

Technical Memorandum

January 30, 2025

To	David Unruh, Ecology	Contact No.	(206) 459-6287
Copy to	Robert W. Bollar, PNEC Corporation	Email	Dunr461@ecy.wa.gov
From	Emily Blakeway, GHD Brian Peters, GHD	Project No.	12654227
Project Name	Former Tosco Bainbridge Bulk Plant 1784 – NW3070		
Subject	Groundwater Non-Potability Demonstration Work Plan		

1. Introduction and Property Description

GHD Services Inc. (GHD) has prepared this *Groundwater Non-Potability Demonstration Work Plan (Work Plan)* for PNEC Corporation c/o Madrona Partners, LLC (Client) for the property located approximately 255 feet east of the intersection of Weaver Avenue and Shepard Way Northwest on Bainbridge Island, Washington (Property, Figure 1). The purpose of this Work Plan is to document the proposed scope of work detailed below to assist in determining if groundwater at the Property can be considered non-potable in accordance with Washington Administrative Code (WAC) 173-340-720(2)(b)(i).

The Property is comprised of approximately 0.9-acre of vacant and undeveloped land (Kitsap County Tax Parcel No. 272502-4-005-2001). Weaver Creek is located along a portion of the west side of the Property and Eagle Harbor is located at the south end of the Property. The Property was formerly developed by Union Oil Company of California (UNOCAL) in about 1970 as a former heating oil bulk petroleum storage facility. Former Property features consisted of two 10,000-gallon and two 4,000-gallon horizontal above ground storage tanks (ASTs), a pumping station, an overhead loading rack, and a detention pond in the southern portion of the Property. A Site Plan showing the approximate locations of former Property features is included as Figure 2. Tosco Corporation (Tosco) acquired the Property from UNOCAL in March 1997. PNEC purchased the Property from Tosco in June 1997 and removed the facility ASTs, pumping station, and overhead loading rack structures in September 1997.

Soil and groundwater containing petroleum hydrocarbon compounds exceeding the Washington State Department of Ecology's (Ecology) Model Toxics Control Act (MTCA) Method A cleanup levels (here in referred to as impacts) were identified during site investigation activities in 1997. The release was reported to Ecology and the Property was assigned Cleanup Site ID 3960. The Property was entered into Ecology's Voluntary Cleanup Program and issued site number NW3070. Several previous site assessment and remedial treatment activities have been conducted at the Property between 1997 and 2024; however, residual soil and groundwater impacts exceeding MTCA Method A cleanup levels remain.

This Technical Memorandum is provided as an interim output under our agreement with Shell International Petroleum. It is provided to foster discussion in relation to technical matters associated with the project and should not be relied upon in any way.

2. Aquifer Yield Testing

As part of the site investigation activities, seven groundwater monitoring wells (MW-1 through MW-7) have been installed on-Property and on the west adjoining City of Bainbridge Strawberry Park property. Depth to perched groundwater ranges from approximately 2 to 14 feet below ground surface (bgs) in the monitoring wells and generally flows to the southwest. To determine if perched groundwater at the Property is a potential non-potable source of groundwater, yield testing will be performed. A single well yield test will be completed on monitoring wells MW-1 and MW-5 for up to 8 hours to determine if each well can sustain a pumping rate of 0.5 gallons per minute (gpm) for a period of 24 hours as defined in WAC 173-340-720(2)(b)(i). Wells MW-1 and MW-5 are anticipated to fully penetrate the perched water zone, which does not extend greater than approximately 15 feet bgs. Groundwater from the yield tests will be pumped into 55-gallon steel drums. The drums will be labelled and stored on-Property for later disposal.

2.1 Water Level Measurements

Prior to beginning the yield tests, the water level will be measured in wells MW-1 through MW-7 and recorded to the nearest 0.01 foot. Water level will be measured again within the pumping wells after placement of the pumps and before pumping begins. Water within the wells will be given time to stabilize after placement of the pump and prior to pumping. After pumping commences, the water level within the pumping wells will be measured as follows:

<i>Time since start of pumping</i>	<i>Time interval between water level measurements</i>
0 to 5 minutes	0.5 minutes
5 to 60 minutes	5 minutes
60 to 120 minutes	20 minutes
120 minutes to shutdown	60 minutes
Shutdown to 80% well recharge	5 minutes

At the completion of the pumping, water levels will be measured and recorded once in wells MW-1 through MW-7, and then every 5 minutes in the pumping wells (MW-1 and MW-5) until the wells have recharged to 80 percent of their initial water level measurement, or until one hour has passed.

