane Service Center Garage Site

1411 East Mission Avenue, Spokane, Washington

Date: _____

Time: _____

Name: _____

Component	Condition	Action Needed/Notes
Perimeter Fence		
Access Gates		
Geotextile		
LLDPE Liner		
Drainage Pipe Inside Manhole		
Soil Cover		
Vegetation		
Stormwater Infiltration Basin		

APPENDIX B
LLDPE Liner Specifications

GSE Roll Allocation

Order SO-085324
Customer ACF West, Inc.
Project Name Water Storage Pond

Roll#	Resin Lot	Product Code	Mfg Date	Length
104191311	18DB236	LST-040AE-BBB-B-W0	8/12/2018	800
104191314	18DB236	LST-040AE-BBB-B-W0	8/12/2018	800
104191315	18DB236	LST-040AE-BBB-B-W0	8/13/2018	800
104191316	18DB236	LST-040AE-BBB-B-W0	8/13/2018	800
104191317	18DB236	LST-040AE-BBB-B-W0	8/13/2018	800
104191318	18DB236	LST-040AE-BBB-B-W0	8/13/2018	800
104191319	18DB236	LST-040AE-BBB-B-W0	8/13/2018	800
104191414	18EB420	LST-040AE-BBB-B-W0	8/19/2018	800

GSE Environmental, LLC

ROLL TEST DATA REPORT

GSE QC APPROVED

Report Date: Aug/20/2018

Sales Order No.	Customer Name	Project Location	Product Name	BOL Number
SO-085324	ACF West, Inc.	Houston TX US	LST-040AE-BBB-B-W0	

Roll Number	Average Thickness ASTM D5994 (mils)	Minimum Thickness ASTM D5994 (mils)	Break Strength ASTM D6693 (ppi) MD	Break Strength ASTM D6693 (ppi) TD	Break Elongation ASTM D6693 (%) MD	Break Elongation ASTM D6693 (%) TD	Tear Resistance ASTM D1004 (lbs) MD	Tear Resistance ASTM D1004 (lbs) TD	Puncture Resistance ASTM D4833 (lbs)	Density ASTM D1505 (g/cc)	Carbon Black Content ASTM D4218 (%)	Carbon Black Dispersion ASTM D5596 (Views in Cat1-Cat2)	Asperity Height ASTM D7466 (mils) A Side
104191311	40	36	157	127	613	528	30	30	99	0.934	2.2	10	31
104191314	42	39	152	111	618	501	29	30	99	0.934	2.1	10	29
104191315	41	38	152	111	618	501	29	30	99	0.934	2.1	10	29
104191316	41	38	152	111	618	501	29	30	99	0.934	2.1	10	31
104191317	43	39	167	133	655	559	34	31	98	0.935	2.2	10	31
104191318	42	38	167	133	655	559	34	31	98	0.935	2.2	10	27
104191319	42	38	148	145	588	608	31	31	98	0.934	2.2	10	27
104191414	42	40	147	150	610	600	31	31	103	0.937	2.4	10	24

Laboratory Manager

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS
201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978
PHONE:(888)FPCUSA3

Certificate of Analysis

(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
UP TRACK 14732 WESTFIELD
19103 GUNDLE ROAD
HOUSTON TX 77070
PRODUCT :L91507H
RAILCAR FPAX201018

S/O NO : JT5A462
CUSTOMER PO : 03-512910
DATE SHIPPED: 6/29/18
LOT NO : 18DB236
WEIGHT (LB) : 194,600.00
CUSTID:FT03112 SPIDE3

TEST ITEM	REFERENCE METHOD	TEST VALUE
Melt Index, g/10min	ASTM D1238	.77
Density, g/cm3	ASTM D1505	.9174

Linda Kao

QC SUPERVISOR: LINDA KAO

Formosa Plastics

FORMOSA PLASTICS CORPORATION, TEXAS
201 FORMOSA DRIVE
PO BOX 700
POINT COMFORT TX 77978
PHONE:(888)FPCUSA3

Certificate of Analysis

(CONFIDENTIAL)

CUSTOMER:GSE ENVIRONMENTAL, LLC
UP TRACK 14732 WESTFIELD
19103 GUNDLE ROAD
HOUSTON TX 77070
PRODUCT :L91507H
RAILCAR FPAX940122

S/O NO : JT6A418
CUSTOMER PO : 03-513118
DATE SHIPPED: 7/03/18
LOT NO : 18EB420
WEIGHT (LB) : 181,400.00
CUSTID:FT03112 SPIDE3

TEST ITEM	REFERENCE METHOD	TEST VALUE
Melt Index, g/10min	ASTM D1238	.89
Density, g/cm3	ASTM D1505	.9170

Linda Kao

QC SUPERVISOR: LINDA KAO

Report Date
8/20/2018

Quality Assurance Laboratory Test Results

Job Name: ACF West/Water Storage Pond
Sales Order: 85324

Required Testing: ASTM D 3895 -- Standard Test Method for Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry

Frequency: 1/200,000 lbs

Specification: >100 minutes

Product Code	Resin Lot Number	Results
LST-040AE-BBB-B-W0	18DB236	PASS
LST-040AE-BBB-B-W0	18EB420	PASS

Approved By:	Lana Hickman
Date Approved:	August 20, 2018

ACF WEST CONSTRUCTION COMPANY, INC.

8951 SE 76th Drive, Portland, OR 97206 503-802-0319 Fax: 503-517-9096

QUOTATION

Sent By: Jeff Boys **Date:** 9-21-2018

Project # _____ - _____

PROJECT: **Avista Service Building**

AGENCY: n/a

BID DATE: n/a

Containment Barrier ***INSTALLED***

GSE 40 mil LLDPE Black Liner	Quantity: 10,710 SF	@ $ .64 per SF	**$6,854.40**
GSE 40 mil LLDPE Pipe Boot	Quantity: 1 each	@ $135.00 each	**$ 135.00**
Mirafi 180N Nonwoven	Quantity: 10,710 SF	@ $ .20 per SF	**$2,142.00**

Includes:
Delivery of material to the site, 2 technicians on site, *1 mobilization*, on-site testing of field welds, and 1 year installation warranty.

Excludes:
Any taxes, earthwork and trenches, prevailing wage rates, union agreements, water testing of liner, de-watering, demolition, site specific training, mechanical attachments, soil sterilants, independent testing, concrete work, cleaning or grinding of concrete, and pipe work.

We will need the following provided by others:
3 laborers for ~2 hours to assist with panel deployment, sanitary facilities for ACF West Const. employees, prepared subgrade maintained in a clean, dry, unencumbered state, and immediate removal of accumulated precipitation. All anchor trenches and concrete work must be complete and all piping must be stubbed through prior to mobilization.

