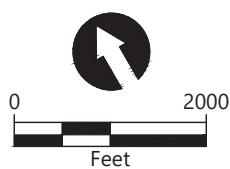


HORIZONTAL DATUM: Oregon State Plane North Zone,
North American Datum (NAD83/HARN 91), International Feet

NOTE: All locations are approximate.

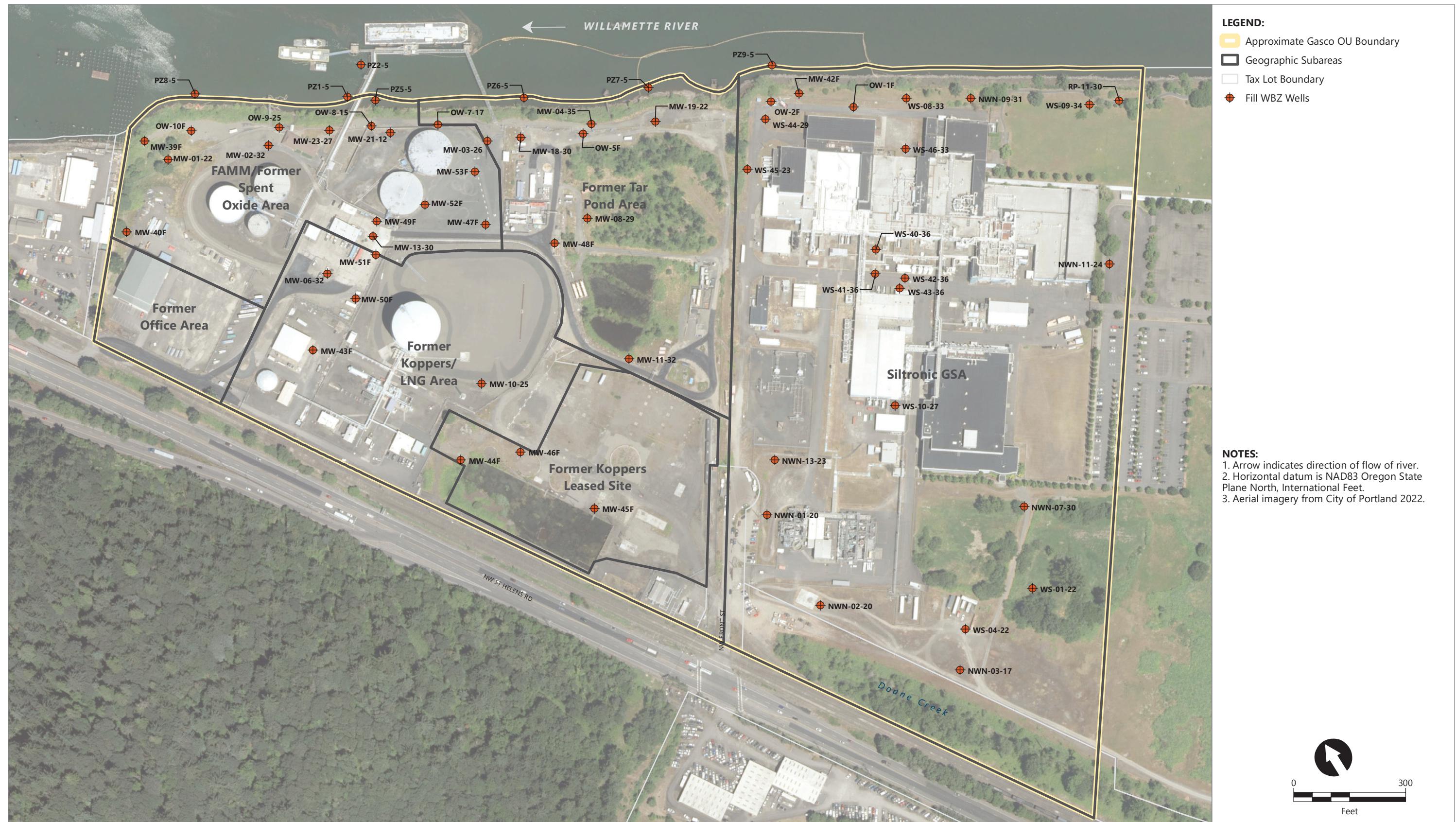


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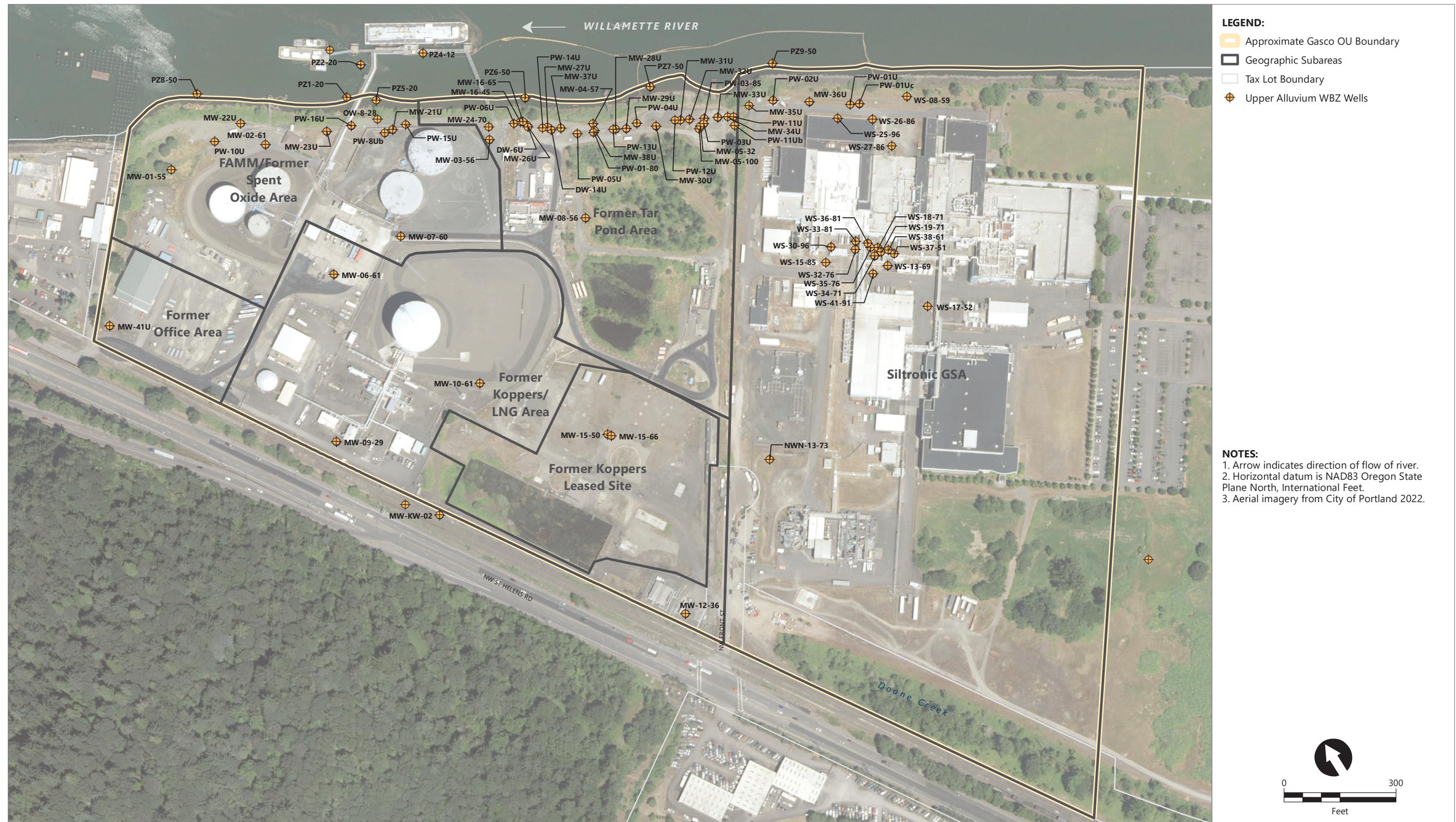


Figure 1.1
Vicinity Map

NW Natural Gasco Site



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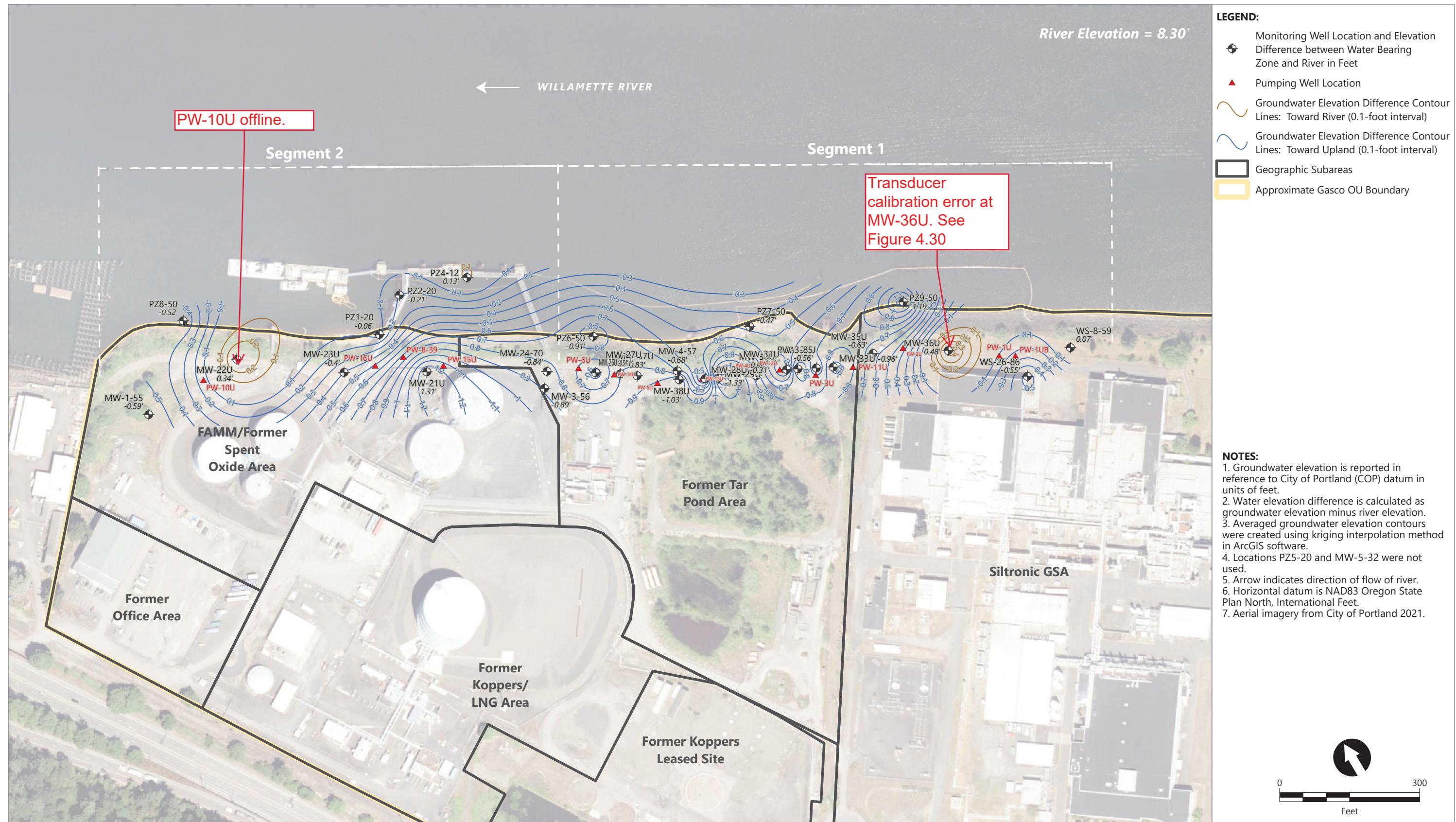


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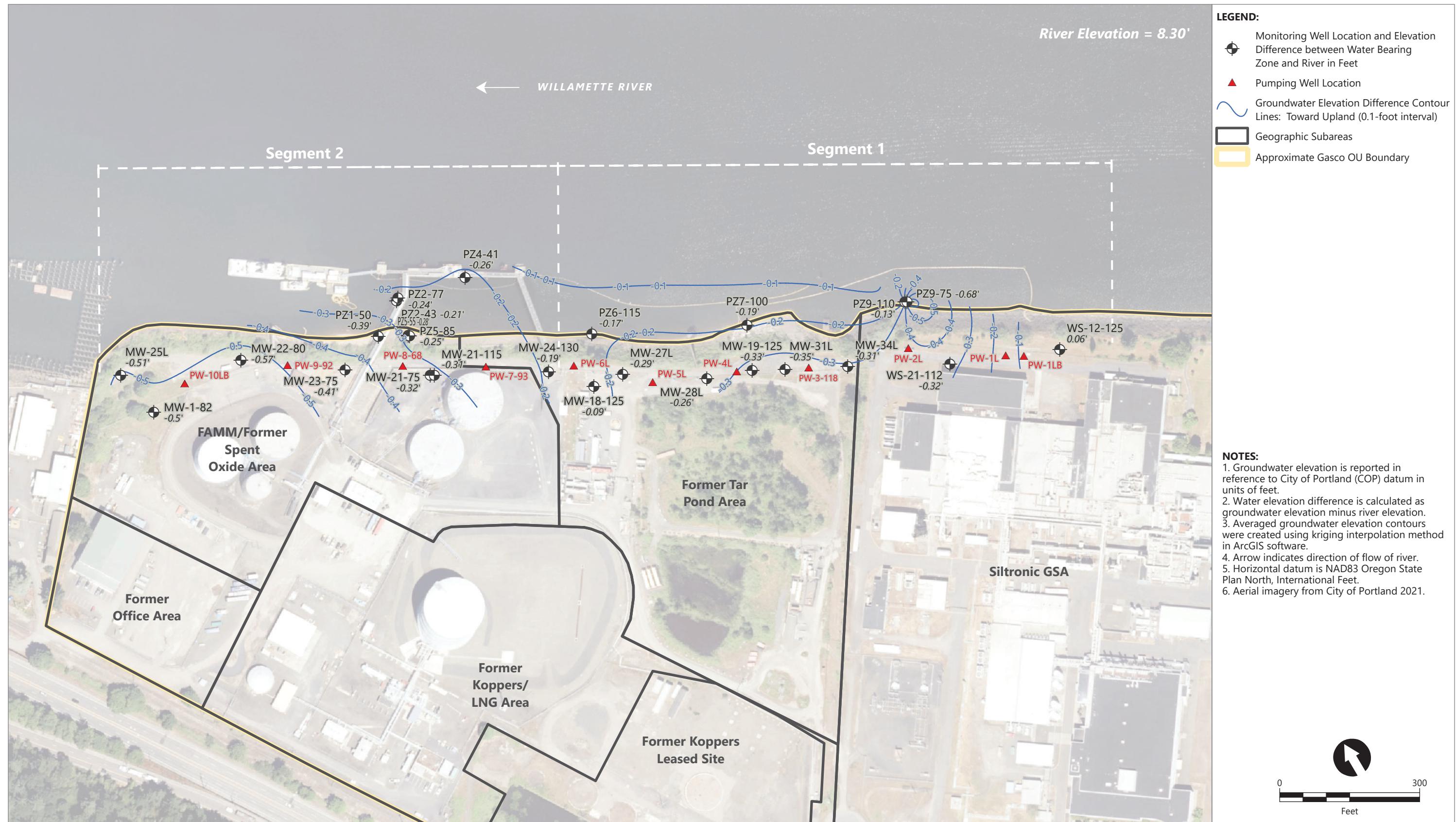




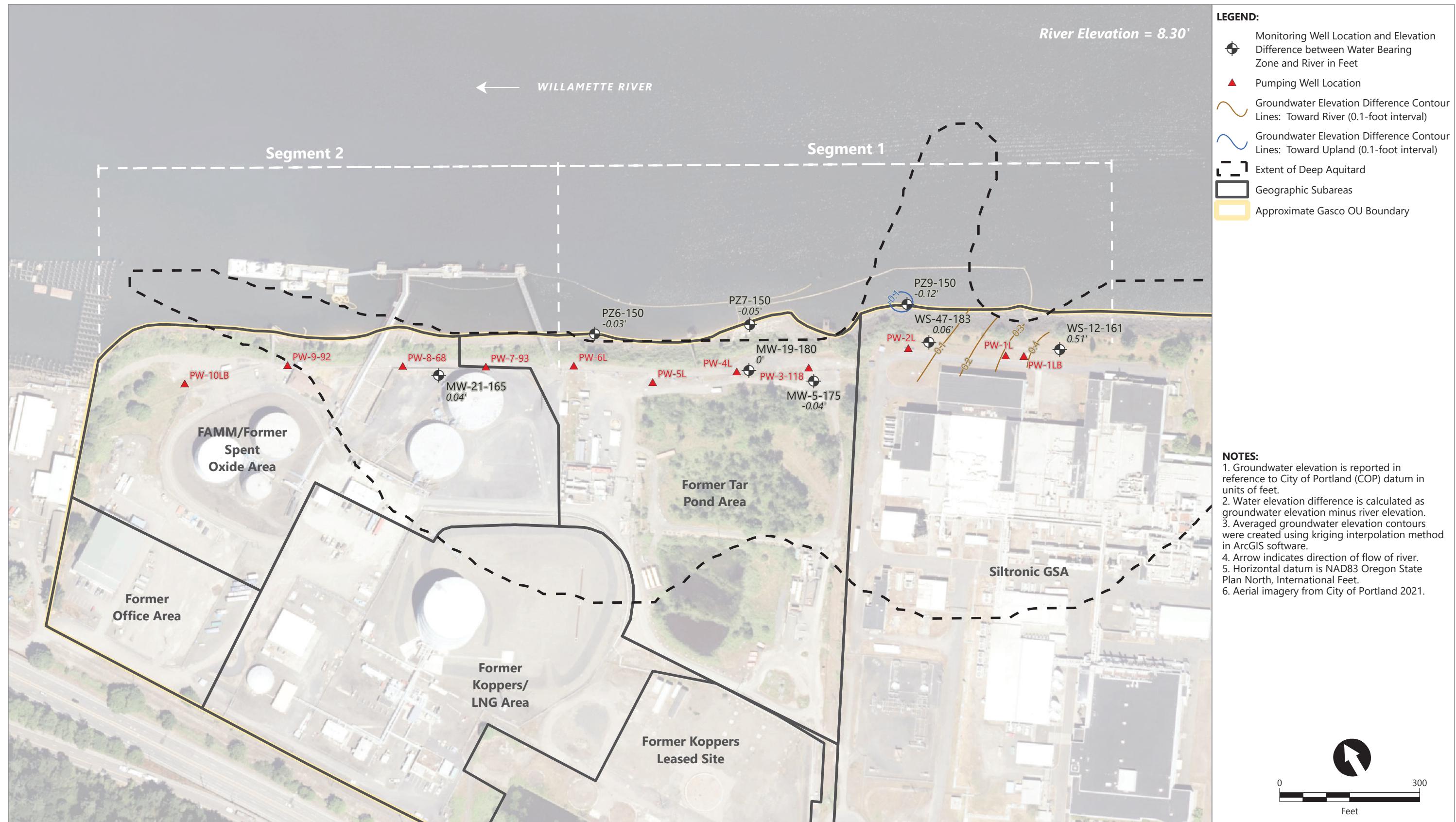
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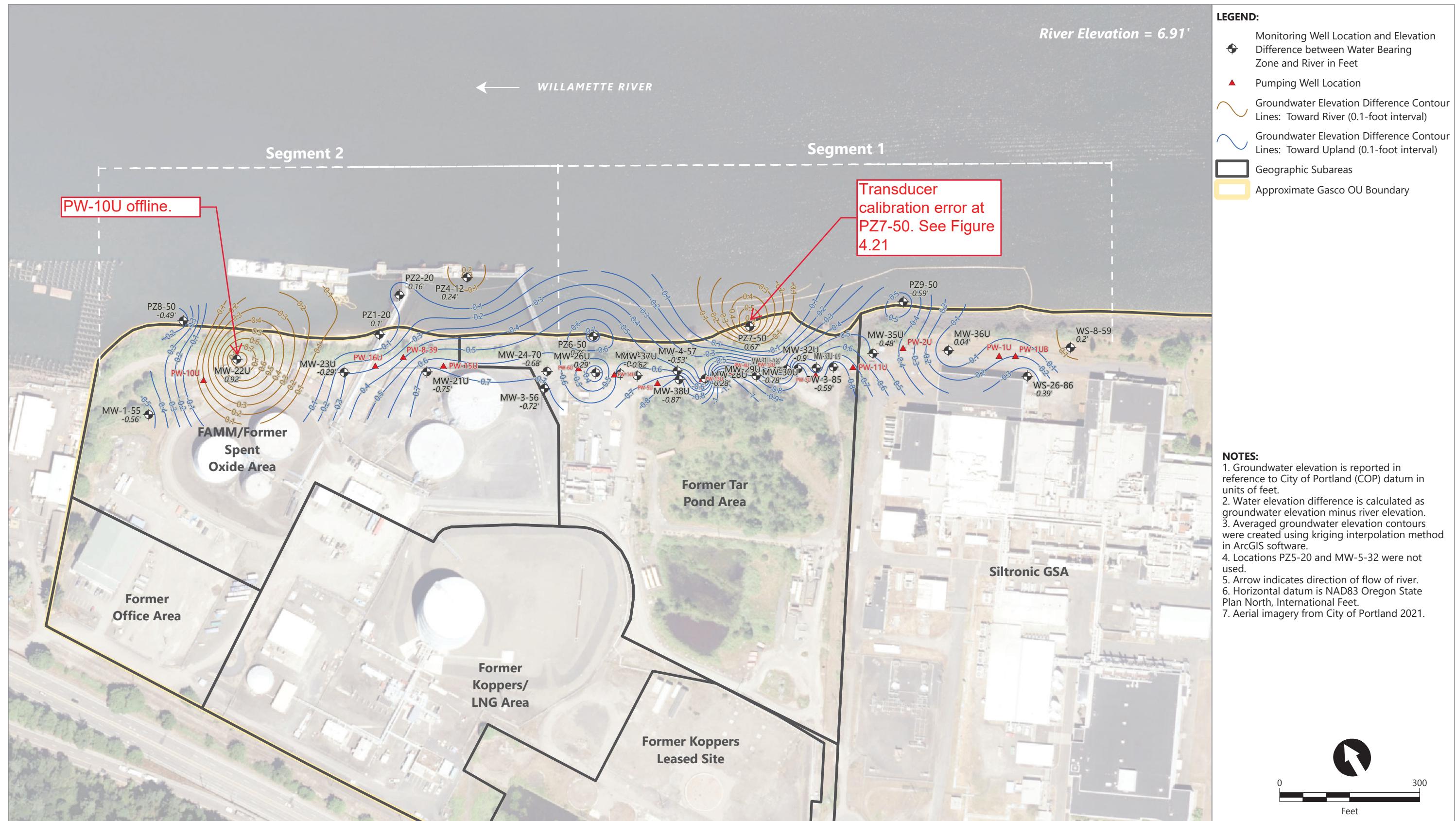
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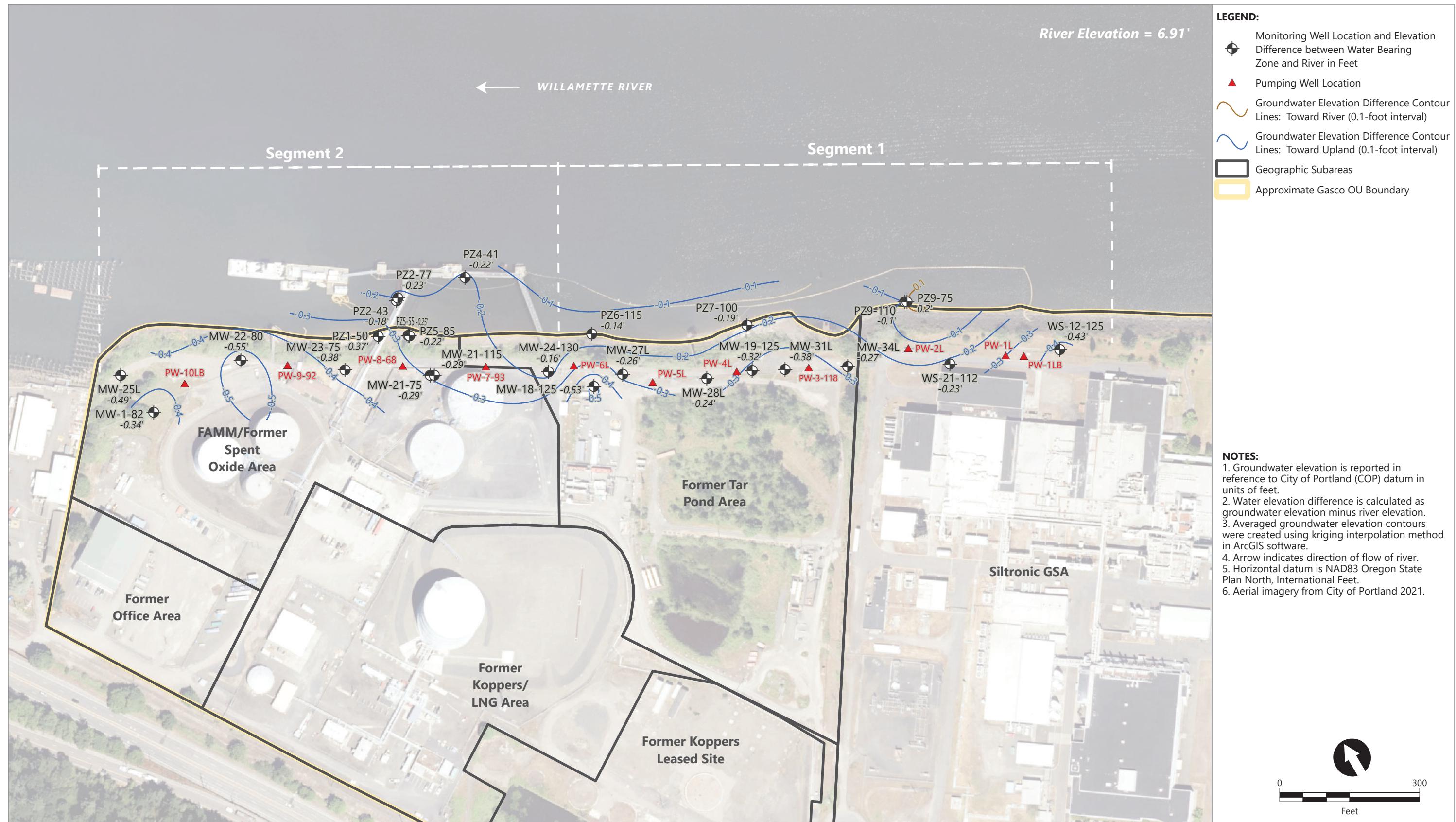
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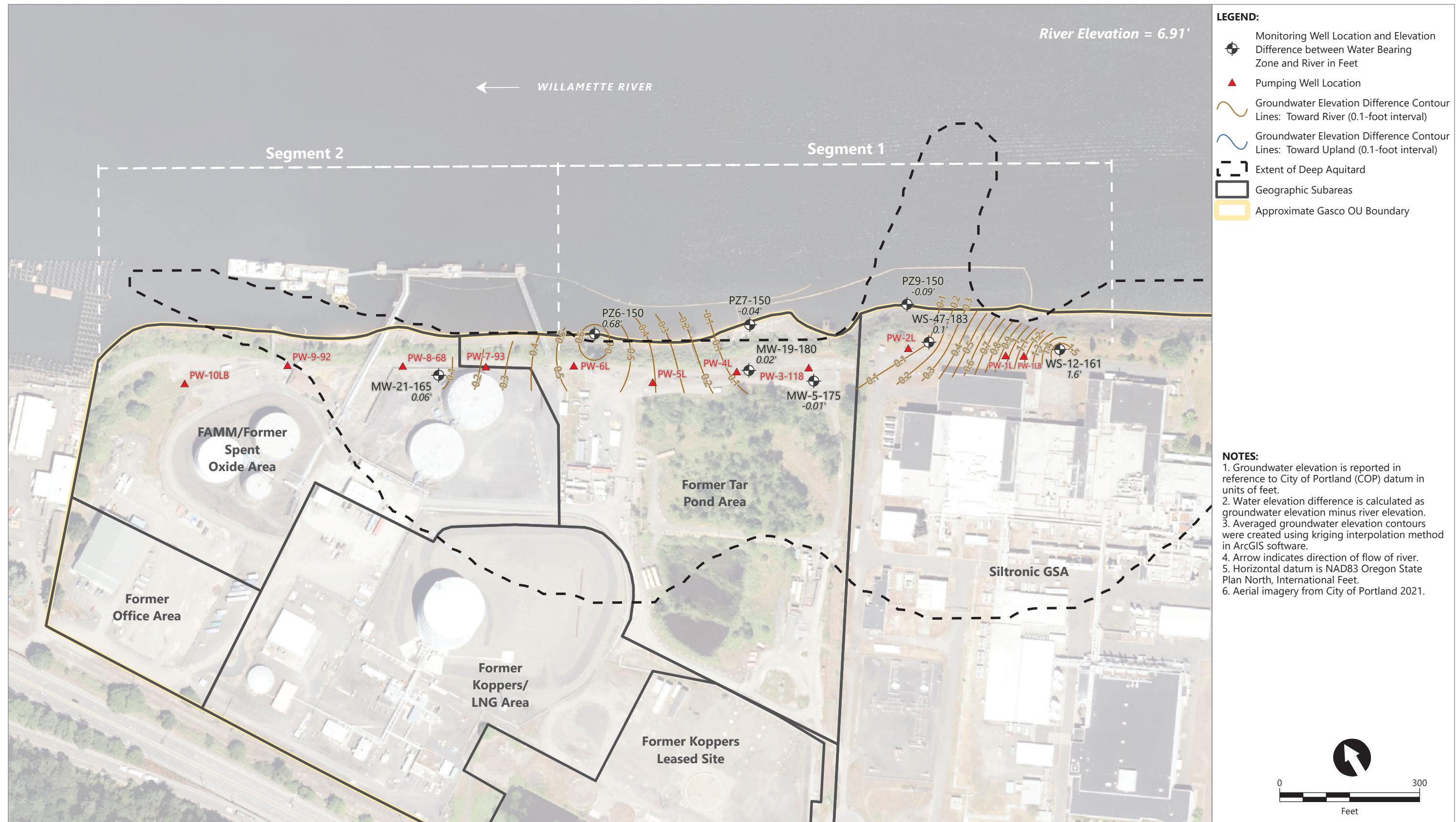
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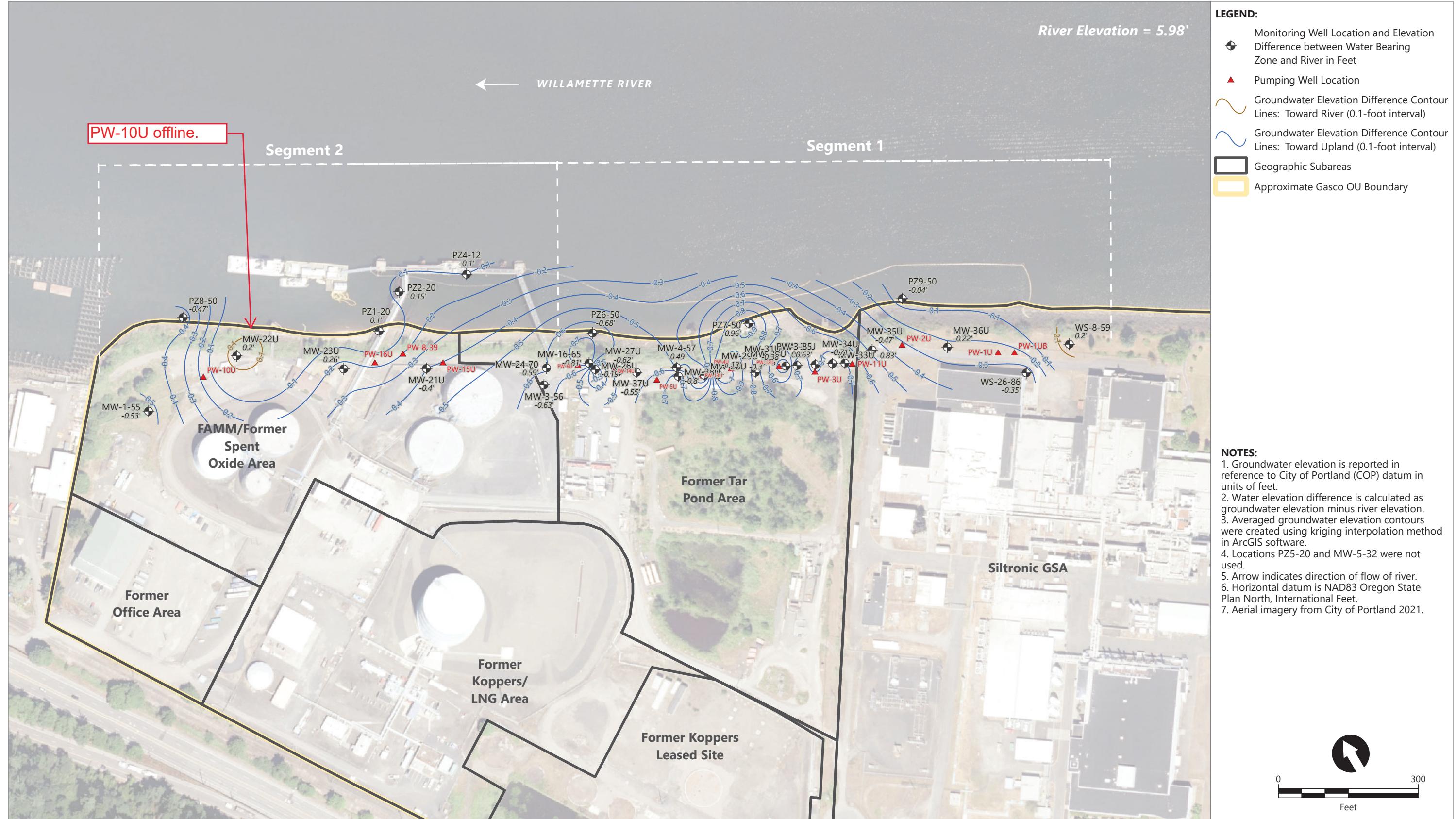


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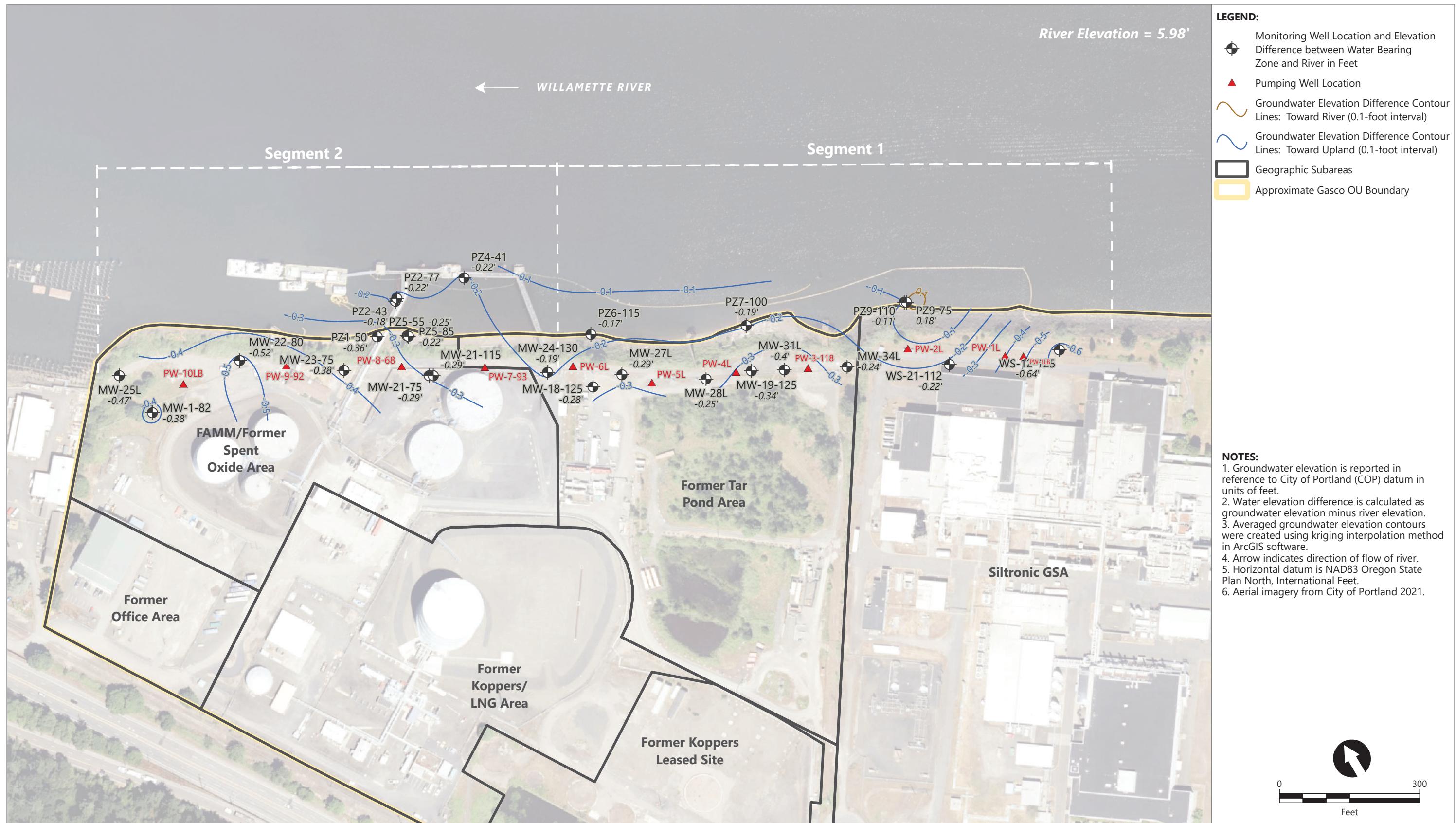