2.2 Initial Pumping Rate

At the start of the yield tests, the pump will be set at a rate of 0.25 gpm, or 0.95 Liters per minute. An inline or totalizing flow meter will be utilized to obtain an accurate pumping rate. The time between starting the pump and achieving a 0.25 gpm pumping rate will be recorded. If the wells dewater, the pump will be stopped, and water level measurements will be recorded once per minute until the wells have recovered to at least 80 percent of their original water level, at which time pumping will be re-initiated at a rate of 0.25 gpm. If the wells dewater three times consecutively within 8 hours, the yield tests will be ceased. If the wells dewater and does not recharge within 2 hours, the yield tests will be ceased.

2.3 Step Up Pumping Rate

If the pumping well can sustain a rate of 0.25 gpm for a 2-hour period, the pump rate will be increased to 0.5 gpm (1.89 Liters per minute). The water level will be measured and recorded as indicated in Section 2.1. Pumping will continue at 0.5 gpm until the wells dewater and recharges three times (or until the wells do not recharge within 2 hours), or until 8 hours of testing has been completed.

2.4 Well Diameter Correction Factor

Since wells MW-1 and MW-5 are 2-inches in diameter, a correction factor will be applied to the yield rate to estimate the yield rate of an equivalent 6-inch diameter well as required under WAC 173-160-211. The correction factor can be developed using the Thiem equilibrium well function equation (Driscoll, 1986). For an unconfined aquifer, the equation is as follows:

$$Q = \frac{K(H^2 - h^2)}{1,055 \log(R/r)}$$

where:

Q = rate of pumping (gpm)

K = hydraulic conductivity of groundwater-bearing unit (gpd/ft²)

H = static head in well measured from the bottom of the aquifer (ft)

h = depth of the water in the well while pumping (ft)

R = radius of the cone of depression (ft)

r = radius of the well (ft)

Assuming that all dynamic conditions are in equilibrium (i.e., constant discharge, stable water level drawdown, radius of influence, and water entering the well at equal rates from all directions), the equation can be simplified by incorporating a constant term (C) as follows (Driscoll, 1986):

$$Q \approx \frac{C}{\log(R/r)}$$

Based on this equation, a conversion factor equation will be developed to calculate equivalent yield rate from a well based on a measured yield from a well of a different diameter. The equation is as follows:

$$Correction = \frac{Q_{6in}}{Q_{2in}} = \frac{\log(R/r_{2in})}{\log(R/r_{6in})} = \frac{\log(50/0.083)}{\log(50/0.25)} = 1.21$$

where:

R = the radius of the cone of depression (ft), the assumed radius of influence for this Site is 50 feet if the well was to be pumped at a sustainable rate.

r = radius of the well (ft)

Q = yield (gpd)

Based on the conversion equation, a correction factor of 1.21 will be applied to the extrapolated well yield of wells MW-1 and MW-5 to obtain the equivalent yield from a 6-inch diameter well screen.

3. Reporting

Following completion of the above activities, GHD will incorporate a summary of these activities and results in an Interim Remedial Action Report. Please contact Emily Blakeway at (425) 536-6502 or Brian Peters at (425) 536-6506 if you have any questions or require additional information.