This proposal is based on 1 mobilization with continuous work throughout. Stand-by time for unprepared subgrade will be $900.00 per day. *Additional mobilizations will be $800.00 each.*

F.O.B. **Job Site** (One delivery per item)
Terms: **Net 30**

Quote good for 60 days

Low Bidder: Contact: Phone #:

Submittals ☐ COI ☐ Install Date: _____ Completion Date: _____ Invoice Date: _____

PRODUCT DATA SHEET

GSE UltraFlex Textured Geomembrane

GSE UltraFlex Textured is a co-extruded textured linear low density polythylene (LLDPE) geomembrane available on one or both sides. It is manufactured from the highest quality resin specifically formulated for flexible geomembranes. This product is used in applications that require increased frictional resistance, flexibility and elongation properties where differential or localized subgrade settlements may occur such as in a landfill closure application.

[*]

AT THE CORE:

An LLDPE geomembrane that is used in applications requiring increased frictional resistance, flexibility and elongation properties, such as landfill closures and mining applications.

Product Specifications

These product specifications meet GRI GM17

Tested Property	Test Method	Frequency	Minimum Average Value			
			40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	40 36	60 54	80 72	100 90
Density, g/cm³ (max.)	ASTM D 1505	200,000 lb	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width Elongation at Break, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in	20,000 lb	 60 250	 90 250	 120 250	 150 250
Tear Resistance, lb	ASTM D 1004	45,000 lb	22	33	44	55
Puncture Resistance, lb	ASTM D 4833	45,000 lb	44	66	88	110
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lb	Note(1)	Note(1)	Note(1)	Note(1)
Asperity Height, mil	ASTM D 7466	second roll	18	18	18	18
Oxidative Induction Time, mins	A5TM D 3895, 200°C; O_2, 1 atm	200,000 lb	> 100	> 100	> 100	> 100
TYPICAL ROLL DIMENSIONS						
Roll Length(2), ft	Double-Sided Textured Single-Sided Textured		700 780	520 540	400 410	330 330
Roll Width(2), ft			22.5	22.5	22.5	22.5
Roll Area, ft²	Double-Sided Textured Single-Sided Textured		15,750 17,550	11,700 12,150	9,000 9,225	7,425 7,425

NOTES:

- (1)Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
- (2)Roll lengths and widths have a tolerance of ±1%.
- GSE UltraFlex Textured is available in rolls weighing approximately 4,000 lb.
- All GSE geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77°C when tested according to ASTM D 746.
- *Modified.

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.

GSE ENVIRONMENTAL™

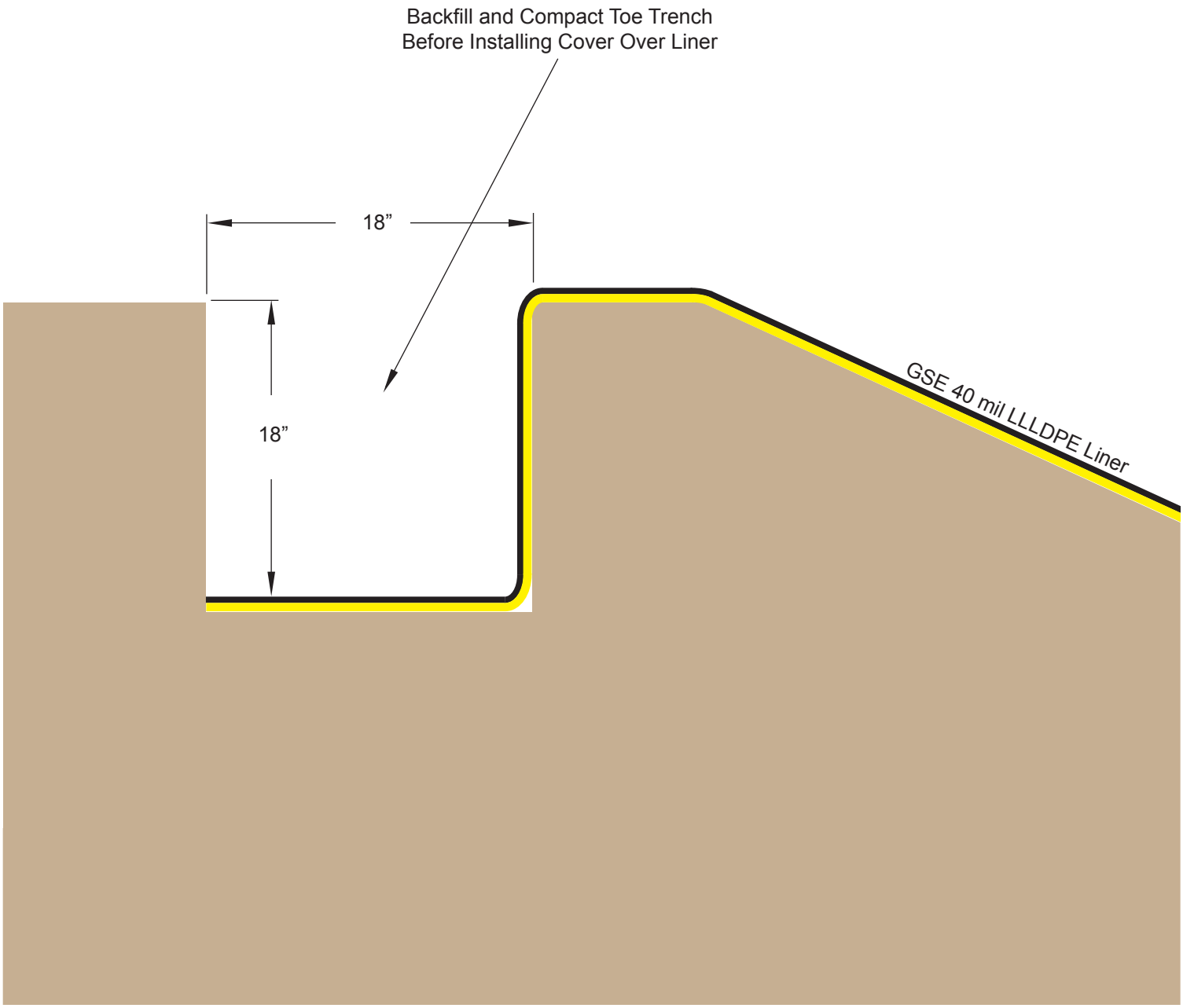
[DURABILITY RUNS DEEP]

For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

ACF WEST CONSTRUCTION COMPANY, INC.
8951 SE 76th Drive, Portland, OR 97206 503-771-5115 800-878-5115 Fax: 877-668-8730