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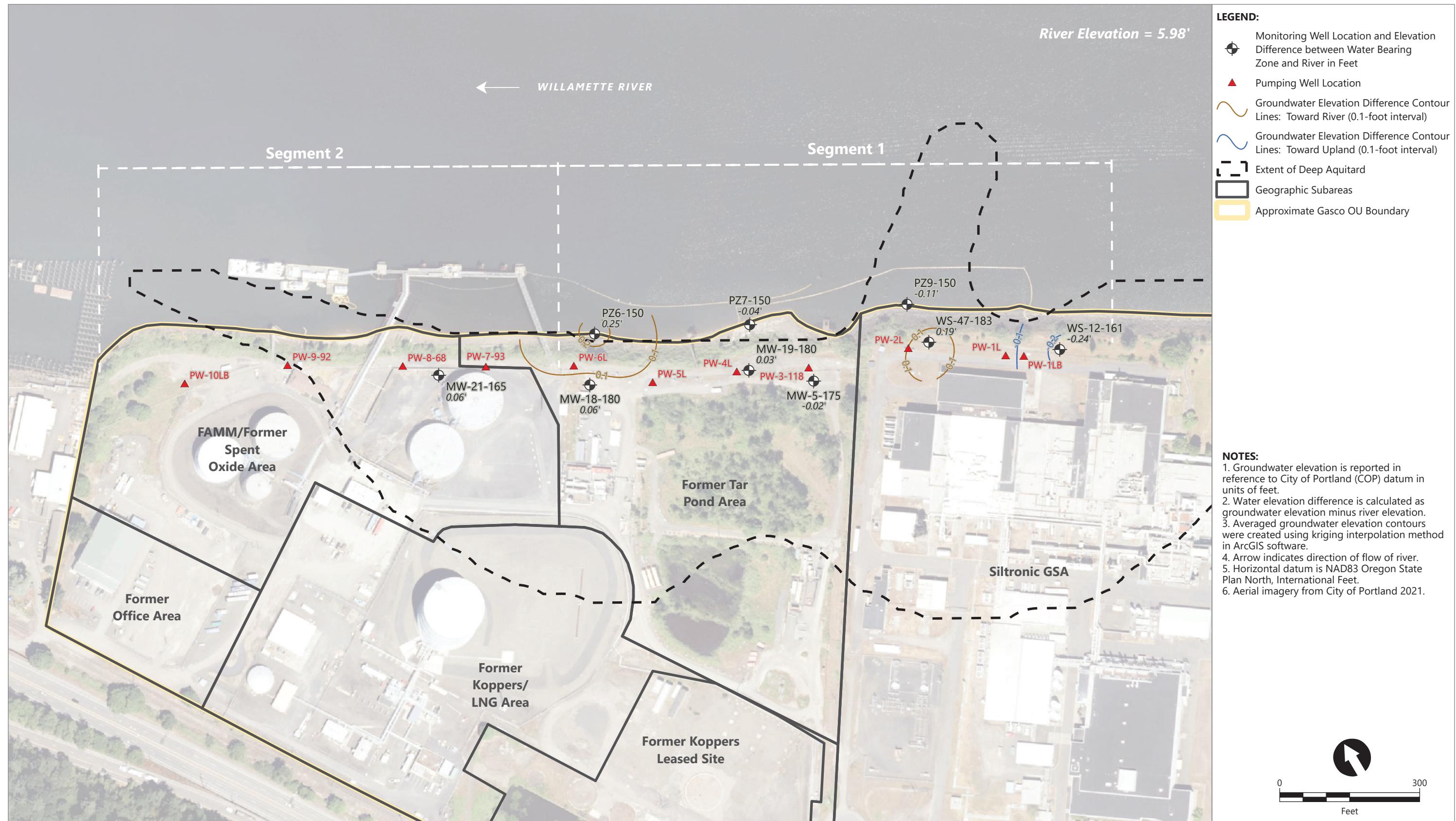


Figure 3.3a
Contours of Water Elevation Difference Between Upper Alluvium WBZ and River Using Serfes 3-Day Rolling Averages From 2/11/2023-2/13/2023

