July 10, 2020

Stan Jones
Port of Portland
PO Box 3529
Portland, OR 97208

Re: Hydrogeologic Summary
2019 Groundwater Monitoring Data
Portland International Airport
Portland, Oregon
1264-07

Dear Mr. Jones:

## INTRODUCTION

At the request of the Oregon Department of Environmental Quality (DEQ), we have prepared this hydrogeologic summary for groundwater monitoring data collected in 2019 for the Original and Former fire training facilities (Site) at Portland International Airport (PDX; Figures 1 and 2). Investigation and monitoring activities are being conducted at the Site with oversight from DEQ in accordance with the Voluntary Cleanup Agreement (VCP) between the DEQ and the Port of Portland for ECSI No. 3324, dated February 8, 2017. The investigation is being conducted to delineate per- and polyfluorinated alkyl substances (PFAS; a component of aqueous film forming foam [AFFF]) impacts associated with fire training activities conducted at the Site.

As presented in the *Fourth Quarter 2019 Groundwater Monitoring Report* (Apex, 2020), quarterly groundwater monitoring and monthly monitoring well gauging activities were conducted in 2019. The purpose of this memorandum is to summarize our review and assessment of monthly gauging data and determine predominant flow direction, gradient, seasonality, and Columbia River stage during each month, for the purposes of recommending whether the existing Shallow Overbank Deposits (OD) and deeper Upper Columbia River Sand Aquifer (CRSA) well networks are adequate for understanding groundwater impacts at the Site.

**Background.** Following submittal of the *Fourth Quarter 2019 Groundwater Monitoring Report* (Apex, 2020), Apex, the Port of Portland, and DEQ held a meeting to discuss next steps and the planned 2020 monitoring program. As an outcome of this meeting, DEQ requested additional hydrogeologic analysis to support conclusions from 2019 monitoring that will serve as a basis for preparation of a work plan for the next phase of monitoring and investigation activities.

## 2019 GROUNDWATER MONITORING SUMMARY

Groundwater levels for monitoring wells screened within the Shallow OD (wells MW-1 through MW-33) and monitoring wells screened within the Upper CRSA (wells DW-1 through DW-3) were gauged monthly between January and December 2019. Monthly groundwater gauging measurements are presented in Table 1. Select shallow (OD) wells and the Upper CRSA wells were sampled quarterly in January, April, July, and October 2019 for PFAS analysis as part of investigation and monitoring activities in accordance with the *Additional Investigation Work Plan Addendum* (Apex, 2018).

**Shallow (OD) Monitoring Wells**. Quarterly groundwater elevation contours were calculated using a manual regression method and knowledge of the site and are shown on Figures 3 through 6. The following paragraphs summarize Shallow OD groundwater conditions encountered in 2019. The OD consist of fine-grained sediments deposited in floodplains adjacent to river channels. This unit is divided into Shallow OD and Deep OD, the former being approximately 30 feet thick and having less sand content.

Groundwater levels observed in shallow (OD) wells were generally highest in December through June and lowest in September through November in response to seasonal precipitation and is typical of historical groundwater elevation observations. An increase in groundwater elevations was observed in April and May 2019 in wells MW-24, MW-25, and MW-31 through MW-33, corresponding to a prolonged period of heavy rainfall. Groundwater elevations in these wells were also observed to have correlation with Columbia River stage. However, this correlation was not observed in well MW-27, which is located to the north of the Site and in similar relative proximity to the Columbia River. Recorded groundwater elevations for well MW-27 were approximately 5 to 8 feet higher than other wells located near the Columbia River and no water level increase was observed in April 2019.

Groundwater elevations observed in other Site monitoring wells were not similarly influenced by the higher river stage in April and May 2019. Groundwater elevations observed in wells MW-23, MW-26, and MW-28 exhibited a less pronounced correlation with river stage, while no correlation with the river stage was observed in wells located to the south and southwest, including those near the fire training areas (wells MW-1 through MW-22 and well MW-29). This suggests that groundwater elevations within these wells are not significantly influenced by the Columbia River on the Site.

The most significant fluctuations in groundwater elevations were observed in wells located near the southwest portion of the Site (wells MW-21 through MW-23) and wells located closest to the Columbia River (wells MW-24 through MW-27 and MW-30 through MW-33). In these wells, monthly groundwater elevations fluctuated within a range of 5.23 feet above mean sea level (MSL, MW-26) and 7.53 feet MSL (MW-21). Limited fluctuation was observed in well MW-5, with a total elevation difference of only 0.71 feet for all of 2019. Well MW-5 is located within the gravel cap at the Former Fire Training Facility. Other wells in the vicinity of the fire training facilities were also observed to have less variation in groundwater elevation throughout the year in comparison to wells located in other areas of the Site. Groundwater elevations within this area are the lowest observed at the Site, a correlation with the flat topography.

The groundwater hydraulic gradient observed in the Shallow OD was variable; however, the Shallow OD groundwater flow is interpreted to be generally to the north. Groundwater flow direction was generally consistent during monthly gauging events, with slight seasonal variation. The monitoring consistently showed a groundwater gradient toward the stormwater conveyance system in the vicinity of the Fire Training Facility, indicating that groundwater infiltration into the stormwater pipe is having a significant influence on groundwater gradient. In addition, based on groundwater elevations in wells MW-27 through MW-30, observed gradients indicate that the stockpiles located north of North Perimeter Road and west of the Jet Fuel Storage tank farm (Figure 2) are consolidating (surcharging) Shallow OD soil and impacting groundwater flow and gradient. In the absence of these influences on gradient, it is anticipated that groundwater flow direction would consistently be to the north-northwest.

Evaluating the influence of the drainage ditch on groundwater, measured elevations in well MW-29 were consistently higher as compared to elevations in well MW-28; however, groundwater elevation in well MW-29 had little variation throughout the year, while well MW-28 had some seasonal variation consistent with increases in the Columbia River stage.

Groundwater flow direction was compared to concentrations of PFAS detected in quarterly samples collected in 2019. With the exception of well MW-33, samples collected from perimeter wells near the Columbia River generally did not contain PFAS. Trace detections of several PFAS compounds (including Perfluorobutanoic acid [PFBA],

Perfluoropentanoic acid [PFPeA], Perfluorohexane sulfonic acid [PFHxS], Perfluoroheptanoic acid [PFHpA], and Perfluorooctanoic acid [PFOA]) were identified in groundwater samples collected from well MW-33; however, these concentrations did not exceed applicable screening levels. Groundwater samples collected from perimeter wells to the south, west, and east of the fire training areas (wells MW-16, MW-18 through MW-21) typically contained trace detections of PFAS, while the concentration in the sample collected from one well (MW-15) exceeded the Tier I Protective Concentration Level for residential ingestion of groundwater from the Texas Commission of Environmental Quality for one PFAS compound (PFPeA).

**Deeper (Upper CRSA) Monitoring Wells**. The CRSA fills a former channel of the ancestral Columbia River. In the Site area, the top of the CRSA is approximately 50 to 60 feet below ground surface (bgs). In 2019, monthly groundwater elevations ranged between 7.58 to 14.02 feet above MSL in well DW-1; 7.91 to 13.90 feet MSL in well DW-2; and 7.91 to 13.74 feet MSL in well DW-3. As with the shallow (OD) wells, groundwater levels in the deep wells were generally highest in April and May 2019. Throughout 2019, observed changes in groundwater elevations exhibited a close correlation with changes in Columbia River stage.

Groundwater gradient and flow direction fluctuated throughout 2019. Groundwater gradient ranged from approximately 0.00013 to 0.00054 feet/feet. Groundwater flow directions were typically to the north-northwest, but hydraulic gradient shifted to the west-southwest during Columbia River flood stage.

Trace detections of PFAS have been measured in samples collected from wells DW-1 through DW-3 (Perfluorooctane sulfonate [PFOS] in well DW-1; PFPeA and PFOS in well DW-2; and PFOS and 8:2 FTS in well DW-3). However, 2019 concentrations of PFAS in samples collected from wells DW-1 through DW-3 were below residential drinking water screening levels, including the Environmental Protection Agency (EPA) Health Advisory (HA) of 70 nanograms per liter (ng/L) for PFOA and PFOS.

## CONCLUSIONS AND RECOMMENDATIONS

Groundwater monitoring wells screened within the Shallow OD (wells MW-1 through MW-33) and the deeper Upper CRSA (wells DW-1 through DW-3) were gauged monthly from January to December 2019. Select shallow (OD) wells and deeper (CRSA) wells were also sampled quarterly in January, April, July, and October 2019 for PFAS.

Shallow (OD) wells located nearest the Columbia River exhibited the greatest fluctuation in groundwater elevation, correlating with Columbia River flood stage. This correlation was not observed in groundwater elevations in well MW-27, likely as a result of surcharged soil from stockpiles located north of North Perimeter Road and west of the Jet Fuel Storage tank farm. Groundwater elevations in other shallow (OD) wells farther from the Columbia River were not significantly influenced by river stage.

Based on our assessment of 2019 monthly gauging results for wells installed in the Shallow OD, groundwater flow direction and hydraulic gradient were observed to be variable across the Site. Overall, groundwater flow direction appears to be to the north-northwest.

For the CRSA wells (wells DW-1 through DW-3), groundwater elevations generally correlated with Columbia River stage variations and had similar amplitude. The groundwater flow direction observed in the CRSA was typically to the north-northeast; however, observed groundwater flow was to the west-southwest during Columbia River at flood stage.

Trace detections of PFAS have been measured samples collected from wells DW-1 through DW-3 in 2019. However, those concentrations were below applicable residential screening levels. Concentrations of PFAS in samples collected from these wells were relatively low. In addition, a relatively flat hydraulic gradient (0.00013 and 0.00054 feet/feet) was observed during all gauging events.

In conclusion, while local variability in Shallow OD groundwater flow direction and gradient was observed, PFAS concentrations in downgradient wells on the Site perimeter of the Site were relatively stable. To demonstrate plume stability and areal confinement, we recommend continued quarterly monitoring of perimeter wells and annual monitoring of interior wells. Installation and monitoring of two additional northern Site perimeter wells are also recommended to address limited Shallow OD analytical data gaps.

Based on evaluation of monitoring data for the three wells screened within the Upper CRSA, groundwater elevations were relatively consistent and correlated with Columbia River stage. Concentrations of PFAS were either low or non-detect in samples collected from these wells. Based on the limited data set, we recommend continued quarterly monitoring of the three Upper CRSA wells.

## REFERENCES

Apex, 2018. *Additional Investigation Work Plan Addendum, Original and Former Fire Training Facilities, Portland International Airport. Portland, Oregon, ECSI No. 3324*. November 20, 2018.

Apex, 2020. *Fourth Quarter 2019 Groundwater Monitoring Report*. January 15, 2020.

If you have any questions or would like to discuss this further, please do not hesitate to contact us at (503) 924-4704, extension 1902, AReese@apexcos.com, or extension 1913, Heather.Gosack@apexcos.com.

Sincerely,

Adam Reese, R.G., C.E.G.
Division Manager

Heather Gosack, R.G.
Senior Project Manager

Cc: Mr. Dan Hafley, Oregon Department of Environmental Quality

***Attachments:***

Table 1 – Groundwater and Columbia River Stage Elevations

Figure 1 – Site Location Map
Figure 2 – Site Vicinity Plan
Figure 3 – Shallow (OD) Groundwater Elevations Contour Map (January 2019)
Figure 4 – Shallow (OD) Groundwater Elevations Contour Map (April 2019)
Figure 5 – Shallow (OD) Groundwater Elevations Contour Map (July 2019)
Figure 6 – Shallow (OD) Groundwater Elevations Contour Map (October 2019)
Figure 7 – Deeper (Upper CRSA) Groundwater Elevations Contour Map (January 31, 2019)