Typical GSE LLDPE Anchor Trench Detail

not to scale



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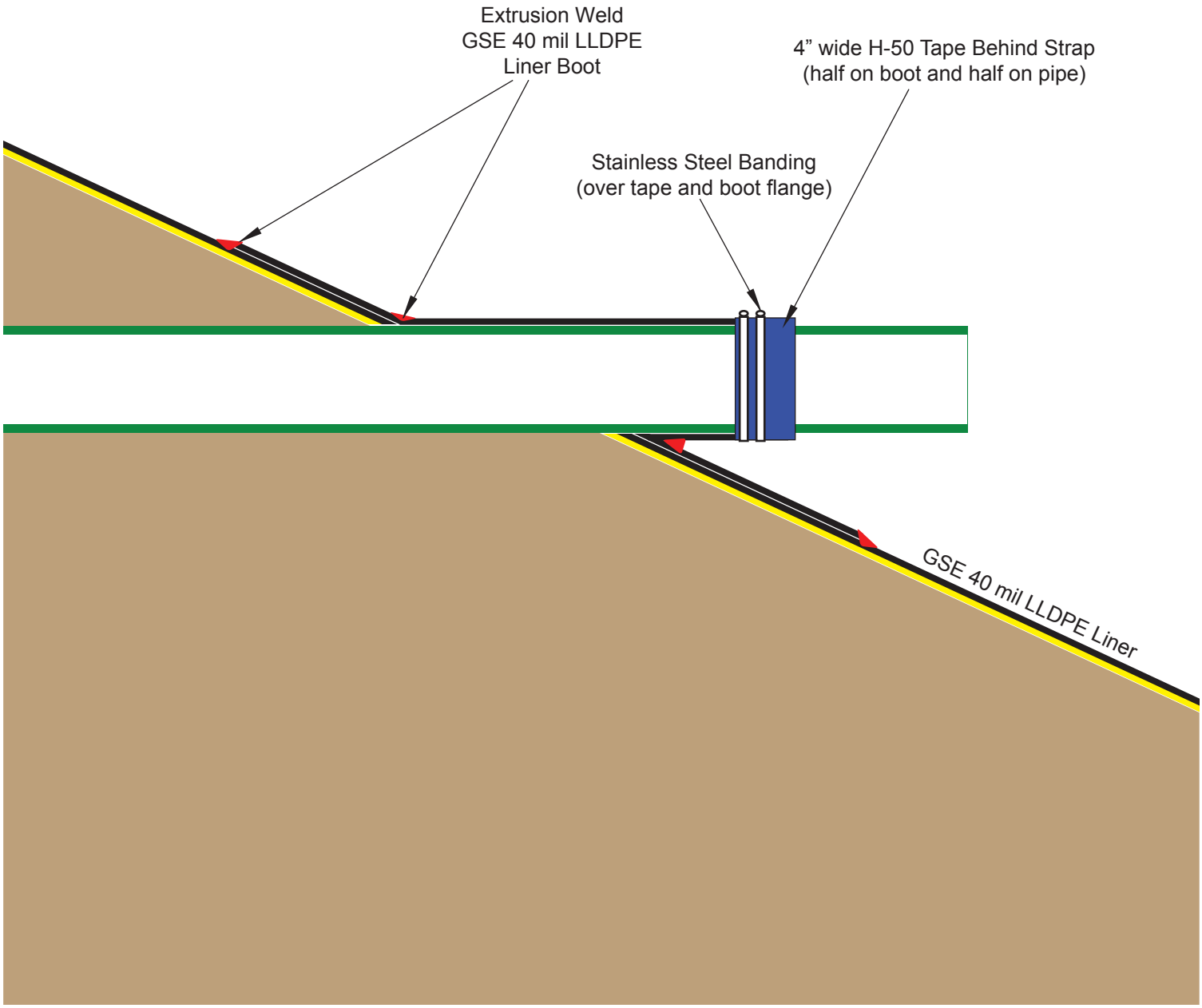
Typical GSE LLDPE Boot Detail (Slope)