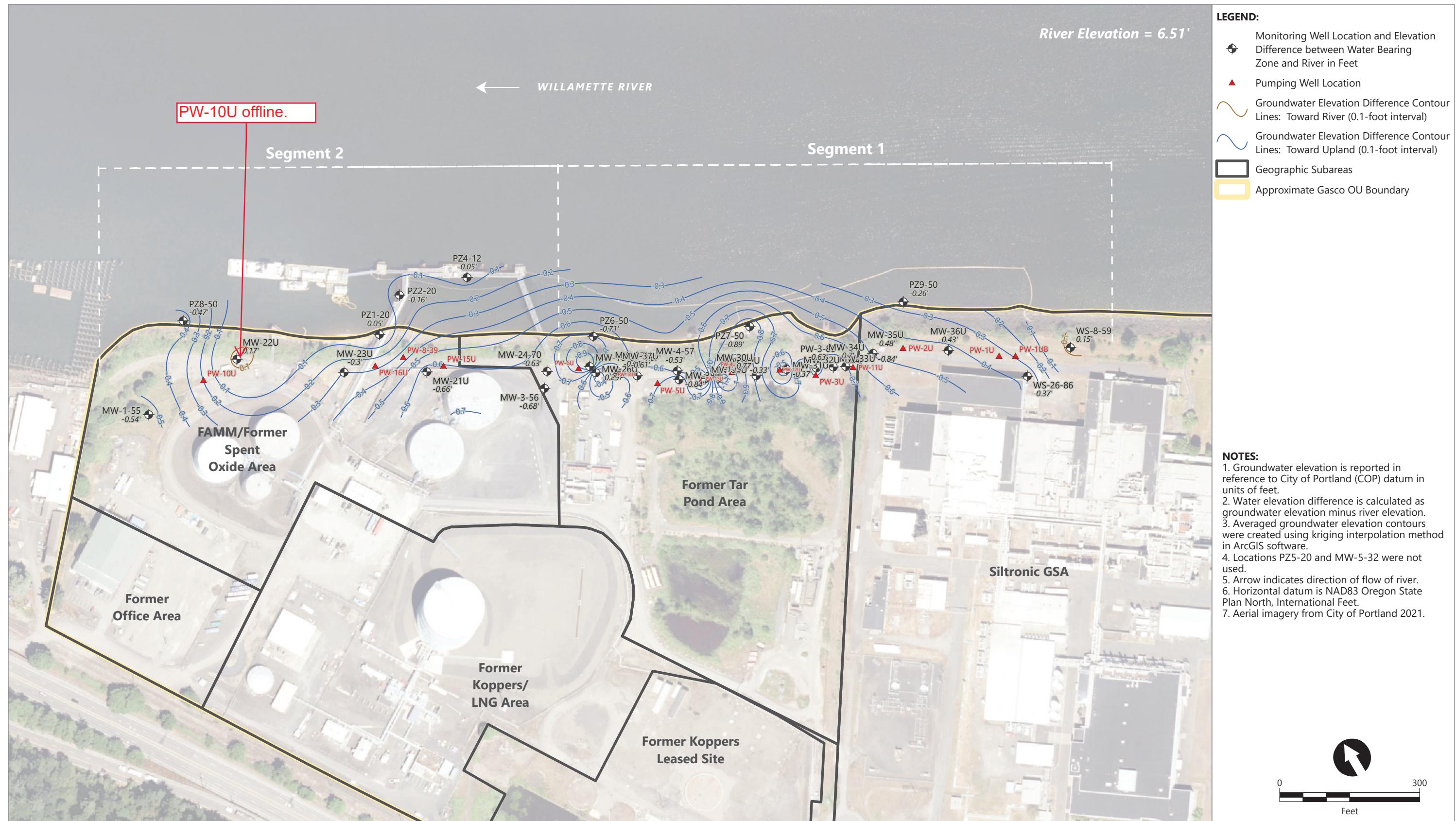
NWN Gasco Site
 Portland, Oregon



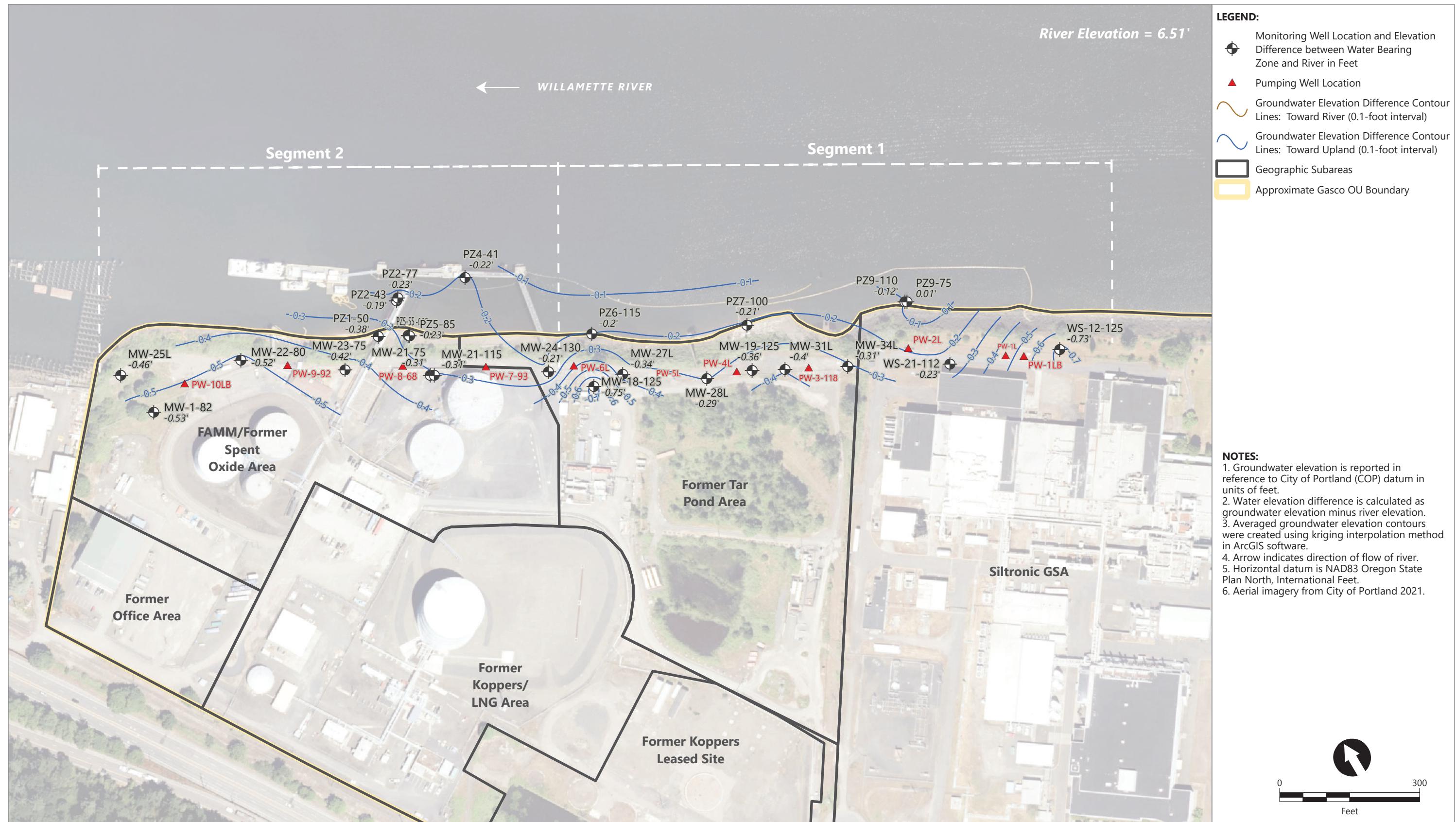
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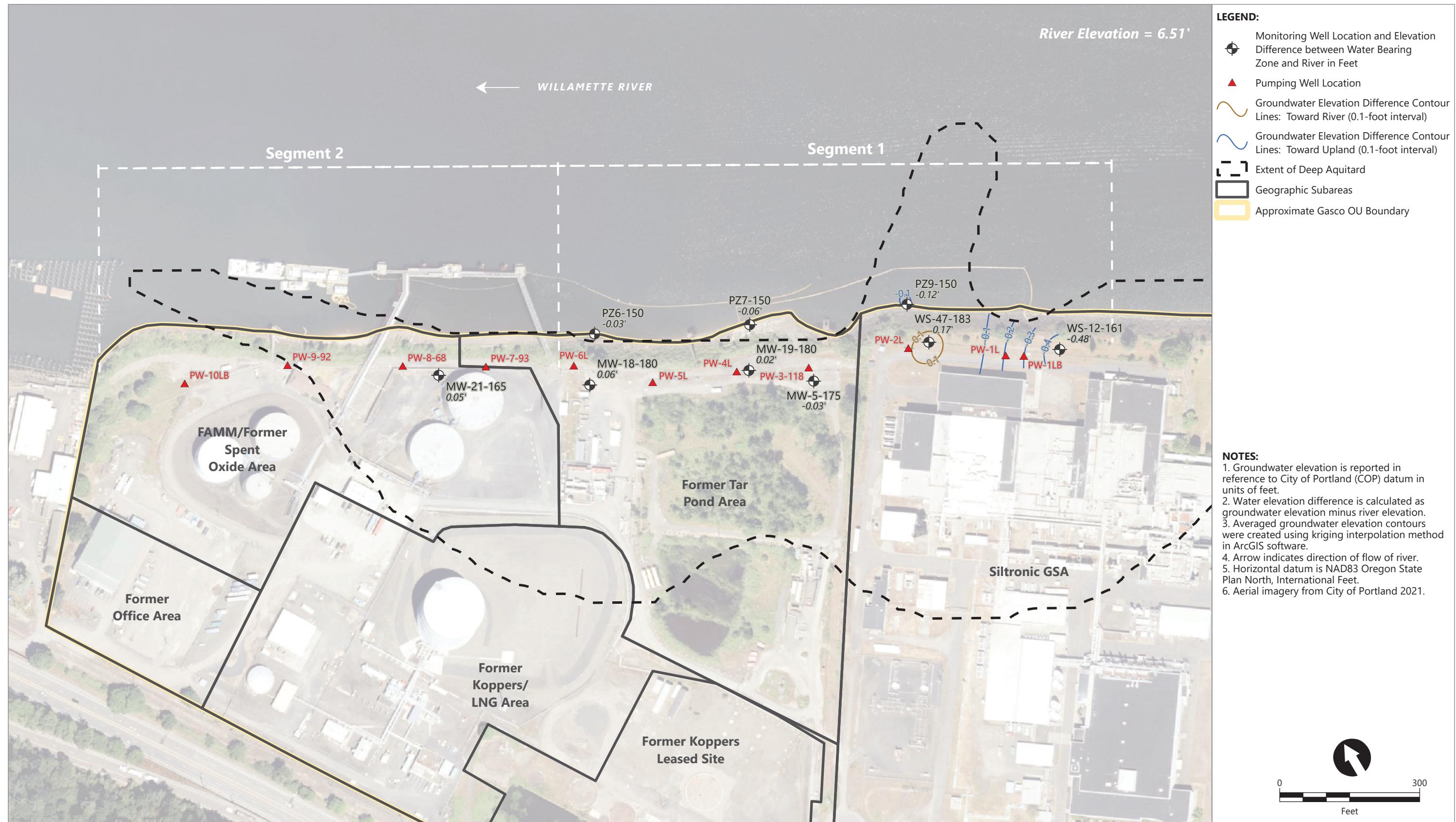
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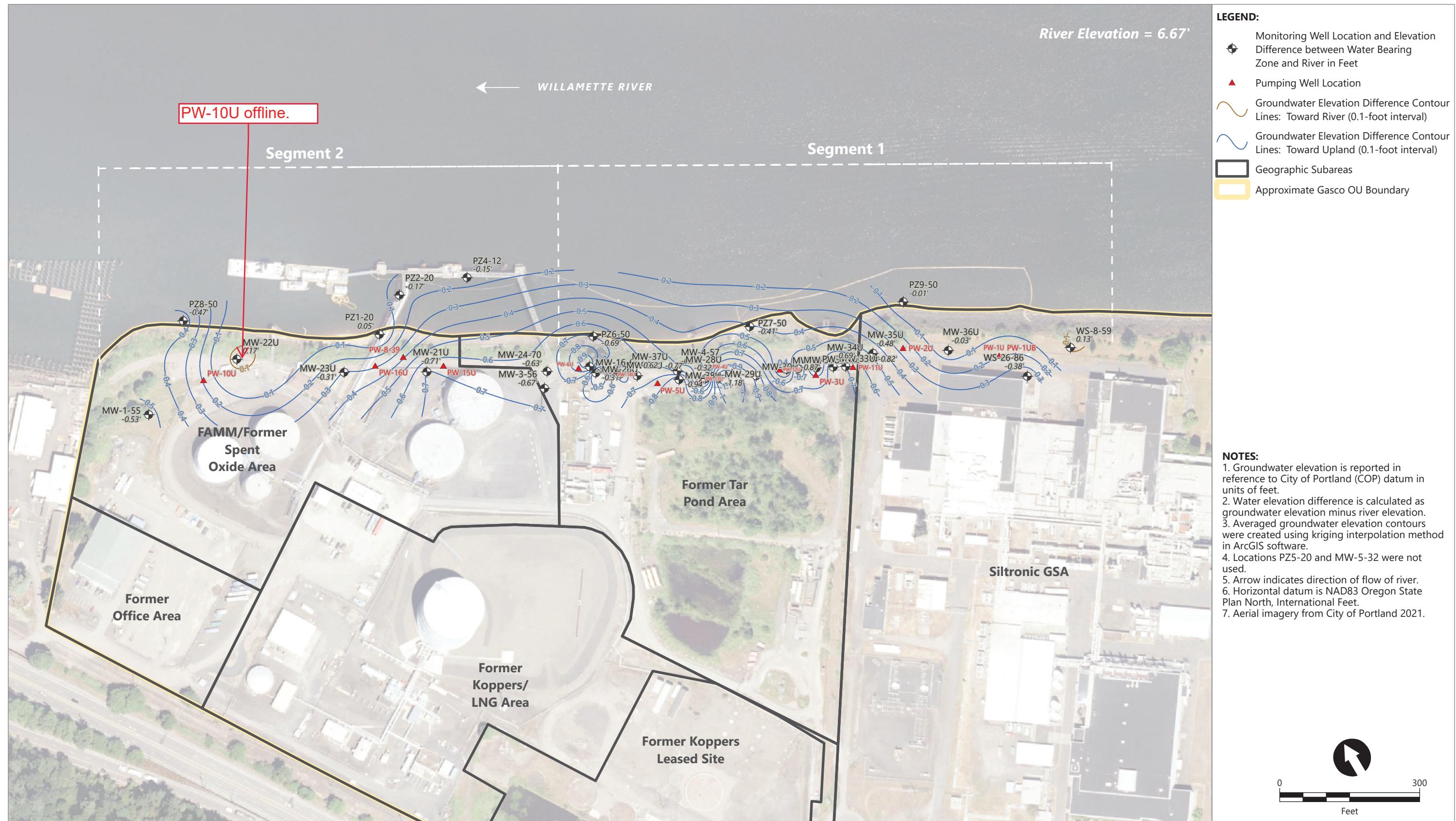
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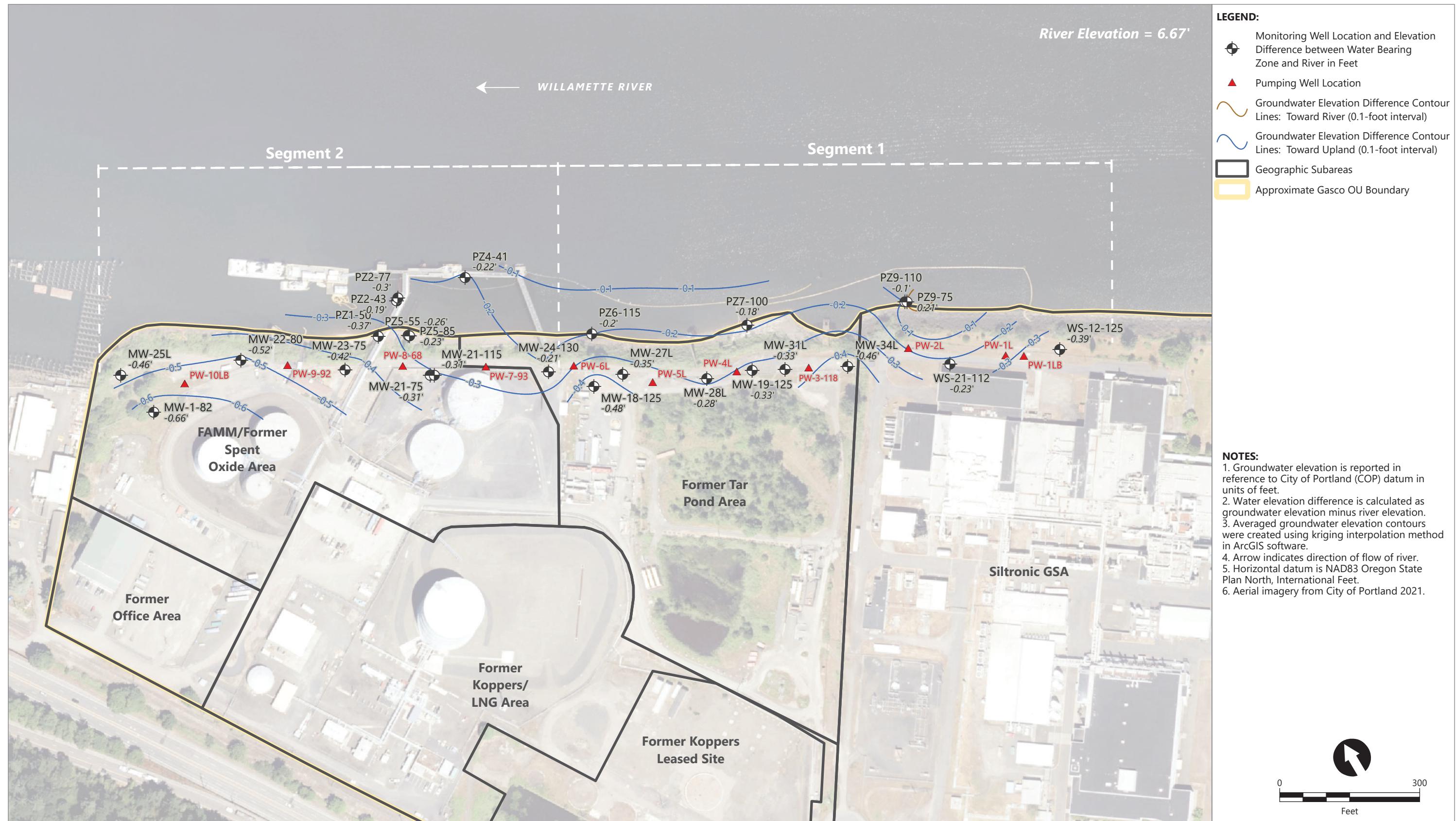
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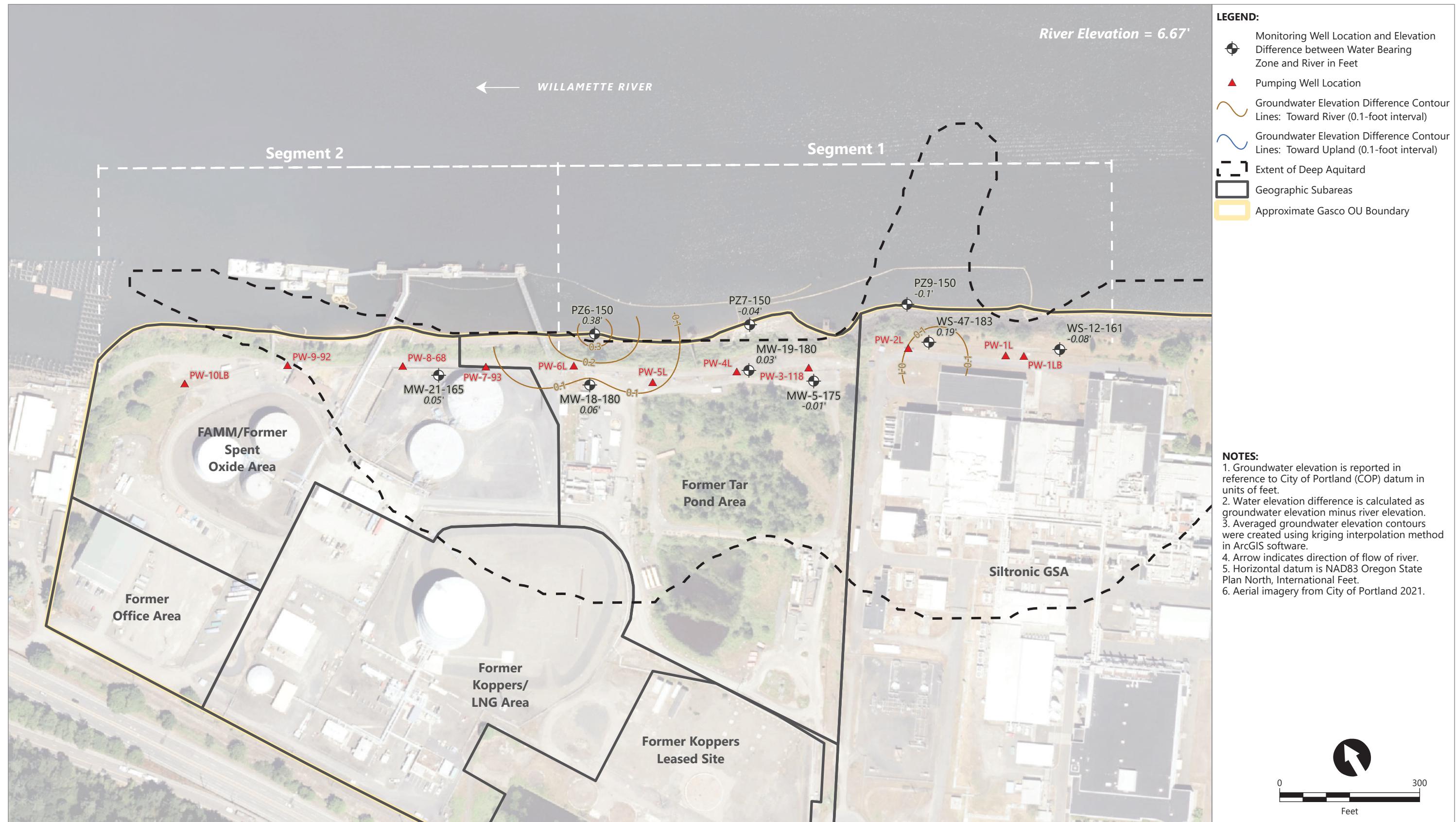
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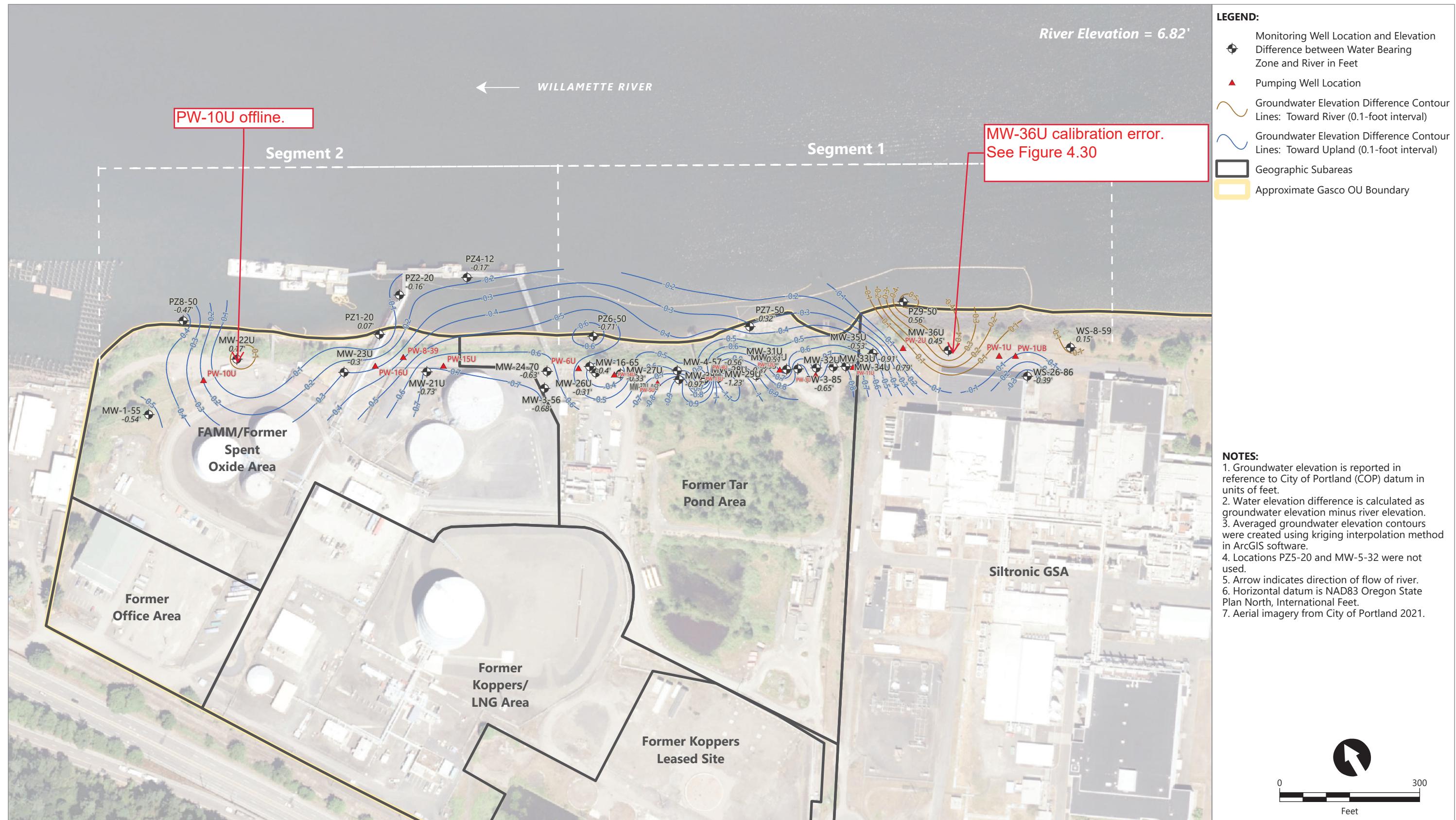
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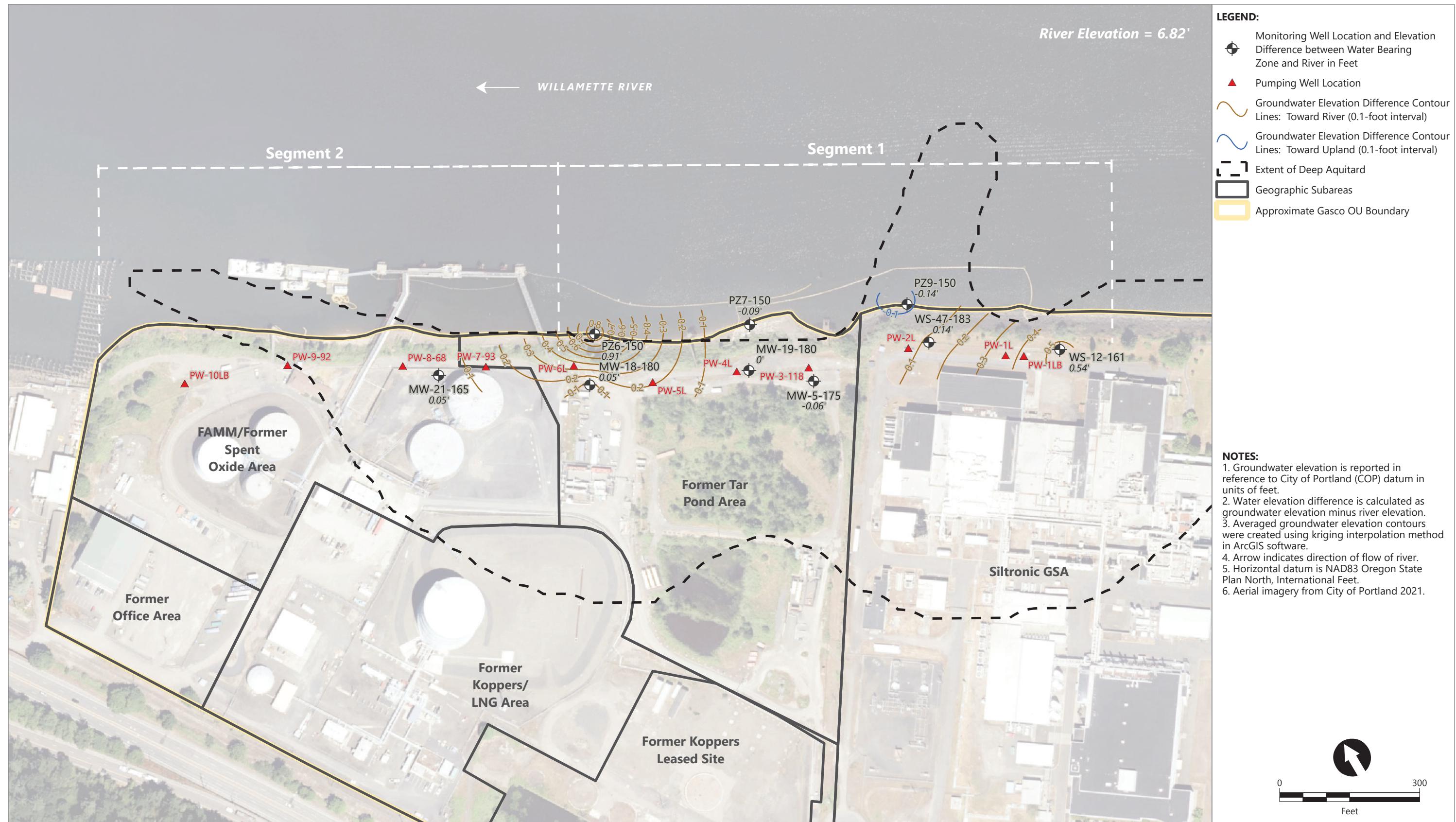
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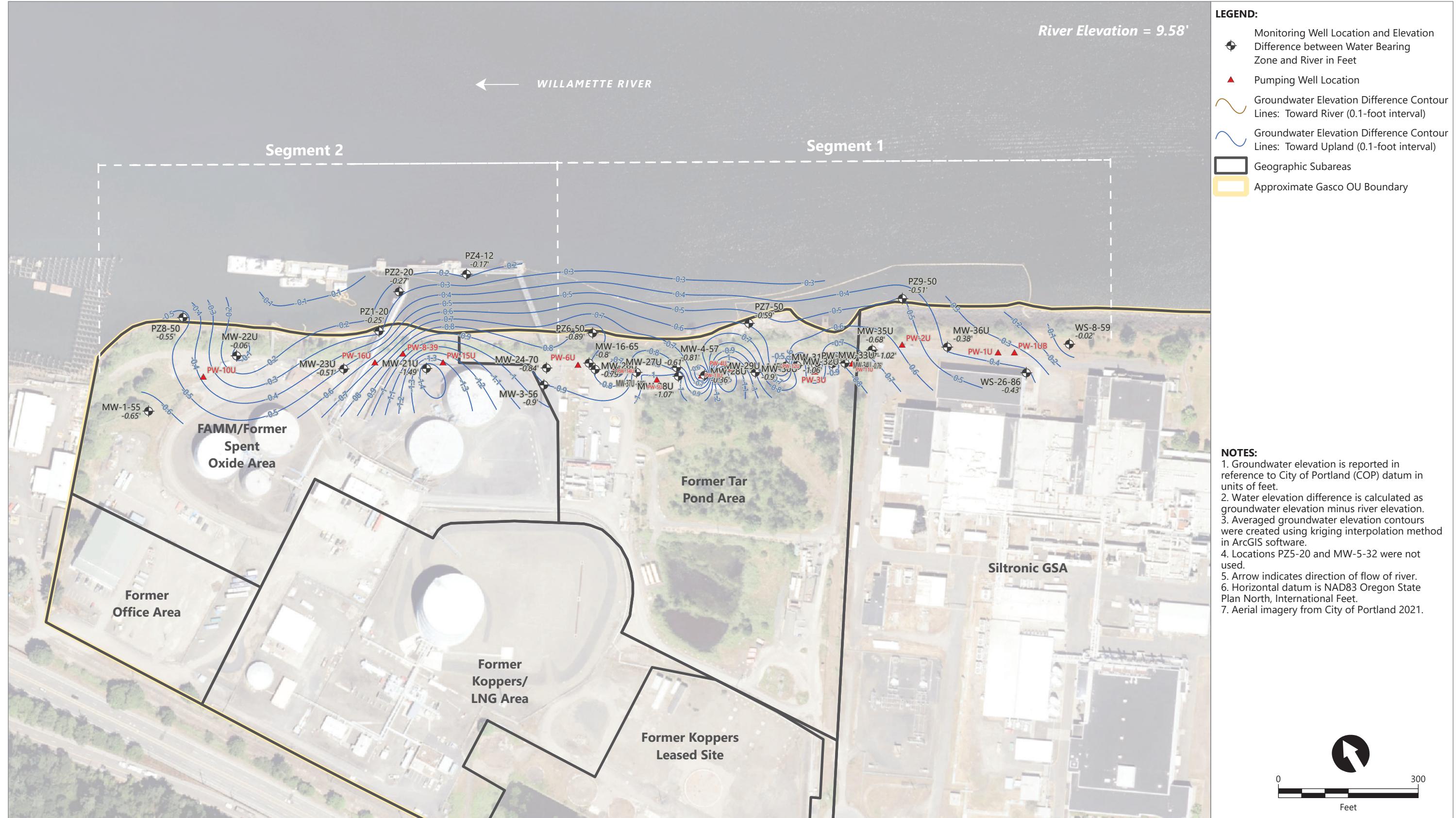
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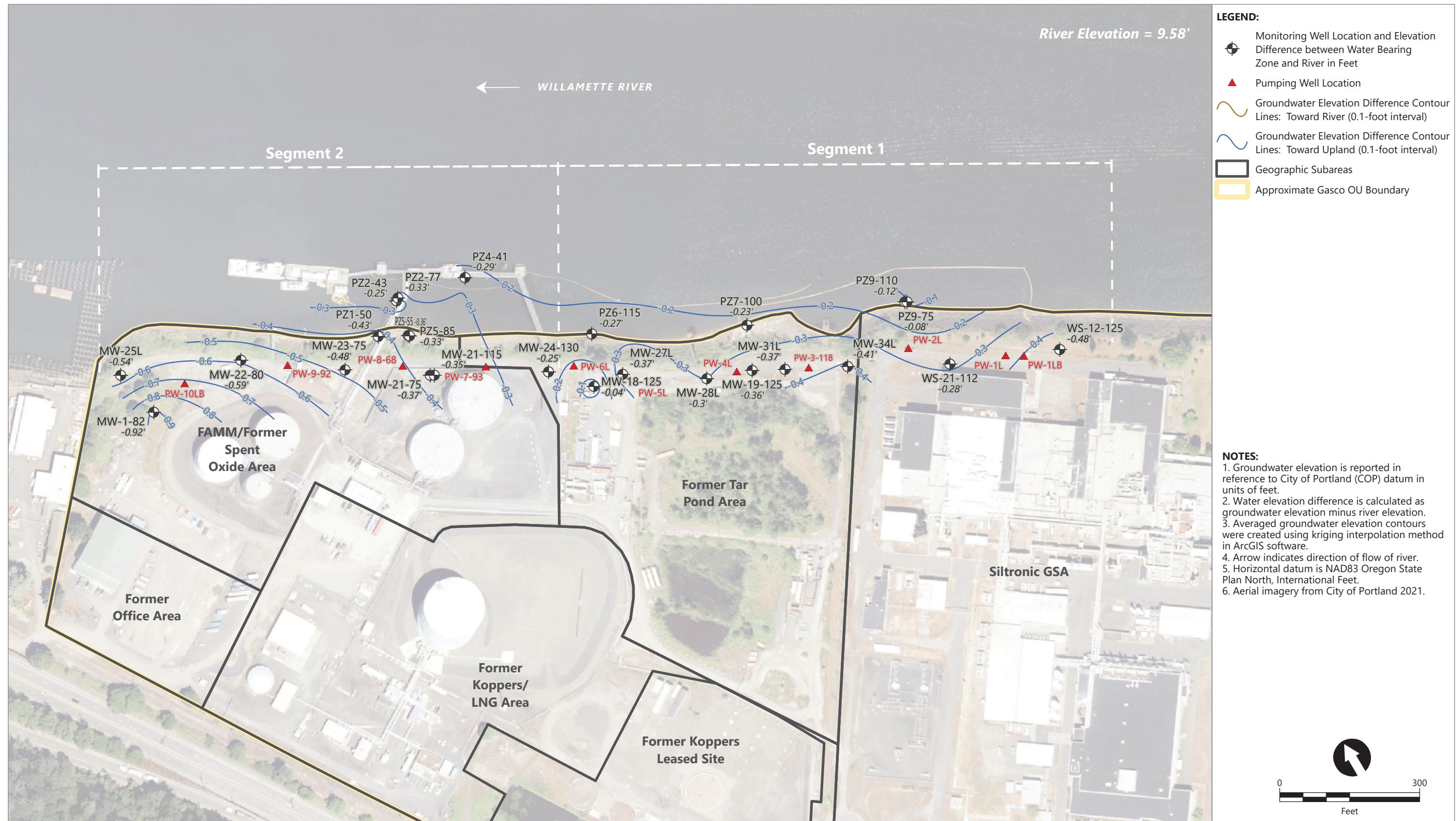
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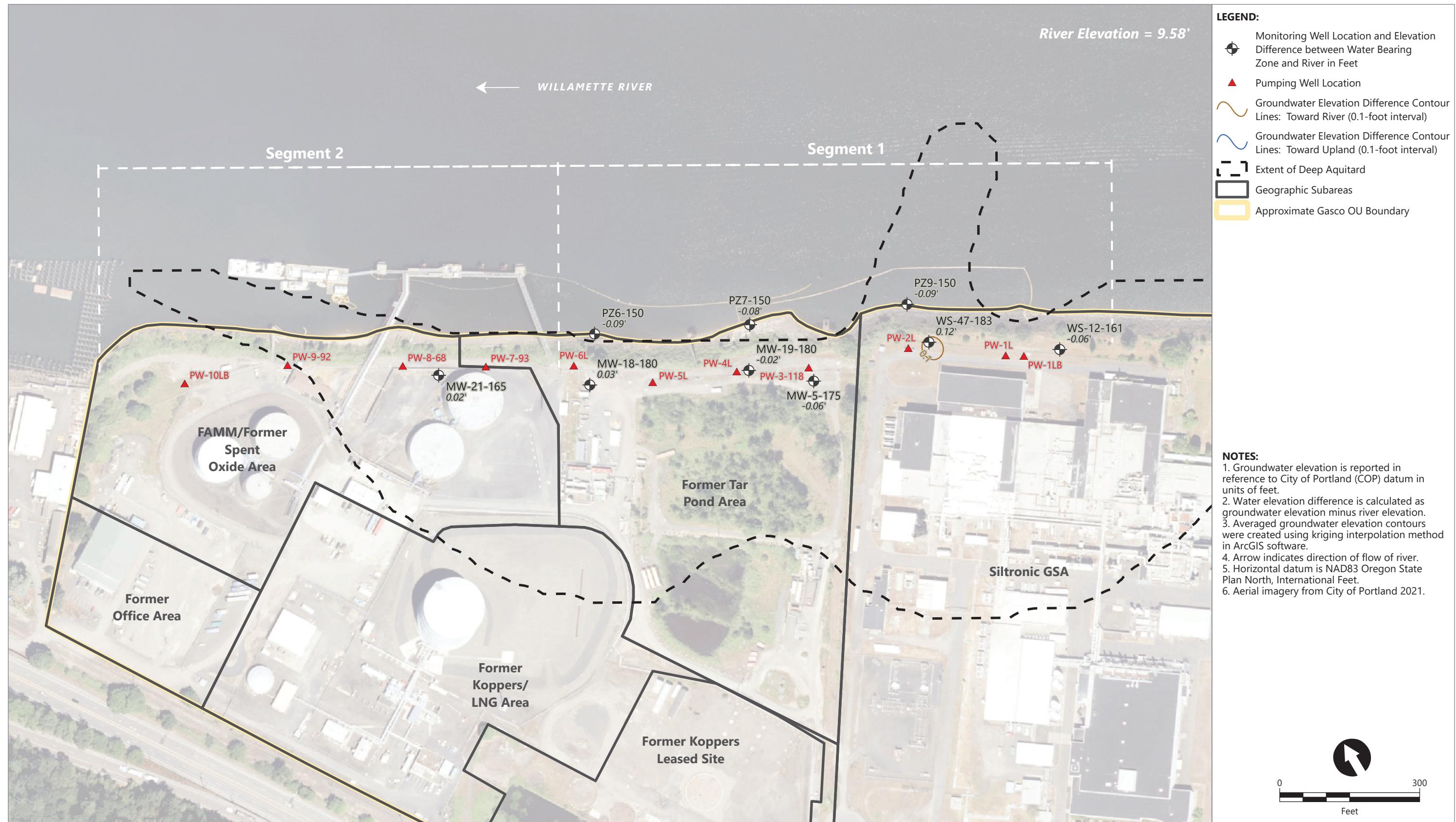
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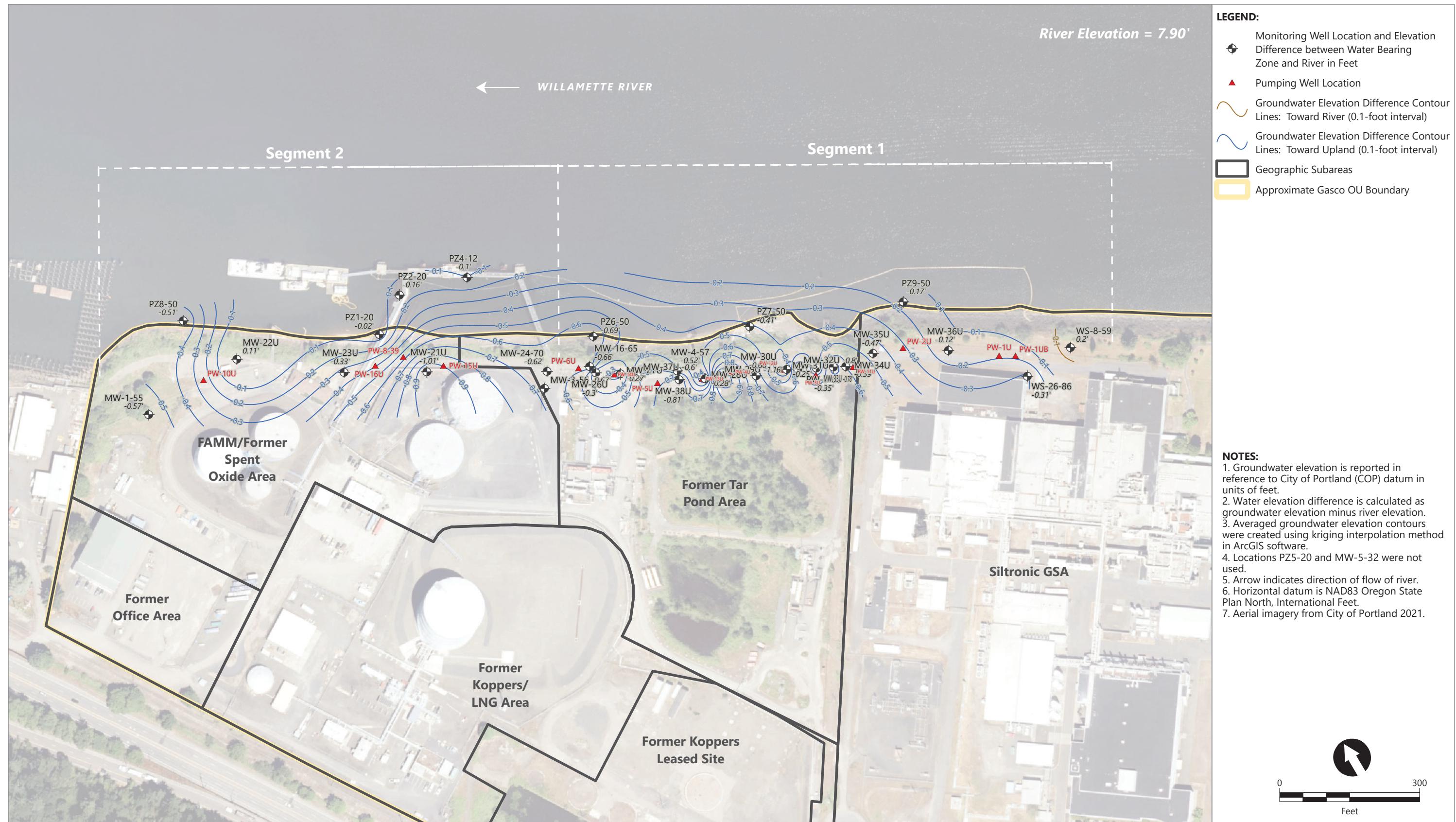
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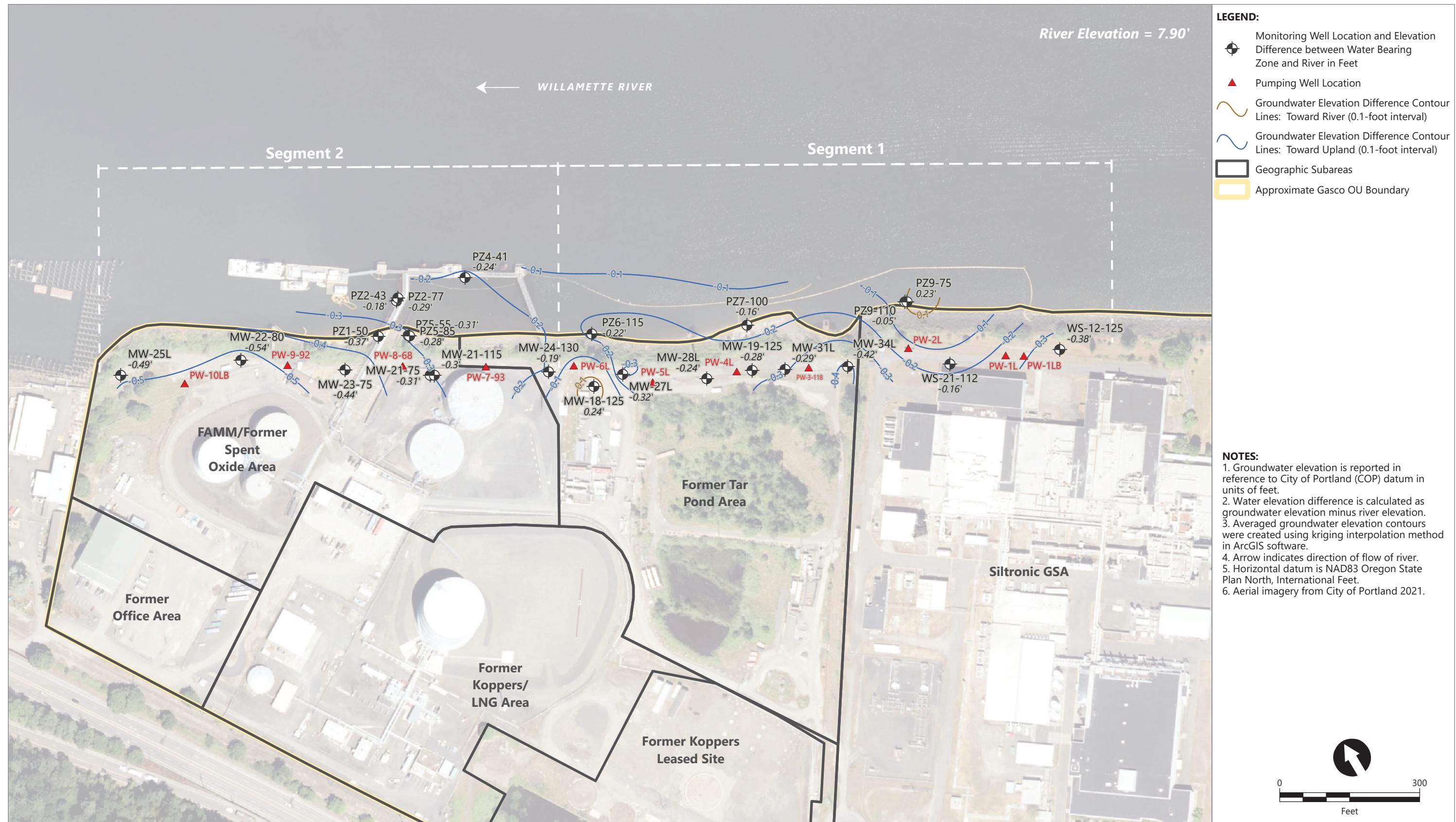
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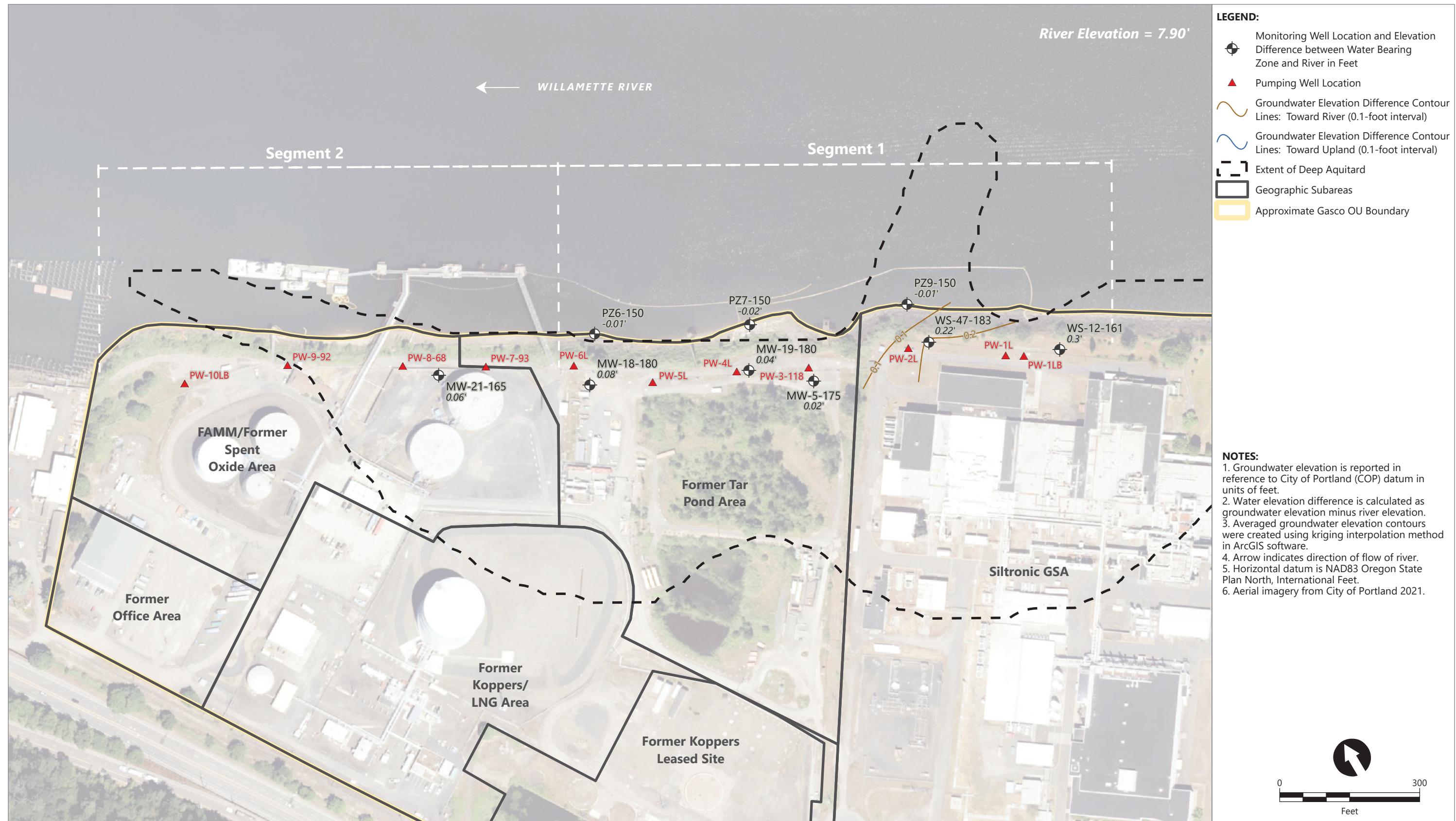
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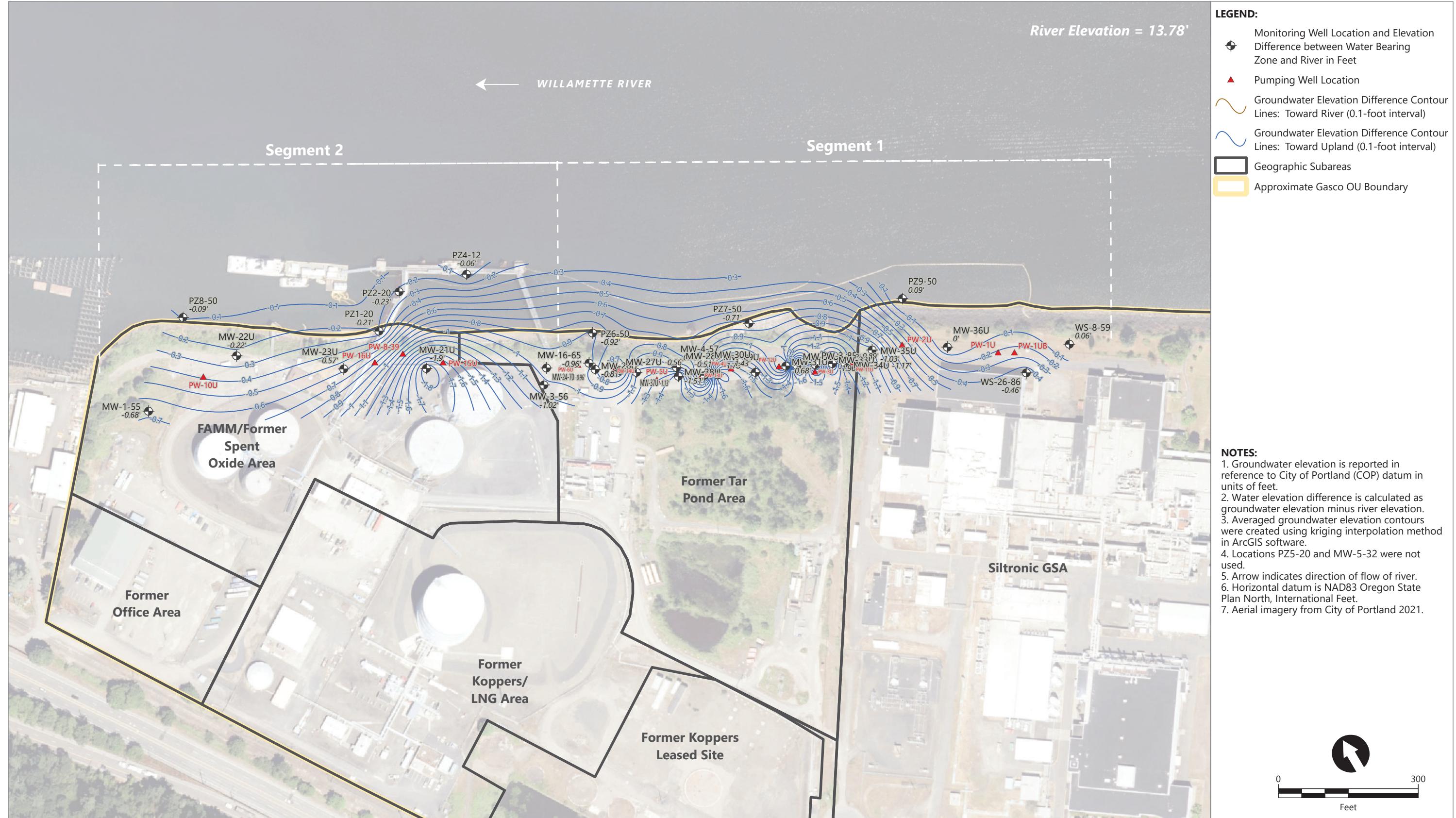
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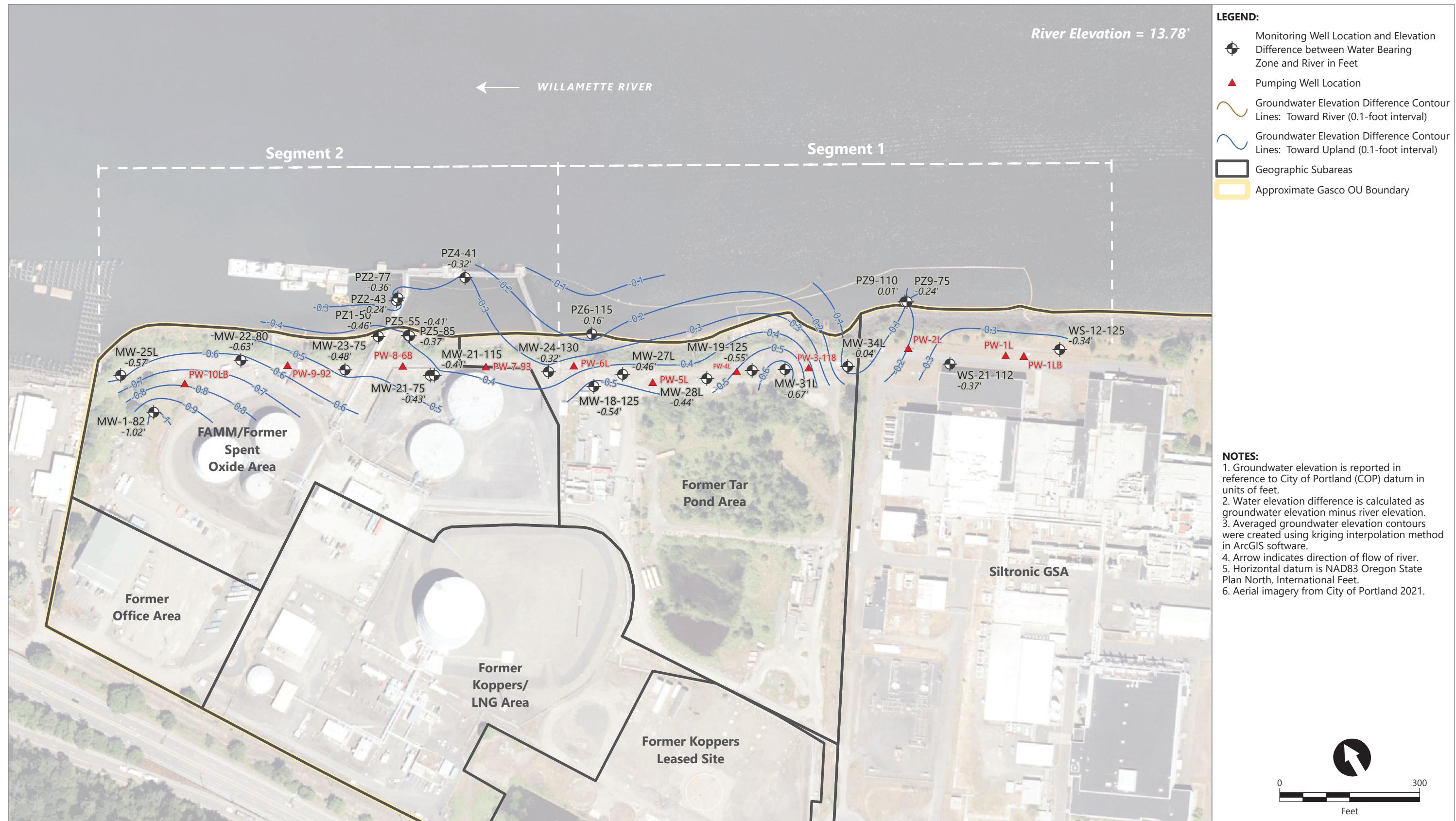
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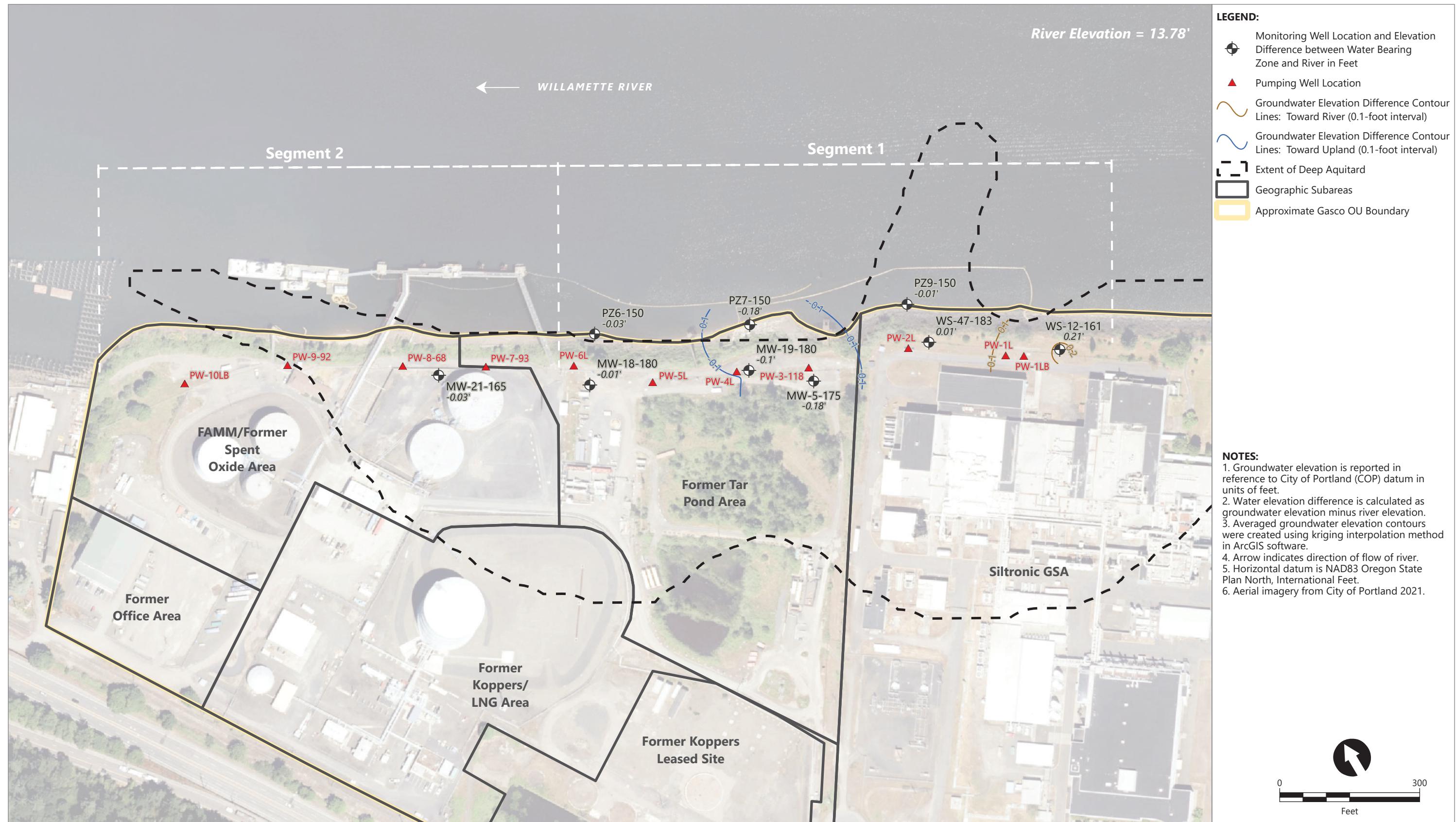
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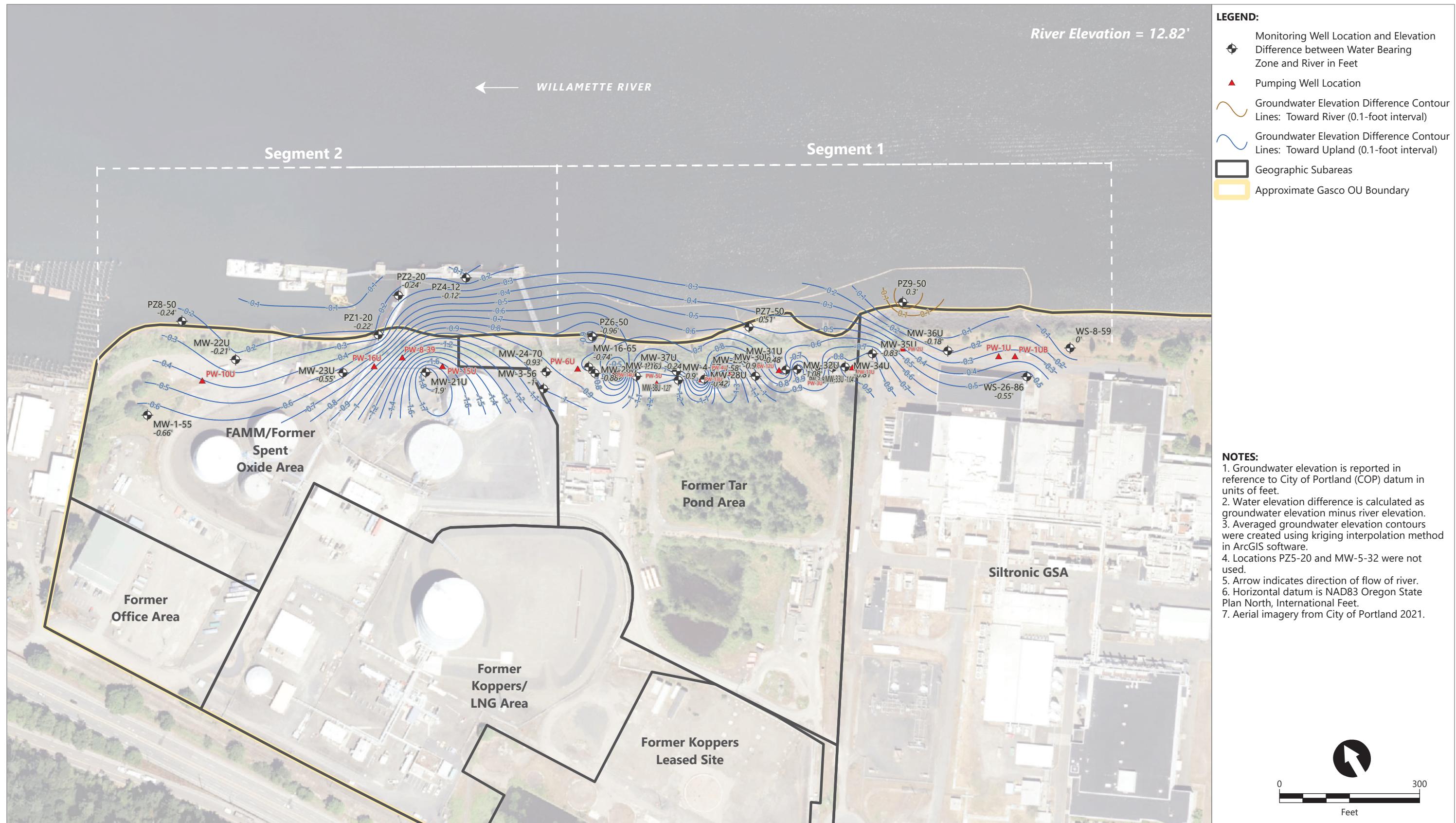
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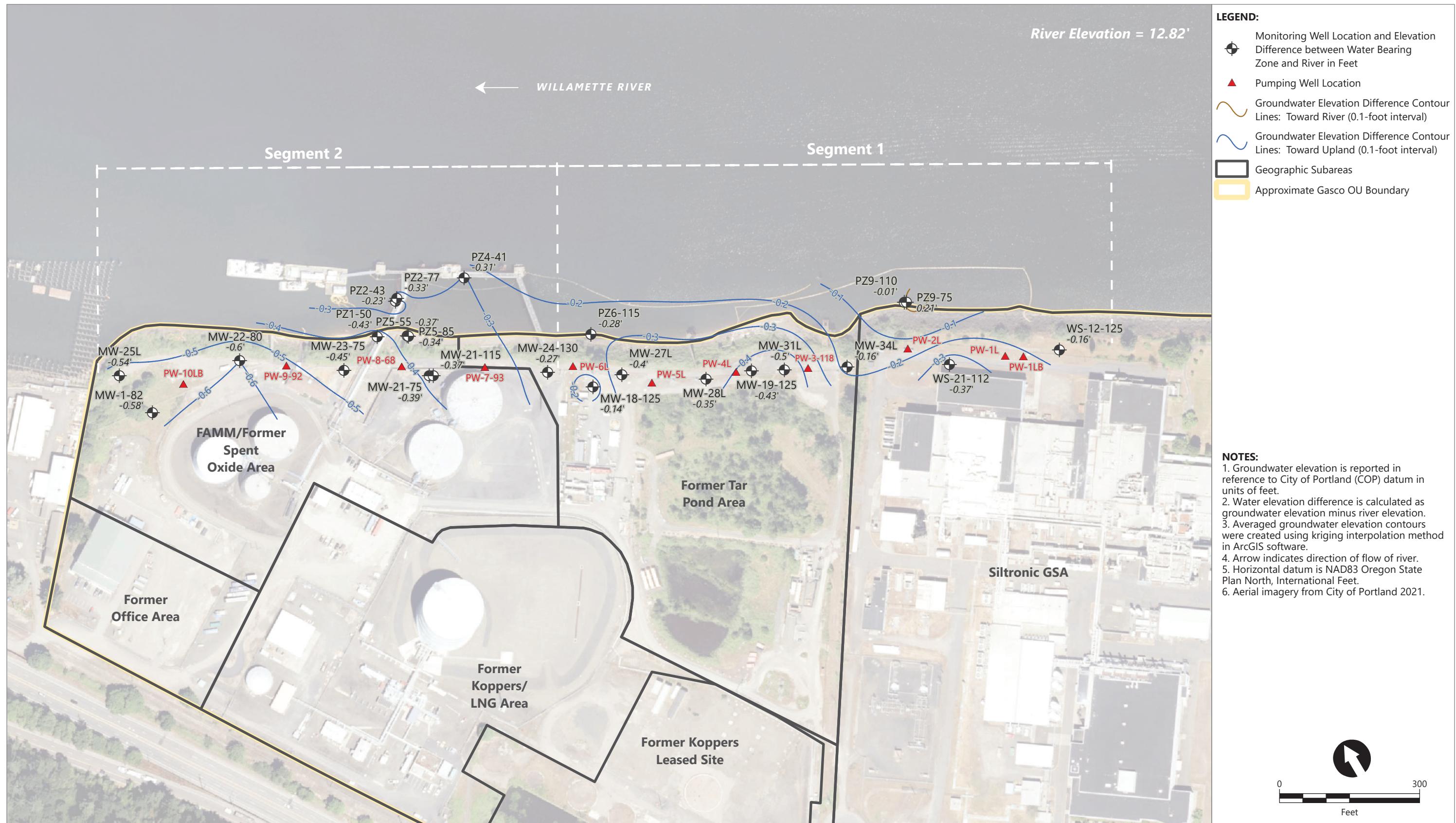


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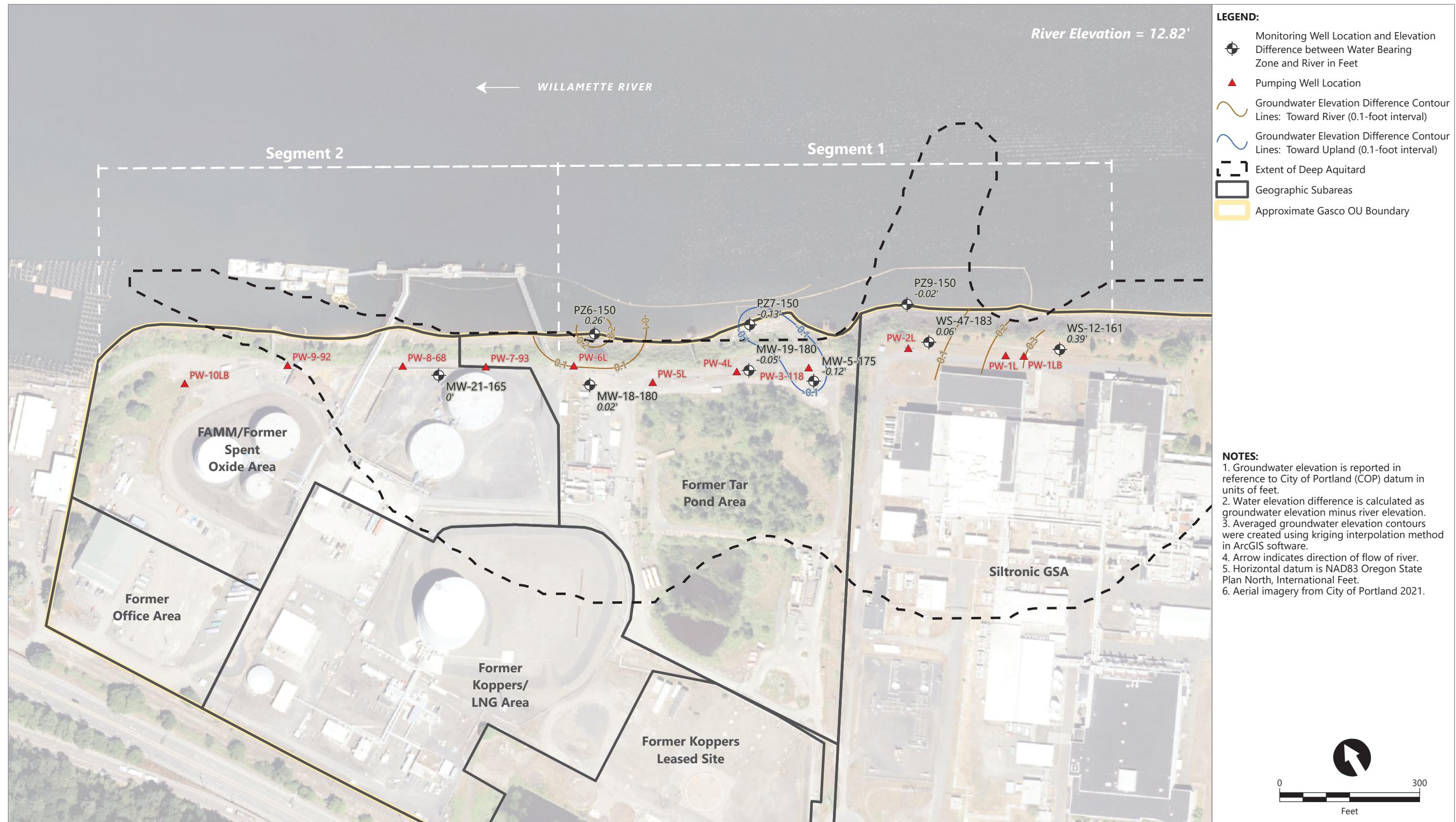


Figure 3.9a
Contours of Water Elevation Difference Between Upper Alluvium WBZ and River Using Serfes 3-Day Rolling Averages From 5/11/2023-5/13/2023