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-1 | 01/31/19 | 8.60 | -- | -- | 9.01 |
| (17.61) | 02/28/19 | 8.37 | -- | -- | 9.24 |
| | 03/22/19 | 8.47 | -- | -- | 9.14 |
| | 04/29/19 | 7.96 | -- | -- | 9.65 |
| | 05/31/19 | 8.37 | -- | -- | 9.24 |
| | 06/28/19 | 8.96 | -- | -- | 8.65 |
| | 07/30/19 | 9.25 | -- | -- | 8.36 |
| | 08/29/19 | 9.52 | -- | -- | 8.09 |
| | 09/27/19 | 9.52 | -- | -- | 8.09 |
| | 10/28/19 | 9.56 | -- | -- | 8.05 |
| | 12/02/19 | 9.75 | -- | -- | 7.86 |
| | 12/30/19 | 9.35 | -- | -- | 8.26 |
| MW-2 | 01/31/19 | 10.24 | -- | -- | 7.60 |
| (17.84) | 02/28/19 | 10.15 | -- | -- | 7.69 |
| | 03/22/19 | 10.19 | -- | -- | 7.65 |
| | 04/29/19 | 9.85 | -- | -- | 7.99 |
| | 05/31/19 | 10.01 | -- | -- | 7.83 |
| | 06/28/19 | 10.40 | -- | -- | 7.44 |
| | 07/30/19 | 10.55 | -- | -- | 7.29 |
| | 08/29/19 | 10.69 | -- | -- | 7.15 |
| | 09/27/19 | 10.70 | -- | -- | 7.14 |
| | 10/28/19 | 10.67 | -- | -- | 7.17 |
| | 12/02/19 | 10.75 | -- | -- | 7.09 |
| | 12/30/19 | 10.53 | -- | -- | 7.31 |
| MW-3 | 01/31/19 | 9.30 | -- | -- | 8.29 |
| (17.59) | 02/28/19 | 8.19 | -- | -- | 9.40 |
| | 03/22/19 | 8.65 | -- | -- | 8.94 |
| | 04/29/19 | 7.86 | -- | -- | 9.73 |
| | 05/31/19 | 8.39 | -- | -- | 9.20 |
| | 06/28/19 | 9.20 | -- | -- | 8.39 |
| | 07/30/19 | 9.71 | -- | -- | 7.88 |
| | 08/29/19 | 10.00 | -- | -- | 7.59 |
| | 09/27/19 | 9.85 | -- | -- | 7.74 |
| | 10/28/19 | 9.95 | -- | -- | 7.64 |
| | 12/02/19 | 10.00 | -- | -- | 7.59 |
| | 12/30/19 | 9.30 | -- | -- | 8.29 |
| MW-4 | 01/31/19 | 8.48 | -- | -- | 9.52 |
| (18.00) | 02/28/19 | 8.11 | -- | -- | 9.89 |
| | 03/22/19 | 8.45 | -- | -- | 9.55 |
| | 04/29/19 | 8.01 | -- | -- | 9.99 |
| | 05/31/19 | 8.45 | -- | -- | 9.55 |
| | 06/28/19 | 9.00 | -- | -- | 9.00 |
| | 07/30/19 | 9.34 | -- | -- | 8.66 |
| | 08/29/19 | 9.61 | -- | -- | 8.39 |
| | 09/27/19 | 9.45 | -- | -- | 8.55 |
| | 10/28/19 | 9.50 | -- | -- | 8.50 |
| | 12/02/19 | 9.65 | -- | -- | 8.35 |
| | 12/30/19 | 8.94 | -- | -- | 9.06 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-5 | 01/31/19 | 10.82 | -- | -- | 9.06 |
| (19.88) | 02/28/19 | 10.40 | -- | -- | 9.48 |
| | 03/22/19 | 10.85 | -- | -- | 9.03 |
| | 04/29/19 | 10.83 | -- | -- | 9.05 |
| | 05/31/19 | 10.95 | -- | -- | 8.93 |
| | 06/28/19 | 11.06 | -- | -- | 8.82 |
| | 07/30/19 | 11.00 | -- | -- | 8.88 |
| | 08/29/19 | 11.00 | -- | -- | 8.88 |
| | 09/27/19 | 11.05 | -- | -- | 8.83 |
| | 10/28/19 | 11.08 | -- | -- | 8.80 |
| | 12/02/19 | 11.11 | -- | -- | 8.77 |
| | 12/30/19 | 10.97 | -- | -- | 8.91 |
| MW-6 | 01/31/19 | 7.48 | -- | -- | 10.60 |
| (18.08) | 02/28/19 | 6.65 | -- | -- | 11.43 |
| | 03/22/19 | 7.07 | -- | -- | 11.01 |
| | 04/29/19 | 6.91 | -- | -- | 11.17 |
| | 05/31/19 | 7.57 | -- | -- | 10.51 |
| | 06/28/19 | 8.36 | -- | -- | 9.72 |
| | 07/30/19 | 8.51 | -- | -- | 9.57 |
| | 08/29/19 | 9.38 | -- | -- | 8.70 |
| | 09/27/19 | 9.47 | -- | -- | 8.61 |
| | 10/28/19 | 9.57 | -- | -- | 8.51 |
| | 12/02/19 | 9.73 | -- | -- | 8.35 |
| | 12/30/19 | 8.85 | -- | -- | 9.23 |
| MW-7 | 01/31/19 | 9.63 | -- | -- | 7.98 |
| (17.61) | 02/28/19 | 9.27 | -- | -- | 8.34 |
| | 03/22/19 | 9.58 | -- | -- | 8.03 |
| | 04/29/19 | 9.45 | -- | -- | 8.16 |
| | 05/31/19 | 9.76 | -- | -- | 7.85 |
| | 06/28/19 | 10.25 | -- | -- | 7.36 |
| | 07/30/19 | 10.51 | -- | -- | 7.10 |
| | 08/29/19 | 10.70 | -- | -- | 6.91 |
| | 09/27/19 | 10.46 | -- | -- | 7.15 |
| | 10/28/19 | 10.56 | -- | -- | 7.05 |
| | 12/02/19 | 10.75 | -- | -- | 6.86 |
| | 12/30/19 | 9.71 | -- | -- | 7.90 |
| MW-8 | 01/31/19 | 9.17 | -- | -- | 8.98 |
| (18.15) | 02/28/19 | 8.80 | -- | -- | 9.35 |
| | 03/22/19 | 9.10 | -- | -- | 9.05 |
| | 04/29/19 | 8.16 | -- | -- | 9.99 |
| | 05/31/19 | 8.55 | -- | -- | 9.60 |
| | 06/28/19 | 9.36 | -- | -- | 8.79 |
| | 07/30/19 | 9.85 | -- | -- | 8.30 |
| | 08/29/19 | 10.10 | -- | -- | 8.05 |
| | 09/27/19 | 10.05 | -- | -- | 8.10 |
| | 10/28/19 | 10.00 | -- | -- | 8.15 |
| | 12/02/19 | 9.88 | -- | -- | 8.27 |
| | 12/30/19 | 9.30 | -- | -- | 8.85 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-9 | 01/31/19 | 5.40 | -- | -- | 11.67 |
| (17.07) | 02/28/19 | 4.65 | -- | -- | 12.42 |
| | 03/22/19 | 5.80 | -- | -- | 11.27 |
| | 04/29/19 | 5.68 | -- | -- | 11.39 |
| | 05/31/19 | 6.14 | -- | -- | 10.93 |
| | 06/28/19 | 6.61 | -- | -- | 10.46 |
| | 07/30/19 | 7.31 | -- | -- | 9.76 |
| | 08/29/19 | 7.87 | -- | -- | 9.20 |
| | 09/27/19 | 7.40 | -- | -- | 9.67 |
| | 10/28/19 | 7.52 | -- | -- | 9.55 |
| | 12/02/19 | 7.79 | -- | -- | 9.28 |
| | 12/30/19 | 5.96 | -- | -- | 11.11 |
| MW-10A | 01/31/19 | 5.46 | -- | -- | 11.78 |
| (17.24) | 02/28/19 | 5.12 | -- | -- | 12.12 |
| | 03/22/19 | 5.76 | -- | -- | 11.48 |
| | 04/29/19 | 5.71 | -- | -- | 11.53 |
| | 05/31/19 | 6.07 | -- | -- | 11.17 |
| | 06/28/19 | 6.36 | -- | -- | 10.88 |
| | 07/30/19 | 6.71 | -- | -- | 10.53 |
| | 08/29/19 | 6.99 | -- | -- | 10.25 |
| | 09/27/19 | 6.73 | -- | -- | 10.51 |
| | 10/28/19 | 6.93 | -- | -- | 10.31 |
| | 12/02/19 | 7.06 | -- | -- | 10.18 |
| | 12/30/19 | 5.96 | -- | -- | 11.28 |
| MW-11 | 01/31/19 | 6.50 | 6.49 | 0.01 | 10.86 |
| (17.35) | 02/28/19 | 6.16 | 6.15 | 0.01 | 11.20 |
| | 03/22/19 | 6.80 | 6.75 | 0.05 | 10.59 |
| | 04/29/19 | 6.51 | 6.50 | 0.01 | 10.85 |
| | 05/31/19 | 7.02 | 6.90 | 0.12 | 10.43 |
| | 06/28/19 | 7.54 | 7.46 | 0.08 | 9.87 |
| | 07/30/19 | 8.21 | 8.20 | 0.01 | 9.15 |
| | 08/29/19 | 8.90 | 8.70 | 0.20 | 8.61 |
| | 09/27/19 | 8.61 | 8.60 | 0.01 | 8.75 |
| | 10/28/19 | 8.90 | 8.75 | 0.15 | 8.57 |
| | 12/02/19 | 8.89 | 8.88 | 0.01 | 8.47 |
| | 12/30/19 | 7.12 | sheen | sheen | 10.23 |
| MW-12 | 01/31/19 | 9.25 | 9.00 | 0.25 | 10.66 |
| (19.71) | 02/28/19 | 8.69 | 8.50 | 0.19 | 11.17 |
| | 03/22/19 | 8.62 | 8.41 | 0.21 | 11.26 |
| | 04/29/19 | 8.37 | 8.14 | 0.23 | 11.52 |
| | 05/31/19 | 8.77 | 8.50 | 0.27 | 11.16 |
| | 06/28/19 | 9.07 | 8.80 | 0.27 | 10.86 |
| | 07/30/19 | 10.00 | 9.81 | 0.19 | 9.86 |
| | 08/29/19 | 10.66 | 10.53 | 0.13 | 9.15 |
| | 09/27/19 | 10.80 | 10.62 | 0.18 | 9.05 |
| | 10/28/19 | 10.93 | 10.86 | 0.07 | 8.84 |
| | 12/02/19 | 11.02 | 10.90 | 0.12 | 8.79 |
| | 12/30/19 | 10.61 | 10.50 | 0.11 | 9.19 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-13 | 01/31/19 | 4.47 | -- | -- | 14.06 |
| (18.53) | 02/28/19 | 4.06 | -- | -- | 14.47 |
| | 03/22/19 | 4.60 | -- | -- | 13.93 |
| | 04/29/19 | 4.63 | -- | -- | 13.90 |
| | 05/31/19 | 4.95 | -- | -- | 13.58 |
| | 06/28/19 | 5.24 | -- | -- | 13.29 |
| | 07/30/19 | 5.51 | -- | -- | 13.02 |
| | 08/29/19 | 5.73 | -- | -- | 12.80 |
| | 09/27/19 | 5.61 | -- | -- | 12.92 |
| | 10/28/19 | 5.80 | -- | -- | 12.73 |
| | 12/02/19 | 5.92 | -- | -- | 12.61 |
| | 12/30/19 | 5.10 | -- | -- | 13.43 |
| MW-14 | 01/31/19 | 3.72 | -- | -- | 14.01 |
| (17.73) | 02/28/19 | 3.30 | -- | -- | 14.43 |
| | 03/22/19 | 3.72 | -- | -- | 14.01 |
| | 04/29/19 | 3.72 | -- | -- | 14.01 |
| | 05/31/19 | 4.03 | -- | -- | 13.70 |
| | 06/28/19 | 4.27 | -- | -- | 13.46 |
| | 07/30/19 | 4.55 | -- | -- | 13.18 |
| | 08/29/19 | 4.79 | -- | -- | 12.94 |
| | 09/27/19 | 4.81 | -- | -- | 12.92 |
| | 10/28/19 | 4.98 | -- | -- | 12.75 |
| | 12/02/19 | 5.13 | -- | -- | 12.60 |
| | 12/30/19 | 4.33 | -- | -- | 13.40 |
| MW-15 | 01/31/19 | 9.71 | -- | -- | 15.30 |
| (25.01) | 02/28/19 | 8.40 | -- | -- | 16.61 |
| | 03/22/19 | 9.42 | -- | -- | 15.59 |
| | 04/29/19 | 8.63 | -- | -- | 16.38 |
| | 05/31/19 | 9.11 | -- | -- | 15.90 |
| | 06/28/19 | 9.80 | -- | -- | 15.21 |
| | 07/30/19 | 10.66 | -- | -- | 14.35 |
| | 08/29/19 | 11.40 | -- | -- | 13.61 |
| | 09/27/19 | 11.95 | -- | -- | 13.06 |
| | 10/28/19 | 12.37 | -- | -- | 12.64 |
| | 12/02/19 | 12.65 | -- | -- | 12.36 |
| | 12/30/19 | 11.34 | -- | -- | 13.67 |
| MW-16 | 01/31/19 | 5.15 | -- | -- | 17.41 |
| (22.56) | 02/28/19 | 4.58 | -- | -- | 17.98 |
| | 03/22/19 | 5.08 | -- | -- | 17.48 |
| | 04/29/19 | 5.05 | -- | -- | 17.51 |
| | 05/31/19 | 5.47 | -- | -- | 17.09 |
| | 06/28/19 | 5.72 | -- | -- | 16.84 |
| | 07/30/19 | 5.97 | -- | -- | 16.59 |
| | 08/29/19 | 6.21 | -- | -- | 16.35 |
| | 09/27/19 | 6.46 | -- | -- | 16.10 |
| | 10/28/19 | 6.69 | -- | -- | 15.87 |
| | 12/02/19 | 6.91 | -- | -- | 15.65 |
| | 12/30/19 | 6.20 | -- | -- | 16.36 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-17 | 01/31/19 | 5.51 | -- | -- | 17.06 |
| (22.57) | 02/28/19 | 4.98 | -- | -- | 17.59 |
| | 03/22/19 | 5.72 | -- | -- | 16.85 |
| | 04/29/19 | 5.68 | -- | -- | 16.89 |
| | 05/31/19 | 6.09 | -- | -- | 16.48 |
| | 06/28/19 | 6.52 | -- | -- | 16.05 |
| | 07/30/19 | 7.09 | -- | -- | 15.48 |
| | 08/29/19 | 7.52 | -- | -- | 15.05 |
| | 09/27/19 | 7.56 | -- | -- | 15.01 |
| | 10/28/19 | 7.82 | -- | -- | 14.75 |
| | 12/02/19 | 7.99 | -- | -- | 14.58 |
| | 12/30/19 | 6.59 | -- | -- | 15.98 |
| MW-18 | 01/31/19 | 5.70 | -- | -- | 17.39 |
| (23.09) | 02/28/19 | 4.93 | -- | -- | 18.16 |
| | 03/22/19 | 5.51 | -- | -- | 17.58 |
| | 04/29/19 | 5.73 | -- | -- | 17.36 |
| | 05/31/19 | 6.15 | -- | -- | 16.94 |
| | 06/28/19 | 6.75 | -- | -- | 16.34 |
| | 07/30/19 | 7.35 | -- | -- | 15.74 |
| | 08/29/19 | 7.84 | -- | -- | 15.25 |
| | 09/27/19 | 7.60 | -- | -- | 15.49 |
| | 10/28/19 | 7.82 | -- | -- | 15.27 |
| | 12/02/19 | 8.10 | -- | -- | 14.99 |