Sincerely,

GHD


Emily Blakeway
Project Manager

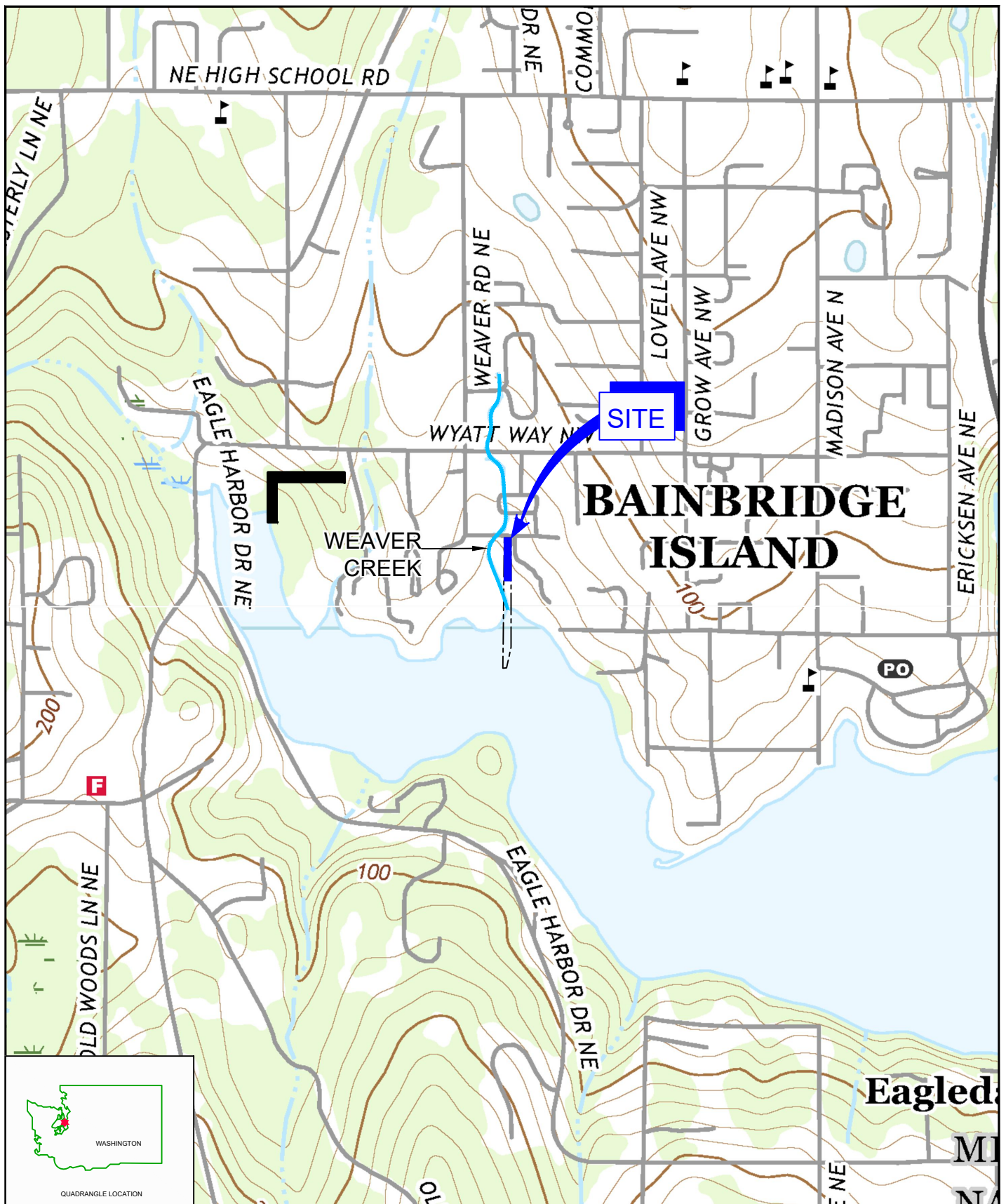

Brian Peters, LG
Project Director

Encl.

Figure 1 – Vicinity Map

Figure 2 – Site Plan

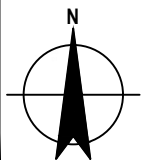
Figures



Source: USGS Quadrangle Map, Suquamish and Bremerton East, WA 2017.