NWN Gasco Site
Portland, Oregon

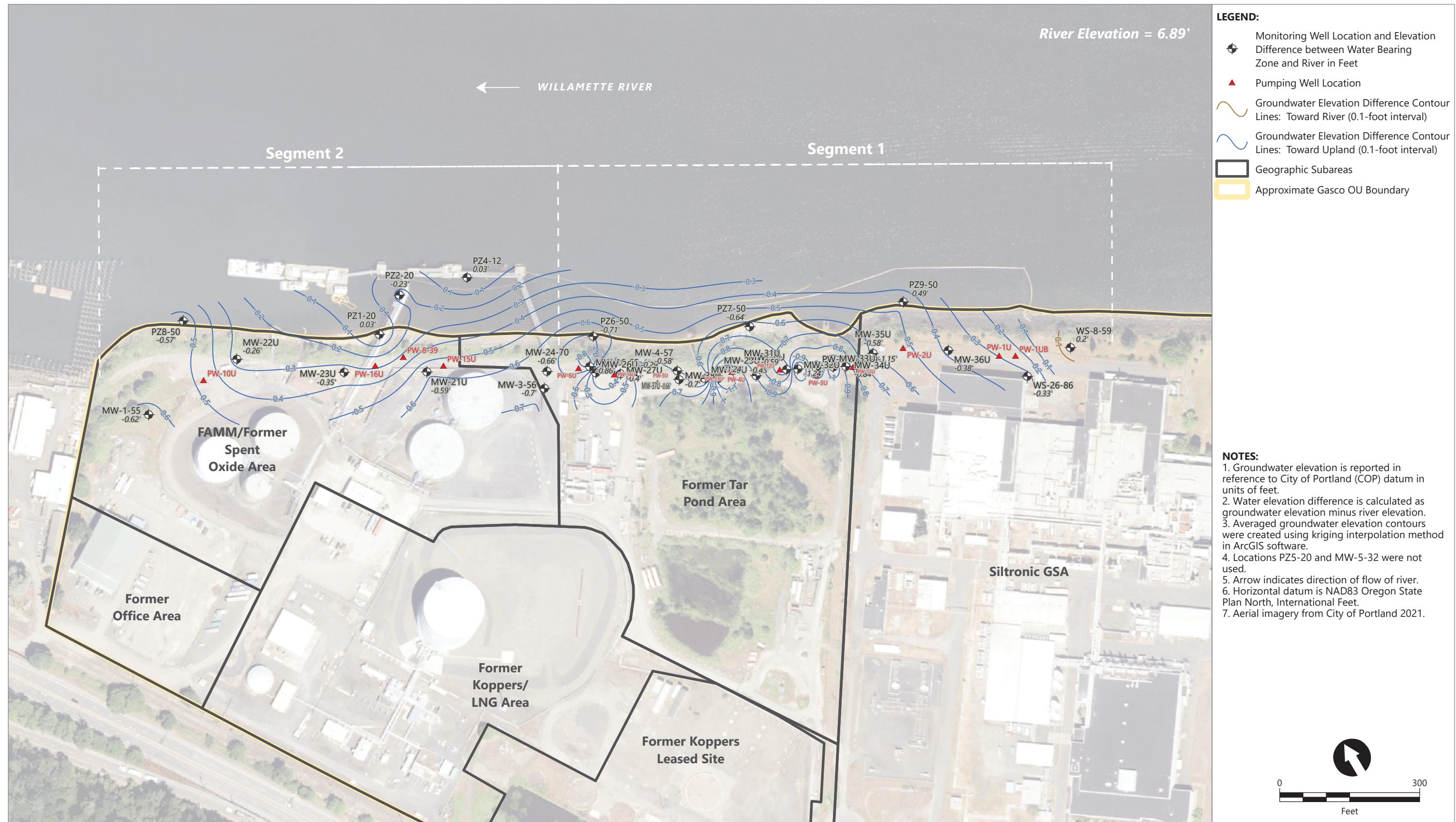


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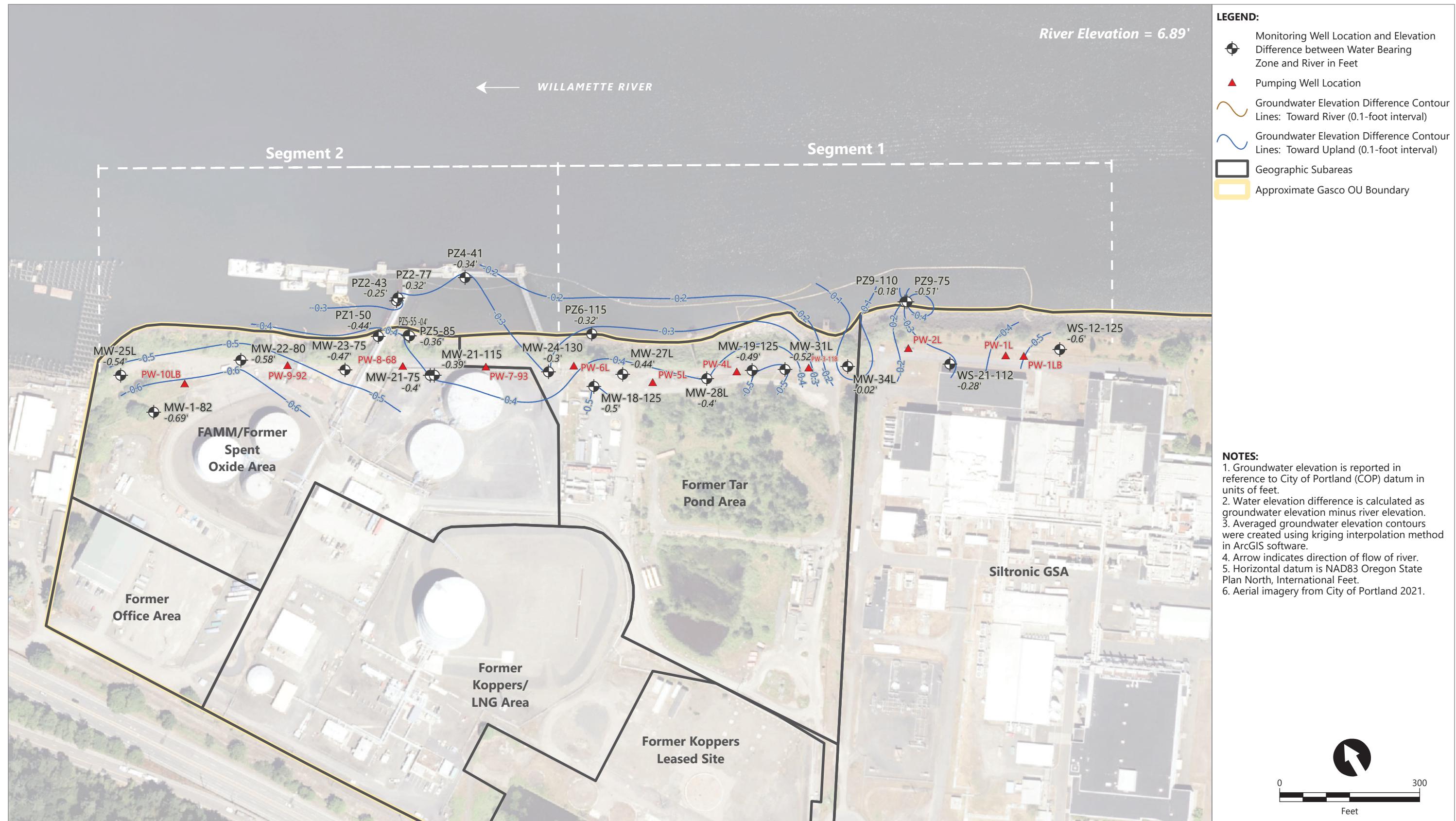


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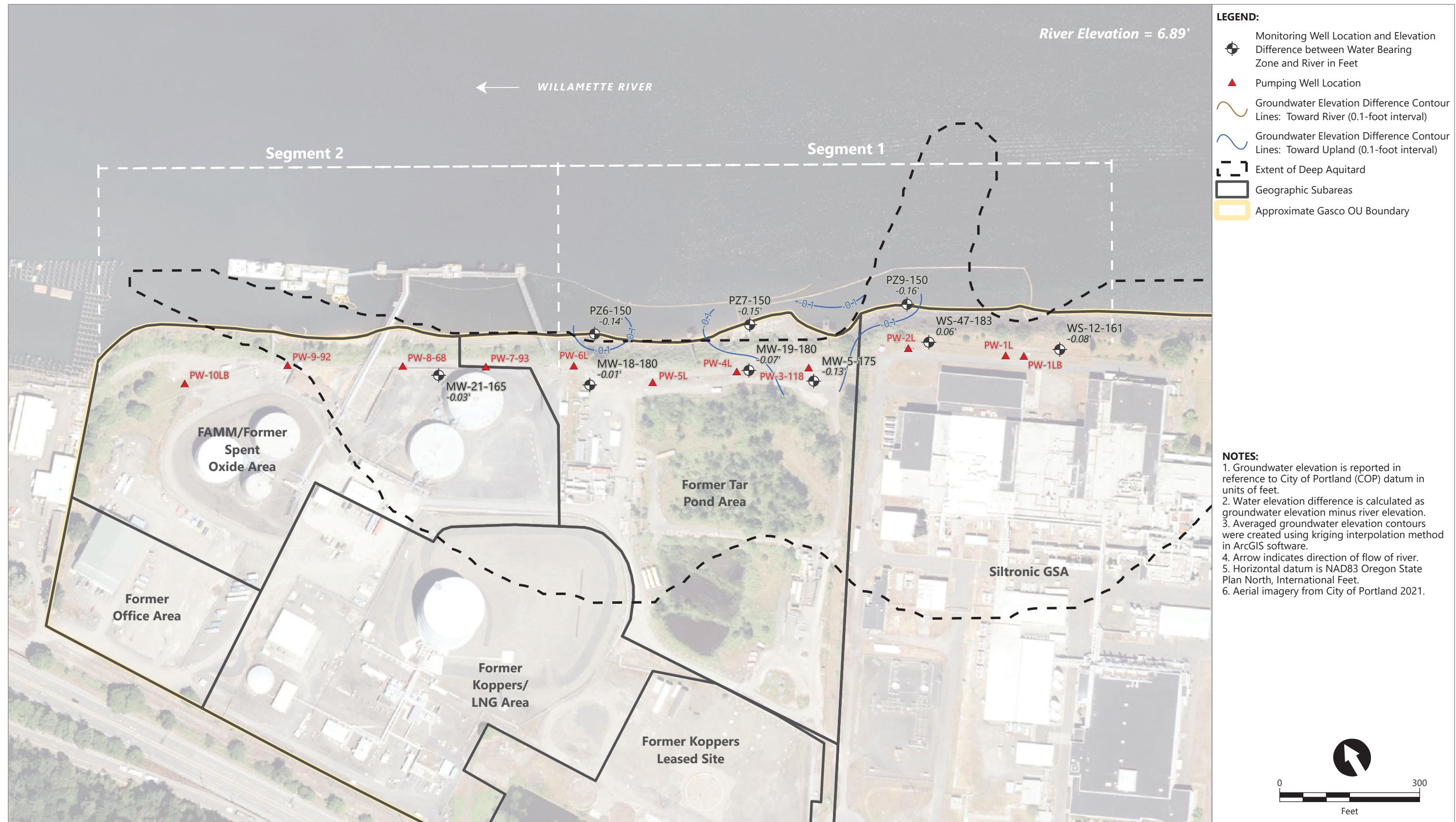
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Contours of Water Elevation Difference Between Deep Lower Alluvium WBZ and River Using Serfes 3-Day Rolling Averages From 5/11/2023-5/13/2023



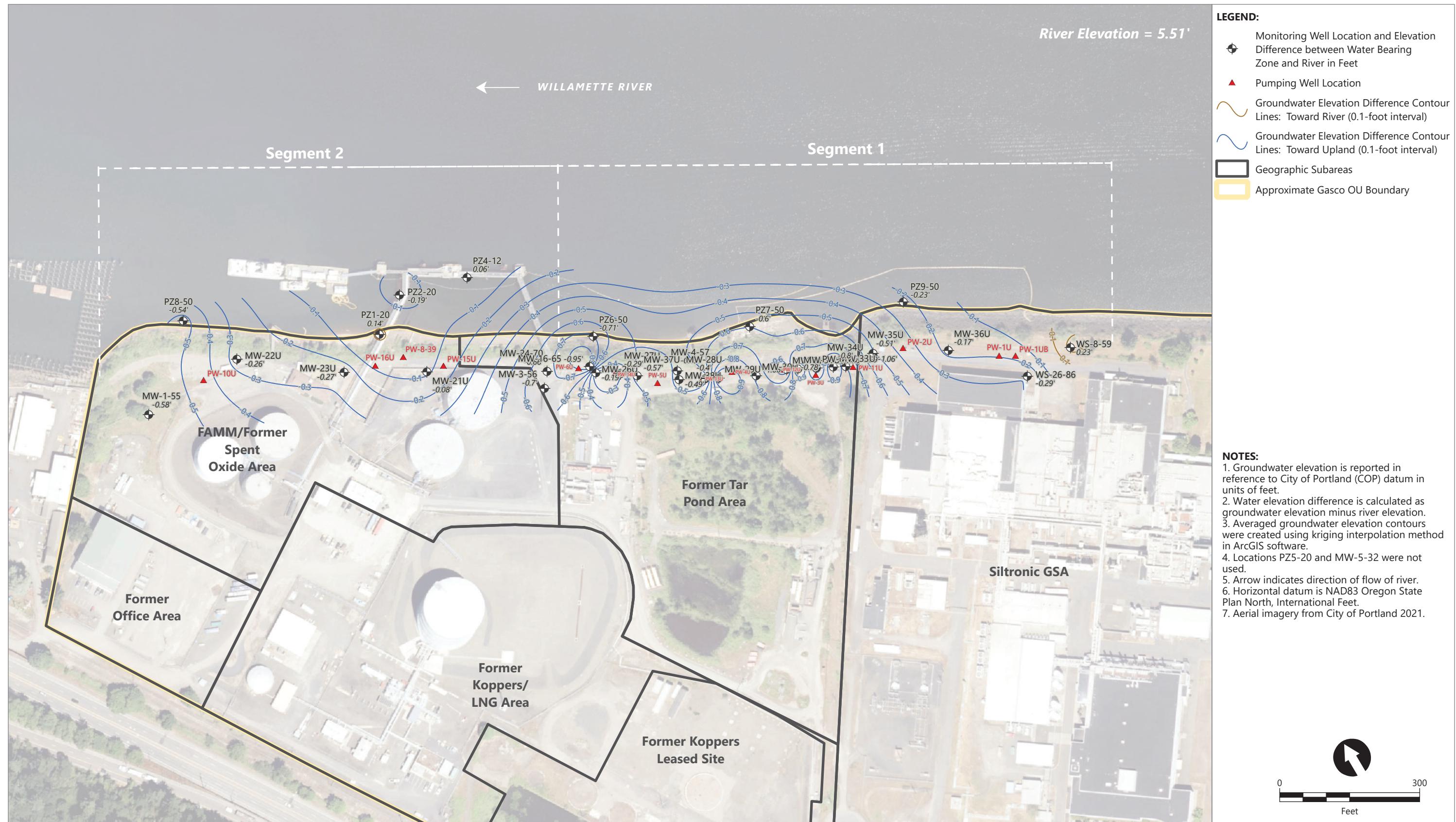
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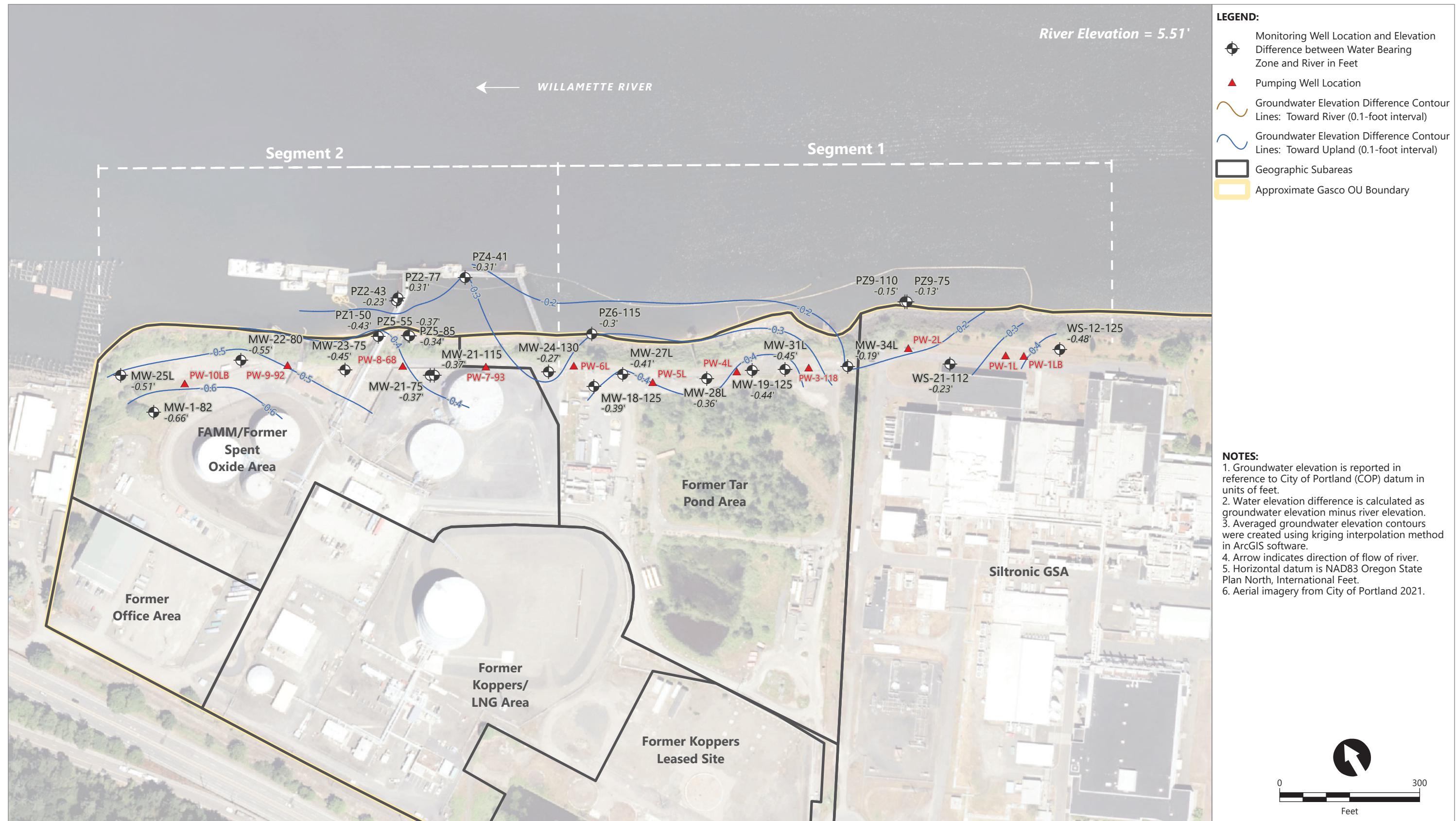
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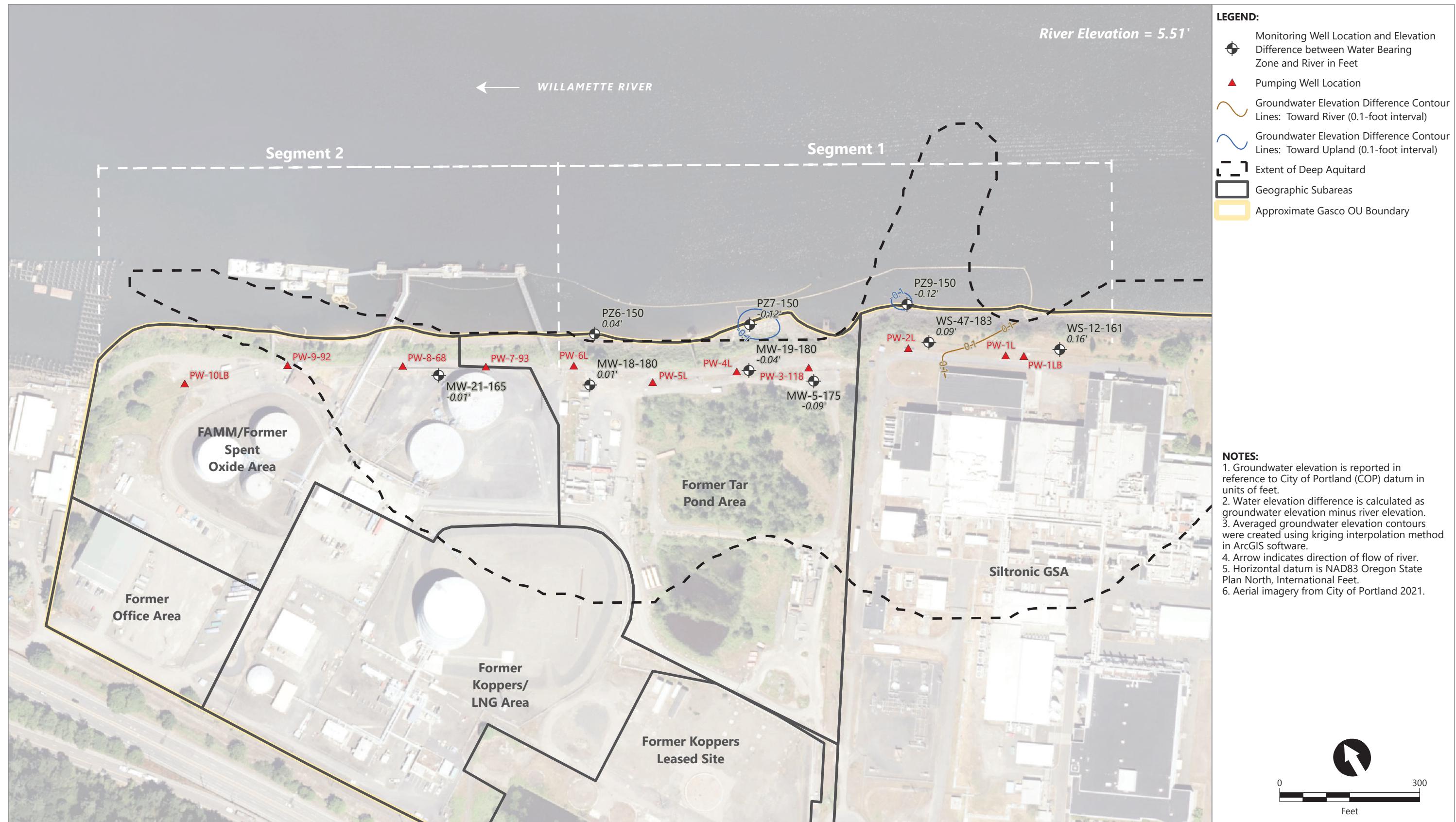


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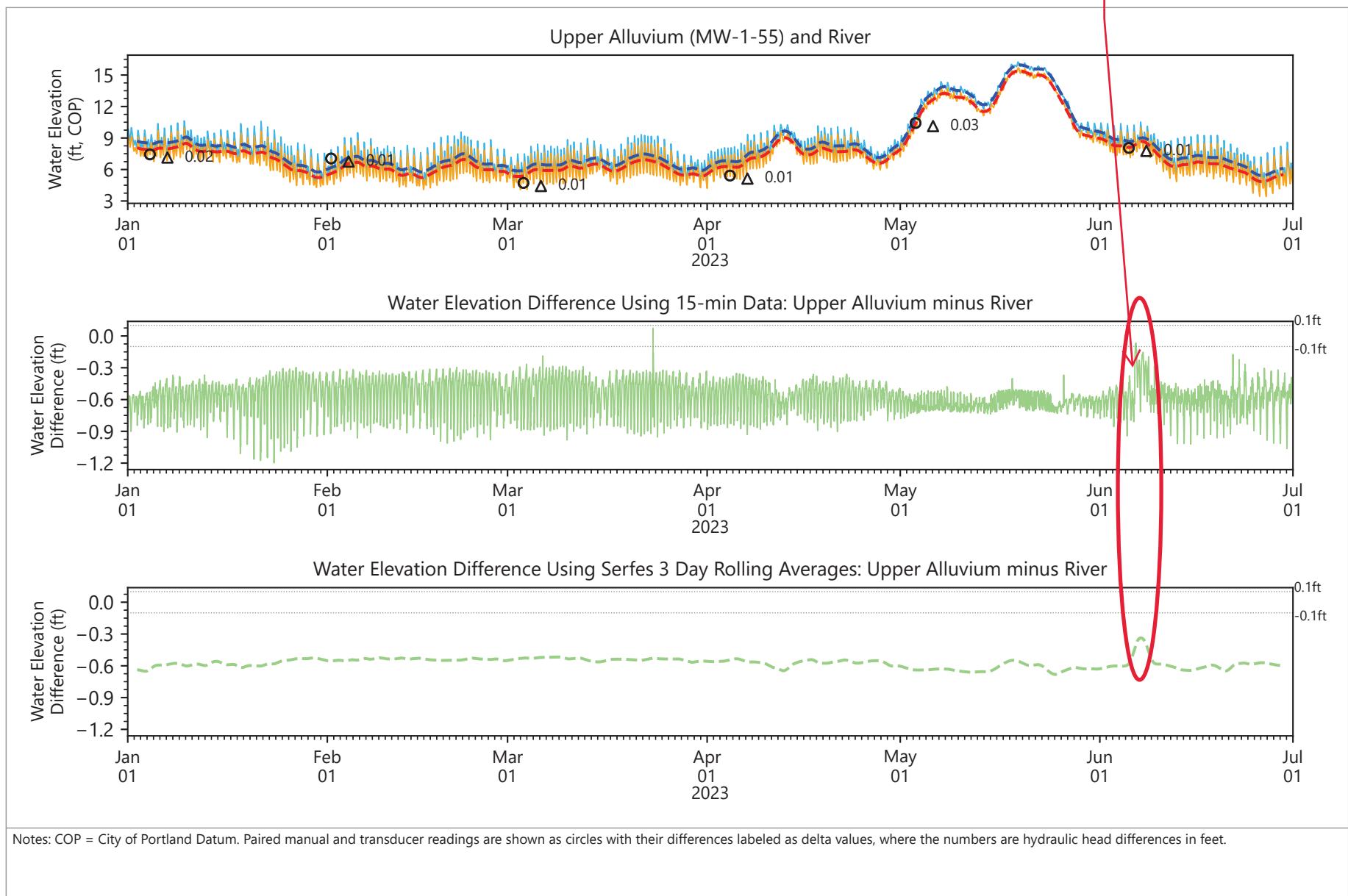
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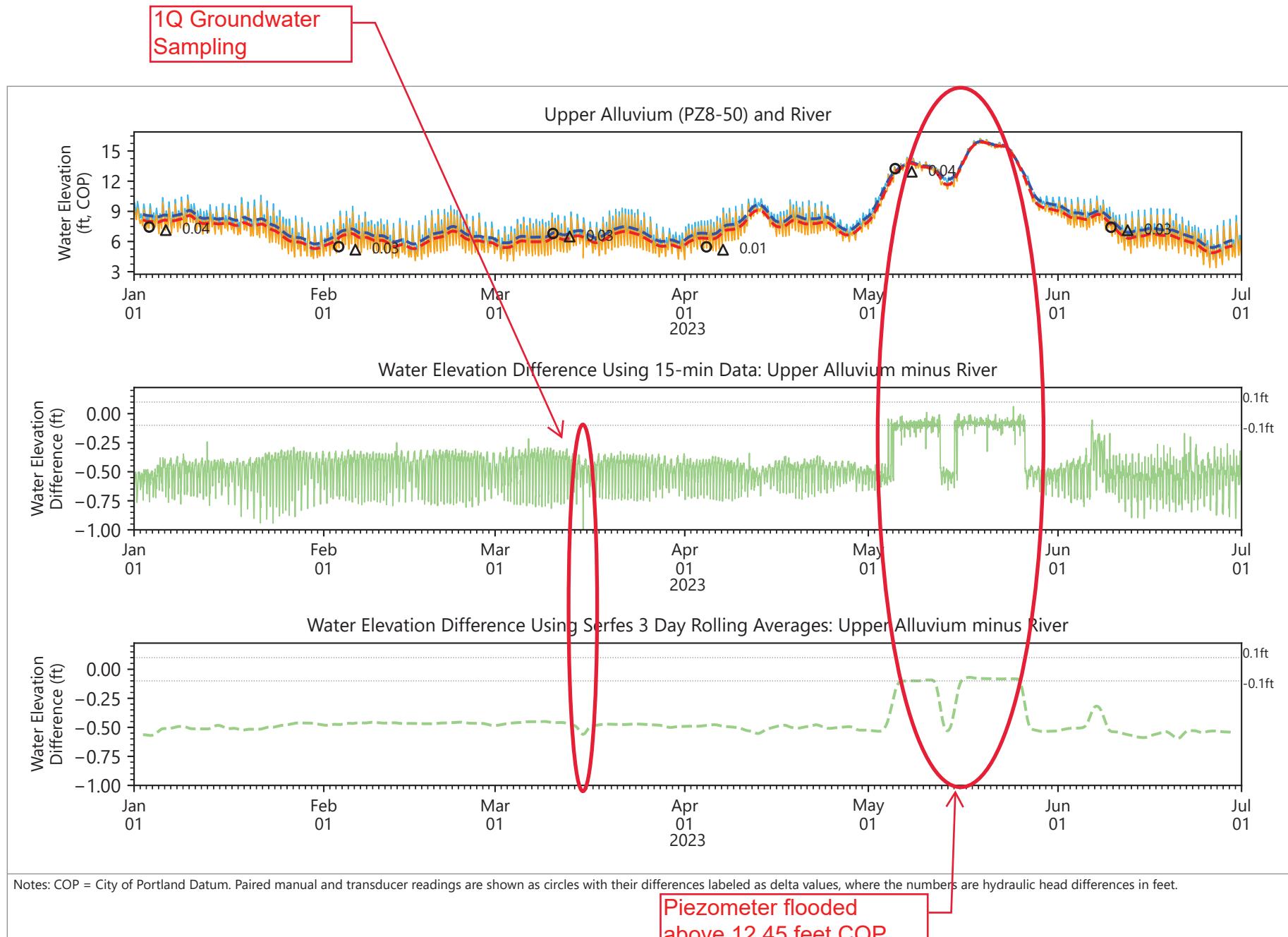


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- | | |
|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.1
Groundwater Elevation Differences
NW Natural Gasco Site

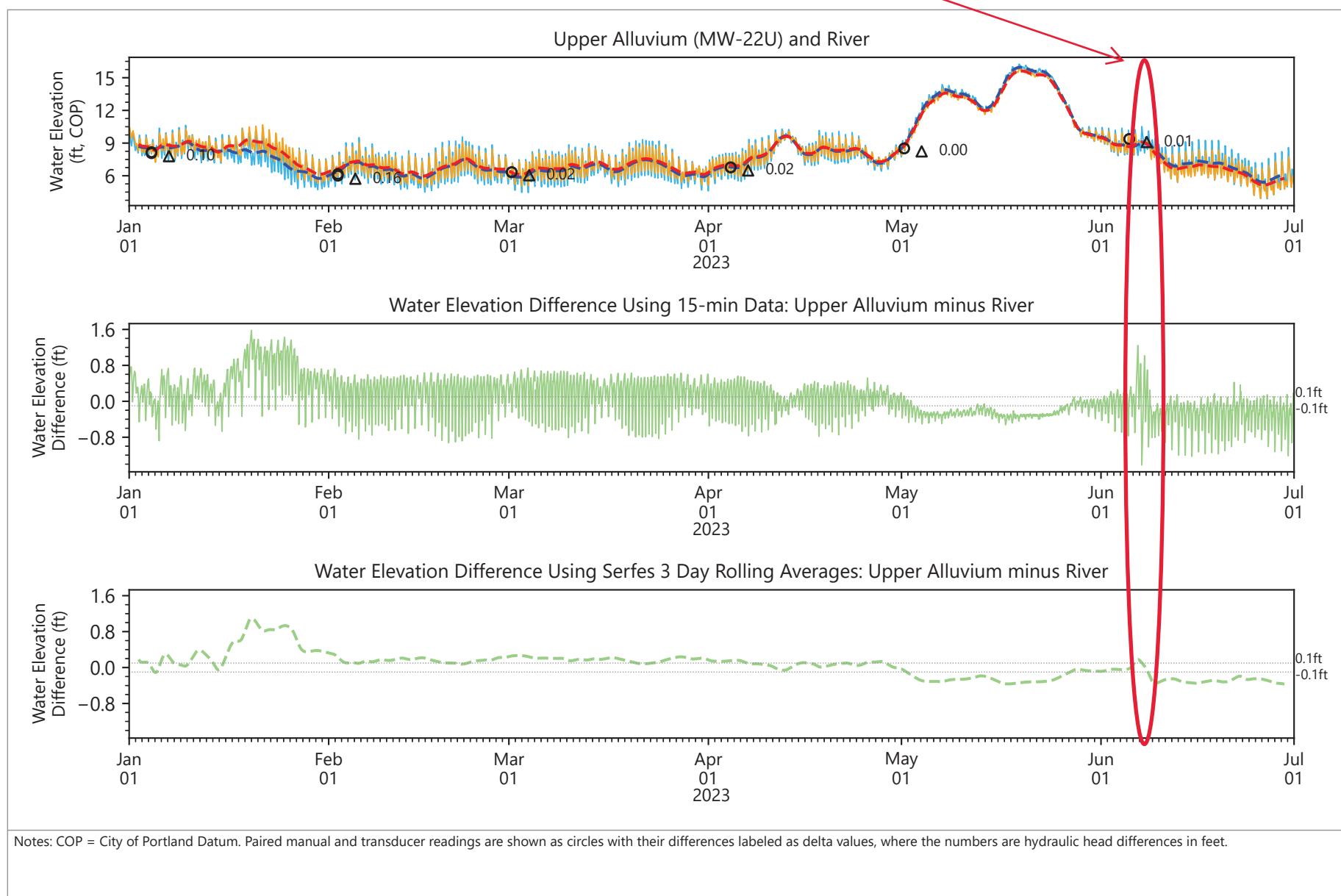


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| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.2
Groundwater Elevation Differences
 NW Natural Gasco Site

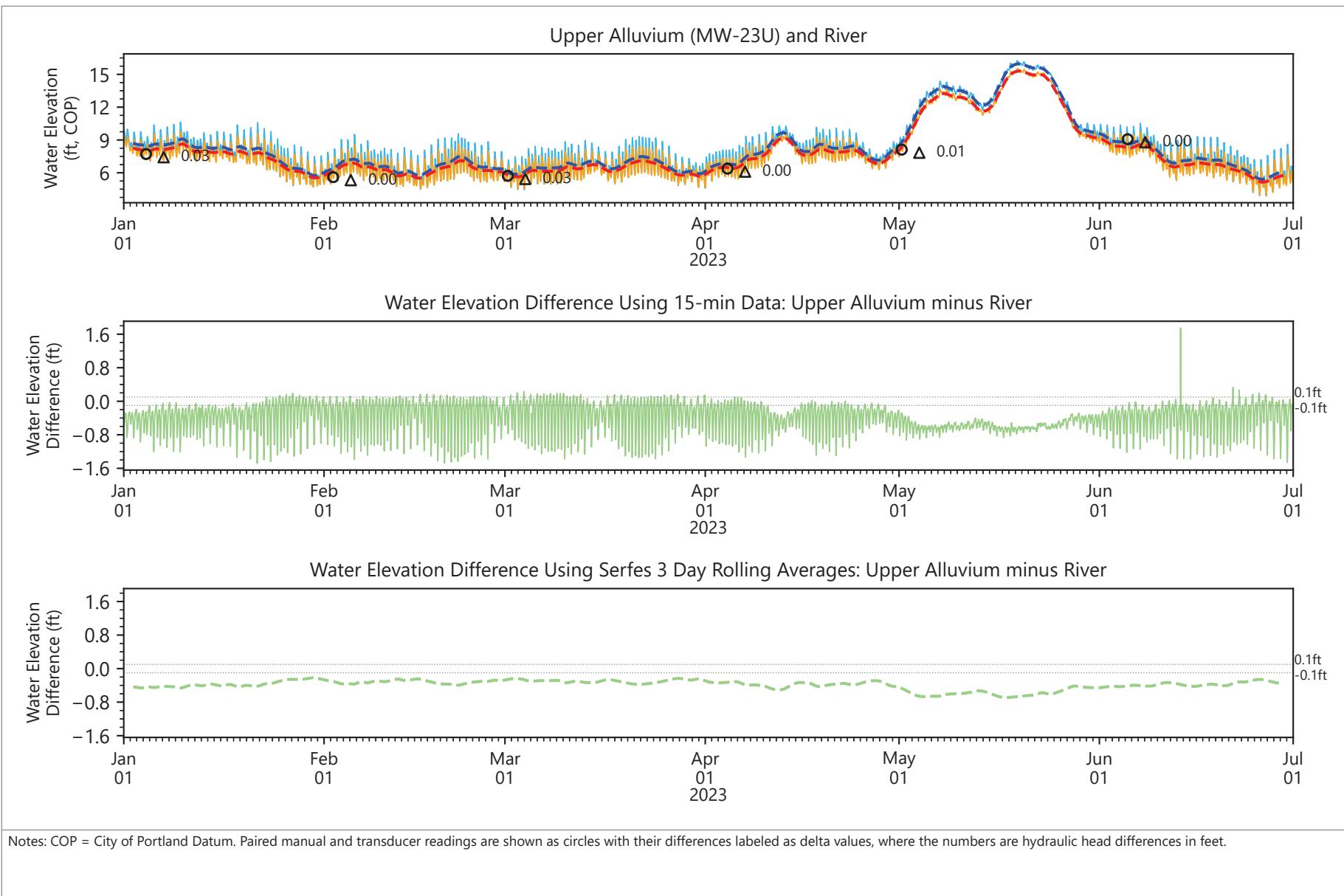


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| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
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Figure 4.3
Groundwater Elevation Differences
 NW Natural Gasco Site

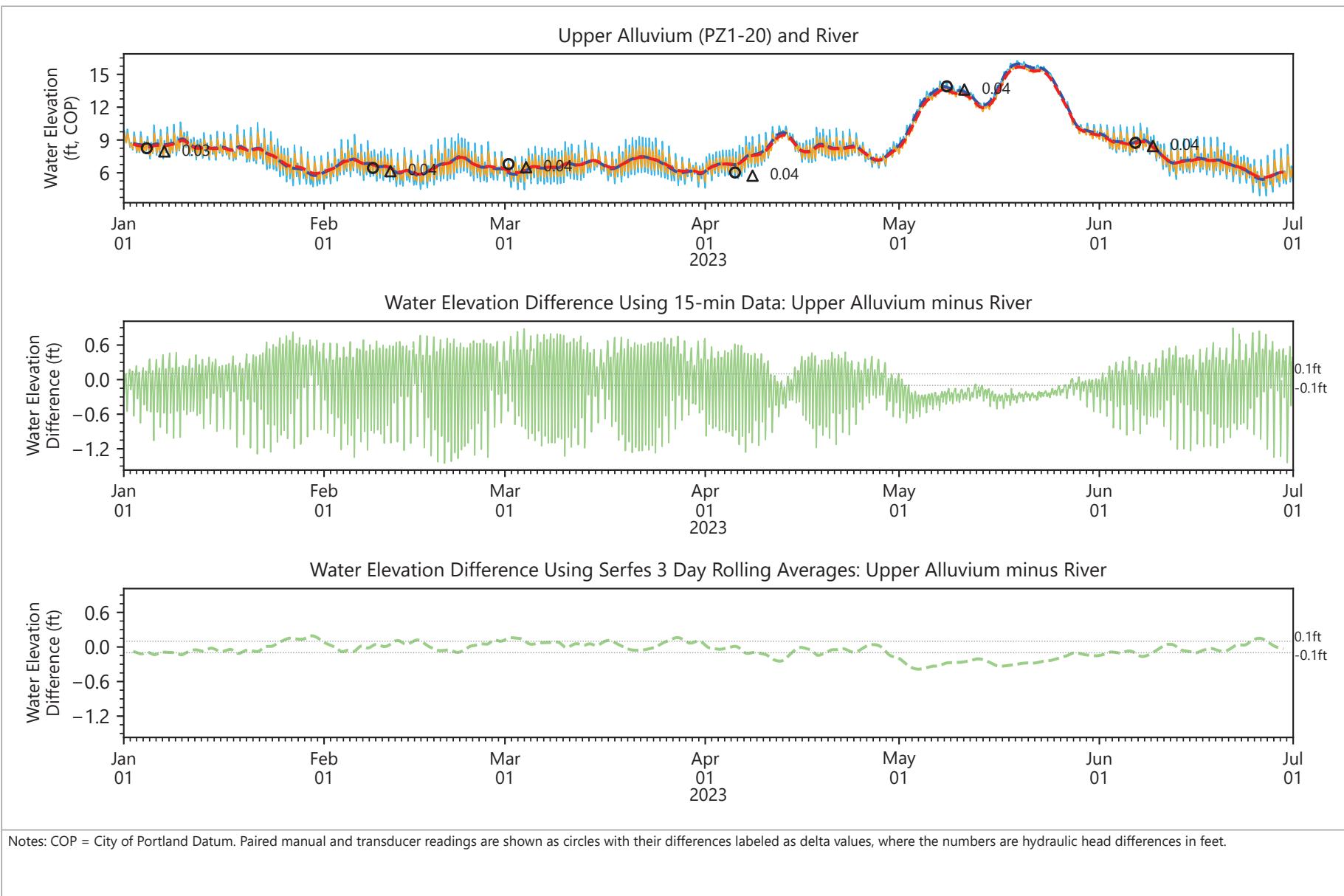


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.4
Groundwater Elevation Differences
 NW Natural Gasco Site