| | 12/30/19 | 6.29 | -- | -- | 16.80 |
| MW-19 | 01/31/19 | 2.20 | -- | -- | 14.83 |
| (17.03) | 02/28/19 | 1.60 | -- | -- | 15.43 |
| | 03/22/19 | 2.45 | -- | -- | 14.58 |
| | 04/29/19 | 2.60 | -- | -- | 14.43 |
| | 05/31/19 | 3.38 | -- | -- | 13.65 |
| | 06/28/19 | 3.82 | -- | -- | 13.21 |
| | 07/30/19 | 4.23 | -- | -- | 12.80 |
| | 08/29/19 | 4.58 | -- | -- | 12.45 |
| | 09/27/19 | 4.52 | -- | -- | 12.51 |
| | 10/28/19 | 4.50 | -- | -- | 12.53 |
| | 12/02/19 | 4.45 | -- | -- | 12.58 |
| | 12/30/19 | 2.77 | -- | -- | 14.26 |
| MW-20 | 01/31/19 | 3.18 | -- | -- | 18.68 |
| (21.86) | 02/28/19 | 2.60 | -- | -- | 19.26 |
| | 03/22/19 | 3.26 | -- | -- | 18.60 |
| | 04/29/19 | 3.25 | -- | -- | 18.61 |
| | 05/31/19 | 3.75 | -- | -- | 18.11 |
| | 06/28/19 | 4.45 | -- | -- | 17.41 |
| | 07/30/19 | 4.97 | -- | -- | 16.89 |
| | 08/29/19 | 5.48 | -- | -- | 16.38 |
| | 09/27/19 | 5.19 | -- | -- | 16.67 |
| | 10/28/19 | 5.62 | -- | -- | 16.24 |
| | 12/02/19 | 6.09 | -- | -- | 15.77 |
| | 12/30/19 | 4.05 | -- | -- | 17.81 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-21 | 01/31/19 | 6.24 | -- | -- | 15.68 |
| (21.92) | 02/28/19 | 3.76 | -- | -- | 18.16 |
| | 03/22/19 | 5.74 | -- | -- | 16.18 |
| | 04/29/19 | 5.94 | -- | -- | 15.98 |
| | 05/31/19 | 7.65 | -- | -- | 14.27 |
| | 06/28/19 | 8.62 | -- | -- | 13.30 |
| | 07/30/19 | 9.52 | -- | -- | 12.40 |
| | 08/29/19 | 10.17 | -- | -- | 11.75 |
| | 09/27/19 | 10.58 | -- | -- | 11.34 |
| | 10/28/19 | 11.00 | -- | -- | 10.92 |
| | 12/02/19 | 11.29 | -- | -- | 10.63 |
| | 12/30/19 | 9.94 | -- | -- | 11.98 |
| MW-22 | 01/31/19 | 6.74 | -- | -- | 15.12 |
| (21.86) | 02/28/19 | 3.48 | -- | -- | 18.38 |
| | 03/22/19 | 4.97 | -- | -- | 16.89 |
| | 04/29/19 | 5.10 | -- | -- | 16.76 |
| | 05/31/19 | 6.69 | -- | -- | 15.17 |
| | 06/28/19 | 7.96 | -- | -- | 13.90 |
| | 07/30/19 | 9.04 | -- | -- | 12.82 |
| | 08/29/19 | 9.78 | -- | -- | 12.08 |
| | 09/27/19 | 10.25 | -- | -- | 11.61 |
| | 10/28/19 | 10.66 | -- | -- | 11.20 |
| | 12/02/19 | 10.95 | -- | -- | 10.91 |
| | 12/30/19 | 10.14 | -- | -- | 11.72 |
| MW-23 | 01/31/19 | 9.45 | -- | -- | 12.87 |
| (22.32) | 02/28/19 | 7.65 | -- | -- | 14.67 |
| | 03/22/19 | 9.61 | -- | -- | 12.71 |
| | 04/29/19 | 8.20 | -- | -- | 14.12 |
| | 05/31/19 | 8.99 | -- | -- | 13.33 |
| | 06/28/19 | 10.29 | -- | -- | 12.03 |
| | 07/30/19 | 11.86 | -- | -- | 10.46 |
| | 08/29/19 | 12.53 | -- | -- | 9.79 |
| | 09/27/19 | 12.72 | -- | -- | 9.60 |
| | 10/28/19 | 13.13 | -- | -- | 9.19 |
| | 12/02/19 | 12.85 | -- | -- | 9.47 |
| | 12/30/19 | 11.06 | -- | -- | 11.26 |
| MW-24 | 01/31/19 | 17.88 | -- | -- | 10.00 |
| (27.88) | 02/28/19 | 15.88 | -- | -- | 12.00 |
| | 03/22/19 | 16.33 | -- | -- | 11.55 |
| | 04/29/19 | 13.28 | -- | -- | 14.60 |
| | 05/31/19 | Well not found | | | |
| | 06/28/19 | Well not found | | | |
| | 07/30/19 | Well not found | | | |
| | 08/29/19 | 18.65 | -- | -- | 9.23 |
| | 09/27/19 | 19.41 | -- | -- | 8.47 |
| | 10/28/19 | 19.43 | -- | -- | 8.45 |
| | 12/02/19 | 18.70 | -- | -- | 9.18 |
| | 12/30/19 | 18.30 | -- | -- | 9.58 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-25 | 01/31/19 | 16.99 | -- | -- | 9.72 |
| (26.71) | 02/28/19 | 15.30 | -- | -- | 11.41 |
| | 03/22/19 | 15.73 | -- | -- | 10.98 |
| | 04/29/19 | 12.11 | -- | -- | 14.60 |
| | 05/31/19 | Well not found | | | |
| | 06/28/19 | 16.40 | -- | -- | 10.31 |
| | 07/30/19 | 17.38 | -- | -- | 9.33 |
| | 08/29/19 | 17.85 | -- | -- | 8.86 |
| | 09/27/19 | 18.54 | -- | -- | 8.17 |
| | 10/28/19 | 18.60 | -- | -- | 8.11 |
| | 12/02/19 | 17.82 | -- | -- | 8.89 |
| | 12/30/19 | 17.32 | -- | -- | 9.39 |
| MW-26 | 01/31/19 | 10.76 | -- | -- | 10.85 |
| (21.61) | 02/28/19 | 7.51 | -- | -- | 14.10 |
| | 03/22/19 | 8.50 | -- | -- | 13.11 |
| | 04/29/19 | 7.10 | -- | -- | 14.51 |
| | 05/31/19 | Well not found | | | |
| | 06/28/19 | 9.33 | -- | -- | 12.28 |
| | 07/30/19 | 10.70 | -- | -- | 10.91 |
| | 08/29/19 | 11.60 | -- | -- | 10.01 |
| | 09/27/19 | 12.10 | -- | -- | 9.51 |
| | 10/28/19 | 12.33 | -- | -- | 9.28 |
| | 12/02/19 | 12.01 | -- | -- | 9.60 |
| | 12/30/19 | 9.93 | -- | -- | 11.68 |
| MW-27 | 01/31/19 | 8.70 | -- | -- | 16.67 |
| (25.37) | 02/28/19 | 7.07 | -- | -- | 18.30 |
| | 03/22/19 | 7.46 | -- | -- | 17.91 |
| | 04/29/19 | 7.42 | -- | -- | 17.95 |
| | 05/31/19 | Well not found | | | |
| | 06/28/19 | 8.79 | -- | -- | 16.58 |
| | 07/30/19 | 10.23 | -- | -- | 15.14 |
| | 08/29/19 | 11.27 | -- | -- | 14.10 |
| | 09/27/19 | 11.85 | -- | -- | 13.52 |
| | 10/28/19 | 12.22 | -- | -- | 13.15 |
| | 12/02/19 | 12.50 | -- | -- | 12.87 |
| | 12/30/19 | 11.62 | -- | -- | 13.75 |
| MW-28 | 01/31/19 | 4.61 | -- | -- | 15.50 |
| (20.11) | 02/28/19 | 4.95 | -- | -- | 15.16 |
| | 03/22/19 | 5.79 | -- | -- | 14.32 |
| | 04/29/19 | 4.19 | -- | -- | 15.92 |
| | 05/31/19 | Well not found | | | |
| | 06/28/19 | 7.08 | -- | -- | 13.03 |
| | 07/30/19 | 8.01 | -- | -- | 12.10 |
| | 08/29/19 | 8.45 | -- | -- | 11.66 |
| | 09/27/19 | 8.24 | -- | -- | 11.87 |
| | 10/28/19 | 8.20 | -- | -- | 11.91 |
| | 12/02/19 | 8.85 | -- | -- | 11.26 |
| | 12/30/19 | 5.94 | -- | -- | 14.17 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-29 | 01/31/19 | 4.31 | -- | -- | 16.13 |
| (20.44) | 02/28/19 | 3.83 | -- | -- | 16.61 |
| | 03/22/19 | 4.46 | -- | -- | 15.98 |
| | 04/29/19 | 4.52 | -- | -- | 15.92 |
| | 05/31/19 | 4.89 | -- | -- | 15.55 |
| | 06/28/19 | 5.11 | -- | -- | 15.33 |
| | 07/30/19 | 5.34 | -- | -- | 15.10 |
| | 08/29/19 | 5.54 | -- | -- | 14.90 |
| | 09/27/19 | 5.65 | -- | -- | 14.79 |
| | 10/28/19 | 5.80 | -- | -- | 14.64 |
| | 12/02/19 | 5.94 | -- | -- | 14.50 |
| | 12/30/19 | 5.05 | -- | -- | 15.39 |
| MW-30 | 01/31/19 | 15.62 | -- | -- | 9.79 |
| (25.41) | 02/28/19 | 14.99 | -- | -- | 10.42 |
| | 03/22/19 | 14.76 | -- | -- | 10.65 |
| | 04/29/19 | 10.88 | -- | -- | 14.53 |
| | 05/31/19 | 11.22 | -- | -- | 14.19 |
| | 06/28/19 | 14.29 | -- | -- | 11.12 |
| | 07/30/19 | 15.96 | -- | -- | 9.45 |
| | 08/29/19 | 16.18 | -- | -- | 9.23 |
| | 09/27/19 | 17.33 | -- | -- | 8.08 |
| | 10/28/19 | 17.34 | -- | -- | 8.07 |
| | 12/02/19 | 16.55 | -- | -- | 8.86 |
| | 12/30/19 | 16.01 | -- | -- | 9.40 |
| MW-31 | 01/31/19 | 10.20 | -- | -- | 13.44 |
| (23.64) | 02/28/19 | 8.73 | -- | -- | 14.91 |
| | 03/22/19 | 10.91 | -- | -- | 12.73 |
| | 04/29/19 | 8.22 | -- | -- | 15.42 |
| | 05/31/19 | 8.92 | -- | -- | 14.72 |
| | 06/28/19 | 12.00 | -- | -- | 11.64 |
| | 07/30/19 | 13.47 | -- | -- | 10.17 |
| | 08/29/19 | 14.26 | -- | -- | 9.38 |
| | 09/27/19 | 14.66 | -- | -- | 8.98 |
| | 10/28/19 | 14.92 | -- | -- | 8.72 |
| | 12/02/19 | 14.54 | -- | -- | 9.10 |
| | 12/30/19 | 12.87 | -- | -- | 10.77 |
| MW-32 | 01/31/19 | 15.80 | -- | -- | 9.82 |
| (25.62) | 02/28/19 | 15.44 | -- | -- | 10.18 |
| | 03/22/19 | 15.59 | -- | -- | 10.03 |
| | 04/29/19 | 11.45 | -- | -- | 14.17 |
| | 05/31/19 | 11.44 | -- | -- | 14.18 |
| | 06/28/19 | 15.42 | -- | -- | 10.20 |
| | 07/30/19 | 16.59 | -- | -- | 9.03 |
| | 08/29/19 | 16.98 | -- | -- | 8.64 |
| | 09/27/19 | 17.66 | -- | -- | 7.96 |
| | 10/28/19 | 17.66 | -- | -- | 7.96 |
| | 12/02/19 | 16.85 | -- | -- | 8.77 |
| | 12/30/19 | 16.21 | -- | -- | 9.41 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| MW-33 | 01/31/19 | 15.11 | -- | -- | 10.23 |
| (25.34) | 02/28/19 | 14.51 | -- | -- | 10.83 |
| | 03/22/19 | 14.77 | -- | -- | 10.57 |
| | 04/29/19 | 10.70 | -- | -- | 14.64 |
| | 05/31/19 | 11.01 | -- | -- | 14.33 |
| | 06/28/19 | 14.41 | -- | -- | 10.93 |
| | 07/30/19 | 15.90 | -- | -- | 9.44 |
| | 08/29/19 | 16.40 | -- | -- | 8.94 |
| | 09/27/19 | 17.06 | -- | -- | 8.28 |
| | 10/28/19 | 17.12 | -- | -- | 8.22 |
| | 12/02/19 | 16.75 | -- | -- | 8.59 |
| | 12/30/19 | 15.78 | -- | -- | 9.56 |
| DW-1 | 01/31/19 | 14.06 | -- | -- | 9.41 |
| (23.47) | 02/28/19 | 13.75 | -- | -- | 9.72 |
| | 03/22/19 | 12.73 | -- | -- | 10.74 |
| | 04/29/19 | 9.97 | -- | -- | 13.50 |
| | 05/31/19 | 9.45 | -- | -- | 14.02 |
| | 06/28/19 | 14.25 | -- | -- | 9.22 |
| | 07/30/19 | 14.87 | -- | -- | 8.60 |
| | 08/29/19 | 14.31 | -- | -- | 9.16 |
| | 09/27/19 | 15.89 | -- | -- | 7.58 |
| | 10/28/19 | 15.44 | -- | -- | 8.03 |
| | 12/02/19 | 14.60 | -- | -- | 8.87 |
| | 12/30/19 | 14.04 | -- | -- | 9.43 |
| DW-2 | 01/31/19 | 10.92 | -- | -- | 9.84 |
| (20.76) | 02/28/19 | 10.60 | -- | -- | 10.16 |
| | 03/22/19 | 9.81 | -- | -- | 10.95 |
| | 04/29/19 | 7.20 | -- | -- | 13.56 |
| | 05/31/19 | 6.86 | -- | -- | 13.90 |
| | 06/28/19 | 11.03 | -- | -- | 9.73 |
| | 07/30/19 | 12.01 | -- | -- | 8.75 |
| | 08/29/19 | 11.85 | -- | -- | 8.91 |
| | 09/27/19 | 12.85 | -- | -- | 7.91 |
| | 10/28/19 | 12.48 | -- | -- | 8.28 |
| | 12/02/19 | 11.64 | -- | -- | 9.12 |
| | 12/30/19 | 11.18 | -- | -- | 9.58 |
| DW-3 | 01/31/19 | 10.61 | -- | -- | 9.80 |
| (20.41) | 02/28/19 | 10.37 | -- | -- | 10.04 |
| | 03/22/19 | 9.54 | -- | -- | 10.87 |
| | 04/29/19 | 6.96 | -- | -- | 13.45 |
| | 05/31/19 | 6.67 | -- | -- | 13.74 |
| | 06/28/19 | 10.74 | -- | -- | 9.67 |
| | 07/30/19 | 11.56 | -- | -- | 8.85 |
| | 08/29/19 | 11.50 | -- | -- | 8.91 |
| | 09/27/19 | 12.50 | -- | -- | 7.91 |
| | 10/28/19 | 12.08 | -- | -- | 8.33 |
| | 12/02/19 | 11.45 | -- | -- | 8.96 |
| | 12/30/19 | 10.89 | -- | -- | 9.52 |