0 500 1000ft

Coordinate System:
Washington State
Plane North
WA83-NF



LEGEND

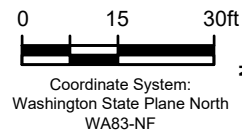
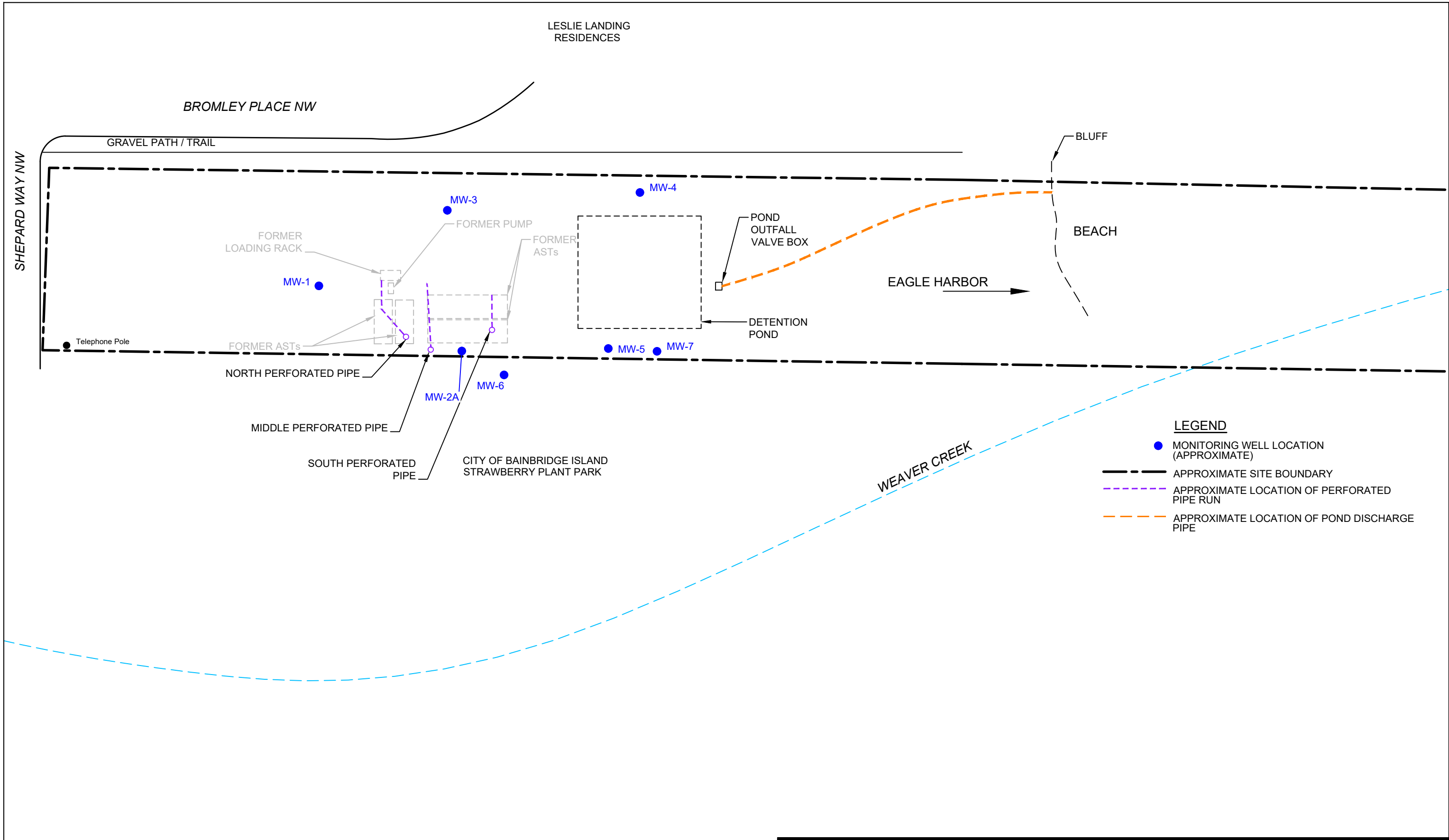


FORMER TOSCO BULK PLANT 1784
WEAVER AVENUE AND SHEPARD WAY NW
BAINBRIDGE ISLAND, WASHINGTON

12564227
Oct 31, 2022

VICINTIY MAP

FIGURE 1



FORMER TOSCO BULK PLANT 1784
WEAVER AVENUE AND SHEPARD WAY NW
BAINBRIDGE ISLAND,
KITSAP COUNTY, WASHINGTON

Project No. 12564227
Date October 2022

SITE PLAN

FIGURE 2