not to scale

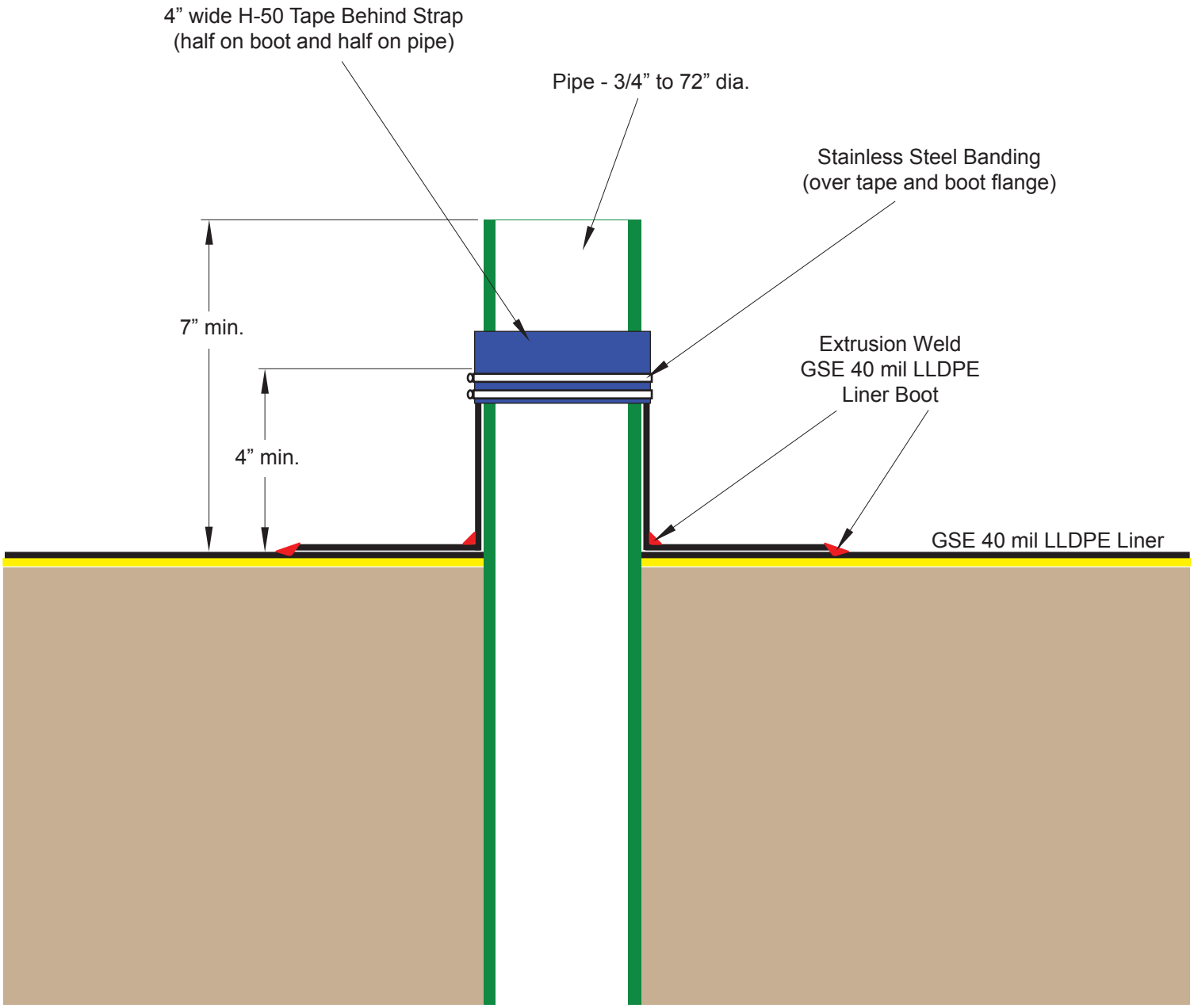


ACF WEST CONSTRUCTION COMPANY, INC.
8951 SE 76th Drive, Portland, OR 97206 503-771-5115 800-878-5115 Fax: 877-668-8730

Typical GSE LLDPE Boot Detail

(90 Degree)

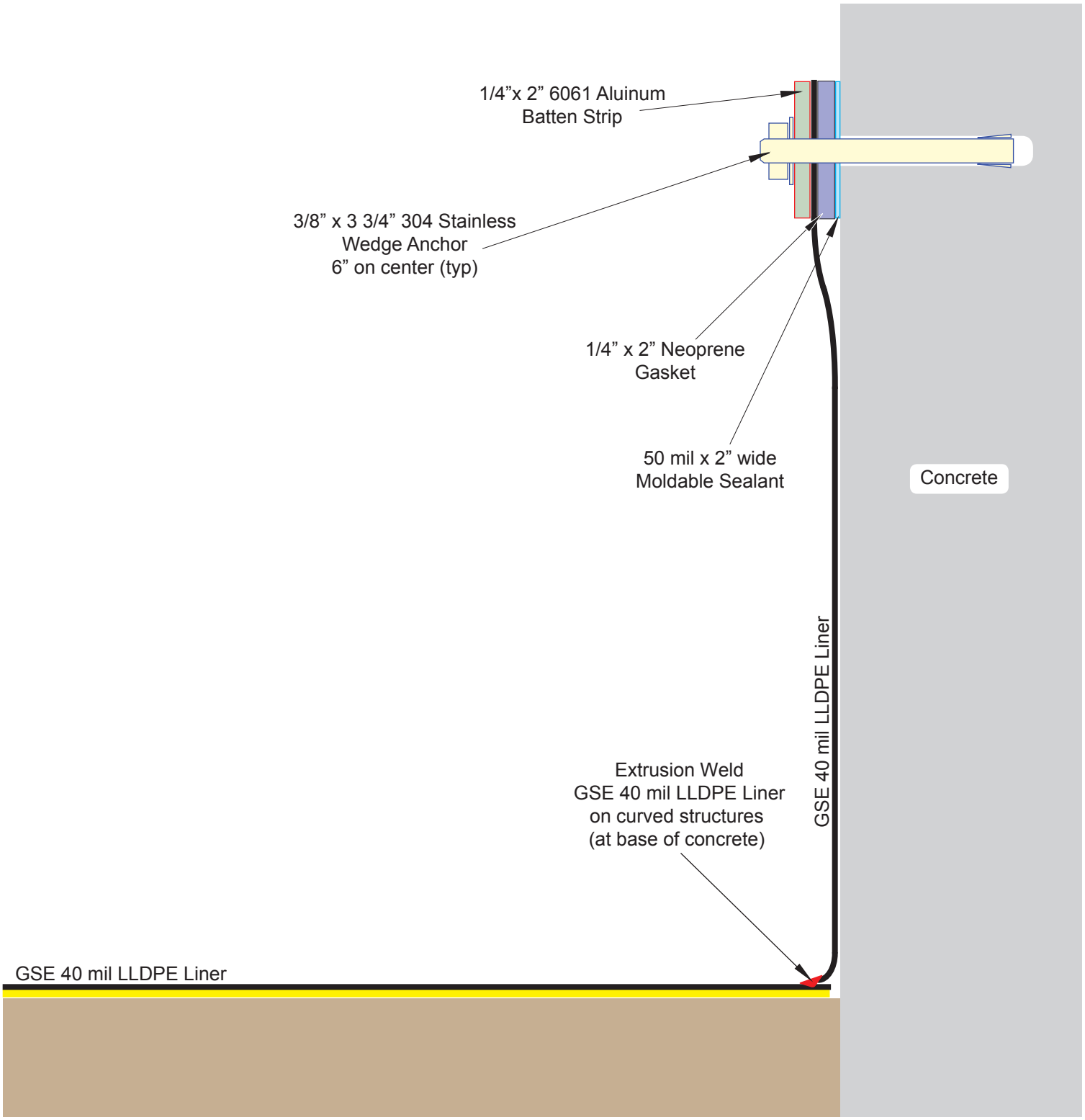
not to scale



ACF WEST CONSTRUCTION COMPANY, INC.
8951 SE 76th Drive, Portland, OR 97206 503-771-5115 800-878-5115 Fax: 877-668-8730