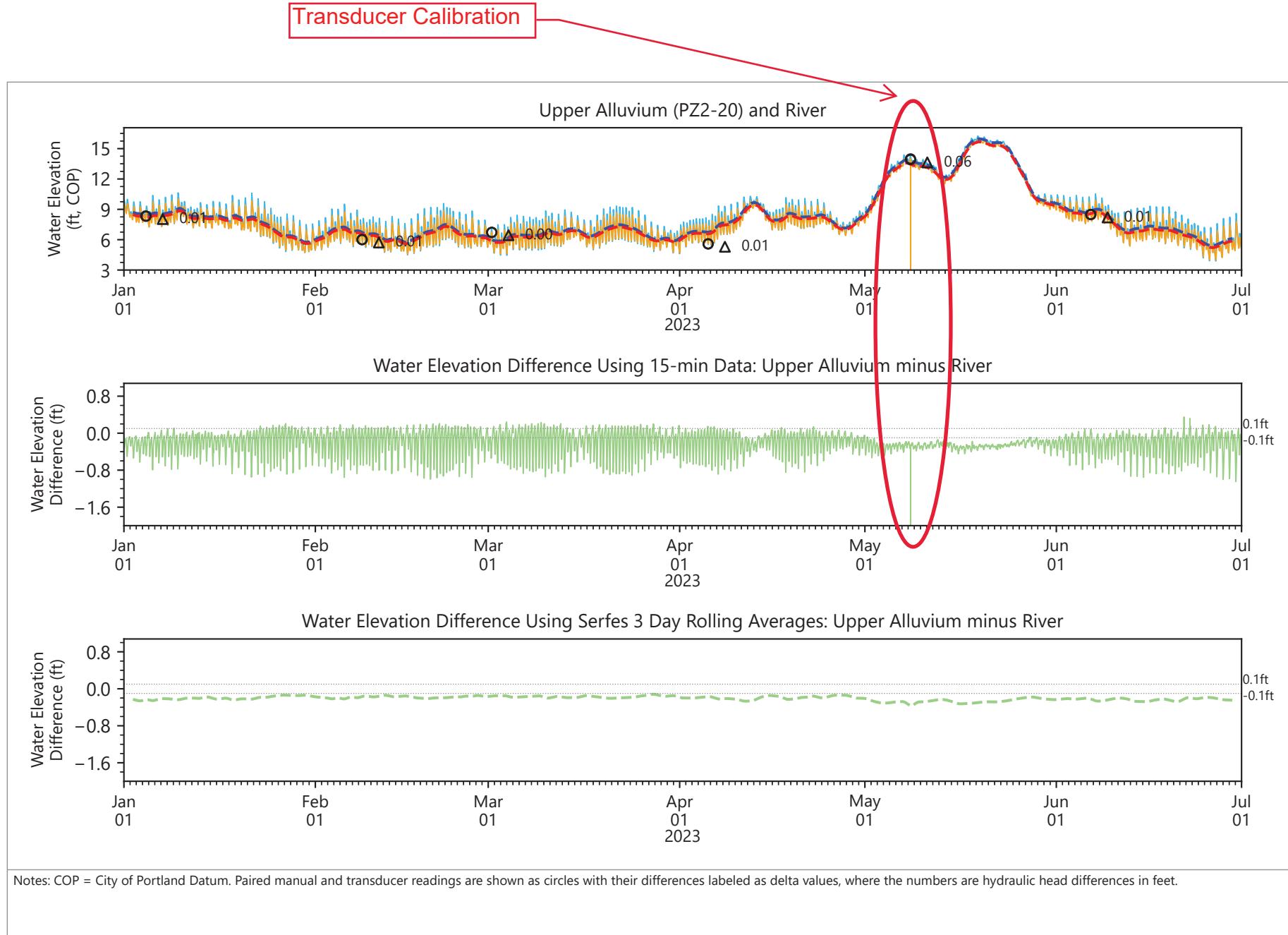


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.5
Groundwater Elevation Differences
 NW Natural Gasco Site



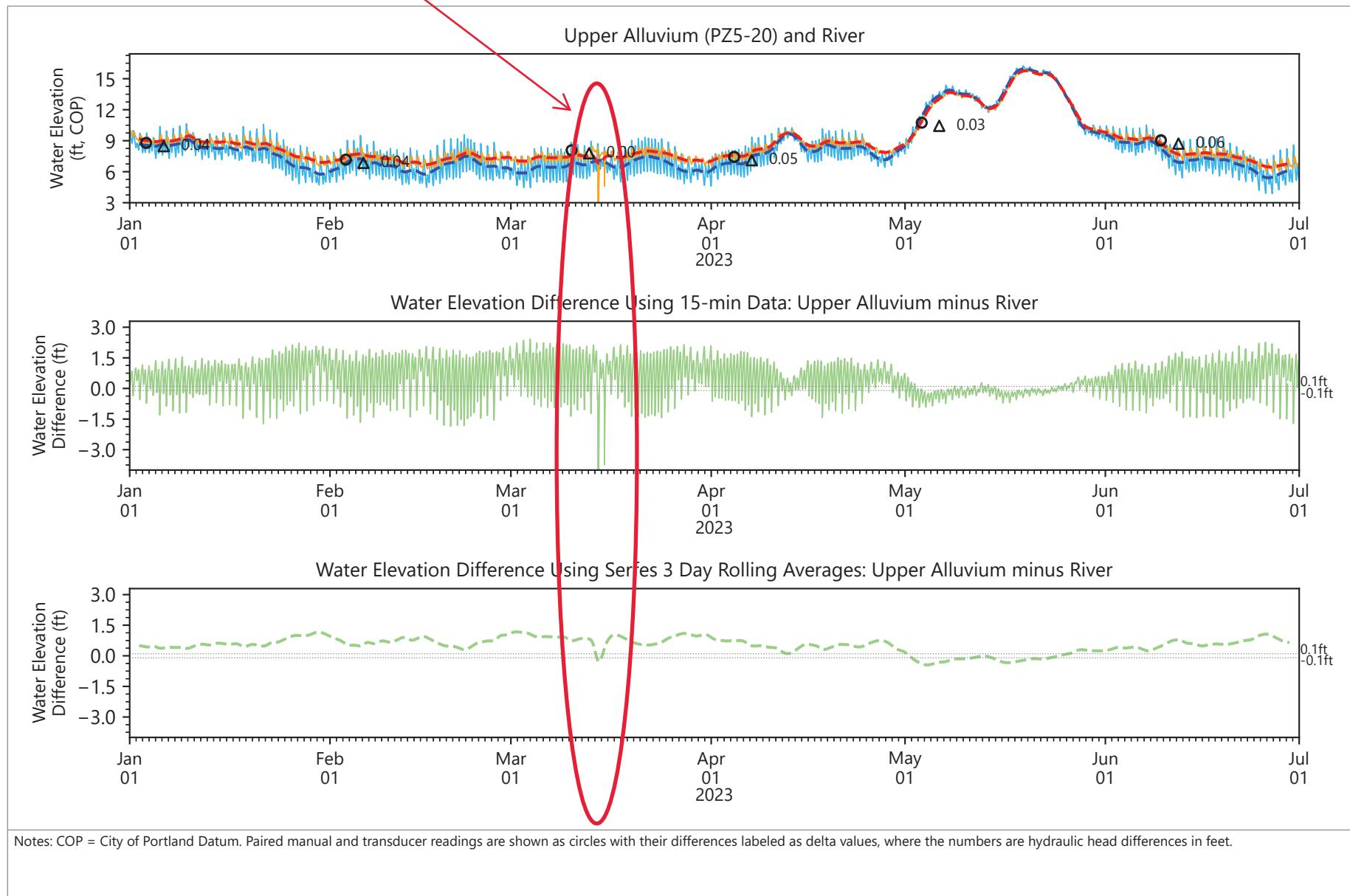
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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.6
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

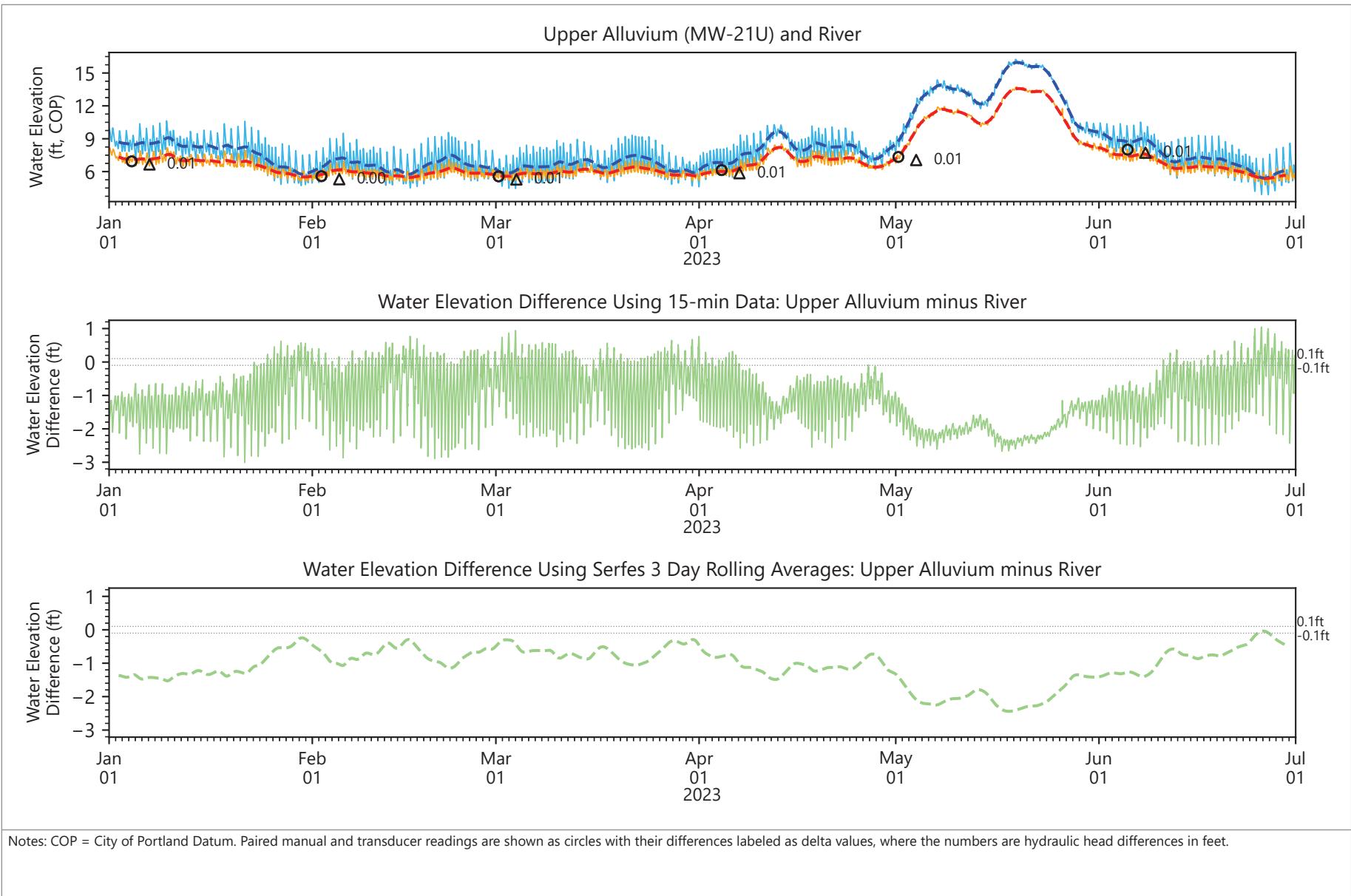


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.7
Groundwater Elevation Differences
 NW Natural Gasco Site

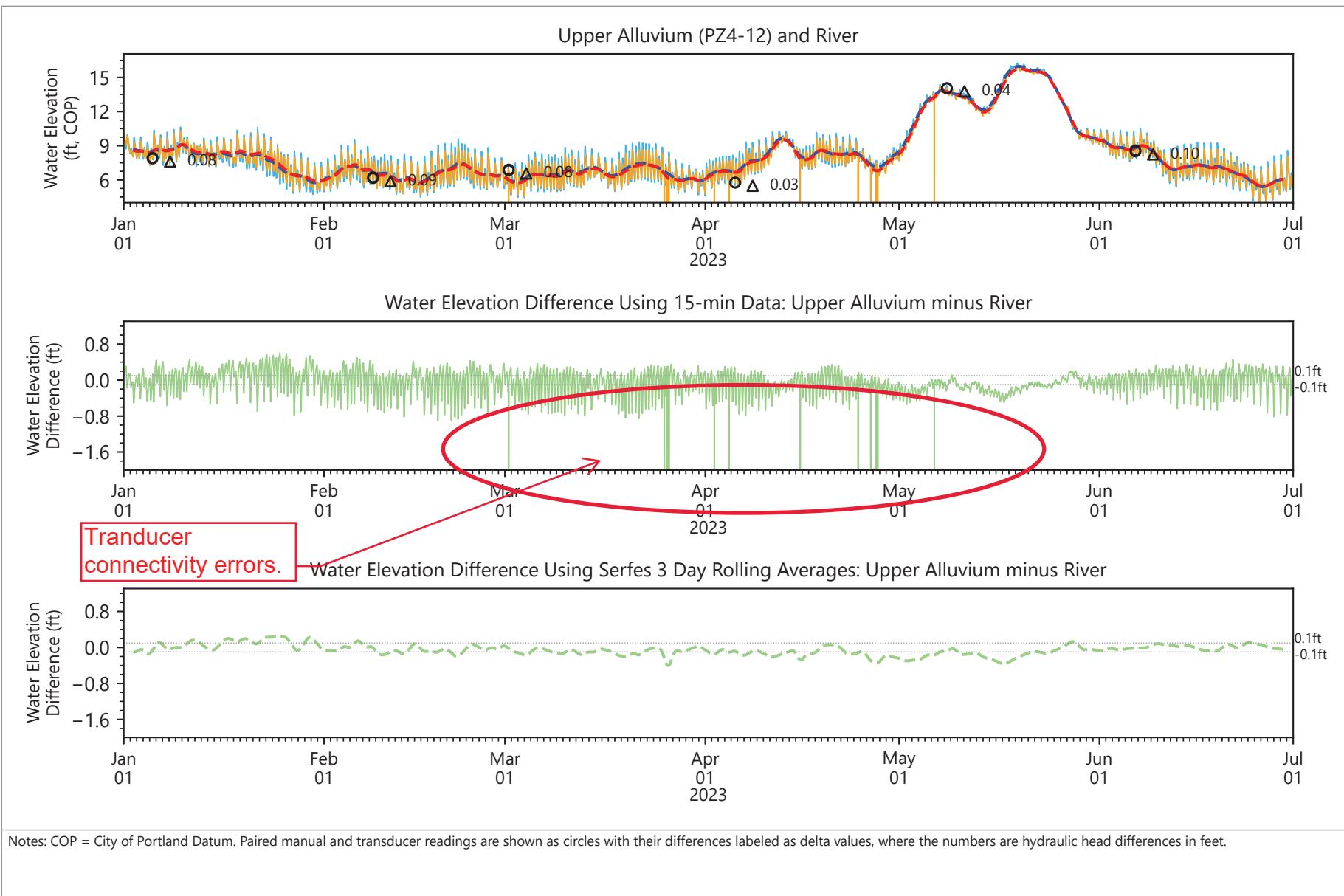


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.8
Groundwater Elevation Differences
 NW Natural Gasco Site

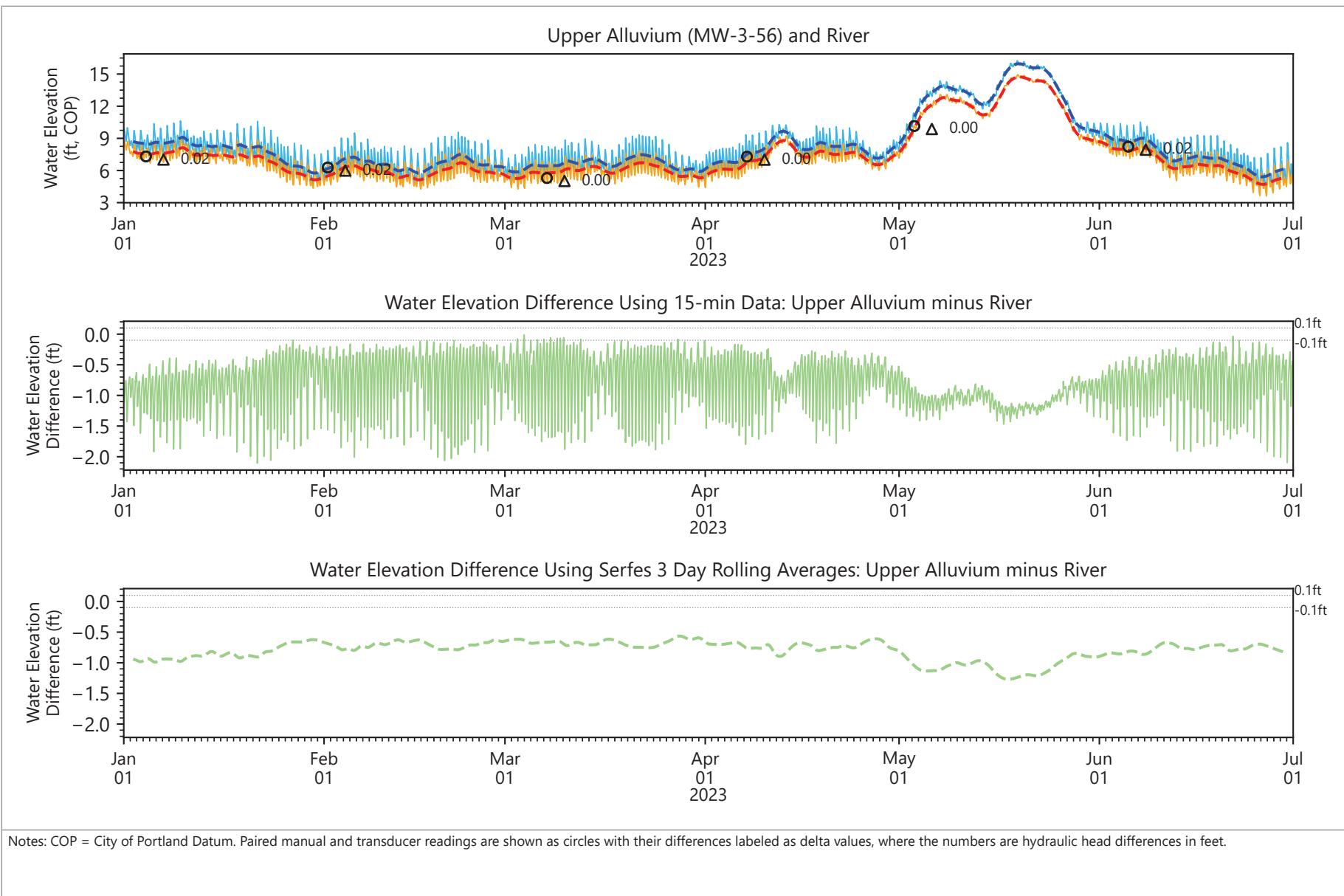


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.9
Groundwater Elevation Differences
 NW Natural Gasco Site

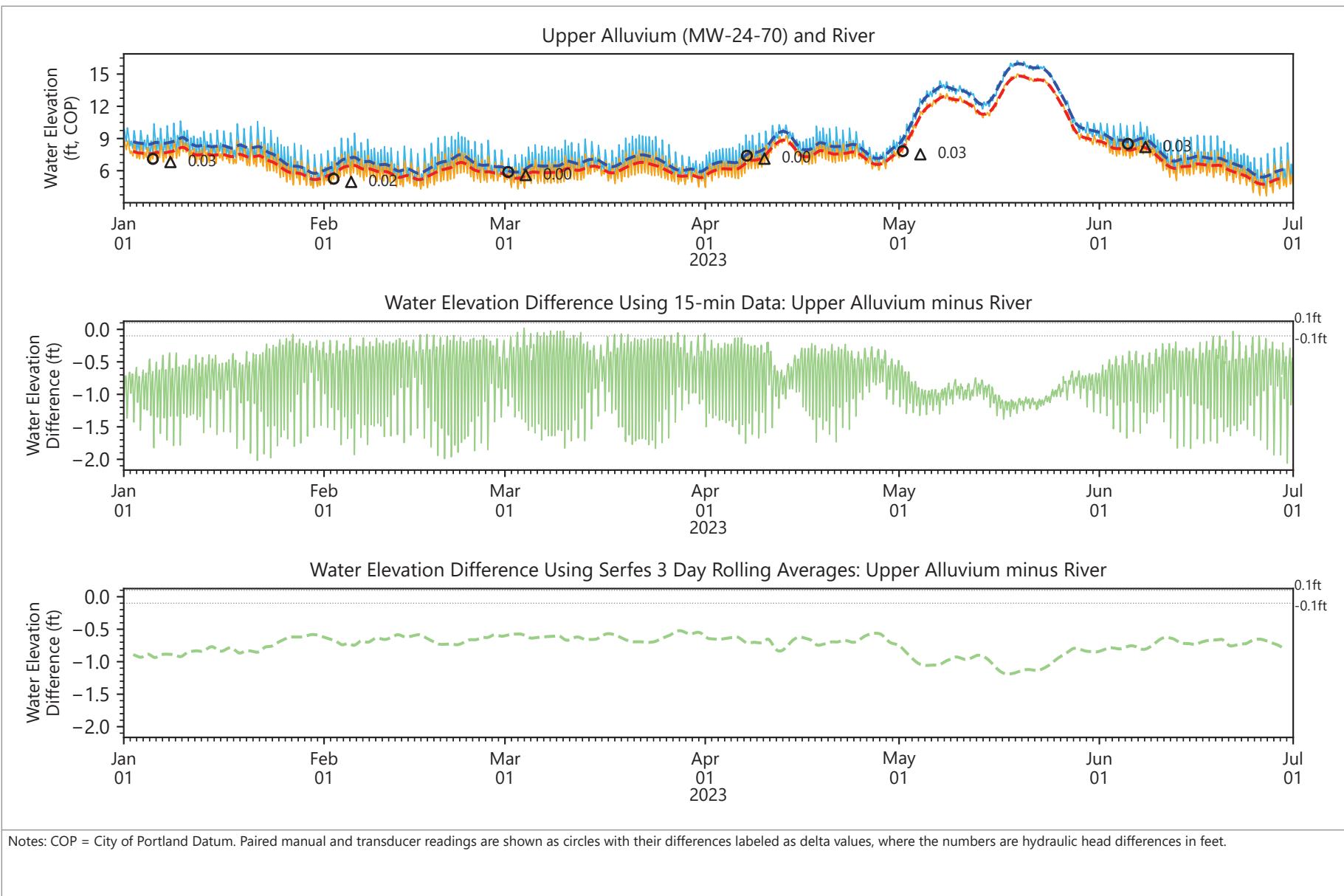


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.10
Groundwater Elevation Differences
 NW Natural Gasco Site

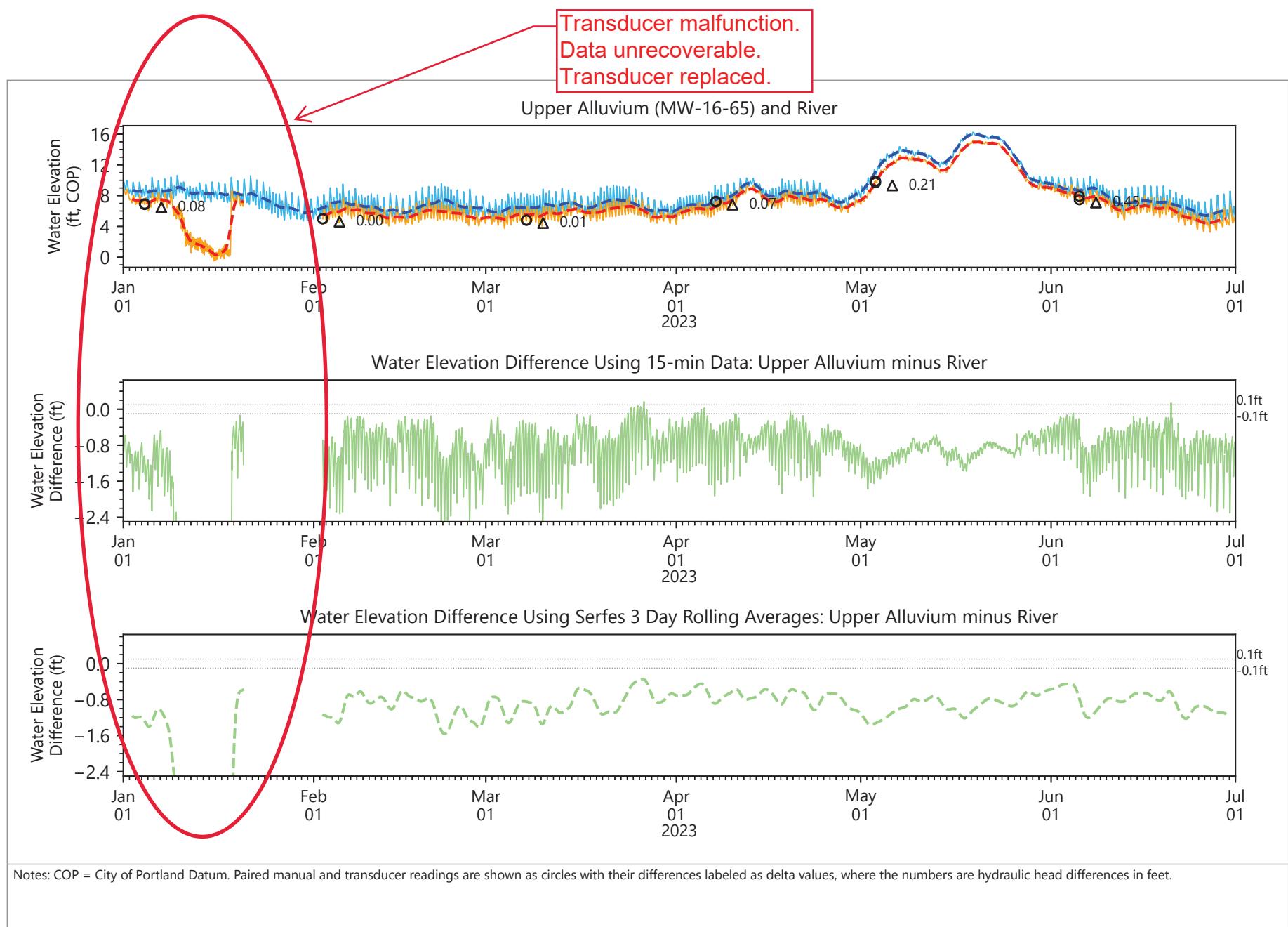


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.11
Groundwater Elevation Differences
 NW Natural Gasco Site



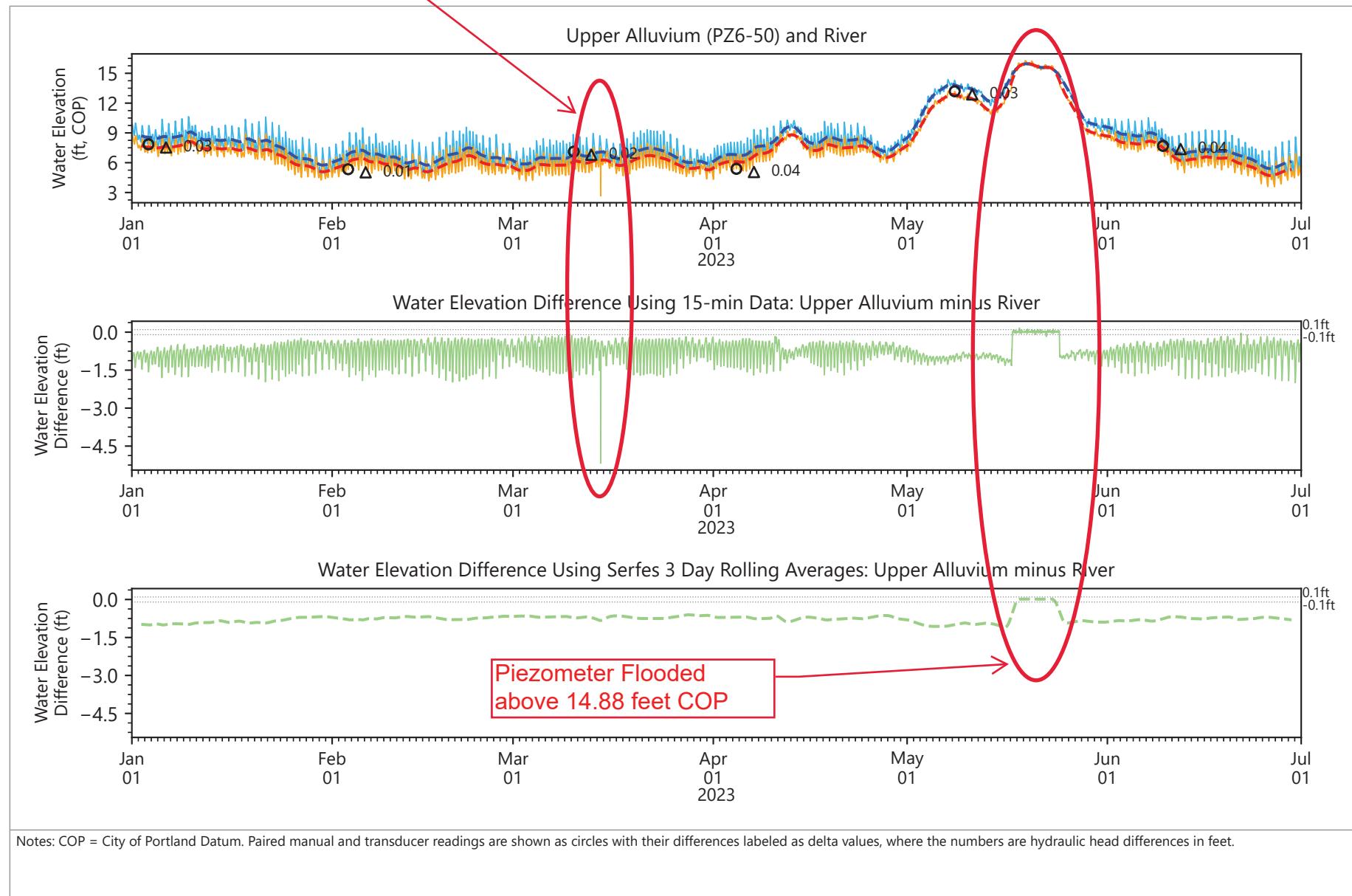
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|---------------------------------------|---|
| — Upper Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Upper Alluvium: Serfes Averages | - - - Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.12
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

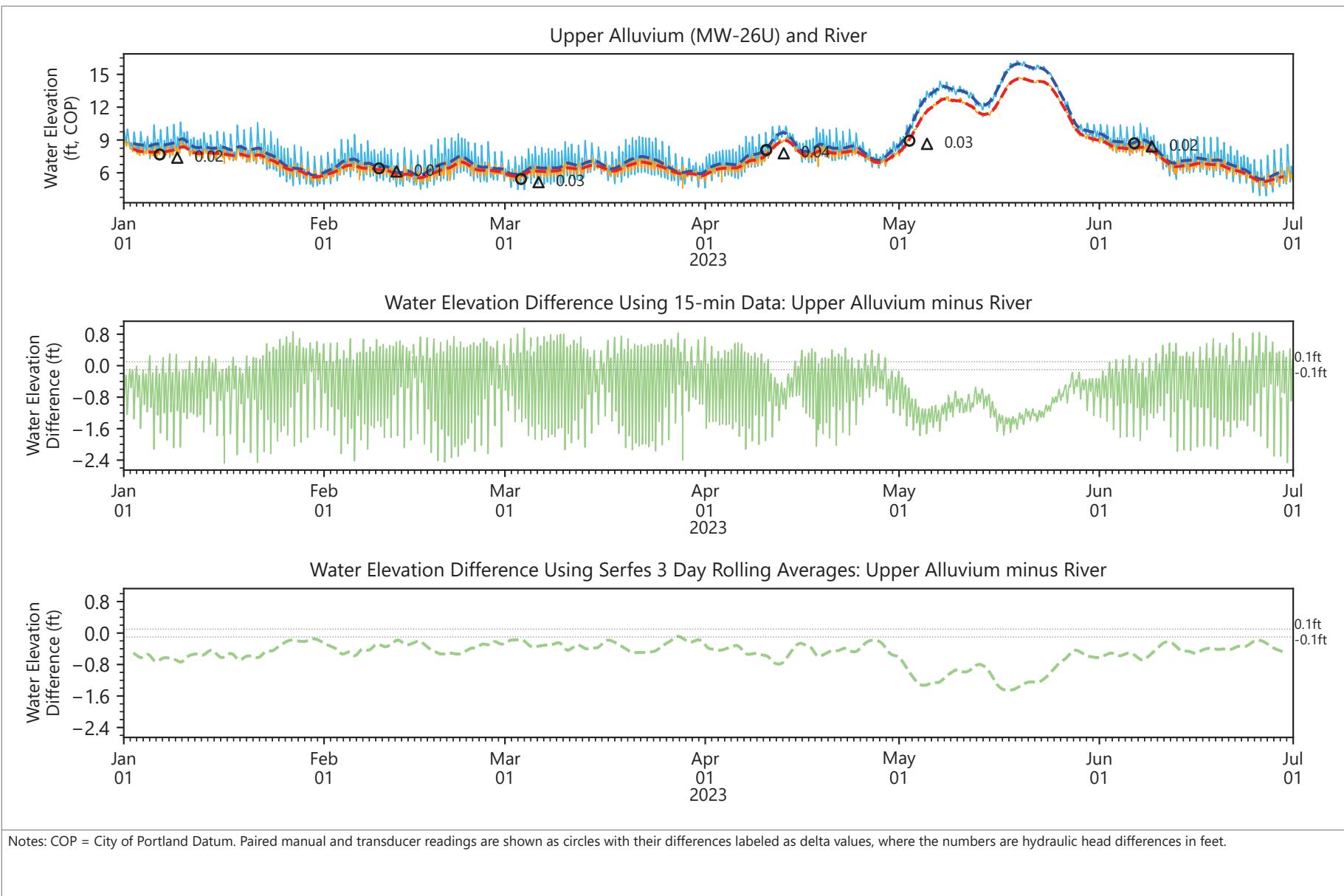


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.13
Groundwater Elevation Differences
 NW Natural Gasco Site

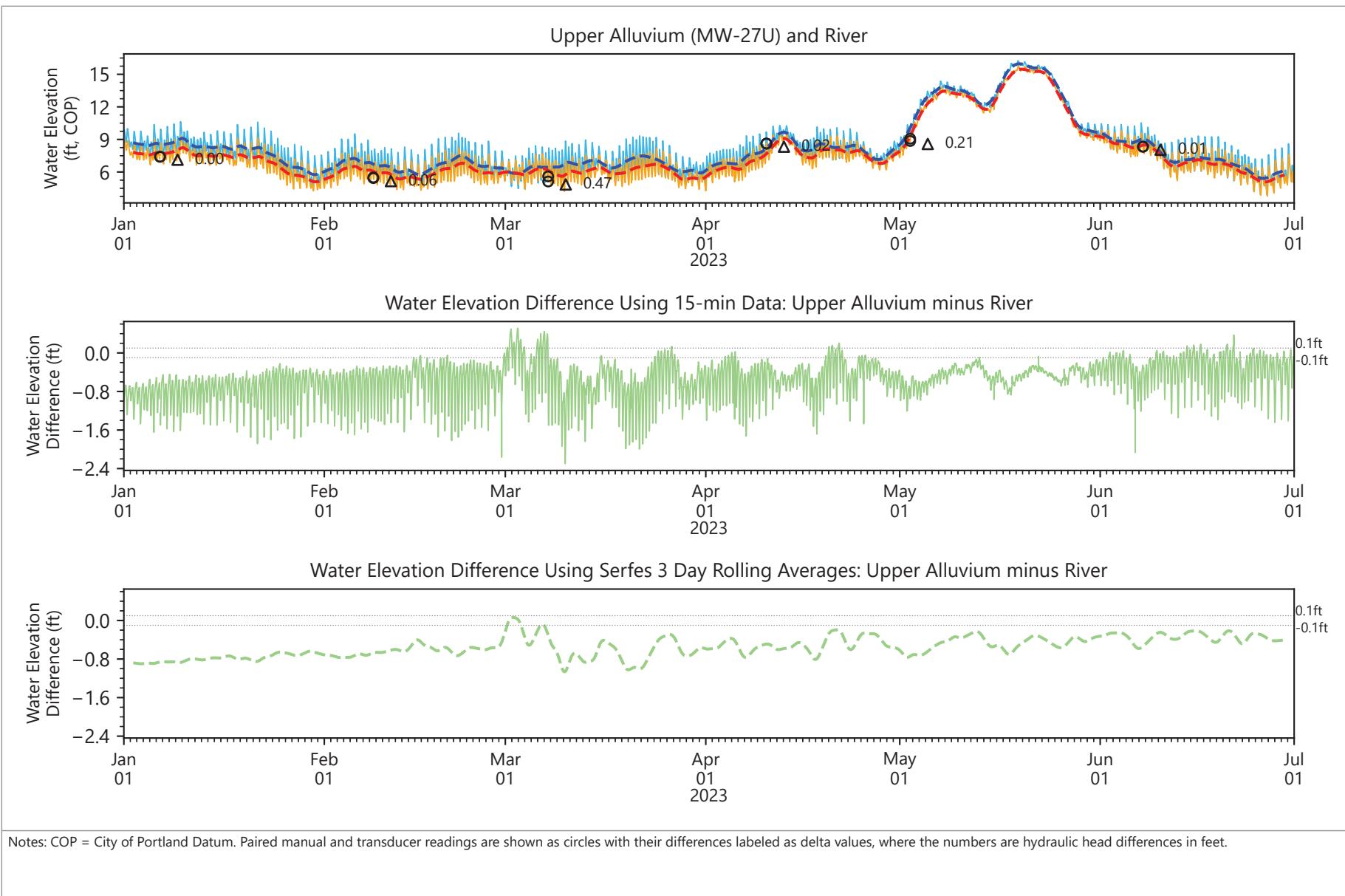


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.14
Groundwater Elevation Differences
 NW Natural Gasco Site