***Please refer to notes at end of table.***

**Table 1**
**Groundwater and Columbia River Stage Elevations**
**Fire Training Facilities**
**Portland International Airport**
**Portland, Oregon**

| Monitoring Well (Elevation in Feet MSL)[1] | Sampling Date | Depth to Water | Depth to Product (feet) | Product Thickness (feet) | Groundwater Elevations (feet) |
|---|---|---|---|---|---|
| Columbia River Stage | 01/31/19 | -- | -- | -- | 8.29 |
| | 02/28/19 | -- | -- | -- | 7.85 |
| | 03/22/19 | -- | -- | -- | 9.24 |
| | 04/29/19 | -- | -- | -- | 11.59 |
| | 05/31/19 | -- | -- | -- | 12.31 |
| | 06/28/19 | -- | -- | -- | 7.76 |
| | 07/30/19 | -- | -- | -- | 7.58 |
| | 08/29/19 | -- | -- | -- | 7.83 |
| | 09/27/19 | -- | -- | -- | 6.48 |
| | 10/28/19 | -- | -- | -- | 6.88 |
| | 12/02/19 | -- | -- | -- | 7.24 |
| | 12/30/19 | -- | -- | -- | 7.61 |

**Notes:**

1. feet MSL = Feet above mean sea level utilizing NAVD88 datum.
2. Casing elevations and groundwater data prior to December 1996 are from a Draft Quarterly Groundwater Monitoring Report dated December 12, 1996, and prepared by Geraghty & Miller.
3. Groundwater data prior to August 2005 were identified from previous report tables and could not be verified by field logs.
4. NM = Water level not measured. NS = Well not surveyed
5. -- = No product.
6. Elevation was corrected in wells with the presence of measurable separate-phase petroleum hydrocarbons using the following equation and assuming a specific gravity for gasoline product of 0.8 gram per cubic centimeter (Merck, 1989):

$$h_w = \frac{p_g h_g}{p_w}$$

water-level elevation = top of casing elevation + $[h_w - d_w]$

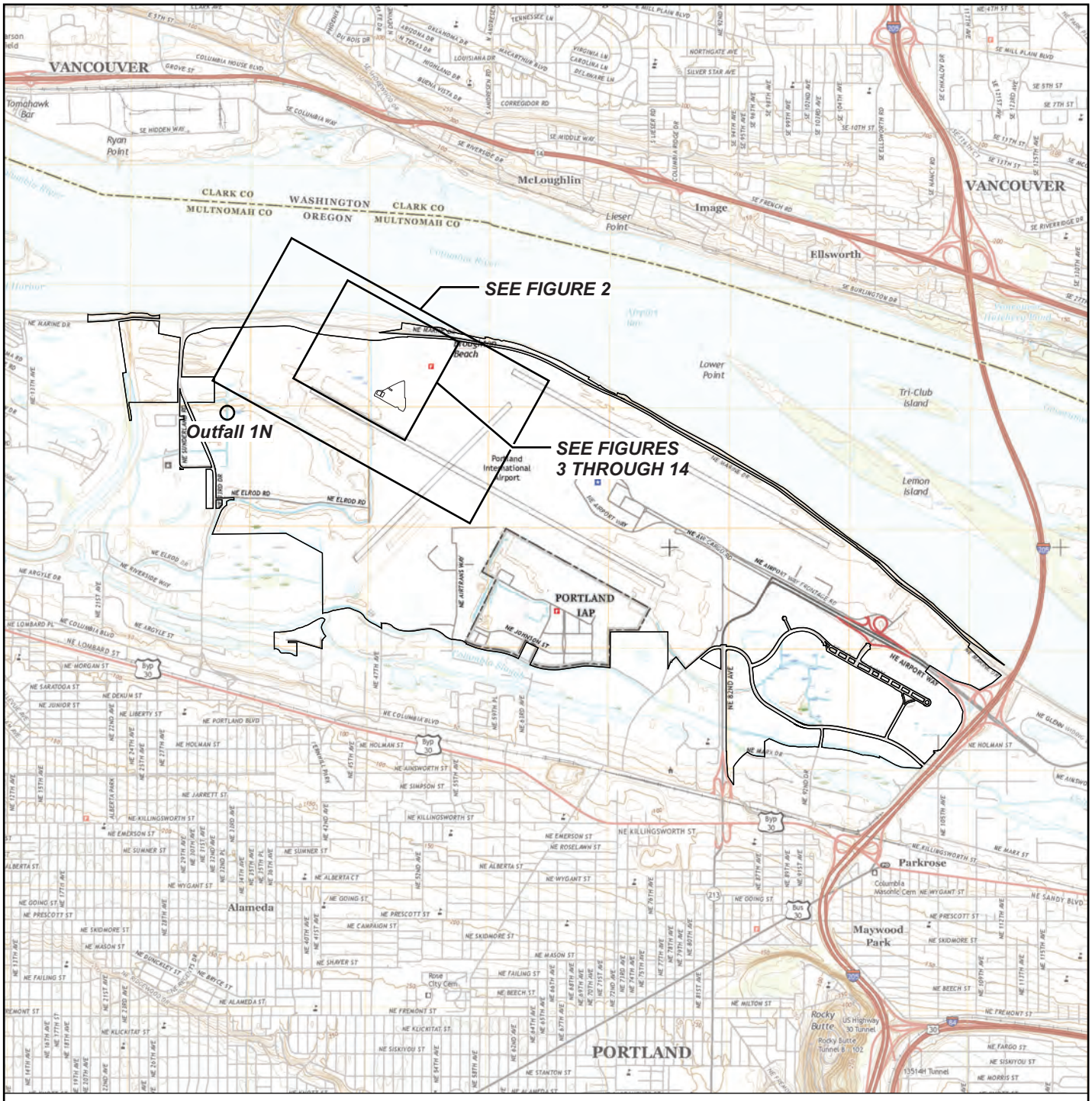
where:

$h_w$ = depth to groundwater correction
$d_w$ = depth to groundwater measuring point
$p_g$ = density of separate-phase hydrocarbons
$p_w$ = density of water
$h_g$ = product thickness

Reference: Merck Index 1989, An Encyclopedia of Chemicals, Drugs and Biologicals, Merck and Company, Rahway, New Jersey.

7. Columbia River Stage obtained from NOAA Station ID 9440083 located in Vancouver, Washington.

8+A1. Columbia River Stage elevation was calculated by averaging readings during the 24-hour period and were converted from local mean sea level to NAVD 88 assuming NAVD 88 is 7.45 feet above the local mean sea level.




***Note:*** Base map prepared from USGS 7.5-minute quadrangle of Portland and Mount Tabor, WA-OR, dated 2017 as provided by USGS.gov.

0 4,000 8,000

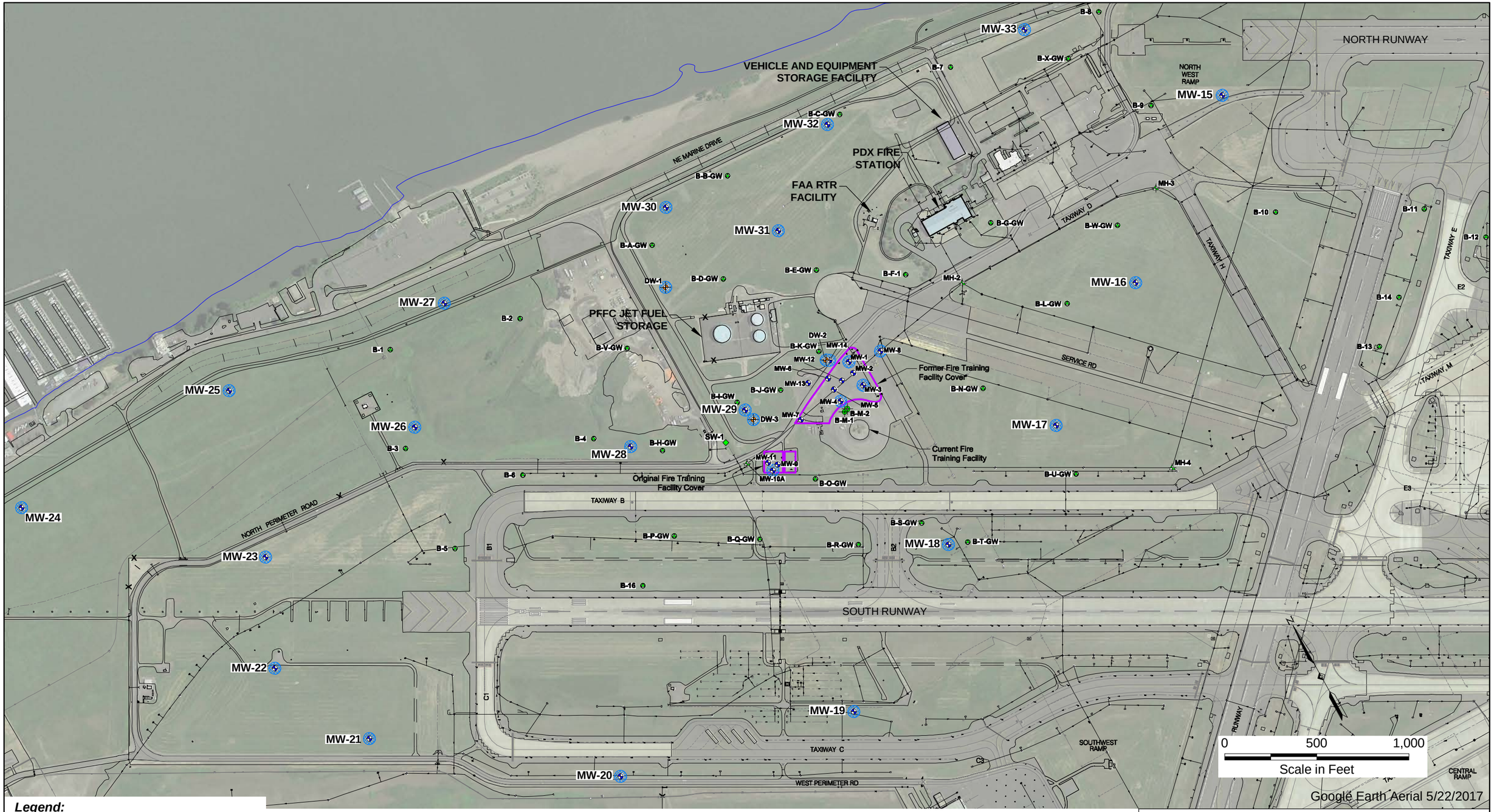
Approximate Scale in Feet


N

# Site Location Map

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon

| | | | |
|---|---|---|---|
| Apex Companies, LLC<br>3015 SW First Avenue<br>Portland, Oregon 97201 | Project Number | 1264-06 | Figure 1 |
| | April 2020 | | |




***Legend:***

- **B-A-GW** — Shallow Groundwater and Vadose Zone Soil Location
- **B-M-1** — Deep Groundwater Location (40'; Overbank Deposits)
- **B-M-2** — Deep Groundwater Location (61.5'; Columbia River Sand Aquifer)

Co-located

- **MH-1** — Stormwater Sample Location (Manhole)
- **SW-1** — Surface Water Sample Location
- **MW-1** — Shallow Monitoring Well Location
- **DW-1** — Deep Monitoring Well Location

- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

- Quarterly Sampling Wells (Additional Investigation Work Plan Addendum; Apex, 2018)

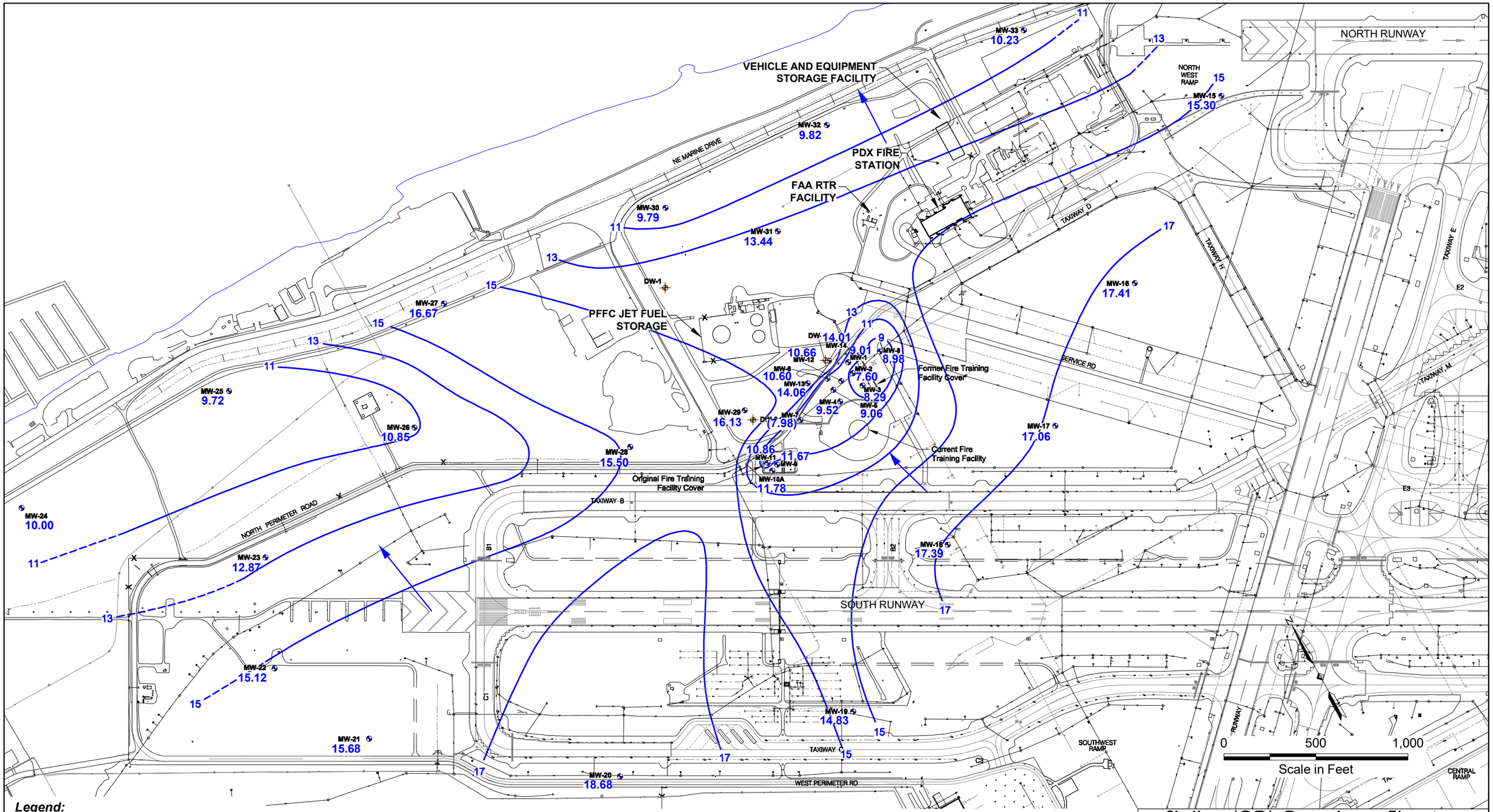
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base Oregon Metro www.oregonmetro.gov/rlis (2018).