GSE LLDPE Concrete Attachment Detail

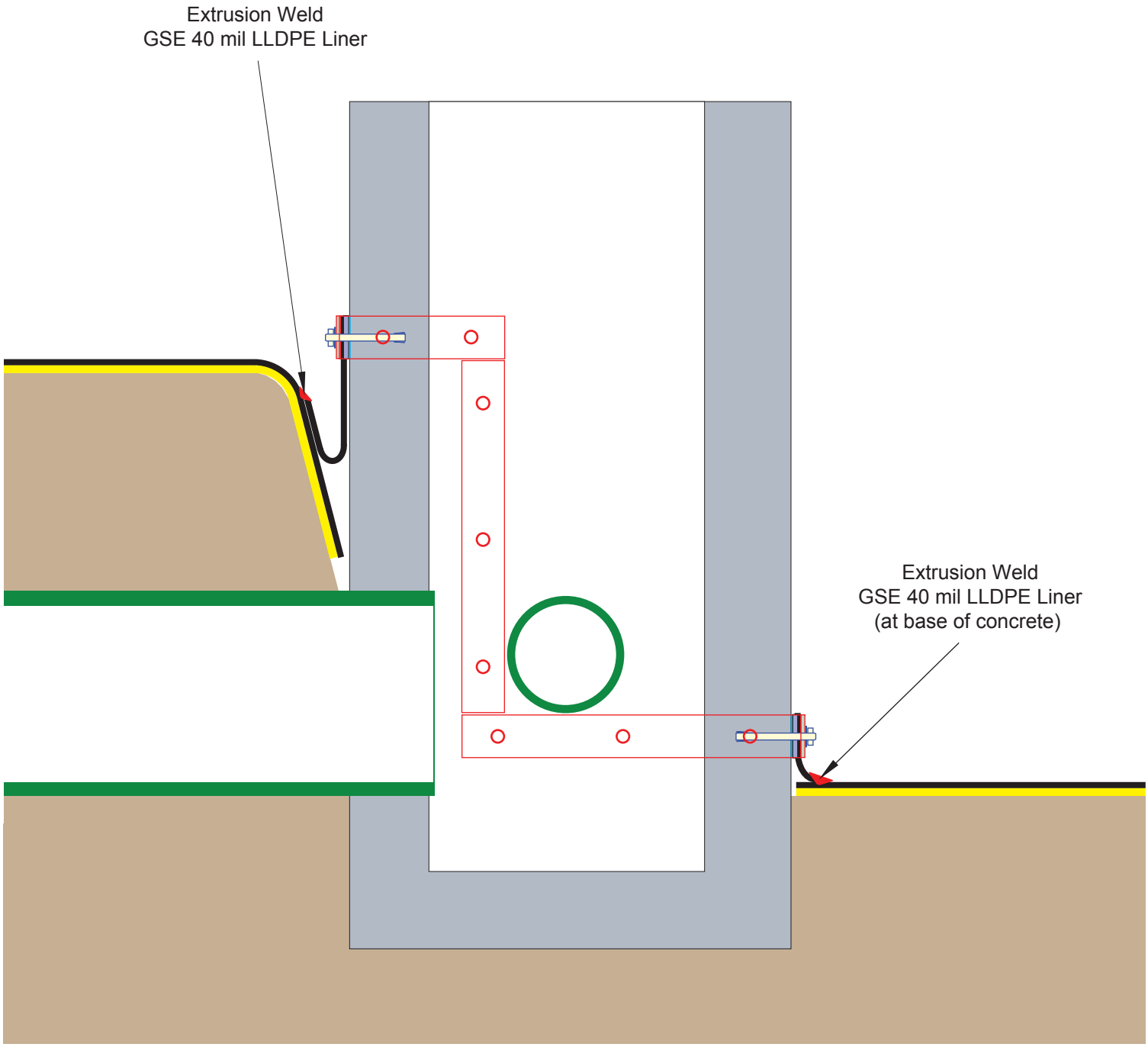
not to scale



ACF WEST CONSTRUCTION COMPANY, INC.
8951 SE 76th Drive, Portland, OR 97206 503-771-5115 800-878-5115 Fax: 877-668-8730

GSE LLDPE Catch Basin Detail

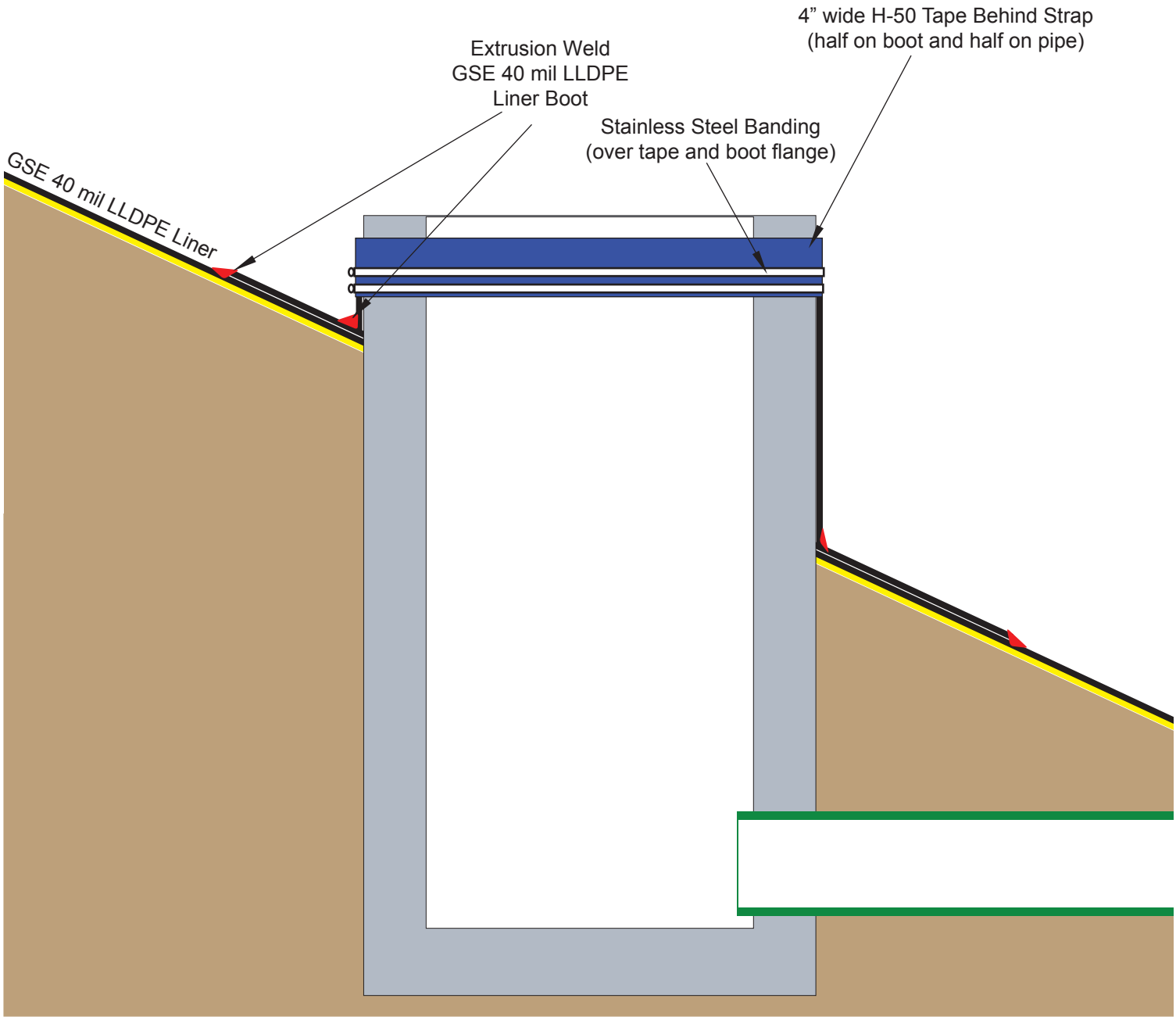
not to scale



ACF WEST CONSTRUCTION COMPANY, INC.
8951 SE 76th Drive, Portland, OR 97206 503-771-5115 800-878-5115 Fax: 877-668-8730