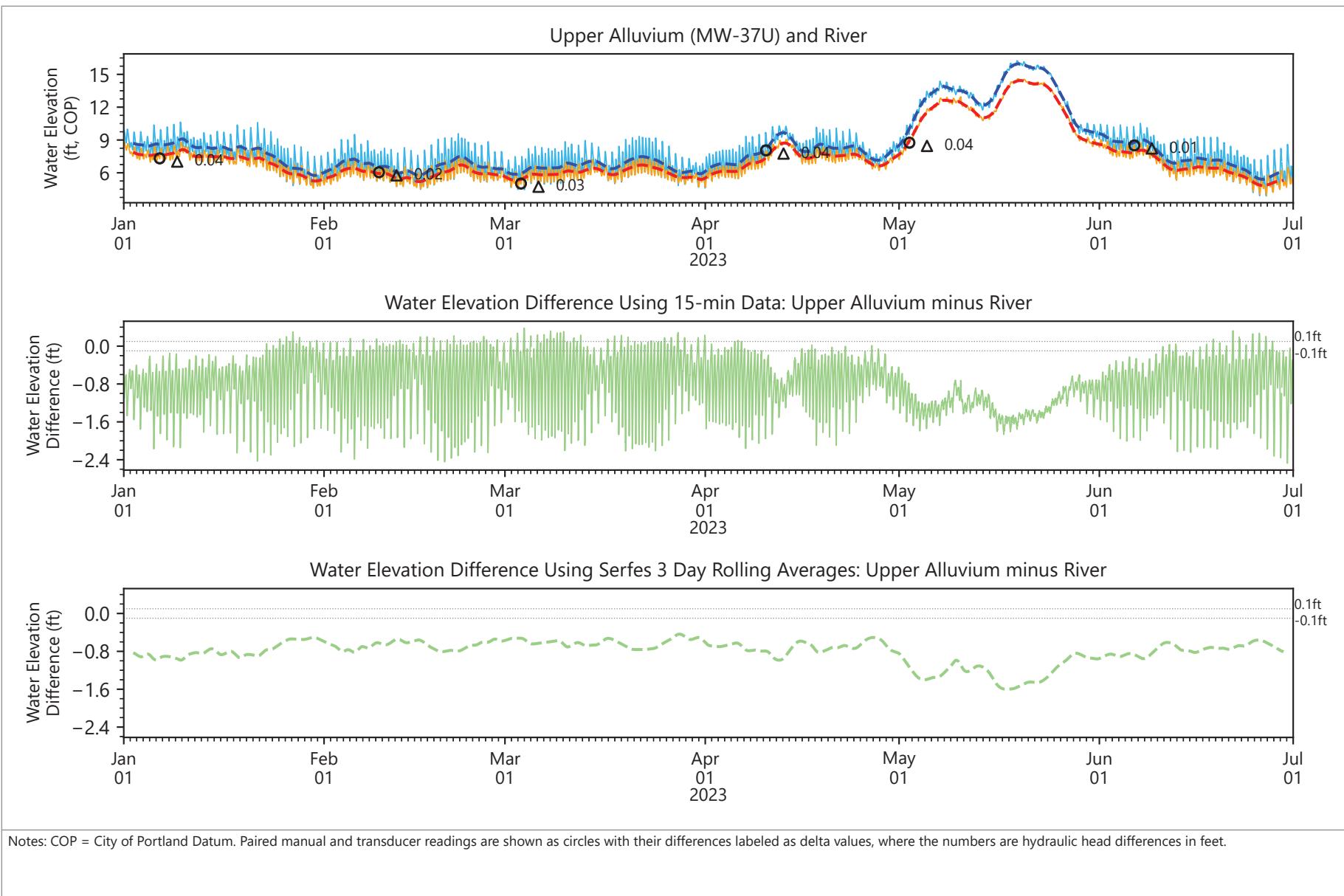


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.15
Groundwater Elevation Differences
 NW Natural Gasco Site

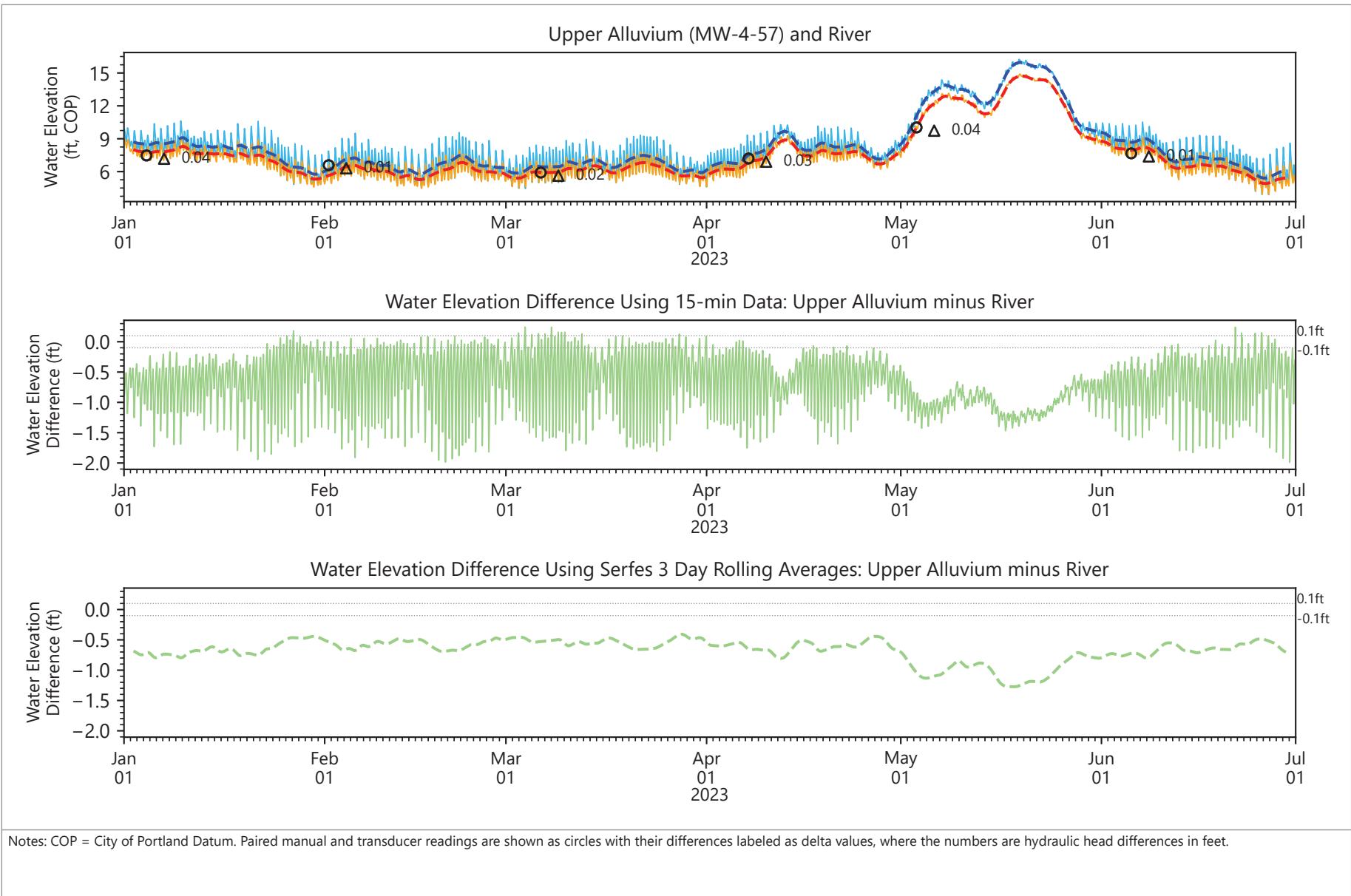


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.16
Groundwater Elevation Differences
 NW Natural Gasco Site

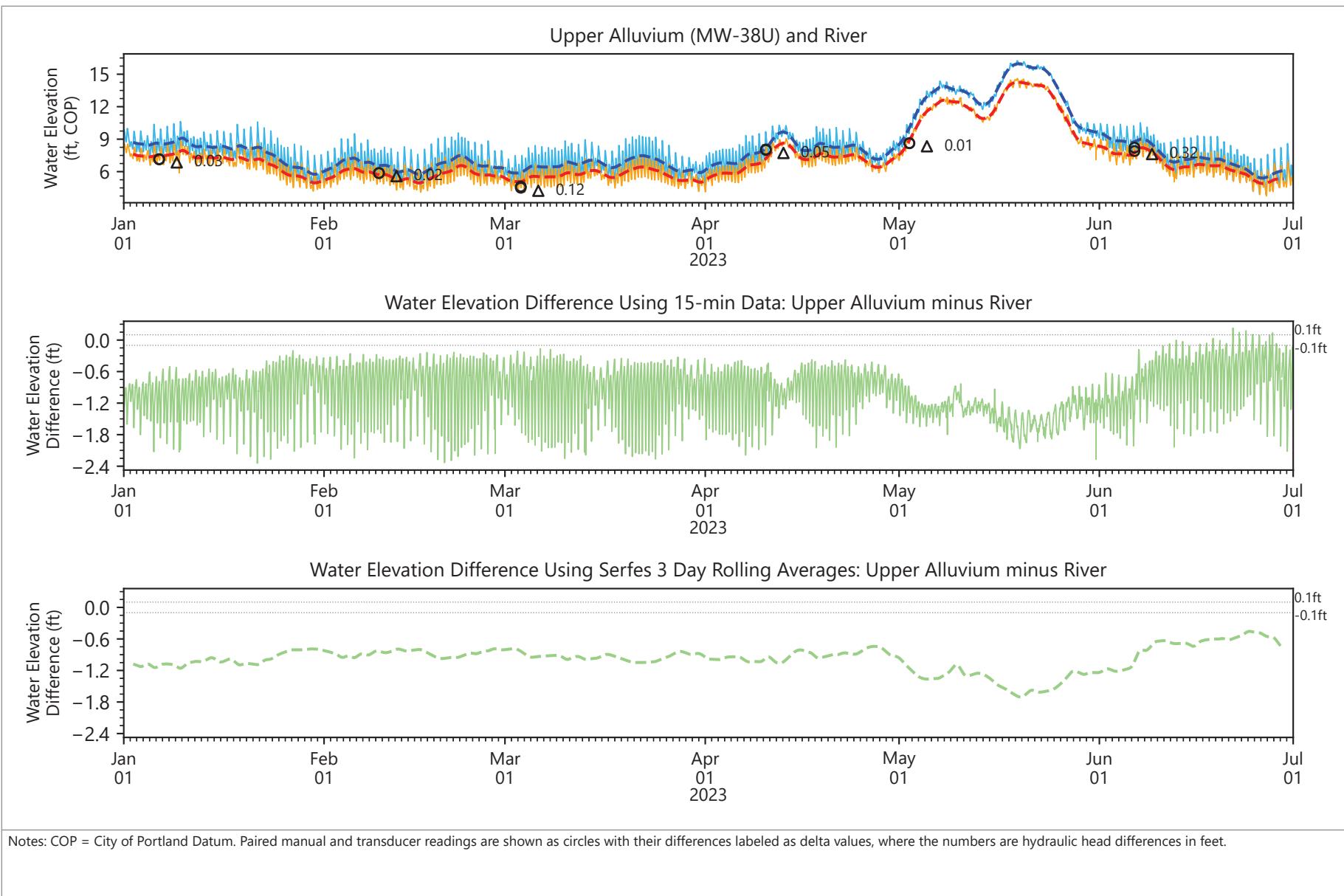


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.17
Groundwater Elevation Differences
 NW Natural Gasco Site

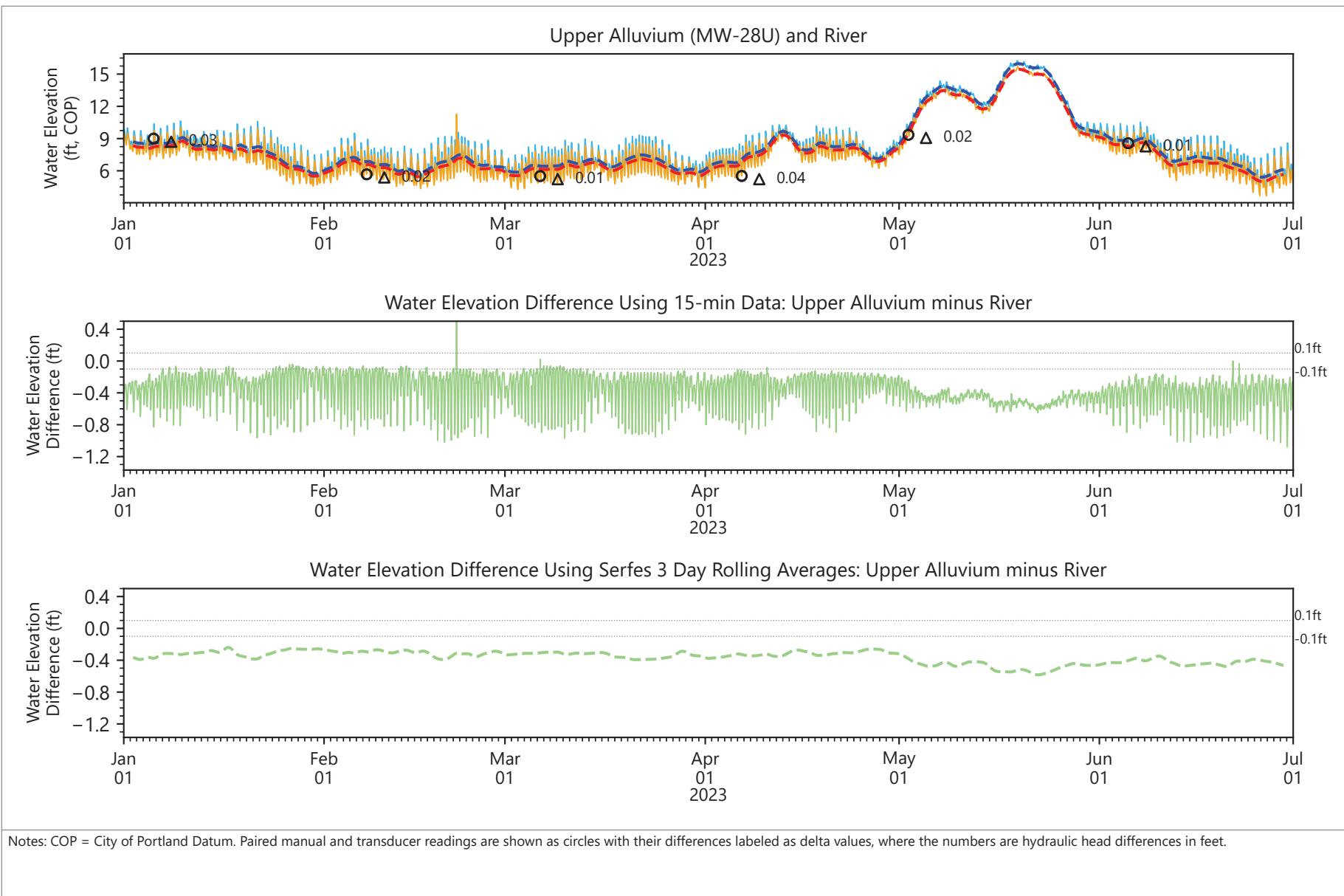


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.18
Groundwater Elevation Differences
 NW Natural Gasco Site

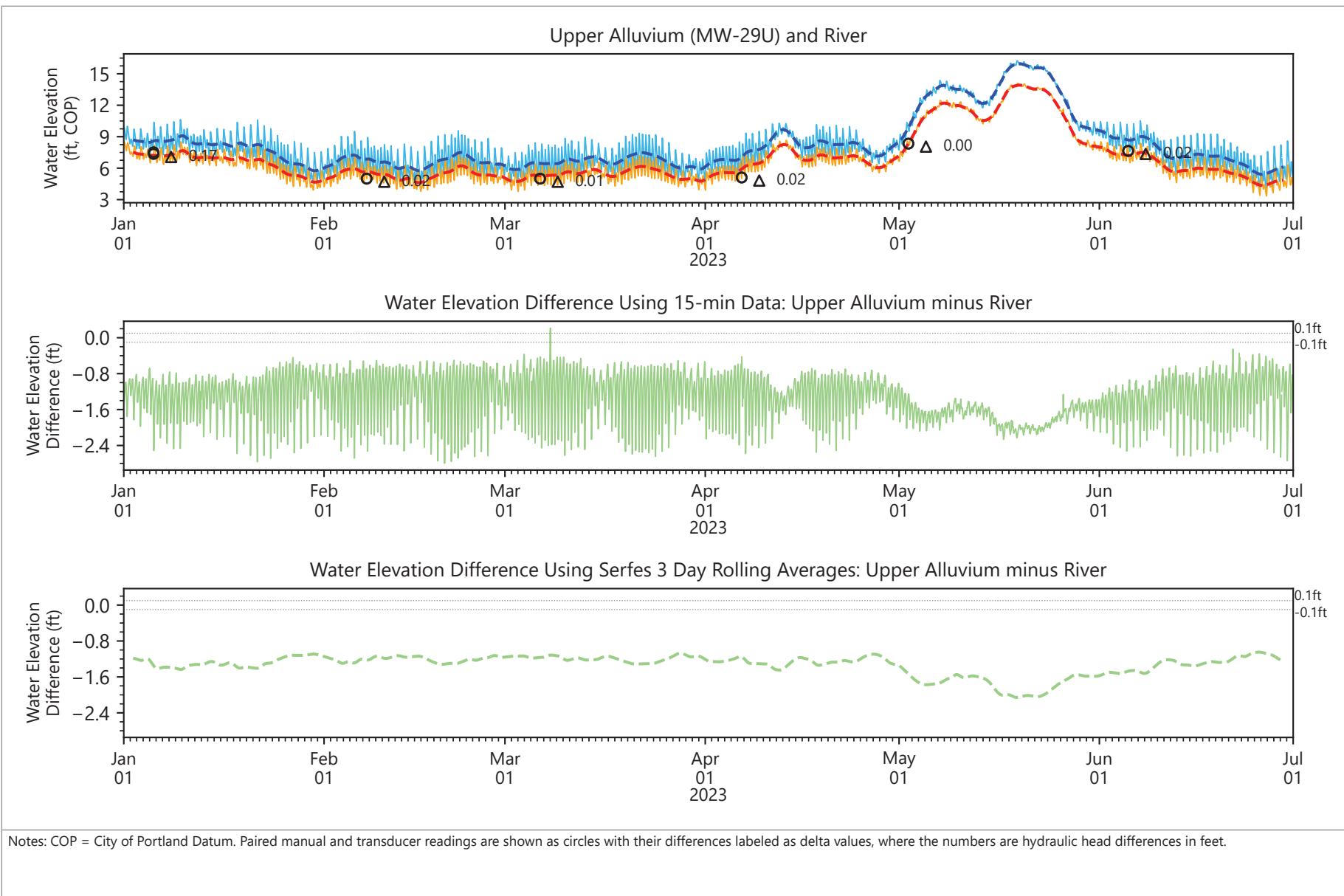


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.19
Groundwater Elevation Differences
 NW Natural Gasco Site

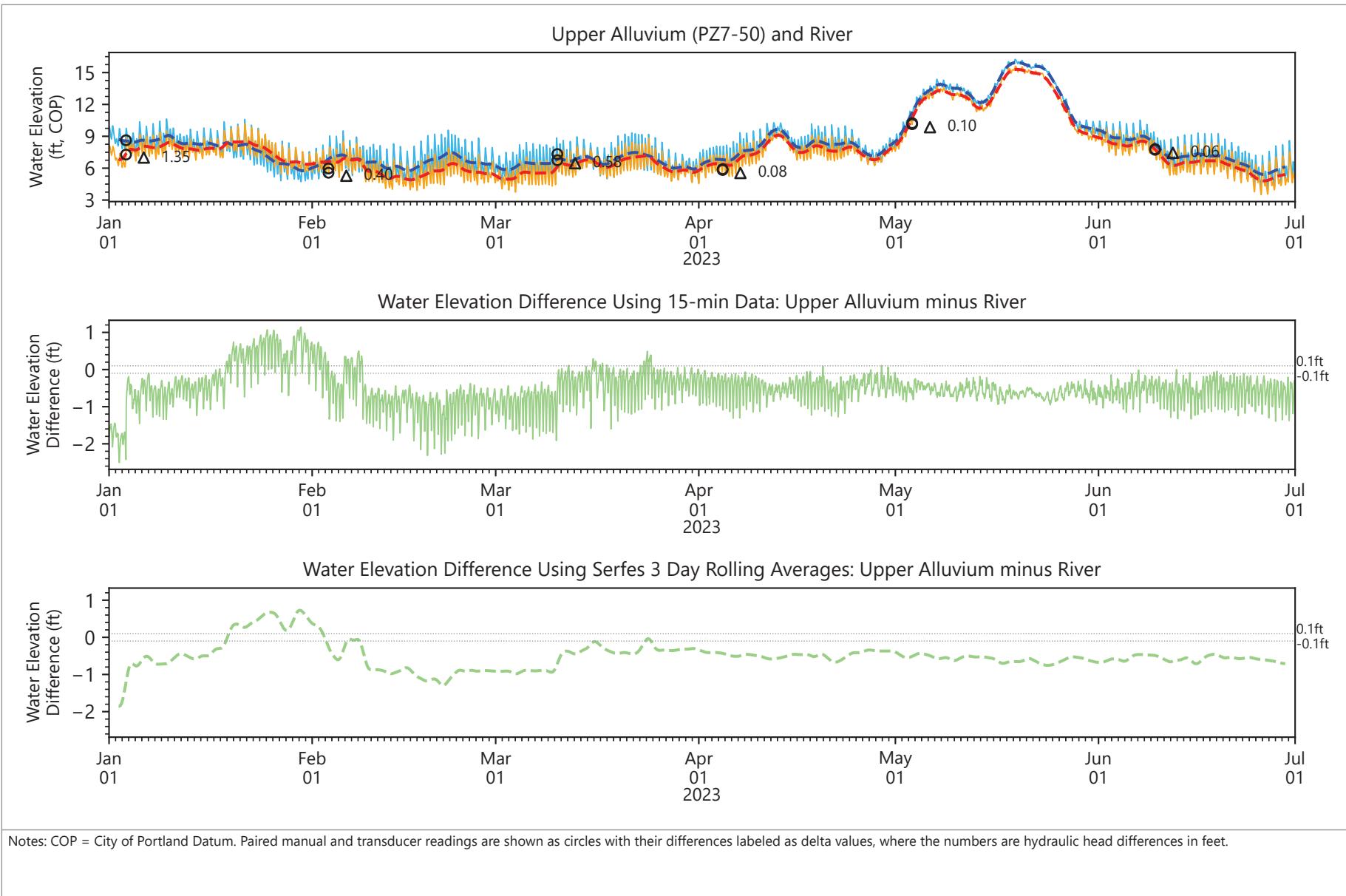


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.20
Groundwater Elevation Differences
 NW Natural Gasco Site

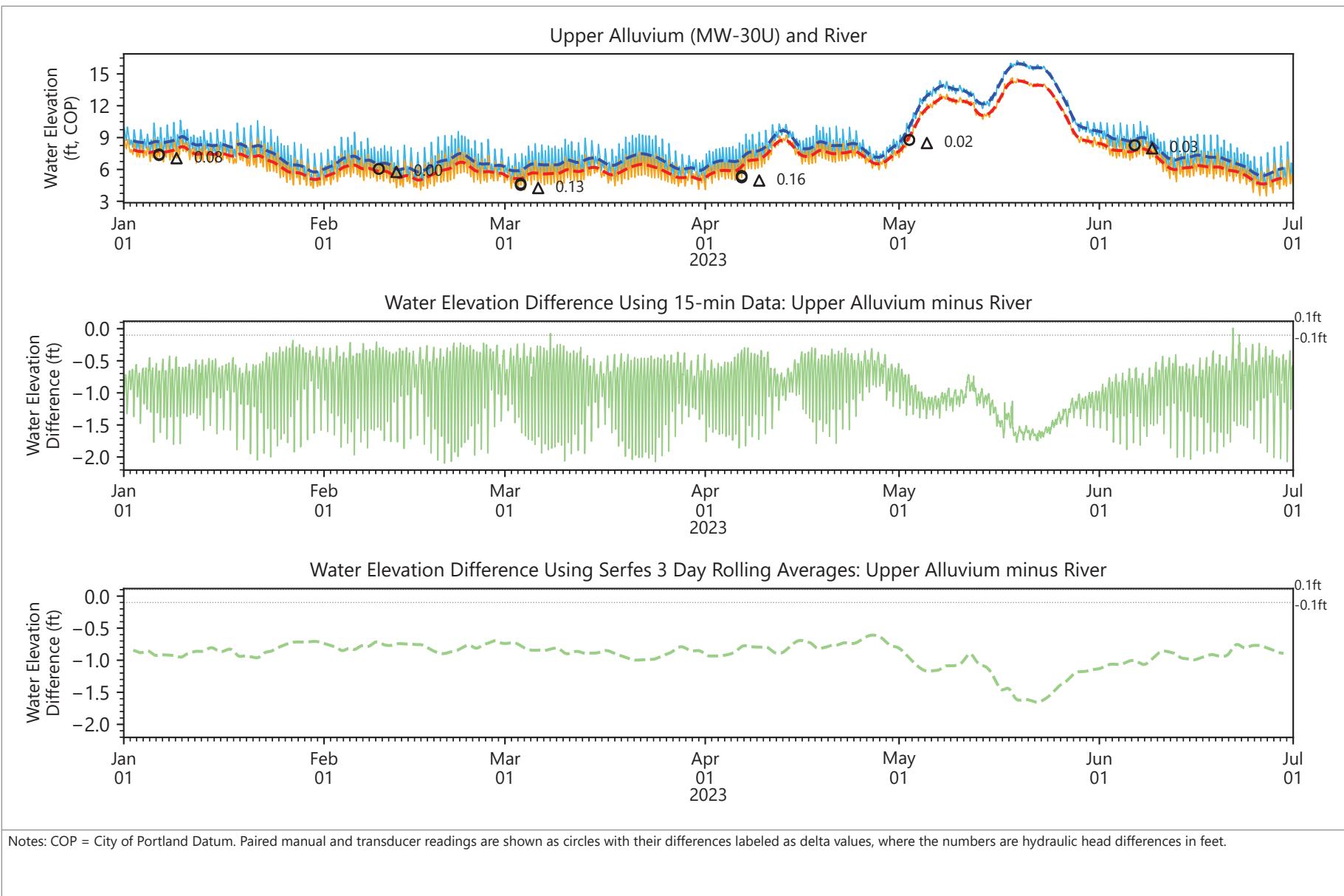


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.21
Groundwater Elevation Differences
 NW Natural Gasco Site

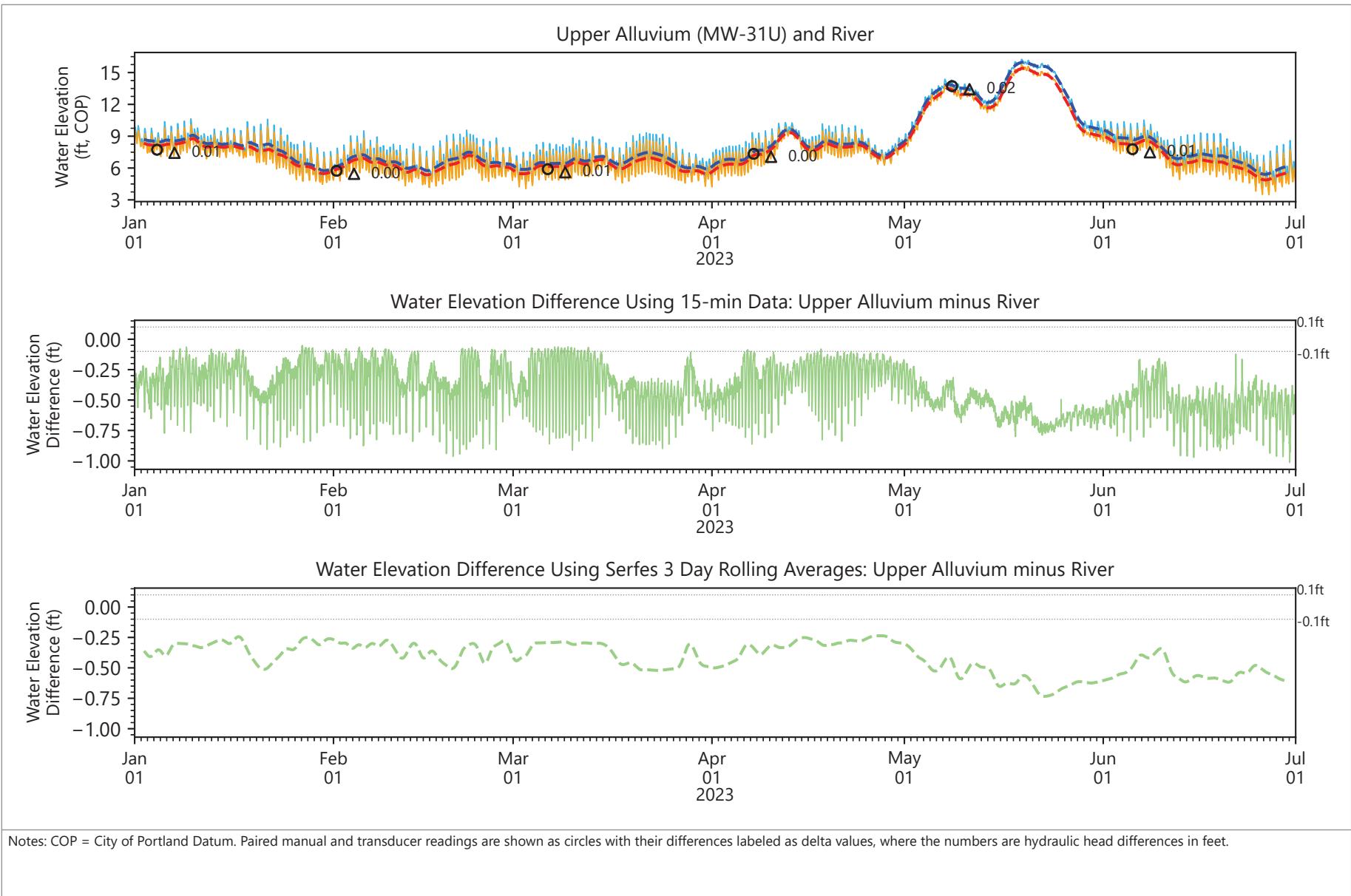


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.22
Groundwater Elevation Differences
 NW Natural Gasco Site

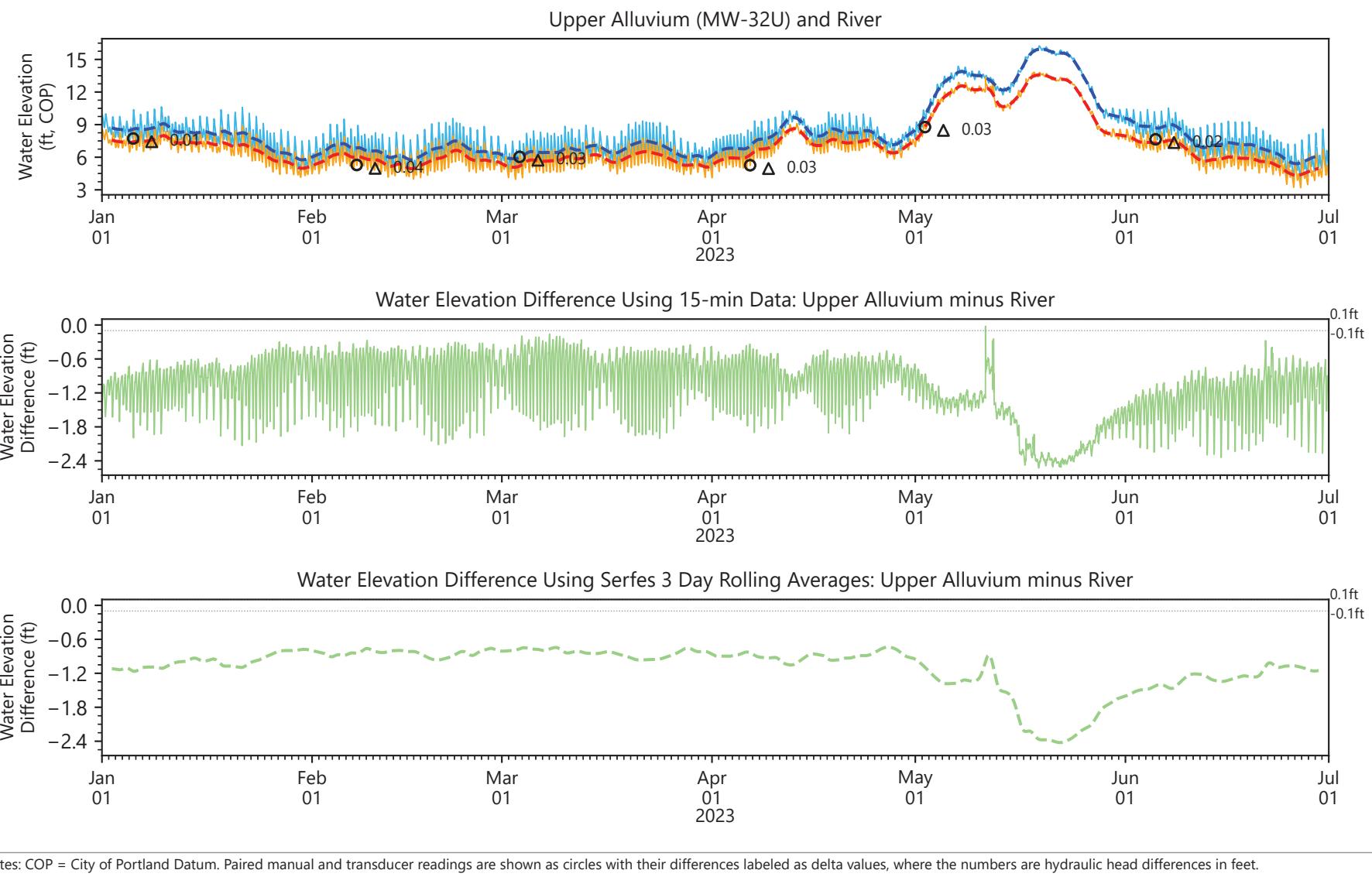


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|--|--|
| — Orange: Upper Alluvium: 15-min Data | — Green: Water Elevation Difference: 15-min Data |
| - - Red: Upper Alluvium: Serfes Averages | - - Green: Water Elevation Difference: Serfes Averages |
| — Blue: River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| — Black: River: Serfes Averages | |

Figure 4.23
Groundwater Elevation Differences
 NW Natural Gasco Site



Notes: COP = City of Portland Datum. Paired manual and transducer readings are shown as circles with their differences labeled as delta values, where the numbers are hydraulic head differences in feet.