# Site Vicinity Plan

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 2 |




***Legend:***

| | |
|---|---|
| **MW-1** | Shallow Monitoring Well Location |
| **9.01** | Groundwater Elevation in Feet MSL |
| **(7.98)** | Groundwater Elevation Not Used for Contouring |
| 9 | Groundwater Elevation Contour (Dashed Where Inferred) |
| | Apparent Groundwater Flow Direction |
| | Underground Storm Sewer Pipeline |
| | Abandoned Storm Sewer Pipeline |
| | Catch Basin |
| | Manhole |
| | Gravel Protective Cap |

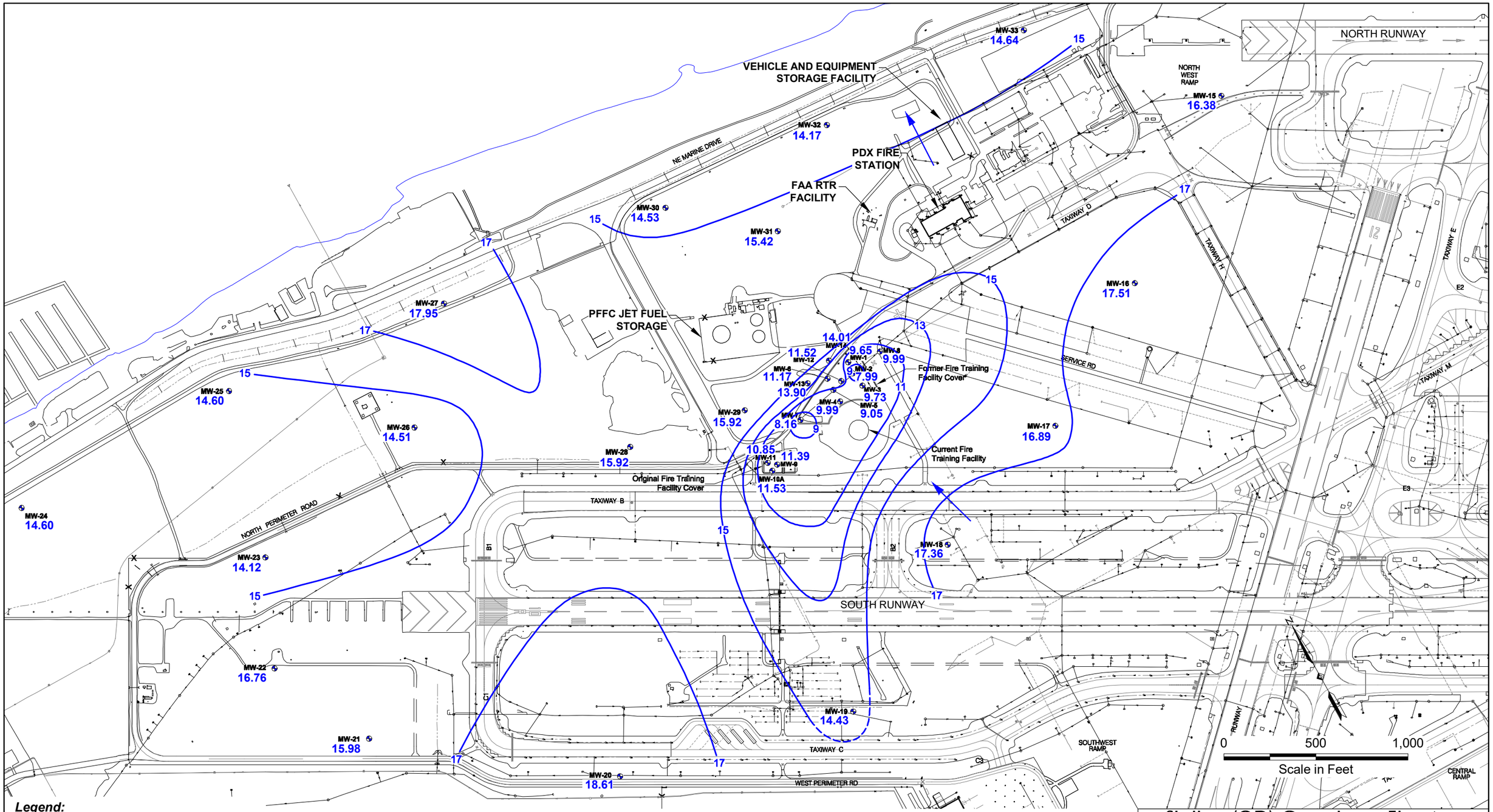
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base Oregon Metro www.oregonmetro.gov/rlis (2018).

# Shallow (OD) Groundwater Elevations Contour Map (January 2019)

Hydrogeologic Summary
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 3 |




***Legend:***

- **MW-1** — Shallow Monitoring Well Location
- **9.65** — Groundwater Elevation in Feet MSL
- 9 — Groundwater Elevation Contour (Dashed Where Inferred)
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

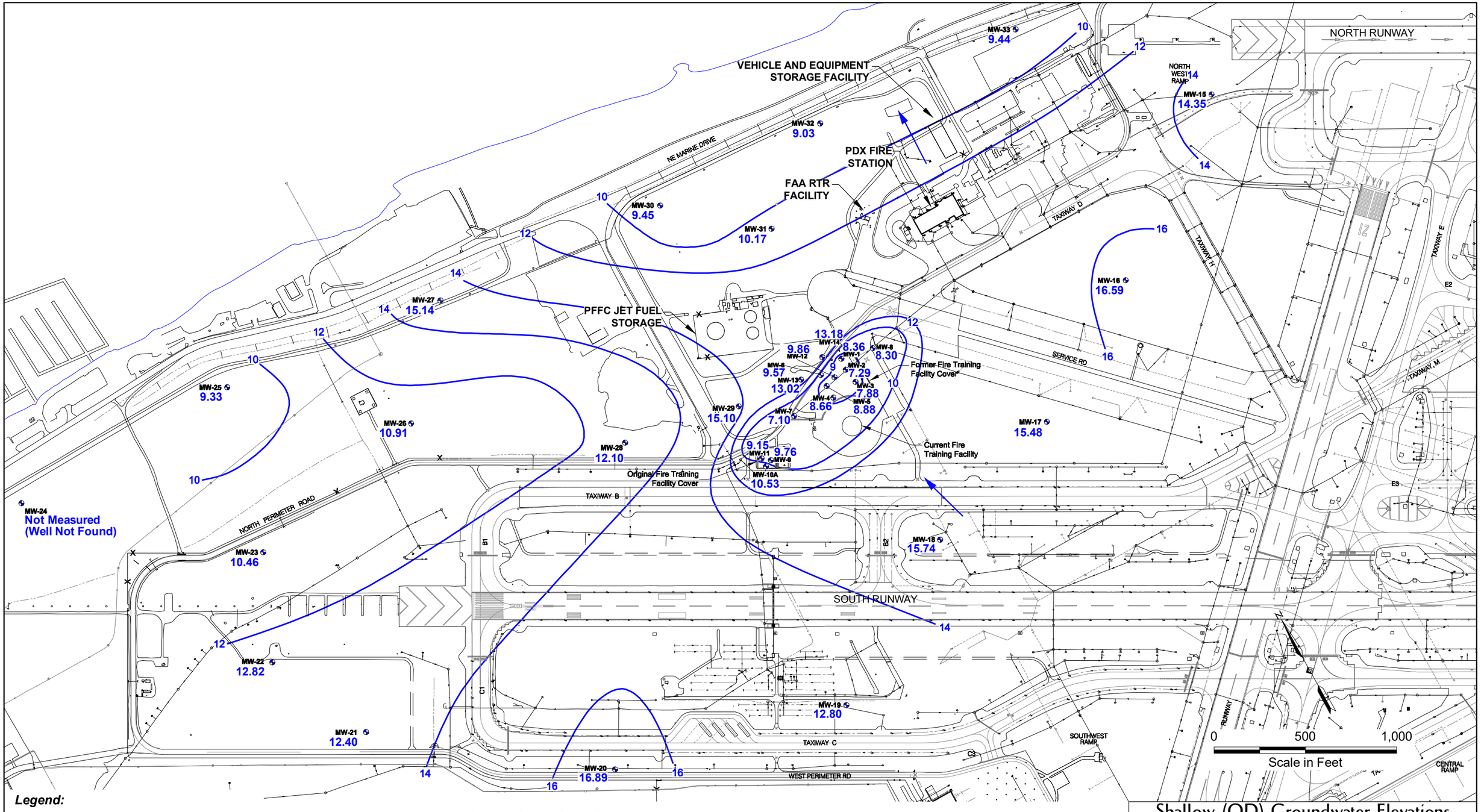
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base Oregon Metro www.oregonmetro.gov/rlis (2018).

# Shallow (OD) Groundwater Elevations Contour Map (April 2019)

Hydrogeologic Summary
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 4 |




***Legend:***

- **MW-1** — Shallow Monitoring Well Location
- **8.36** — Groundwater Elevation in Feet MSL
- 10 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

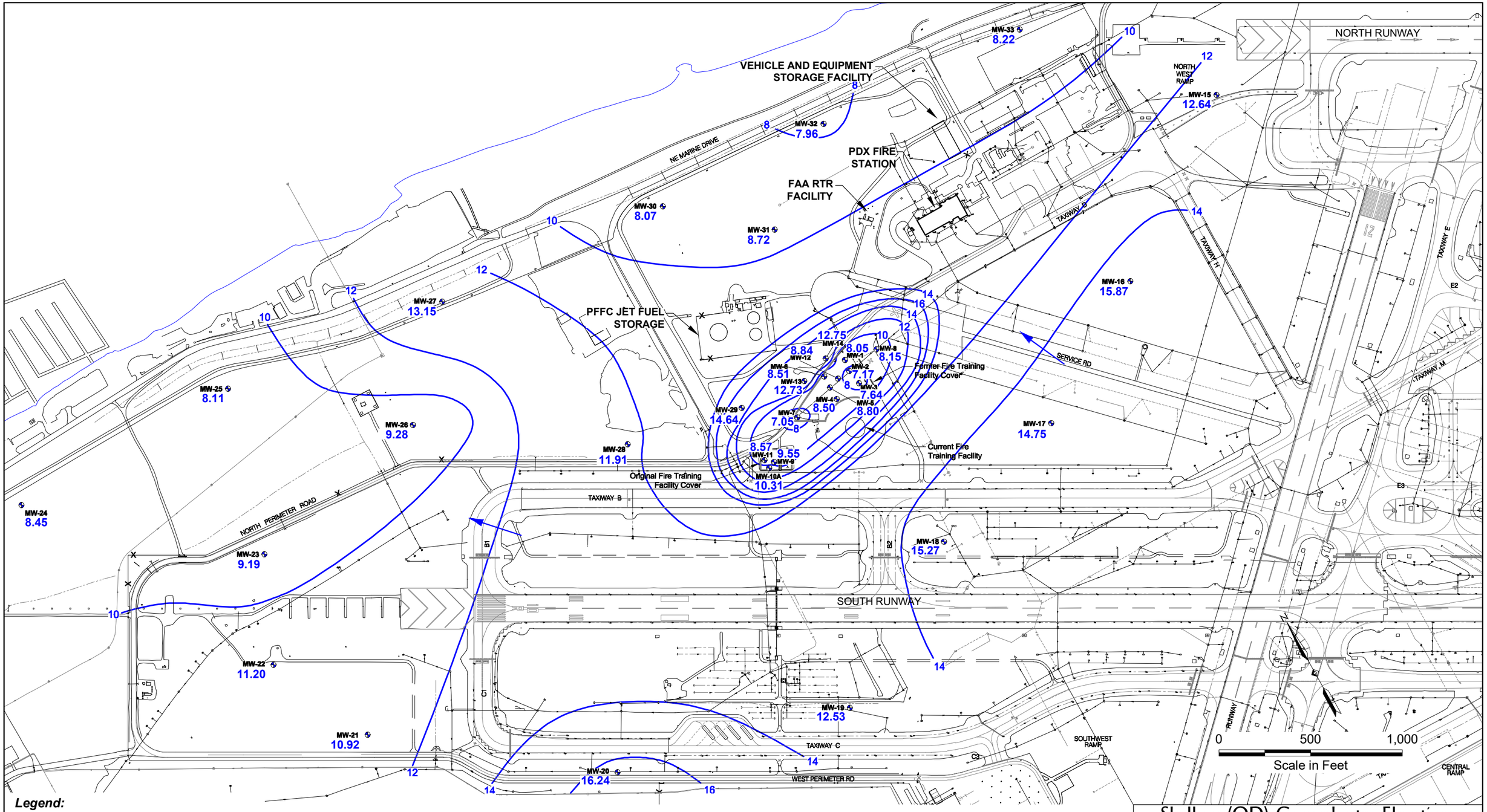
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base Oregon Metro www.oregonmetro.gov/rlis (2018).