Typical GSE LLDPE Manhole Boot Detail (Slope)

not to scale



GSE ENVIRONMENTAL™

GEOMEMBRANE PRODUCTS

INSTALLATION QUALITY ASSURANCE MANUAL

Contents

Geomembrane Products

1.0 INTRODUCTION

This manual provides an overview of the GSE Installation Quality Assurance procedures consistent with industry accepted practices to ensure that the geomembrane products installed will perform for its intended purpose. In addition, all installation work will be performed in strict accordance per the customer's specifications. Please read the procedures below completely before you begin. If you need further clarification, contact GSE Engineering Support Staff for assistance. Remember safety first and usemsafe practices always on every project.

2.0 STANDARD TEST METHODS

ASTM D 6392: Standard Test Methods For Determining The Integrity Of Non-Reinforced Geomembrane Seams Produced Using Thermo Fusion Methods ASTM D 5820: Standard Practice For Pressurized Air Channel Evaluation of Dual Seamed Geomembranes

ASTM D 5641: Standard Practice For Geomembrane Seam Evaluation By Vacuum Chamber

ASTM D 6497: Standard Guide For Mechanical Attachment of Geomembrane to Penetrations or Structures

ASTM D 7240: Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test) GRI Standard GM13: Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

GRI Standard GM14: Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method
of Attributes

GRI Standard GM17: Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

GRI Standard GM19: Standard Specification for Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

3.0 MATERIAL DELIVERY

A. Upon arrival on site, the QA personnel will inventory all materials on the job site.

B. Roll numbers of geomembrane will be logged on the Inventory Check List (Appendix A) and crossreferenced with the Bill of Lading for materials supplied by GSE.

C. Copies of the Inventory Check List and signed Bill of Lading should be sent to the GSE's corporate headquarters while the QA personnel retains the original copies.

D. Any visible damage to roll materials should be noted on the roll and Inventory Check List.

4.0 EARTHWORK

A. The general contractor is responsible for preparing and maintaining the subgrade. The subgrade should be prepared and maintained per the job specifications.

B. The site manager shall be responsible for assuring that the subgrade surface has been properly prepared for deployment of geosynthetics. After each day's deployment the Subgrade Surface Acceptance form (Appendix B) will be signed by all parties.

5.0 PANEL PLACEMENT

A. Each panel will be assigned a number as described below.

1. When there is one layer, panels may be designated with only a number, i.e...1, 2, 3, 4 etc.
2. When two or more layers are required, use a letter and number, i.e....

   Primary Liner P1, P2, P3, P4 etc...

   Secondary Liner S1, S2, S3, S4 etc...

   Tertiary Liner T1, T2, T3, T4 etc...

B. This numbering system should be used whenever possible. Agreement to a panel numbering system should be made at the pre-construction meeting. However, it is essential that the installer, the owner representative and third party QA inspector agree.

C. Panel numbers shall be written in large block letters in the center of each deployed panel. The roll number, date of deployment and length (gross) should be noted below the panel number. All notes should be made, so that they are easily visible from a distance. On long panels it is beneficial to write information on both ends.

D. Panel numbers shall be logged on the Panel Placement Log (Appendix C) along with the roll number and other information neccessary to complete the form.

E. If there is a partial roll left after deployment, it is important to write the last four digits of the roll number in several locations on the roll along with the estimated length for future identification.

F. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:

1. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage. GSE Leak Location should be installed with Conductive layer facing down.
2. Place temporary ballast, such as sangbags, on geomembrane that will not damage the geomembrane and to prevent wind uplift.
3. Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage it. Smoking is not permitted on the geomembrane.
4. Do not allow heavy vehicular traffic directly on geomembrane. Rubber tired and tracked ATV's and equipment are acceptable if contact pressure is less than 8 psi.
   a. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.
   b. Prior to driving on any geomembrane layer, please check for sharp edges, embedded rocks, or other foreign objects that may protrude in the tires and tracks.
   c. Path driven on geomembranes shall be as straight as possible with no sharp turns, sudden stops or quick starts.
   d. Areas where driving occurs shall be continuously and thoroughly inspected throughout the deployment process by the contractor and the third party CQA.

6.0 TRIAL WELDS

A. Seaming apparatus shall be allowed to warm up a minimum of 10 minutes before performing trial welds.

B. Each seaming apparatus along with a welding technician will pass a trial weld prior to use. Trial welds to be performed in the morning and afternoon, as a minimum, as well as whenever there is a power shutdown.

C. Fusion or wedge welds will always be performed or conducted on samples at least 6.0 ft long. Extrusion welds will be done on samples at least 3.0 ft long.

Note: Always perform trial welds in the same conditions that exist on the job. Run the trial welds on the ground, not the installed liner. Do not use a wind break unless you are using one on the job.

D. Operating temperatures should be monitored while welding. The welding technician should verify that the equipment is capable of maintaining temperature while welding.

E. Sampling Procedure

1. Cut five 1.0 in wide specimens from the trial weld sample. Specimens will always be cut using a 1.0 in die cutter, so the peel values may be used for qualitative analysis.
2. When cutting coupons from the trial weld samples, the inside and outside tracks on the coupon should be identified to assist in troubleshooting problems in case the weld fails. The outside track will be defined as the track, which would be peeled if pulling the overlap exposed in a typical installation, or the seam that is closest to the edge of the top sheet. The inside track is the seam closest to the edge of the bottom sheet.

F. Cutter

1. Only cut one sample at a time to avoid damaging the die cutter.
2. Samples should be free of sand and grit prior to cutting sample.
3. Inspect the die edge weekly for nicks, dents or signs of dullness. Dullness of the cutting edge may damage the units.
4. Remove die when edge has been dulled and lightly reshape it with a medium hand file. When wear is excessive return it for a replacement die.
5. When the cutting board becomes deeply scored and/or interferes with coupon cutting it should be replaced.
6. To adjust the depth of the die cut into the cutting board, after replacing the cutting board or sharpening the die, 0.015 in washer shims can be added or removed between the cutting ram and the ram extension. Only add shims when cutting is difficult due to lack of depth of cut.