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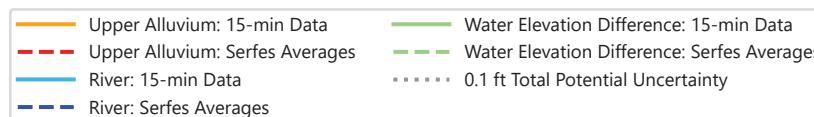
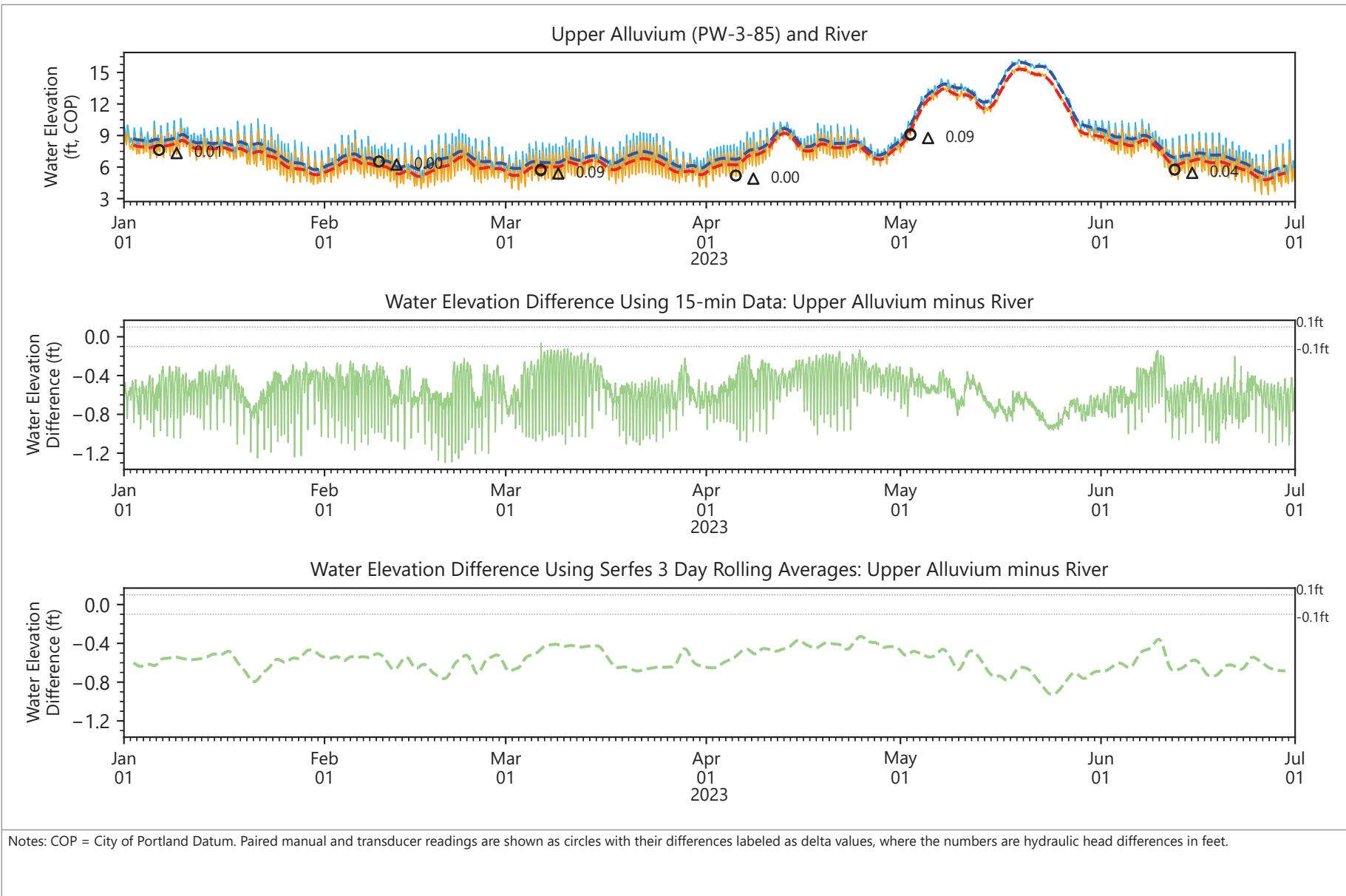


Figure 4.24 Groundwater Elevation Differences NW Natural Gasco Site

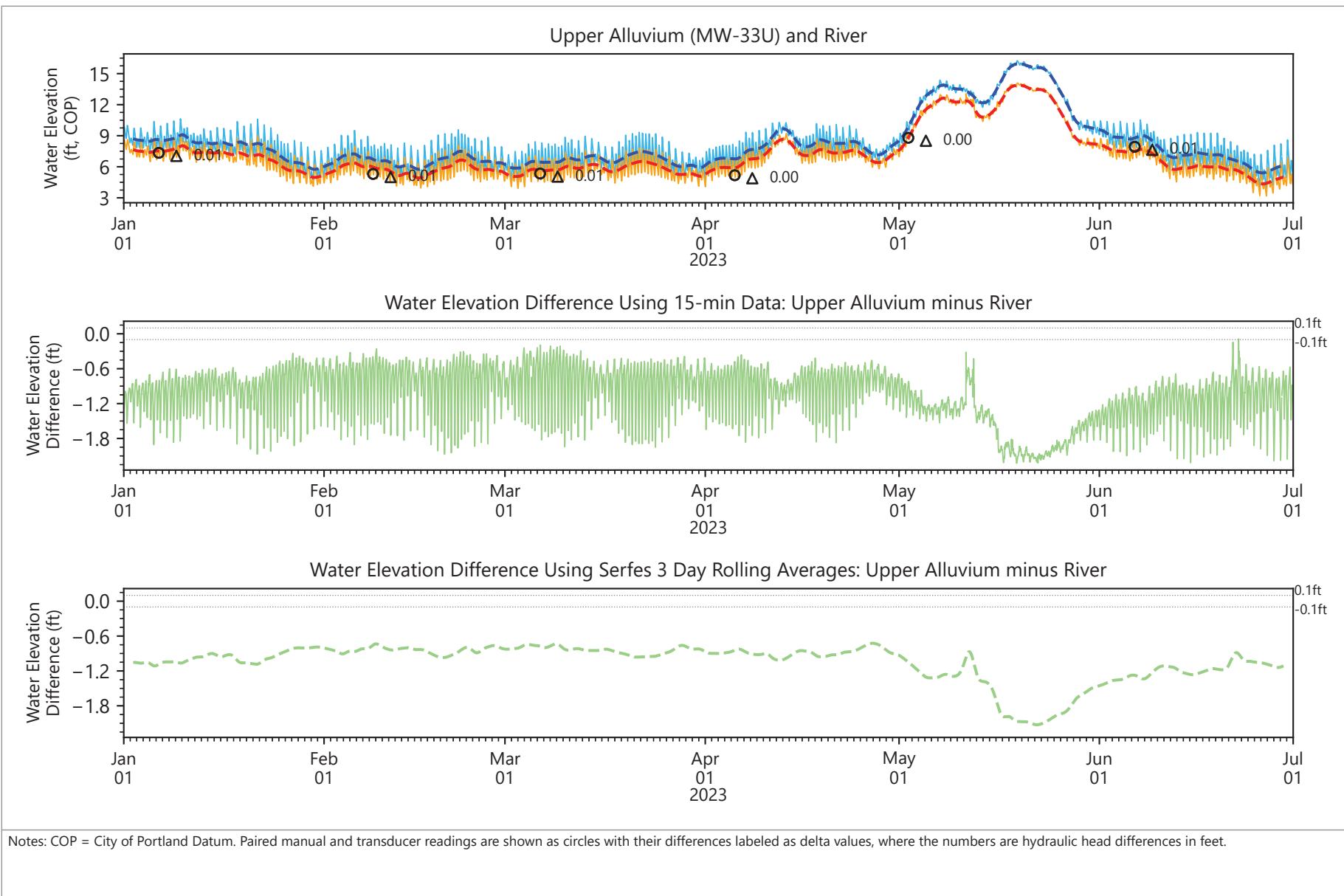


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.25
Groundwater Elevation Differences
 NW Natural Gasco Site

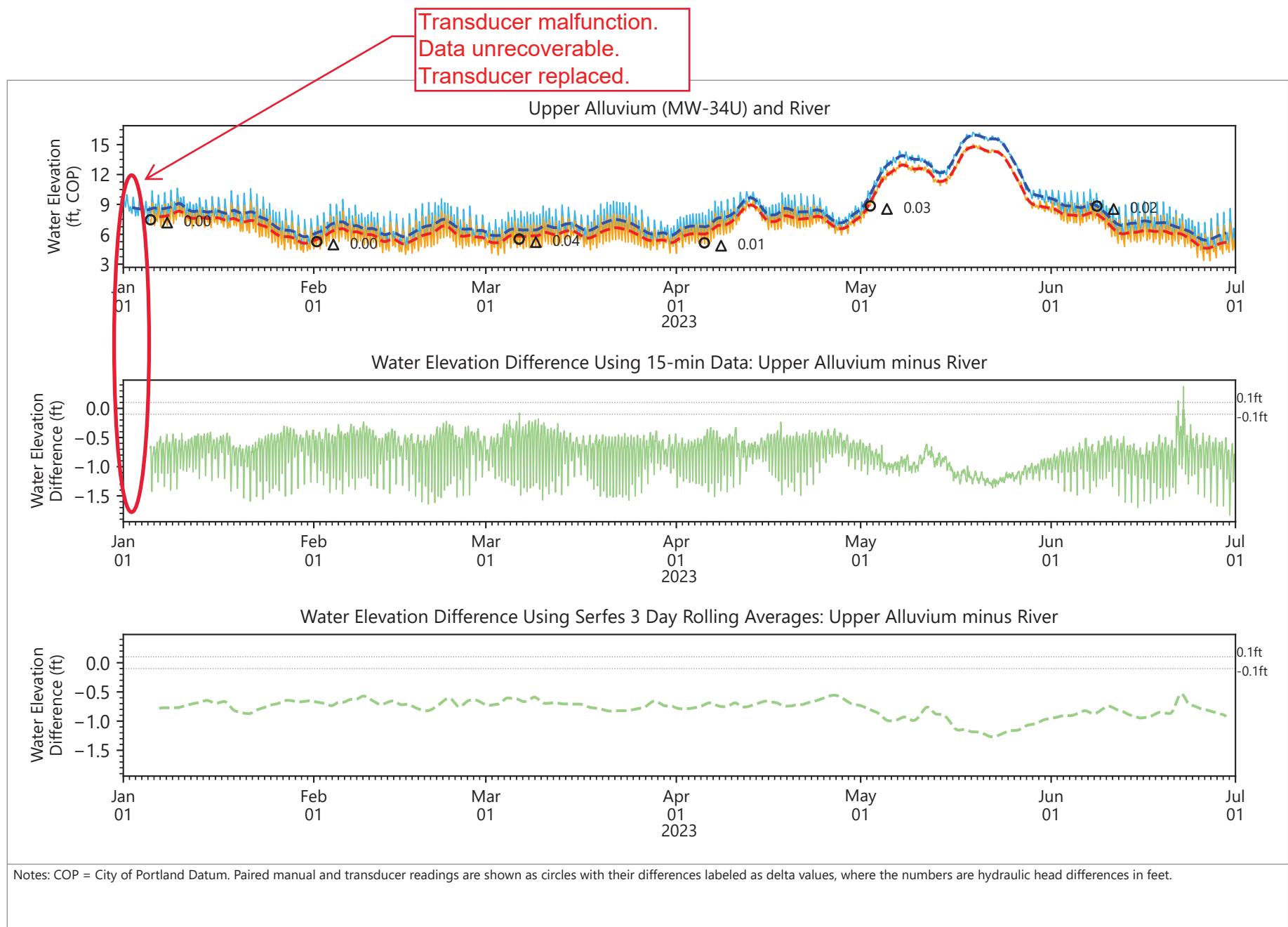


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.26
Groundwater Elevation Differences
 NW Natural Gasco Site

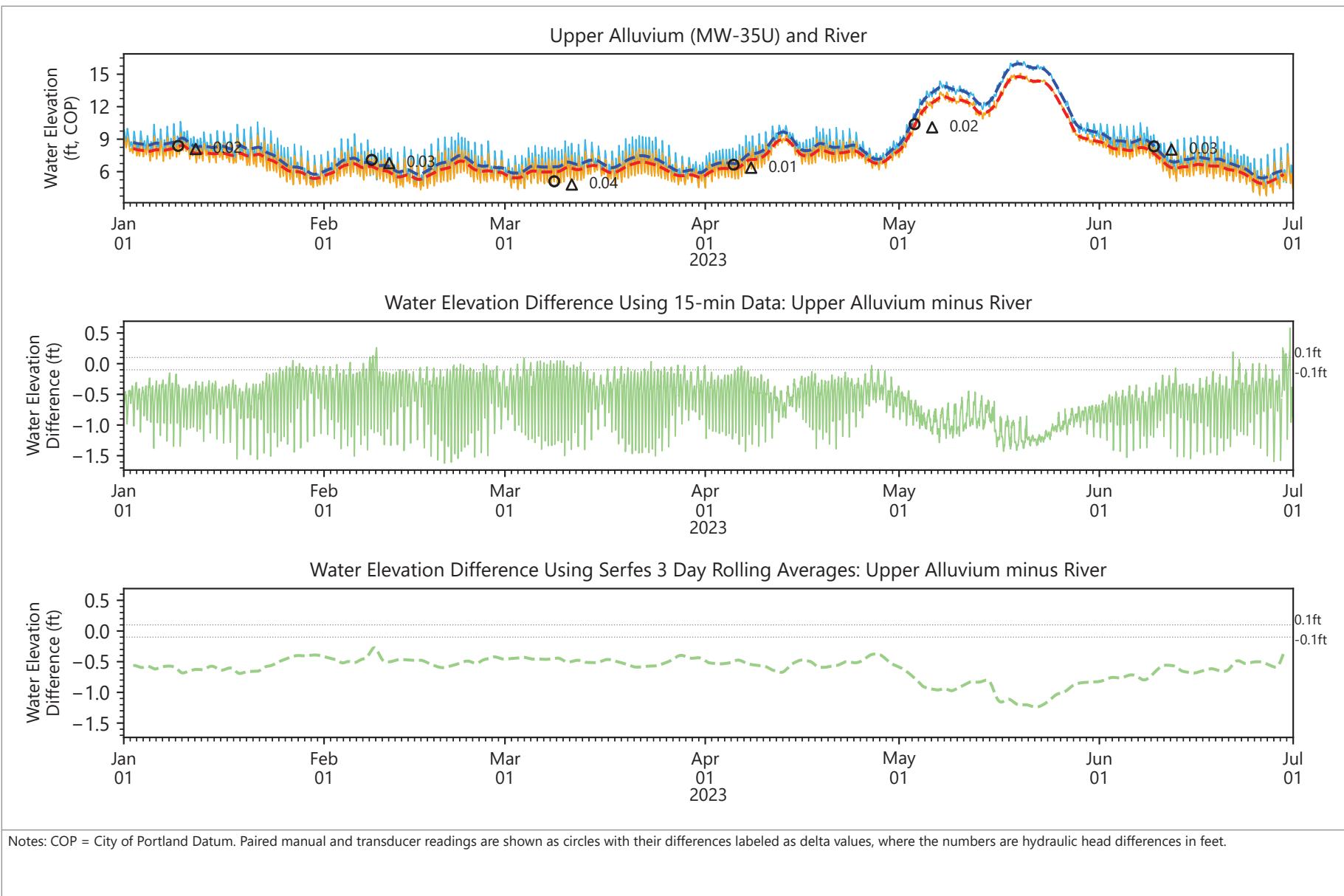


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.27
Groundwater Elevation Differences
 NW Natural Gasco Site



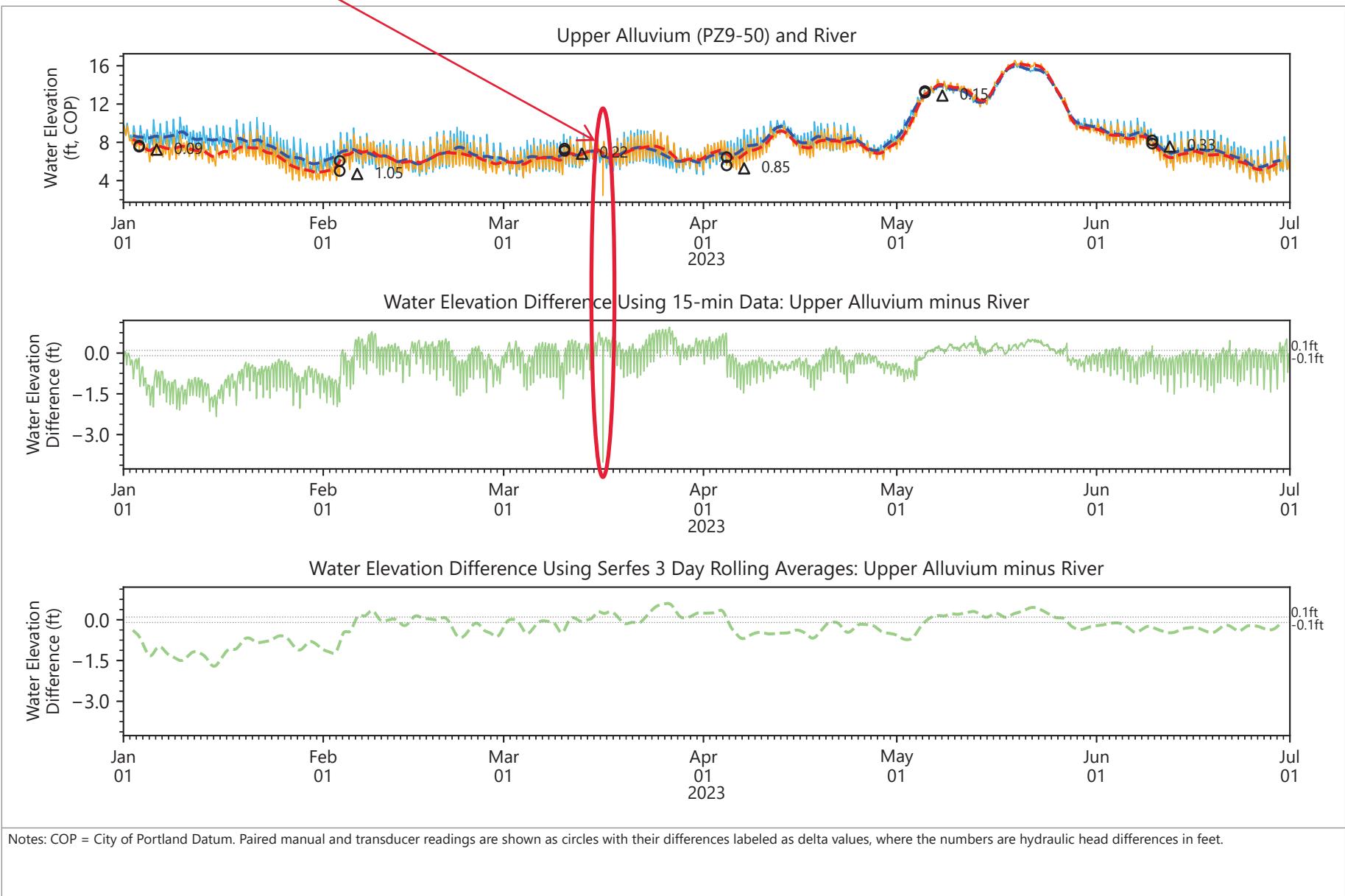
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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.28
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

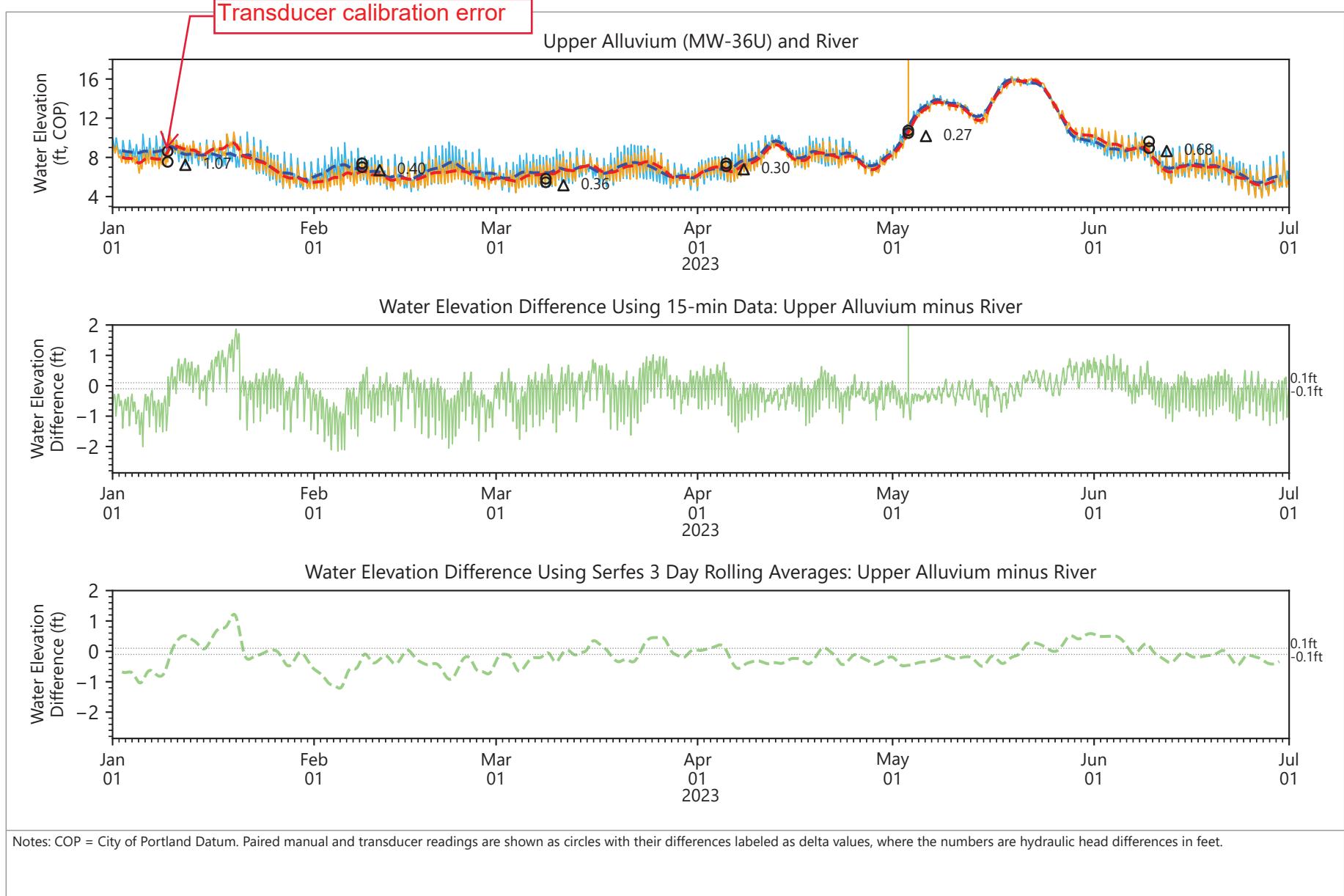


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.29
Groundwater Elevation Differences
 NW Natural Gasco Site



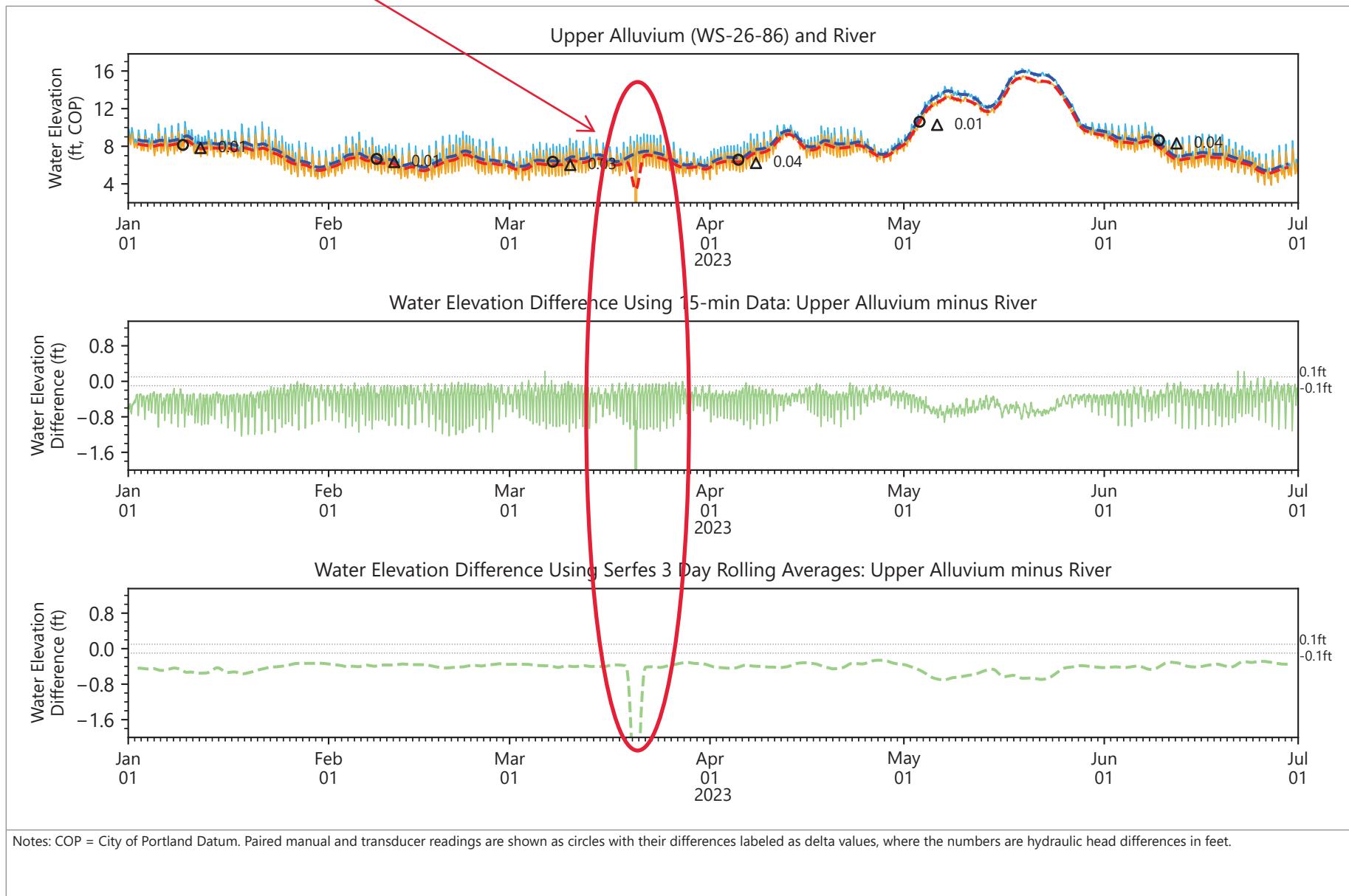
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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.30
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

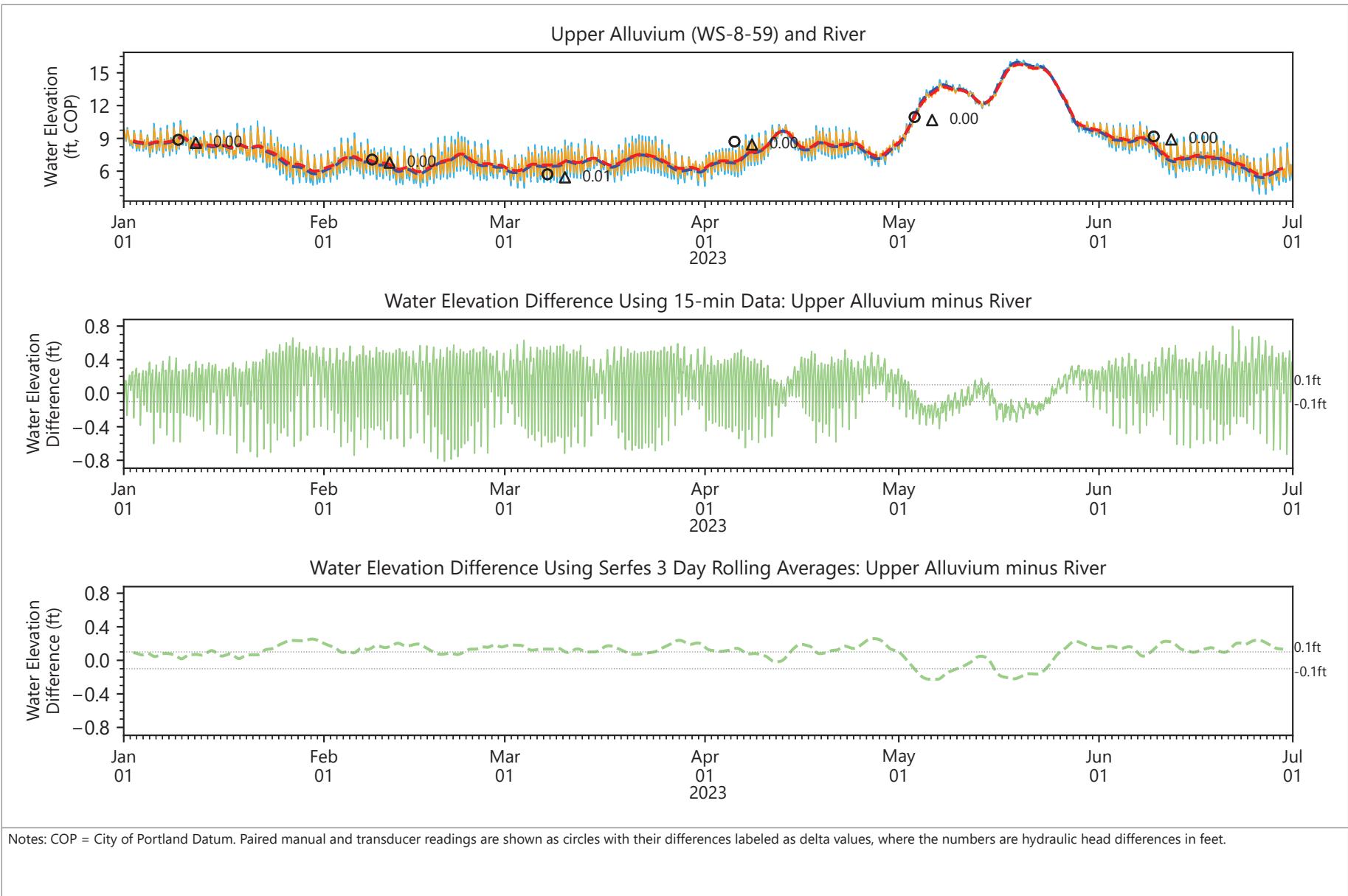


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.31
Groundwater Elevation Differences
 NW Natural Gasco Site

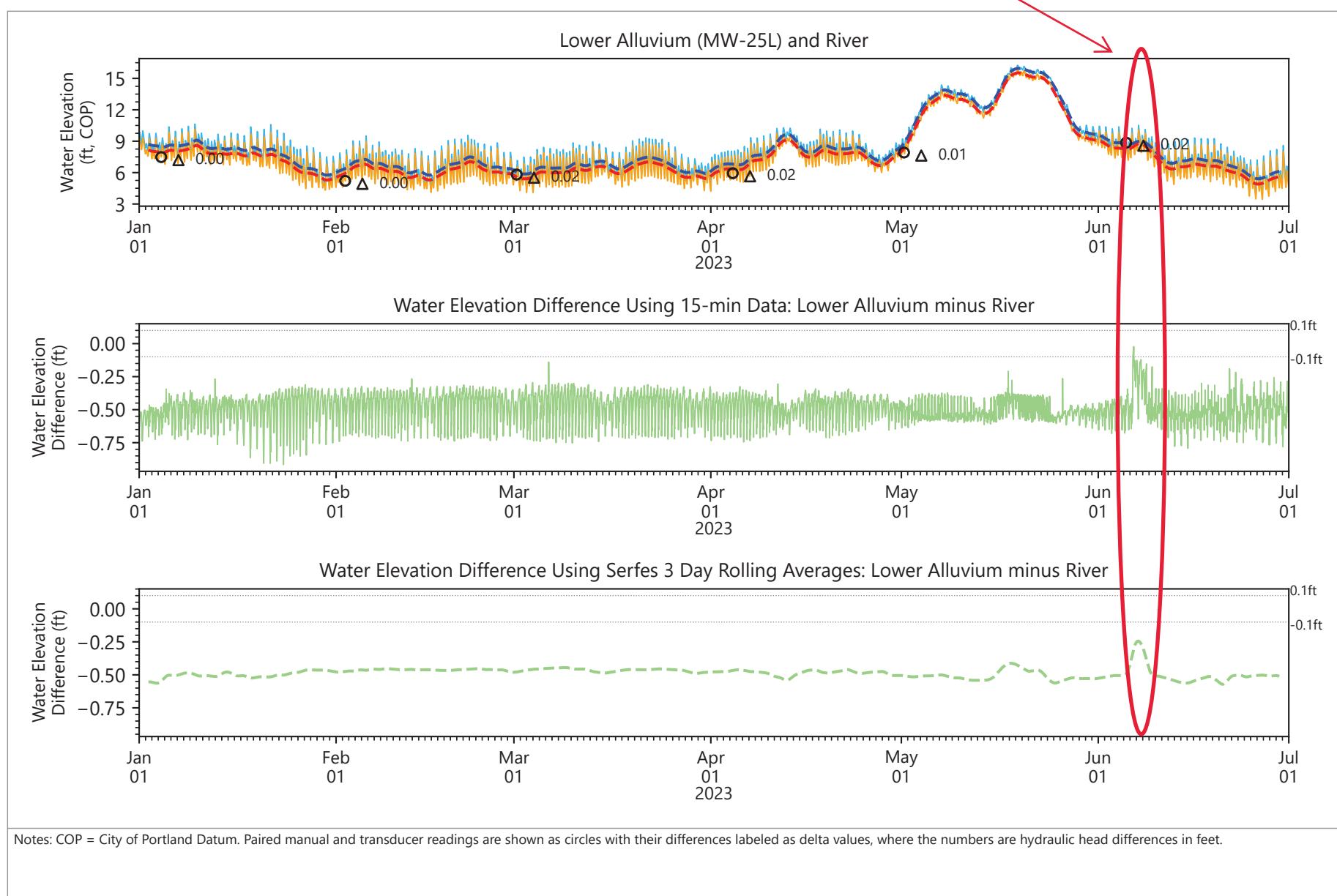


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|---------------------------------|---|
| Upper Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Upper Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.32
Groundwater Elevation Differences
 NW Natural Gasco Site

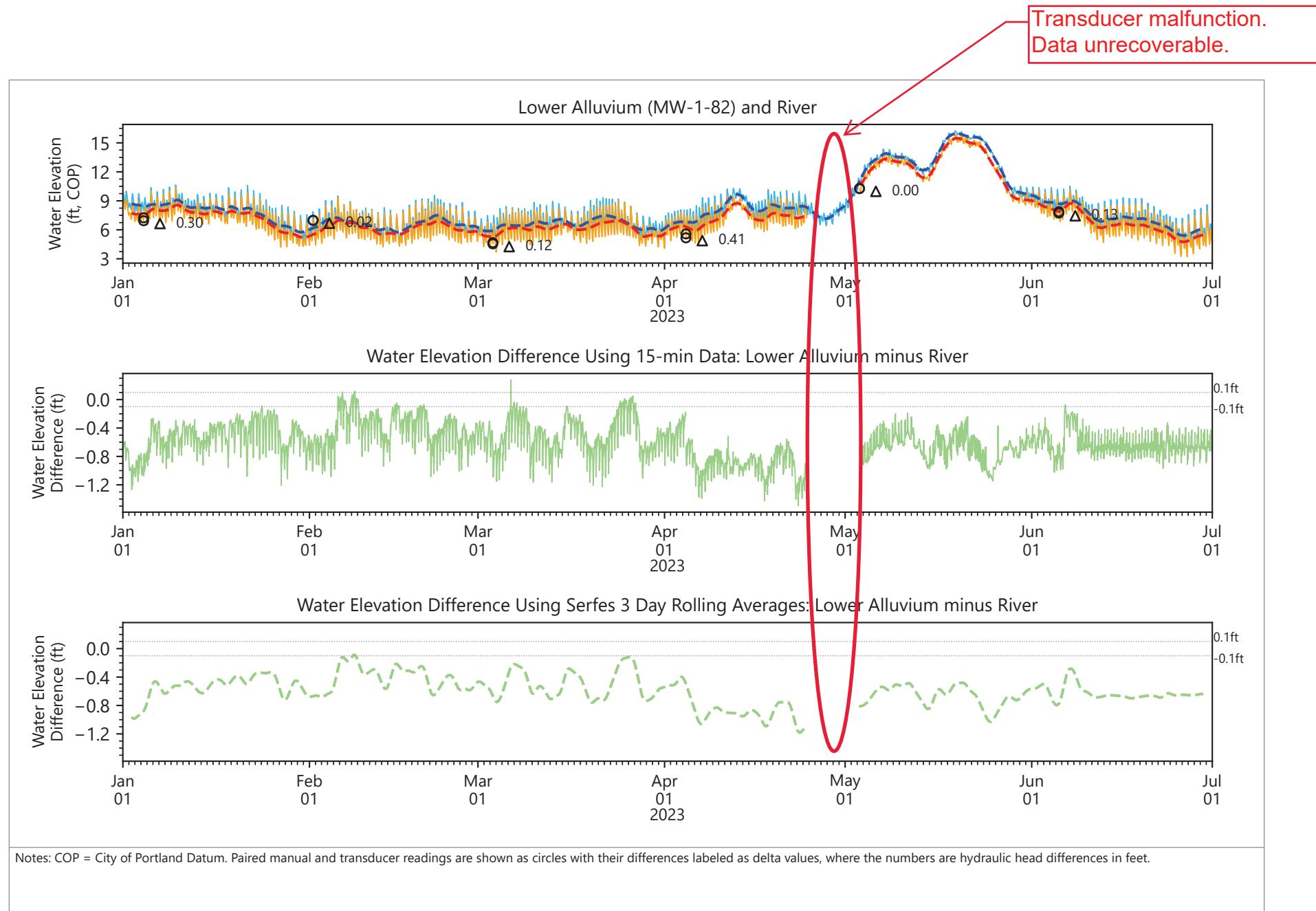


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.33
Groundwater Elevation Differences
 NW Natural Gasco Site

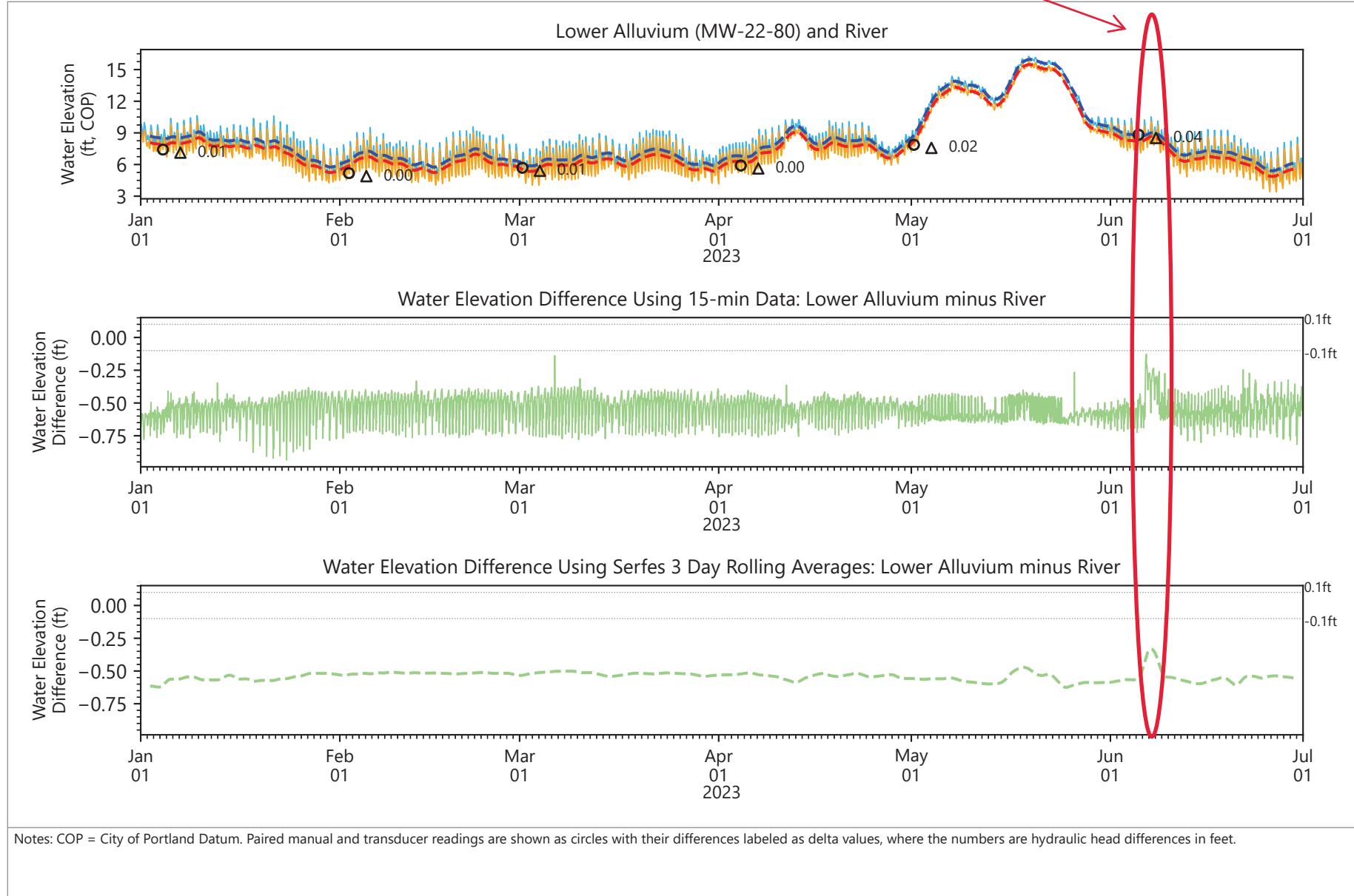


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.34
Groundwater Elevation Differences
 NW Natural Gasco Site

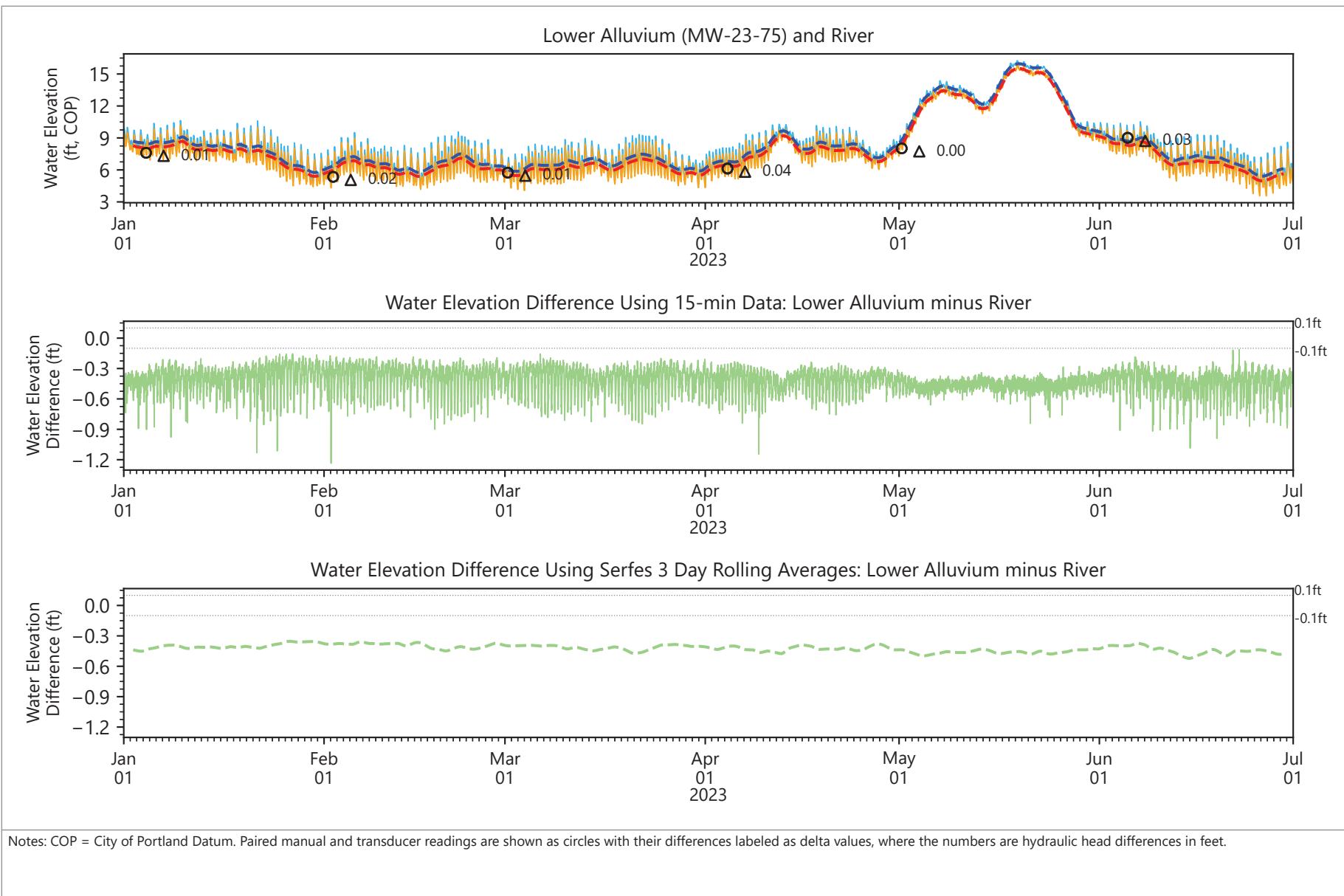


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- | | |
|---------------------------------------|---|
| — Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Lower Alluvium: Serfes Averages | - - - Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.35
Groundwater Elevation Differences
 NW Natural Gasco Site