# Shallow (OD) Groundwater Elevations Contour Map (July 2019)

Hydrogeologic Summary
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 5 |




***Legend:***

- **MW-1** — Shallow Monitoring Well Location
- **8.45** — Groundwater Elevation in Feet MSL
- 10 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

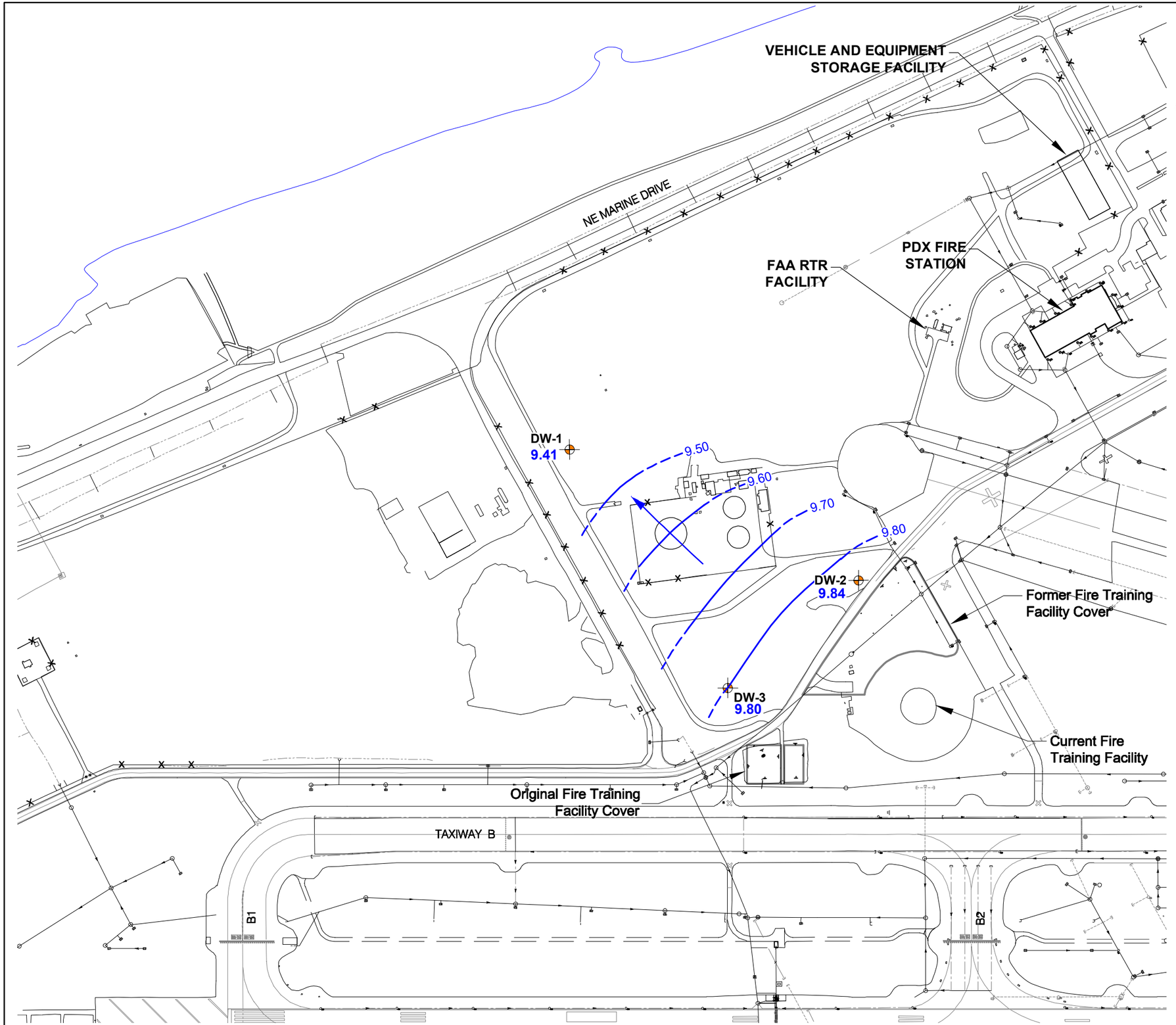
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base Oregon Metro www.oregonmetro.gov/rlis (2018).

# Shallow (OD) Groundwater Elevations Contour Map (October 2019)

Hydrogeologic Summary
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 6 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 9.41 — Groundwater Elevation in Feet MSL
- 9.50 — Groundwater Elevation Contour (Dashed Where Inferred)
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deep (CRSA) Groundwater Elevations Contour Map (January 31, 2019)

Hydrogeological Assessment

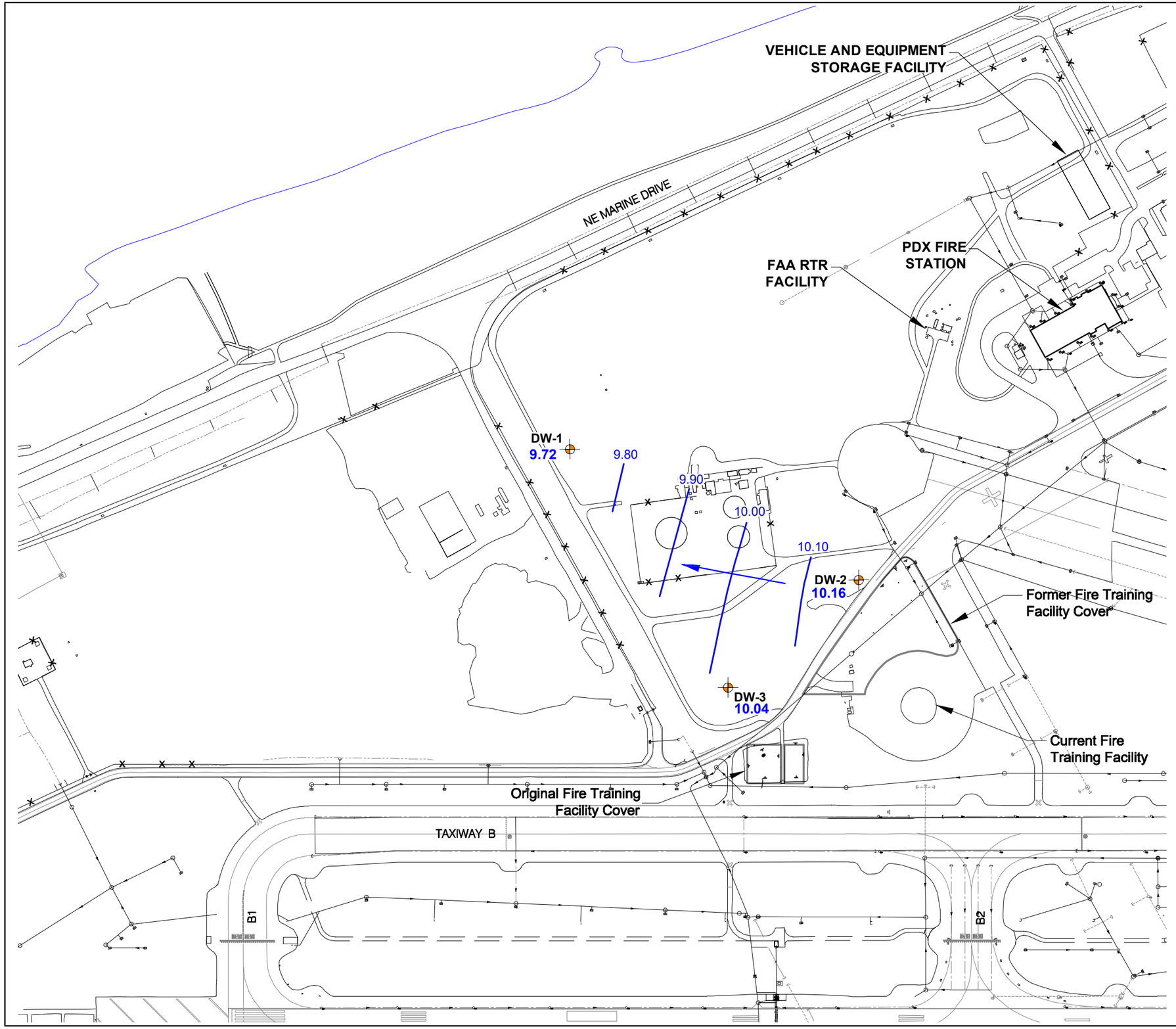
Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon


APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 7 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 9.72 — Groundwater Elevation in Feet MSL
- 9.70 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

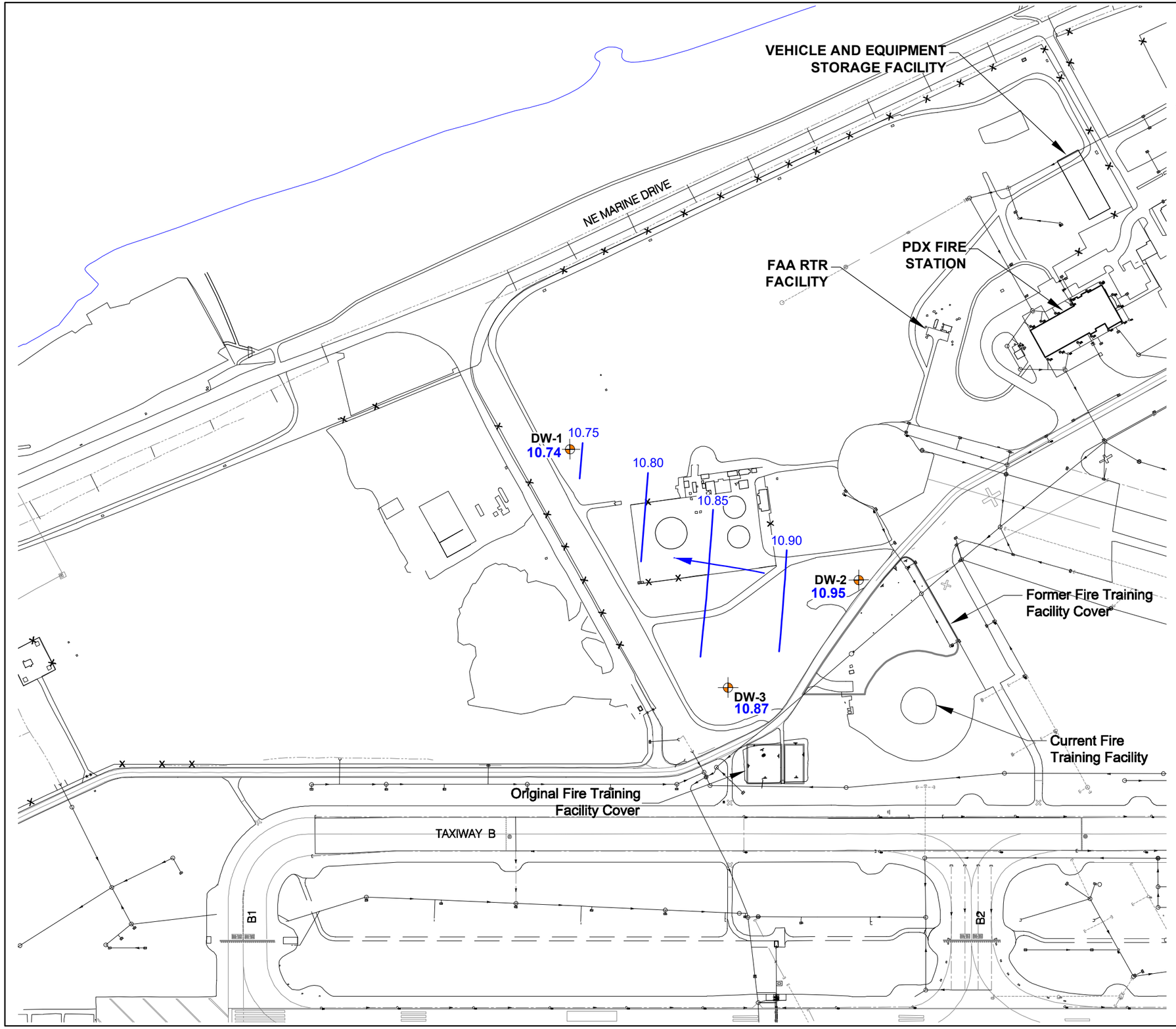
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (February 28, 2019)

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 8 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 10.74 — Groundwater Elevation in Feet MSL
- 10.90 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

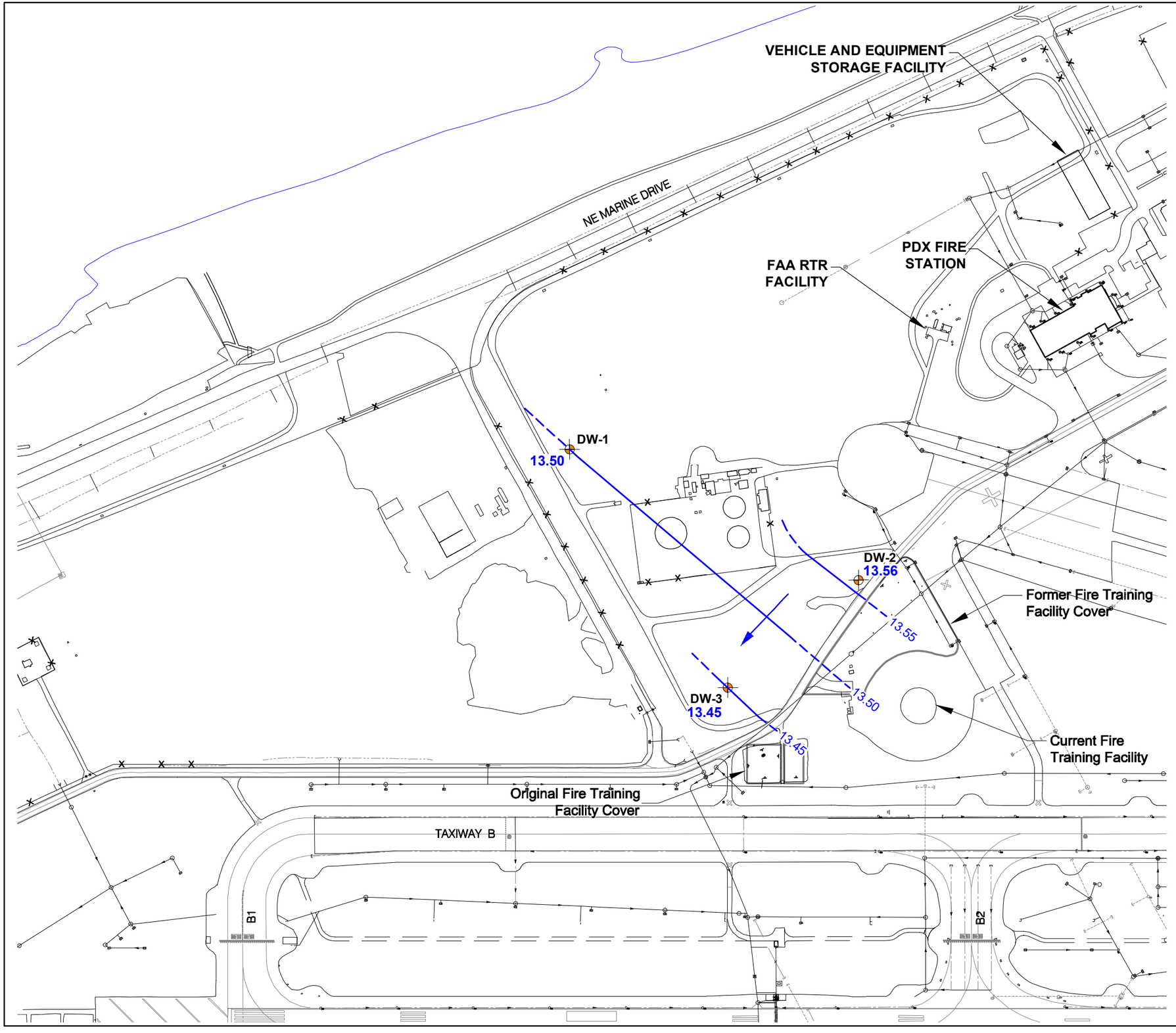
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (March 22, 2019)

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 9 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 13.50 — Groundwater Elevation in Feet MSL
- 13.45 — Groundwater Elevation Contour (Dashed Where Inferred)
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (April 29, 2019)