G. Trial Weld Testing

1. Allow coupons to cool prior to testing. Avoid separating the coupons while hot as failure of the sheet may be initiated and false readings indicated.
2. In extreme heat the coupons may need to be cooled, using water or an insulated cooler prior to peel testing. Lab conditions specify 70 degrees (plus or minus 4 degrees) Fahrenheit. Coupon temperatures greater than 70 degrees may result in lowered strengths.
3. Visually inspect the coupons for squeeze-out, footprint, pressure and general appearance.
4. Each of the five coupons will be tested in peel on the field tensiometer at a separation rate of 2 in per minute (for HDPE). Shear tests, in addition to the peel tests, will be performed.

H. Pass/Fail Criteria

1. Criteria for passing trial welds will be as follows:
    a. Seam must exhibit film tear bond (FTB). Trial welds should have no incursion into the weld.
    b. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 1 for HDPE smooth or textured sheet (@ 2 in/min).
    c. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 2 for LLDPE smooth or textured sheet (@ 20 in/min).
    d. Both tracks of fusion welded samples must pass for the trial weld to be considered acceptable. If any of the five coupons fail due to seam incursion (no FTB) or low strength values, the trial weld must be performed again.
    e. The QA personnel will give approval to proceed with welding after observing and recording all trial welds.
2. All trial weld data will be logged on the Trial Weld Log (Appendix E).
3. When logging fusion welded peel values on the Trial Weld Log indicate the values. for the outside track first, followed by the inside track.
4. Speed and temperature settings will be recorded for each machine trial weld as appropriate.

7.0 GEOMEMBRANE FIELD SEAMING

A. The seam number takes the identity of the panels on each side. The seam between panels 1 & 2 becomes seam 1/2.

B. Welding technicians will record their initials, machine number, date and time at the start of every seam and on the Seam Log (Appendix F). The technician should also periodically mark temperatures along the seam and at the end of the seam.

C. Approved processes for field seaming and repairing are fusion welding and extrusion welding. All welding equipment shall have accurate temperature monitoring devices installed and working to ensure proper measurement.

D. Fusion welding shall be used for seaming panels together and is not used for patching or detail work. The site manager shall verify that:

1. The equipment used is functioning properly.
2. All work is performed on clean surfaces and done in a professional manner. No seaming will be performed in adverse weather conditions.

E. Extrusion welding shall be used primarily for repairs, patching and special detail fabricating and may be used for seaming. The site manager shall verify that:

1. Equipment used is functioning properly.
2. Welding personnel are purging the extrusion welders of heat degraded extrudate prior to actual use.
3. All work is performed on clean surfaces and done in a professional manner. No seaming will be performed in adverse weather conditions.

F. For seam preparation, the welding technician shall verify that:

1. Prior to seaming, the seaming area is free of moisture, dust, dirt, sand or debris of any nature.
2. The seam is overlapped properly for fusion welding.
3. The seam is overlapped or extended beyond damaged areas at least 4.0 in when extrusion welding.
4. The seam is properly heat tacked and abraded prior to extrusion welding.
5. Seams are welded with fewest number of unmatched wrinkles or "fishmouths".

G. No seaming will be performed in ambient air temperatures or adverse weather conditions that would jeopardize the integrity of the liner installation.

8.0 FIELD DESTRUCTIVE TESTING

A. Destructive seam tests shall be performed to evaluate bonded seam strength. The frequency of sample removal shall be one sample per 500 ft of seam, unless site specifications differ. Location of the destructive samples will be selected and marked by the QA technician or third party QA inspector. Field testing should take place as soon as possible after seam is completed.

B. Samples should be labeled in numerical order, i.e. DS-1, DS-2 etc....This should carry thru any layer and or multiple ponds, do not start numbering from 1 again. The size of samples and distribution should be approximately 12 in x 39 in (Size may vary depending on job requirements) and distributed as follows:

1. 12 in x 12 in piece given to QA technician for field testing.
2. 12 in x 12 in piece sent to the GSE's corporate headquarters for testing, if required.
3. 12 in x 12 in piece given to third party for independent testing or to archive.

NOTE: All samples will be labeled showing test number, seam number, machine number, job number, date welded and welding tech number.

C. The sample given to the QA technician in the field shall have ten coupons cut and be tested with a tensiometer adjusted to a pull rate as shown below. The strength of four out of five specimens should meet or exceed the values below, and the fifth specimen must meet or exceed 80% of the value below.

1. Seam must exhibit film tear bond (FTB). Welds should have < 25% incursion into the weld.
2. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 1 for HDPE smooth or textured sheet (@ 2 in/min).
3. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 2 for LLDPE smooth or textured sheet (@ 20 in/min).

D. All weld destructive test data will be logged on the Destructive Test Log (Appendix G).

E. When logging fusion welded peel values on the Destructive Test Log, indicate the values for the outside track first, followed by the inside track.

F. Test results will be noted in the Destructive Test Log as Pass (P) or Fail (F).

G. If a test fails, additional samples will be cut, approximately 10 ft on each side of the failed test, and retested. These will be labeled A (After) & B (Before). This procedure will repeat itself until a sample passes. Then the area of failed seam between the two tests that pass will be capped or reconstructed.

9.0 NON-DESTRUCTIVE TESTING

A. All seams shall be non-destructively tested over their full length using an air pressure or vacuum test. The purpose of this test is to check the continuity of the seam.

B. For air pressure testing, the following procedures are applicable to those seams welded with a double seam fusion welder.

1. The equipment used shall consist of an air tank or pump capable of producing a minimum 35 psi and a sharp needle with a pressure gauge attached to insert into the air chamber.
2. Seal both ends of the seam by heating and squeezing them together. Insert the needle with the gauge into the air channel. Pressurize the air channel to 30 psi. Note time test starts and wait a minimum of 5 minutes to check. If pressure after five minutes has dropped less than 2 psi then the test is successful (Thickness of material may cause variance).
3. Cut opposite seam end and listen for pressure release to verify full seam has been tested.
4. If the test fails, follow these procedures.
    a. While channel is under pressure walk the length of the seam listening for a leak.
    b. While channel is under pressure apply a soapy solution to the seam edge and look for bubbles formed by air escaping.
    c. Re-test the seam in smaller increments until the leak is found.
5. Once the leak is found using one of the proceedures above, cut out the area and retest the portions of the seams between the leak areas per 4a to 4b above. Continue this procedure until all sections of the seam pass the pressure test.
6. Repair the leak with a patch and vacuum test.

C. For vacuum testing, the following procedures are applicable to those seams welded with an extrusion welder.

1. The equipment used shall consist of a vacuum pumping device, a vacuum box and a foaming agent in solution.
2. Wet a section with the foaming agent, place vacuum box over wetted area. Evacuate air from the vacuum box to a pressure suitable to affect a seal between the box and geomembrane. Observe the seam through the viewing window for the presence of soap bubbles emitting from the seam.
3. If no bubbles are observed, move box to the next area for testing. If bubbles are observed, mark the area of the leak for repair per section 11.0 and re-test per section 9.0.

NOTE: If vacuum testing fusion welded seams, the overlap flap must be cut off to perform the tests

4. All non-destructive tests will be noted in the Non-Destructive Logs (Appendixes H-I).

D. For spark testing GSE Leak Location geomembranes, ASTM D 7240 will be the procedure, unless otherwise instructed by the engineer client.

10.0 DEFECTS & REPAIRS

A. All seams and non-seam areas of the geomembrane lining system shall be examined for defects.

B. Identification of the defect should be made using the following procedures:

1. For any defect in the seam or sheet that is an actual breach (hole) in the liner, installation personnel shall circle the defect and mark with the letter P along side the circle. The letter P indicates a patch is required.
2. For any defect that is not an actual hole, installation personnel shall circle the defect indicating that the repair method may be only an extruded bead and that a patch is not required.
3. Each suspect area that has been identified as repair shall be repaired in accordance with section 11.0 and in the non-destructively testing per section 9.0. After all work is completed, the site manager will conduct a final walk-through to confirm all repairs have been completed and debris removed. Only after this final evaluation by the site manager, the owner, and the agent shall any material be placed over the installed liner.

11.0 REPAIR PROCEDURES

A. Any portion of the geomembrane lining system exhibiting a defect that has been marked for repair may be repaired with any one or combination of the following procedures:

1. Patching - used to repair holes, tears, undispersed raw materials in the sheet.
2. Grind and Reweld - used to repair small sections of extrusion welded seams.
3. Spot Welding - Used to repair small minor, localized flaws.
4. Flap Welding - Used to extrusion weld the flap of a fusion weld in lieu of a full cap.
5. Capping - Used to repair failed seams.

B. The following conditions shall apply to the above methods:

1. Surfaces of the geomembrane which are to be repaired shall be prepared according to this section.
2. All surfaces must be clean and dry at the time of the repair.
3. All seaming equipment used in repairing procedures shall be qualified.
4. All patches and caps shall extend at least 4 in beyond the edge of the defect, and all patches must have rounded corners.
5. All cut out holes in liner must have rounded corners of 3.0 in minimum radius.

C. Patches should be labeled in numerical order, i.e. RP-1, RP-2, etc... This should carry through any layer and/or multiple ponds, and do not start with the number 1 again.

12.0 AS-BUILT DRAWINGS

The installer shall provide the following:

A. As-built drawings will be provided at the completion of the project.

B. As-built drawings will include geomembrane panels and panel numbers with the last four digits of the roll number.

C. Panel numbers and the full roll numbers will correspond with the Panel Placement Log(Appendix C).

D. All destructive testing and repair locations will be placed on the as-built drawings.

Inventory Check List

Project:_____ Site Manager: _____ Date:

Project # _____ QA Technician: _____ Page: _____ of ____

Material	Roll #	Used	Material	Roll #	Used	Material	Roll #	Used	Material	Roll #	Used

Subgrade Surface Acceptance

Date: _____

Project: _____ Site Manager:_____

Project #: _____

Location:_____ Partial: _____

Final: _____

This document only applies to the acceptability of surface conditions for installation of geosynthetic products. GSE does not accept responsibility
for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.

_____

_____

_____

_____

_____

For GSE Lining Technology, LLC. :

_____

_____

For Owner / Contractor:

_____

_____

Acceptance Number:_____ Area Accepted: _____ s.f Total Area Accepted to date: _____ s.f.

APPENDIX C

Panel Placement Log

Project Name: _____
Location: _____ Site Supervisor: _____
Job Number: _____ Type of Materials: _____
Q.A. Tech.: _____ Sheet Thickness: _____

Panel Number	Roll Number	Deployment Date	Width (Feet)	Length (Feet)	Squar Feet	Squar Feet (Cumulative)	A/T 1	A/T 2

APPENDIX D

TABLE 1. HDPE Seam Strength Properties

Material (Mil)	Shear Strength (PPI)	Fusion Peel (PPI)	Extrusion Peel (PPI)
40	81	65	52
60	121	98	78
80	162	130	104
100	203	162	130

TABLE 1. LLDPE Seam Strength Properties

Material (Mil)	Shear Strength (PPI)	Fusion Peel (PPI)	Extrusion Peel (PPI)
40	60	50	48
60	90	75	72
80	120	100	96
100	150	125	120

Trial Weld Log

Project Name: _____
Location: _____
Job Number: _____
Q.A.: _____

Site Supervisor: _____
Type of Material: _____
Sheet Thickness: _____

Fusion (ppi) Extrusion (ppi)
Min. Peel _____ Min. Peel_____
Min. Sheer _____ Min. Sheer_____

Trial No.	Date of Trial	Time of Trial	Technicians ID Number	Ambient Temp.	Welder Type	Wedge Mass	Speed Preheat	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass Fail

APPENDIX F

Seam Log

Project Name: _____
Location: _____ Site Supervisor: _____
Job Number: _____ Type of Materials: _____
Q.A. Tech.: _____ Sheet Thickness: _____

Seam Number	Time of Weld	Date of Weld	Type of Weld	Length of Seam	Machine Number	Technician ID Number

Destructive Test Log

Project Name: _____
Location: _____
Job Number: _____
Q.A.: _____

Site Supervisor: _____
Type of Material: _____
Sheet Thickness: _____

Fusion (ppi) Extrusion (ppi)
Min. Peel _____ Min. Peel_____
Min. Sheer _____ Min. Sheer_____

Sample Number	Date Welded	Seam Number	Technicians ID Number	Machine Type & No.	Location	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Peel ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Shear ppi	Pass Fail

APPENDIX H

Repair Log - Vacuum Test

Project Name: _____
Location: _____ Site Supervisor: _____
Job Number: _____ Type of Materials: _____
Q.A. Tech.: _____ Sheet Thickness: _____

Repair Number	Weld Date	Machine Number	Tech ID	Location	Test Date	Tech ID	Pass/Fail

APPENDIX I

Non-Destructive Log - Air Test

Project Name: _____
Location: _____ Site Supervisor: _____
Job Number: _____ Type of Materials: _____
Q.A. Tech.: _____ Sheet Thickness: _____

Seam Number	Test Date	Technician ID Number	Air Pressure Test		Test Result (P or F)	Location
			psi start	psi finish		

GSE is a leading manufacturer and marketer of geosynthetic lining products and services. We've built a reputation of reliability through our dedication to providing consistency of product, price and protection to our global customers.

Our commitment to innovation, our focus on quality and our industry expertise allow us the flexibility to collaborate with our clients to develop a custom, purpose-fit solution.

For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

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