Hydrogeological Assessment

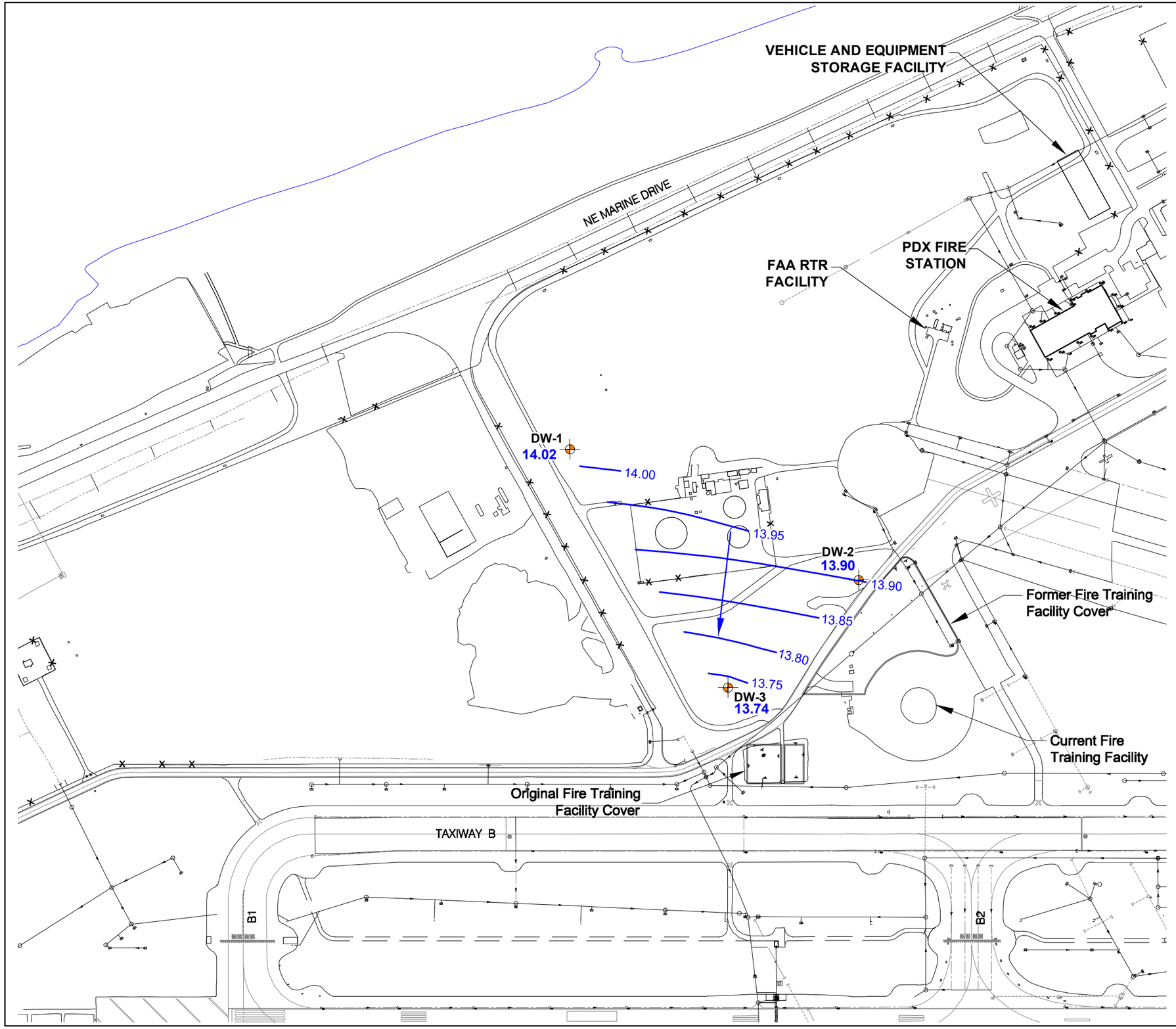
Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon


APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 10 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 14.02 — Groundwater Elevation in Feet MSL
- 14.00 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (May 31, 2019)

Hydrogeological Assessment

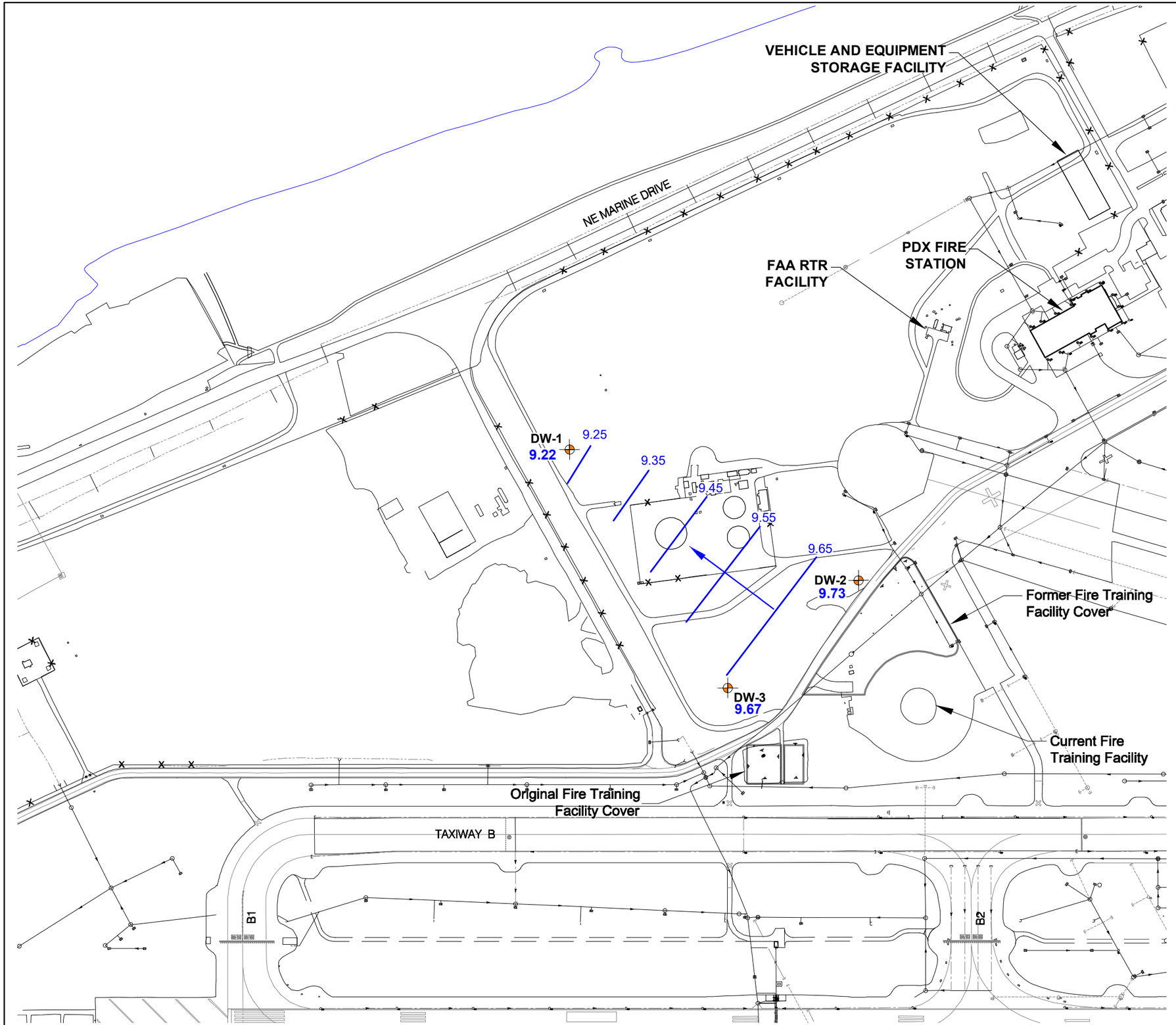
Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon


APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 11 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 9.22 — Groundwater Elevation in Feet MSL
- 9.65 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (June 28, 2019)

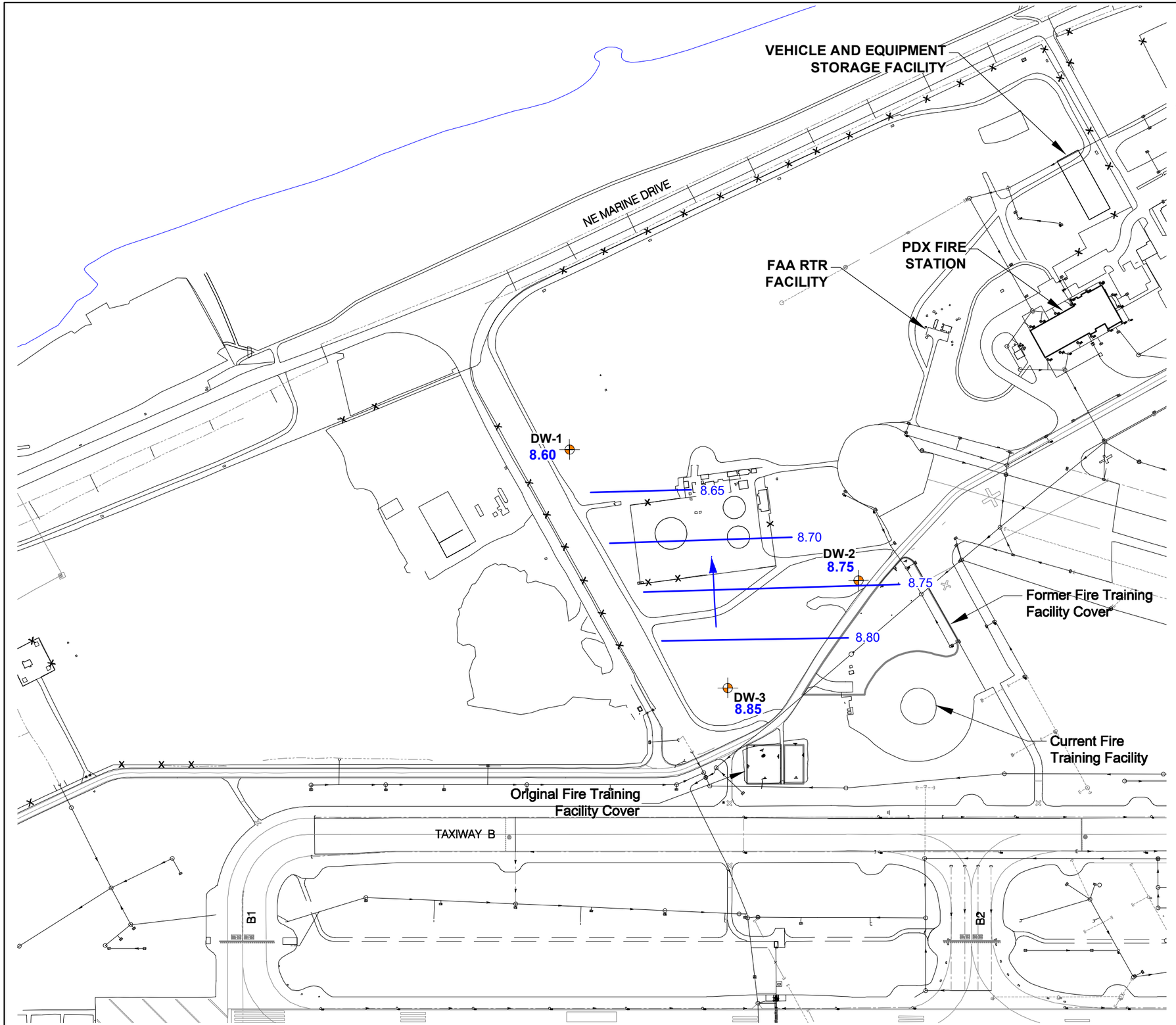
Hydrogeological Assessment

Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon


Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 12 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 8.60 — Groundwater Elevation in Feet MSL
- 8.65 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (July 30, 2019)

Hydrogeological Assessment

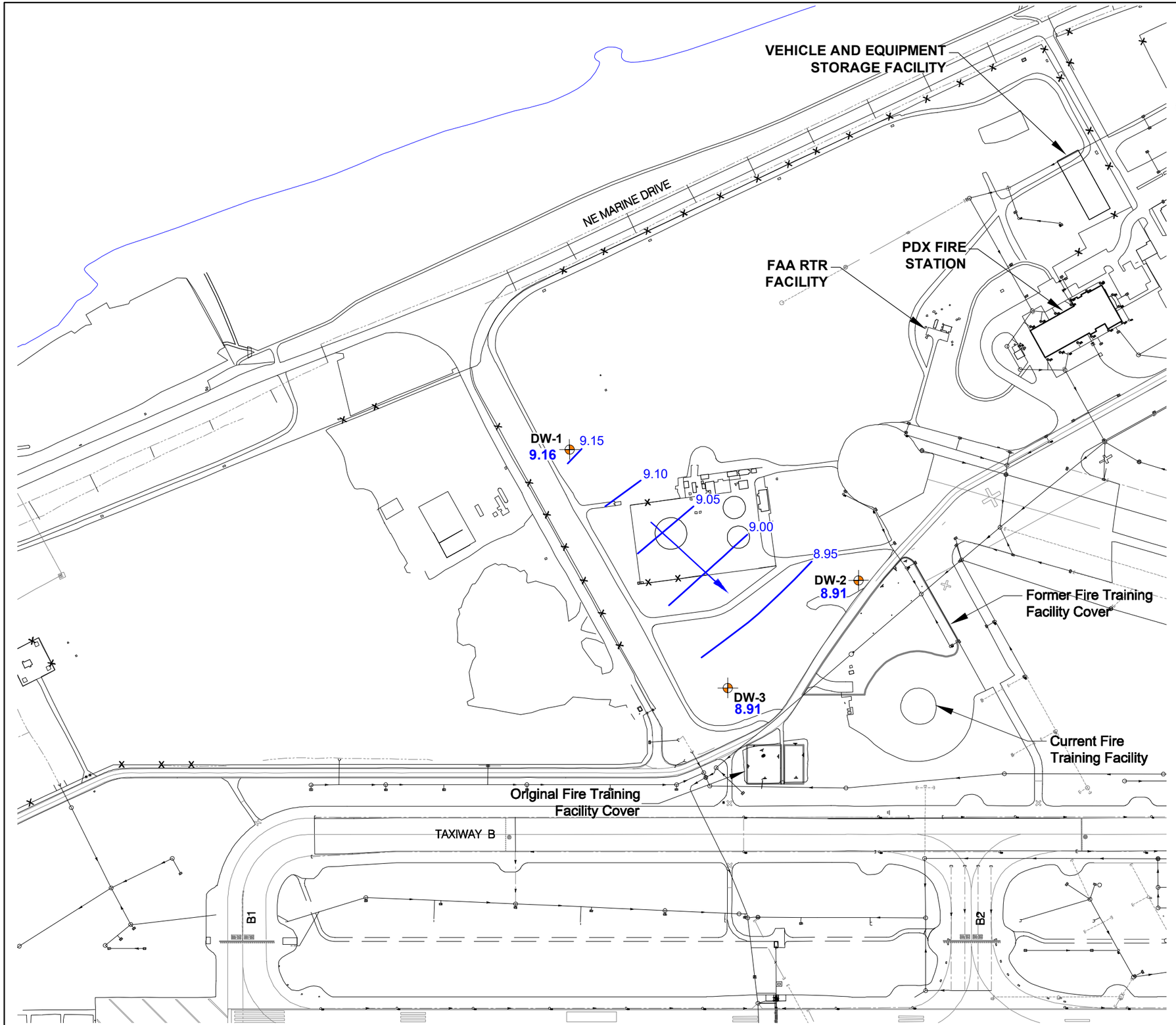
Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon


APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 13 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 9.16 — Groundwater Elevation in Feet MSL
- 9.15 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (August 29, 2019)

Hydrogeological Assessment

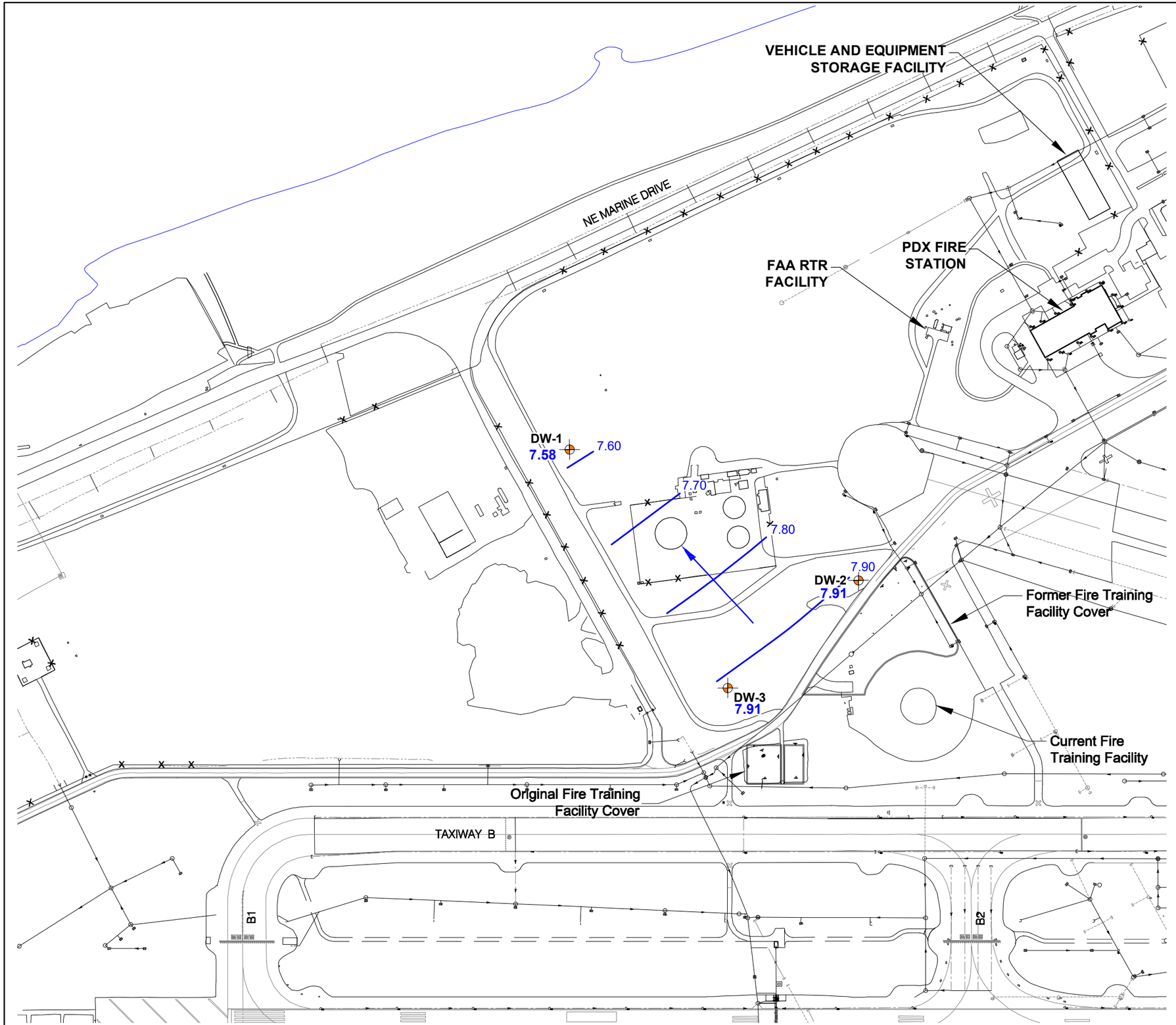
Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon


APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 14 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 7.58 — Groundwater Elevation in Feet MSL
- 7.90 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

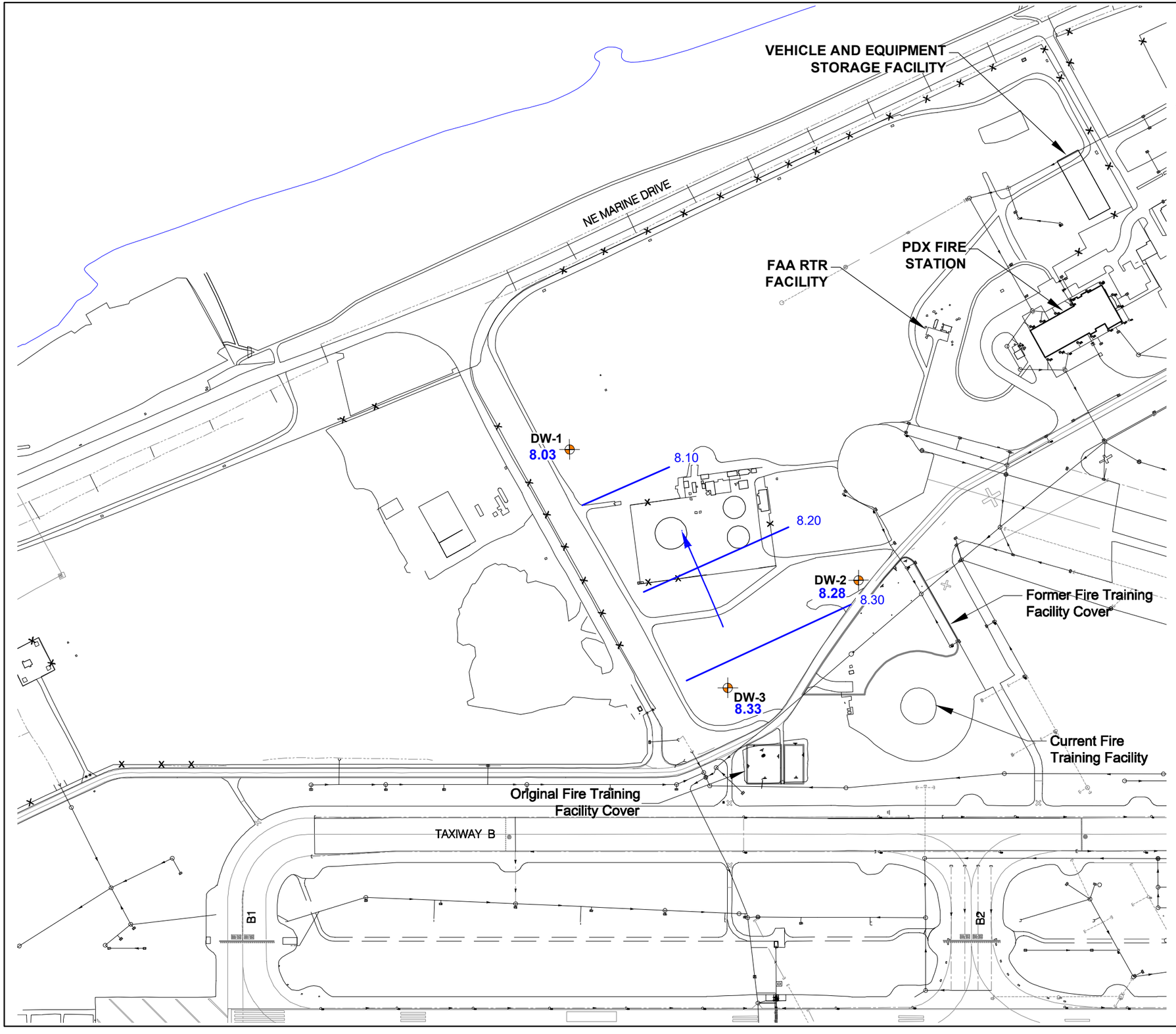
***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (September 27, 2019)

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 15 |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 8.03 — Groundwater Elevation in Feet MSL
- 8.10 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

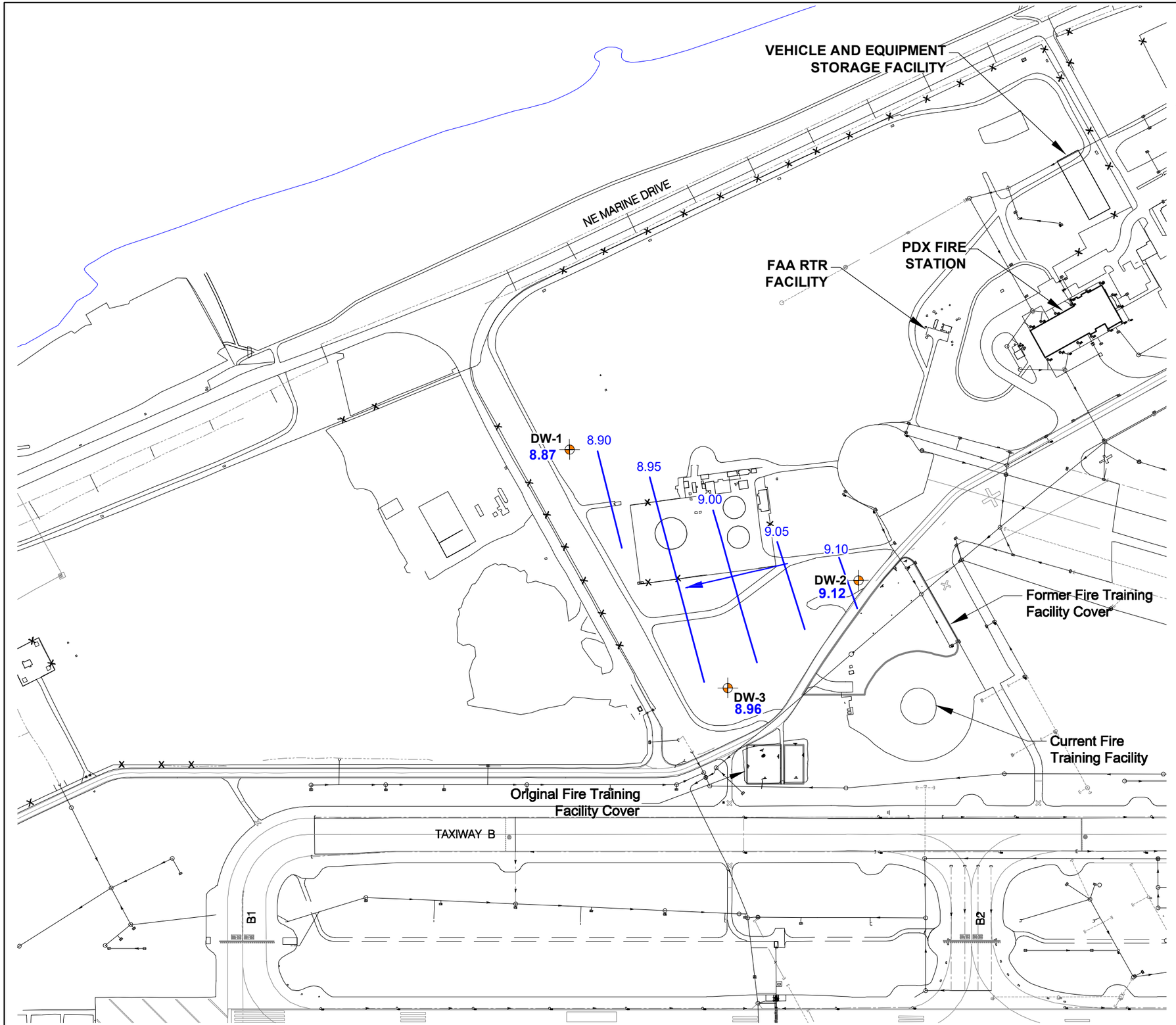
# Deeper (Upper CRSA) Groundwater Elevations Contour Map (October 28, 2019)

Hydrogeological Assessment

Original and Former Fire Training Facilities - Port of Portland

Portland, Oregon

| | | | |
|---|---|---|---|
| Apex Companies, LLC<br>3015 SW First Avenue<br>Portland, Oregon 97201 | Project Number | 1264-06 | Figure 16 |
| | April 2020 | | |




***Legend:***

- DW-1 — Deep Monitoring Well Location
- 8.87 — Groundwater Elevation in Feet MSL
- 9.10 — Groundwater Elevation Contour
- Apparent Groundwater Flow Direction
- Underground Storm Sewer Pipeline
- Abandoned Storm Sewer Pipeline
- Catch Basin
- Manhole
- Gravel Protective Cap

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (December 2, 2019)

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon


APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201


| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 17 |

VEHICLE AND EQUIPMENT STORAGE FACILITY

NE MARINE DRIVE

FAA RTR FACILITY

PDX FIRE STATION

DW-1
9.43

9.45

9.50

9.55

DW-2
9.58

DW-3
9.52

Former Fire Training Facility Cover

Current Fire Training Facility

Original Fire Training Facility Cover

TAXIWAY B

B1

B2

***Legend:***

| | |
|---|---|
| DW-1 | Deep Monitoring Well Location |
| 9.43 | Groundwater Elevation in Feet MSL |
| 9.55 | Groundwater Elevation Contour |
| | Apparent Groundwater Flow Direction |
| | Underground Storm Sewer Pipeline |
| | Abandoned Storm Sewer Pipeline |
| | Catch Basin |
| | Manhole |
| | Gravel Protective Cap |

N

0 300 600

Scale in Feet

***Note:*** Base map prepared from a 2013 Port of Portland AutoCAD base.

# Deeper (Upper CRSA) Groundwater Elevations Contour Map (December 30, 2019)

Hydrogeological Assessment
Original and Former Fire Training Facilities - Port of Portland
Portland, Oregon

APEX
Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

| Project Number | 1264-06 | Figure |
|---|---|---|
| April 2020 | | 18 |