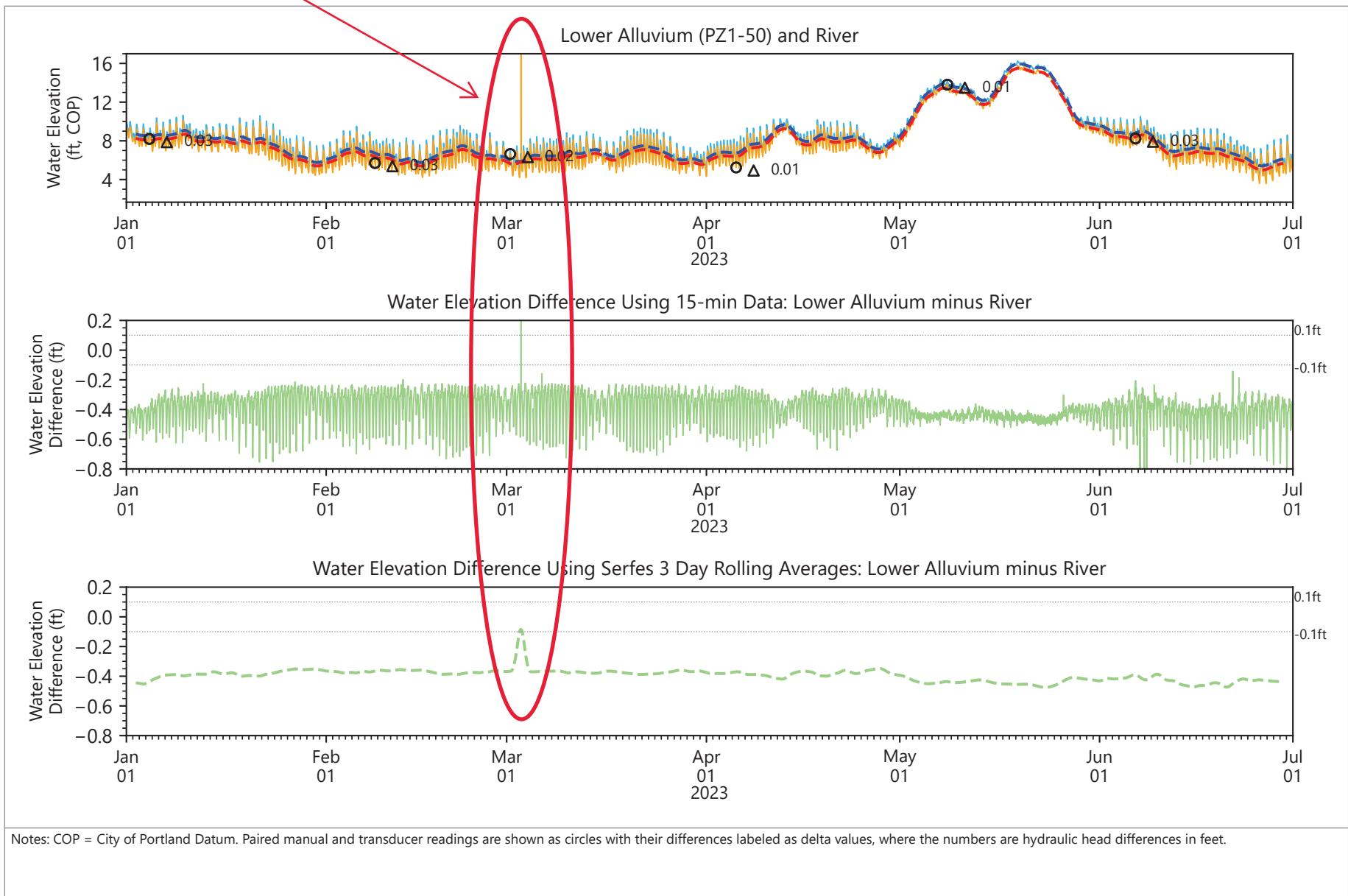
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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.36
Groundwater Elevation Differences
 NW Natural Gasco Site

Transducer maintenance

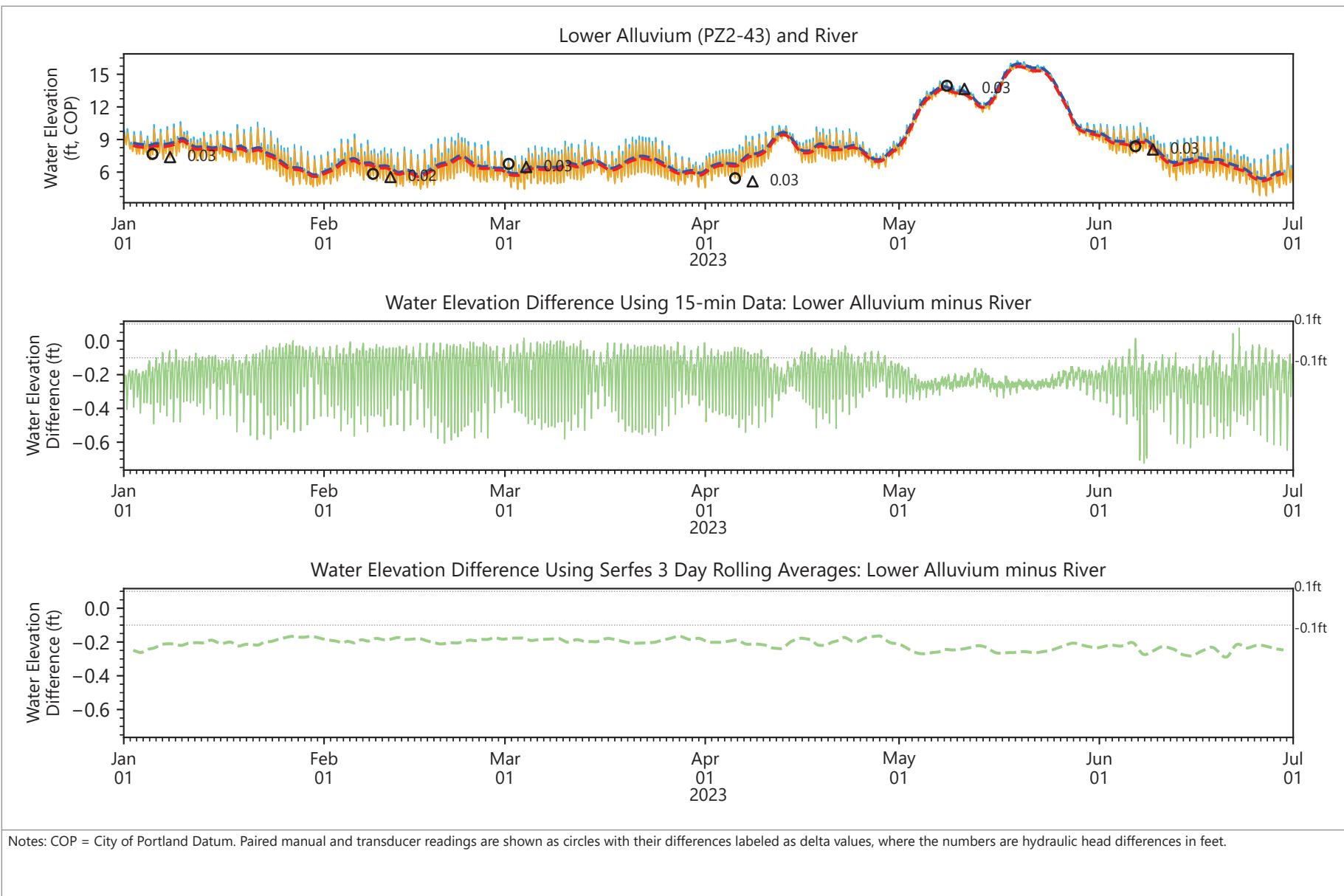


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.37
Groundwater Elevation Differences
 NW Natural Gasco Site



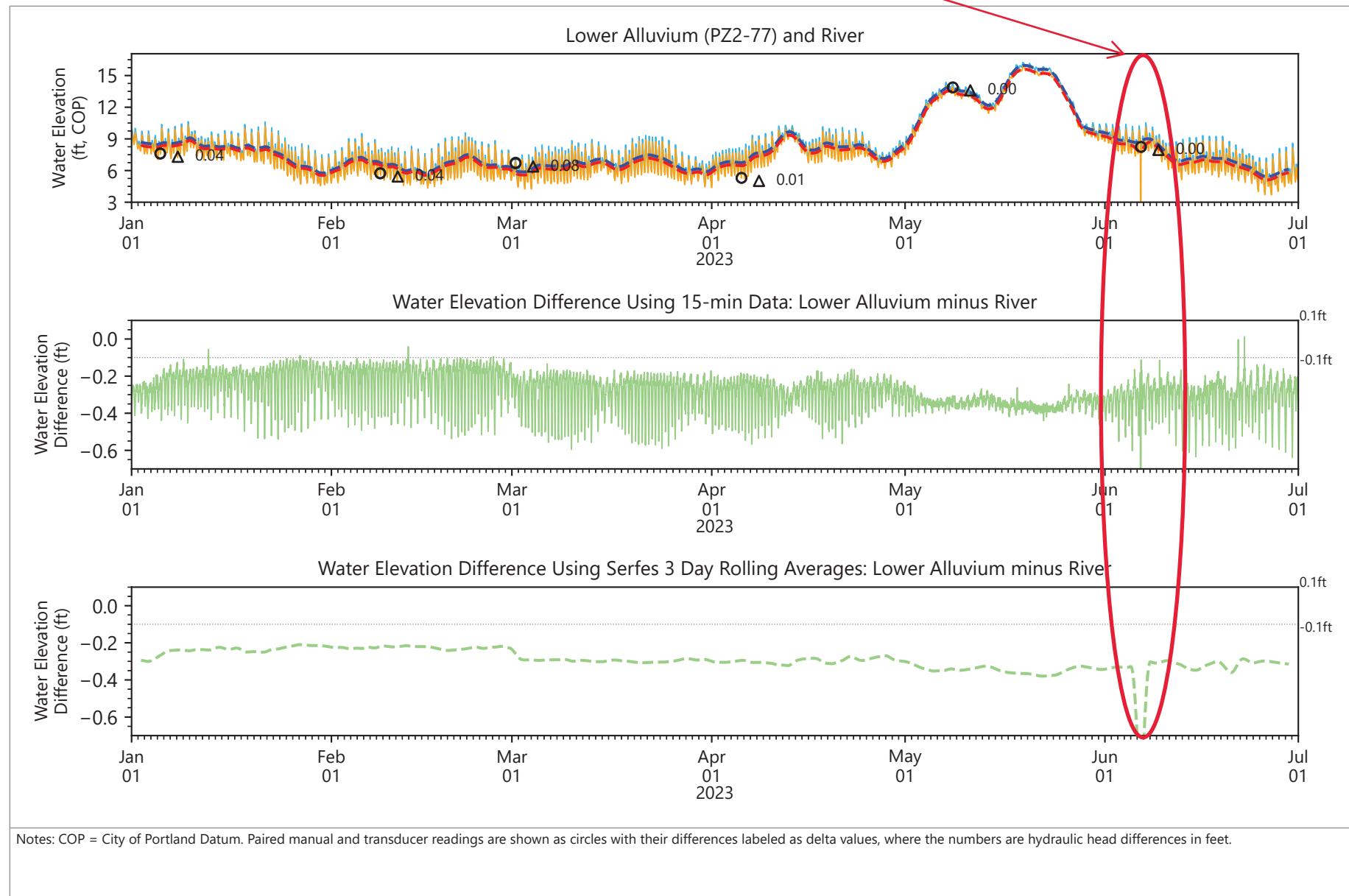
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|---------------------------------------|---|
| — Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Lower Alluvium: Serfes Averages | - - - Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.38
Groundwater Elevation Differences
 NW Natural Gasco Site

Transducer Maintenance.



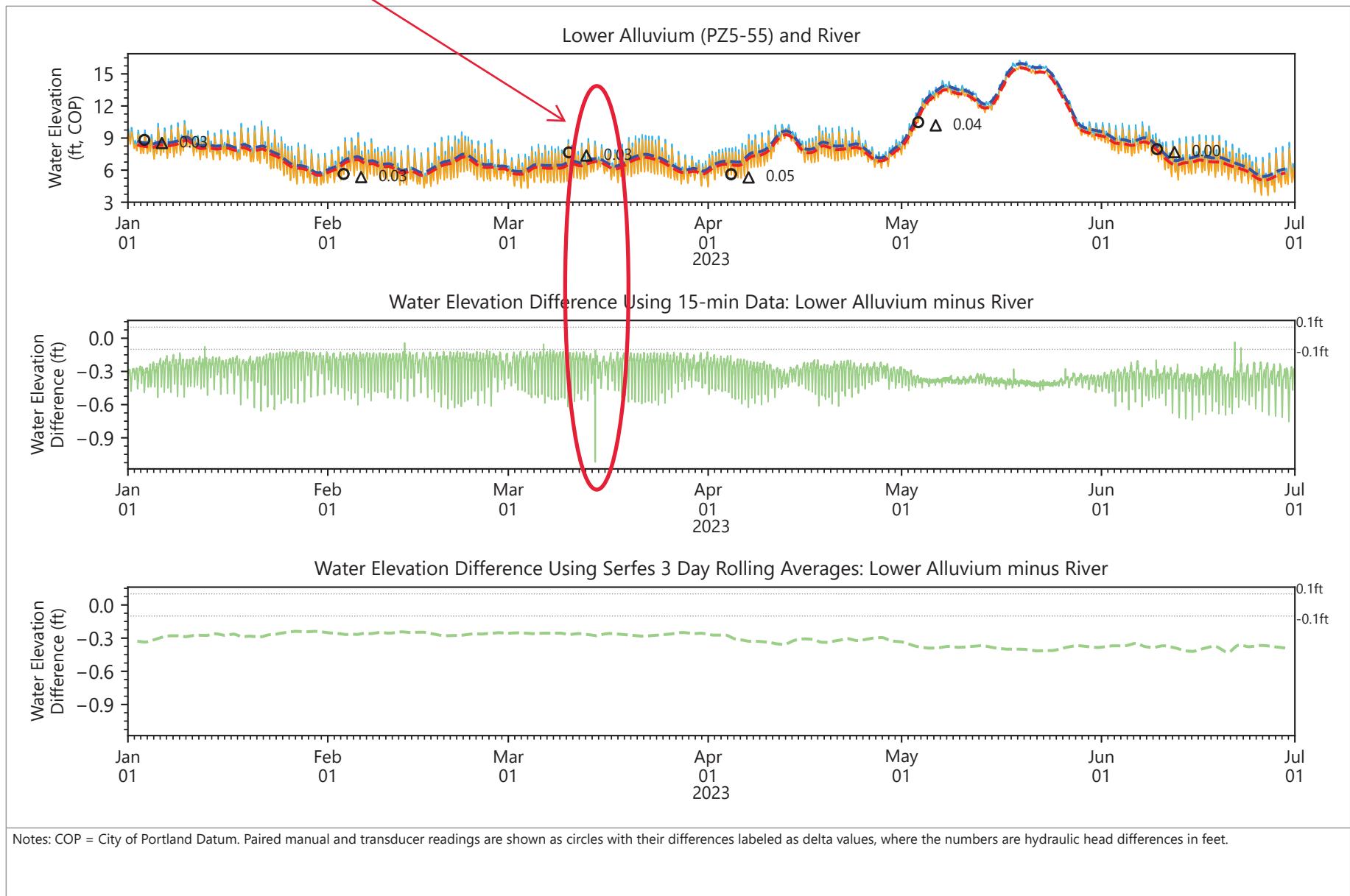
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|---------------------------------------|---|
| — Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Lower Alluvium: Serfes Averages | - - - Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.39
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

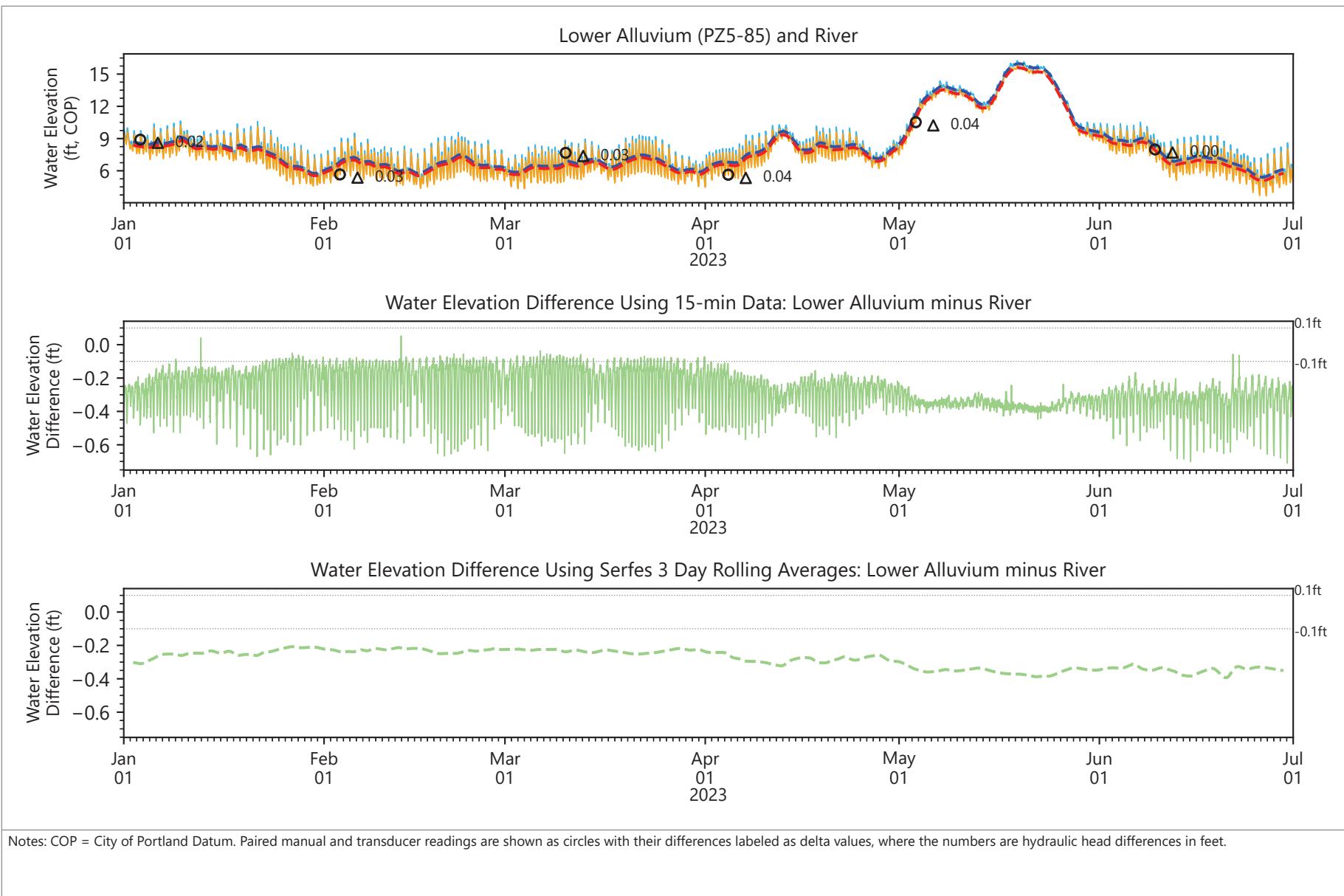


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.40
Groundwater Elevation Differences
 NW Natural Gasco Site

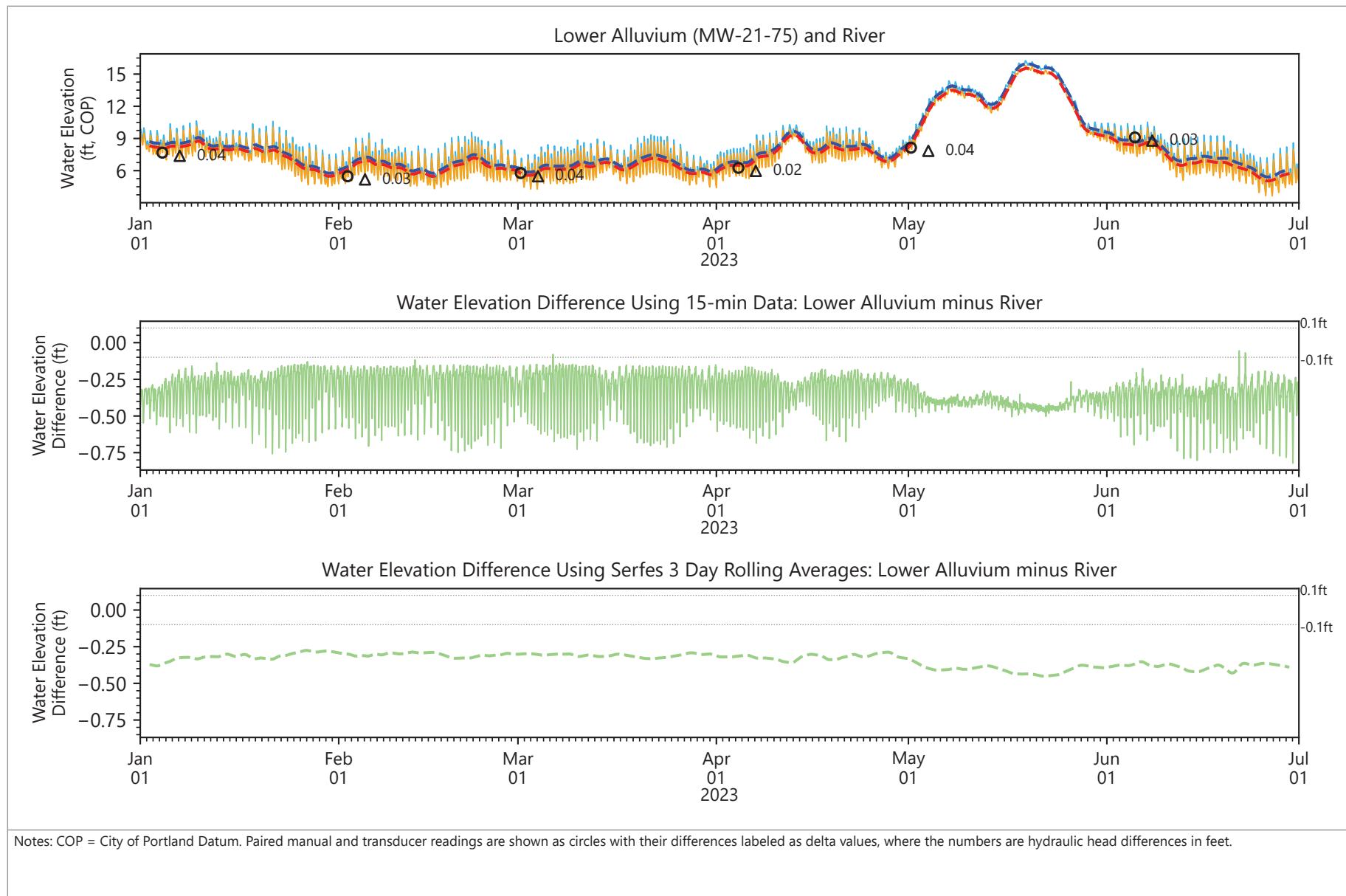


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.41
Groundwater Elevation Differences
 NW Natural Gasco Site

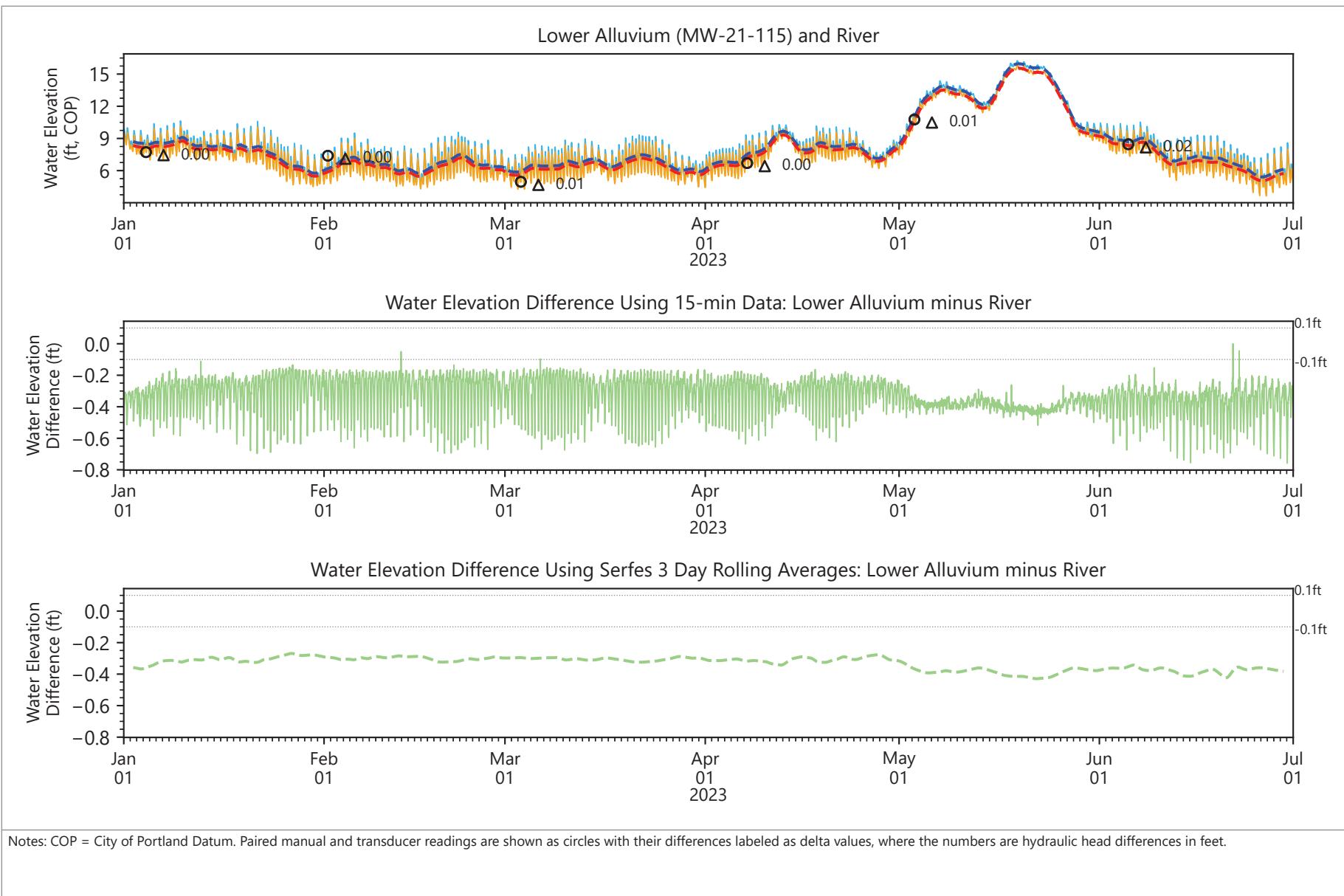


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.42
Groundwater Elevation Differences
 NW Natural Gasco Site

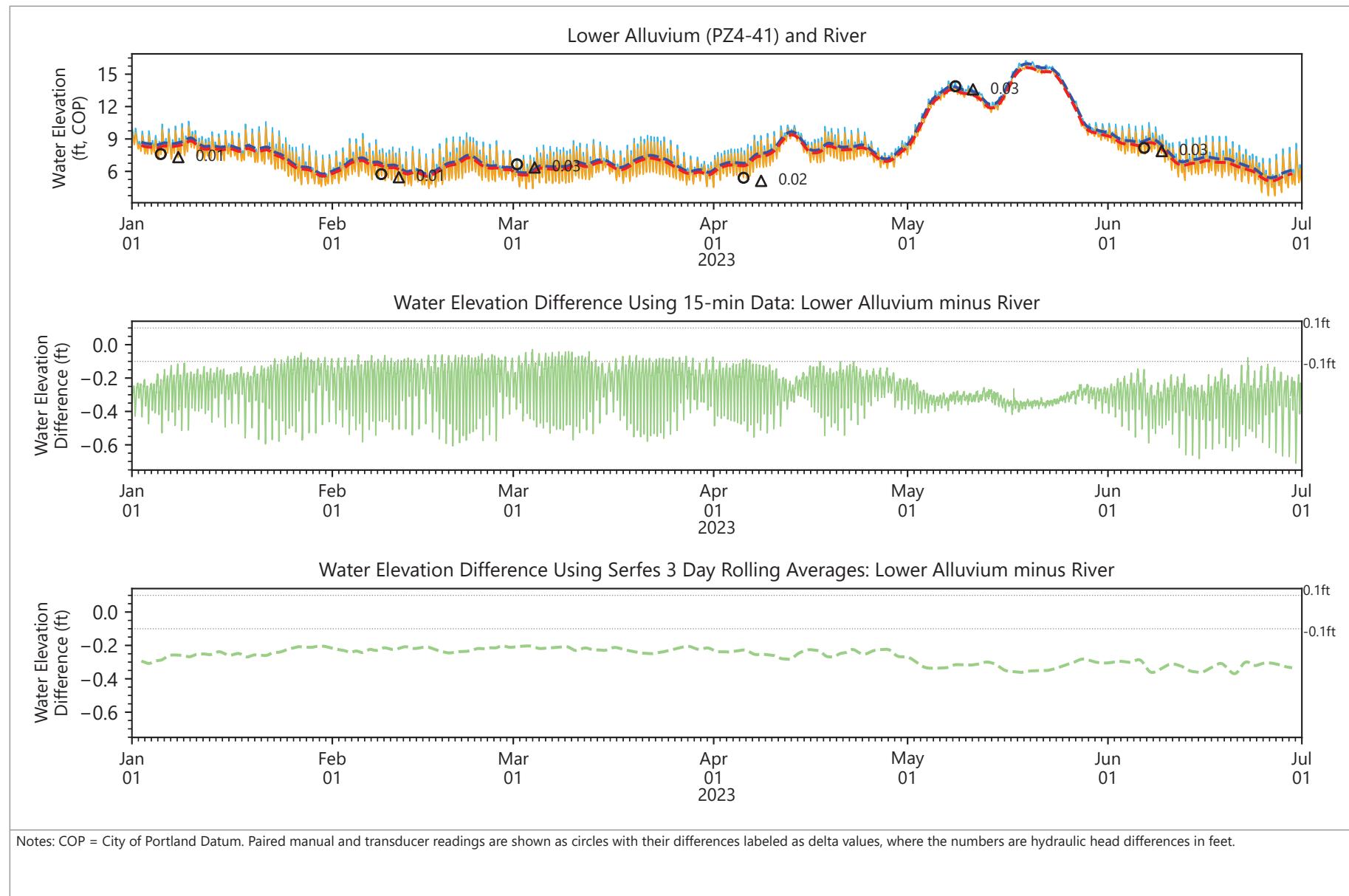


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.43
Groundwater Elevation Differences
 NW Natural Gasco Site

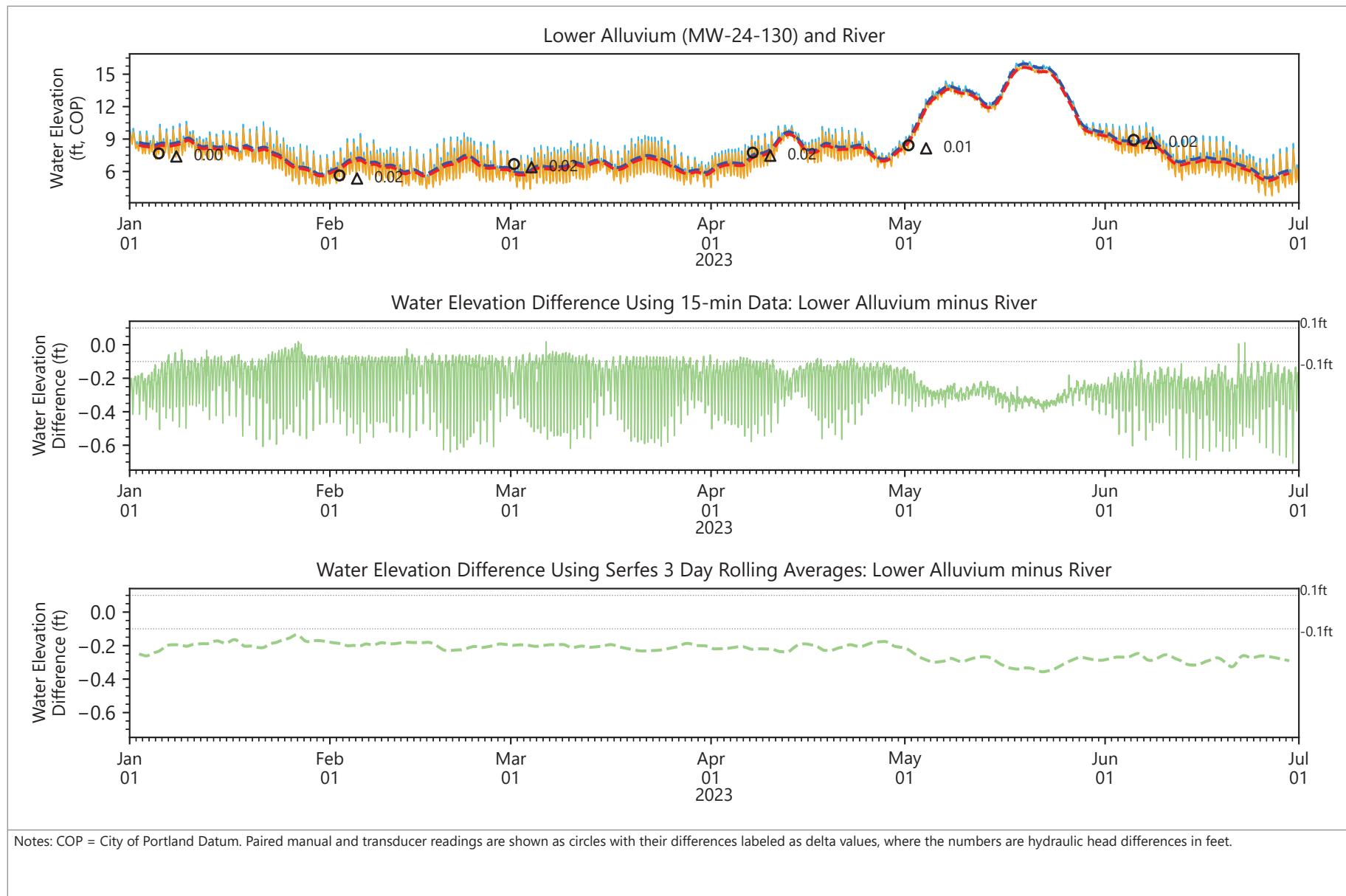


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.44
Groundwater Elevation Differences
 NW Natural Gasco Site



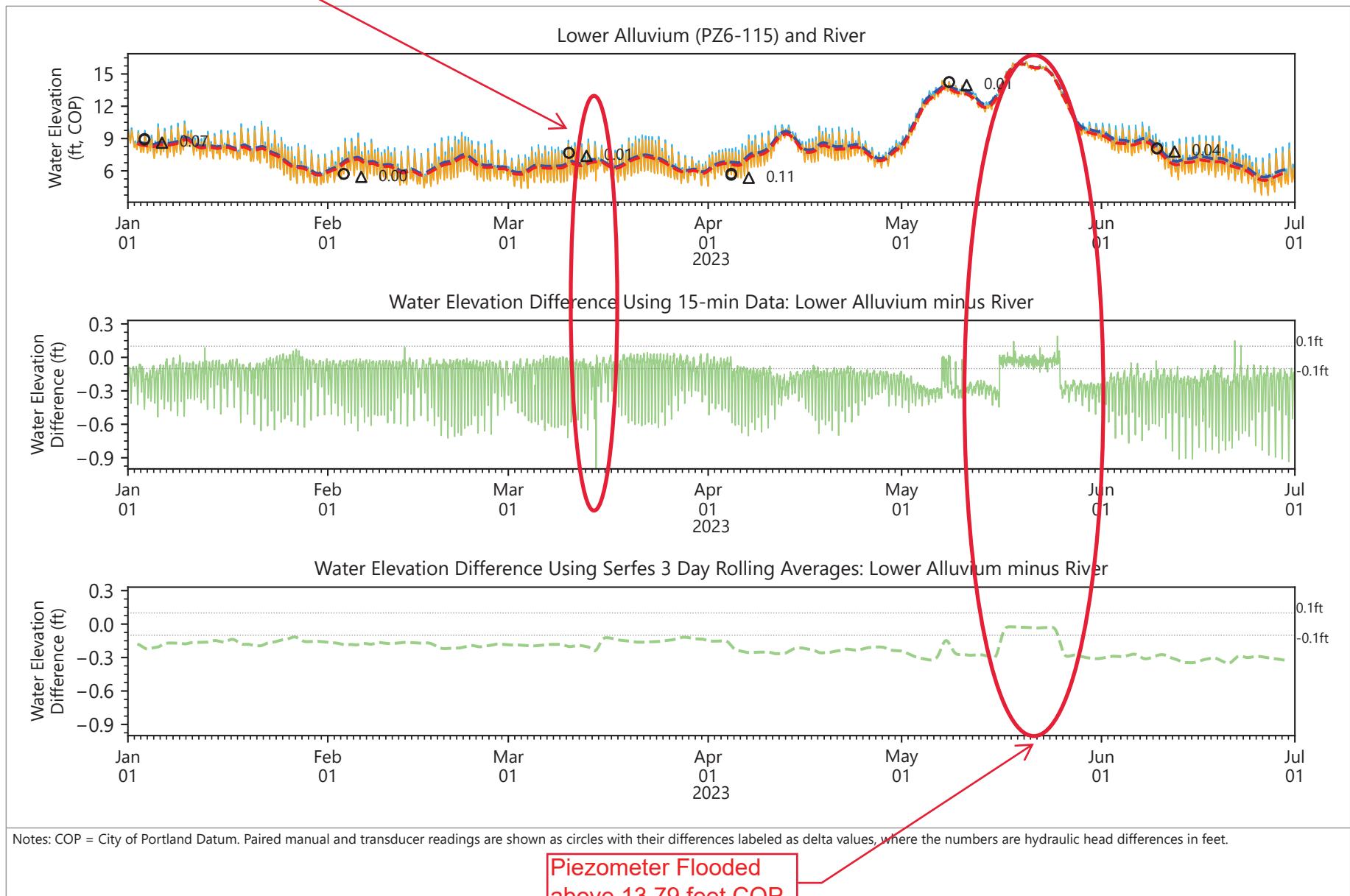
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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.45
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling



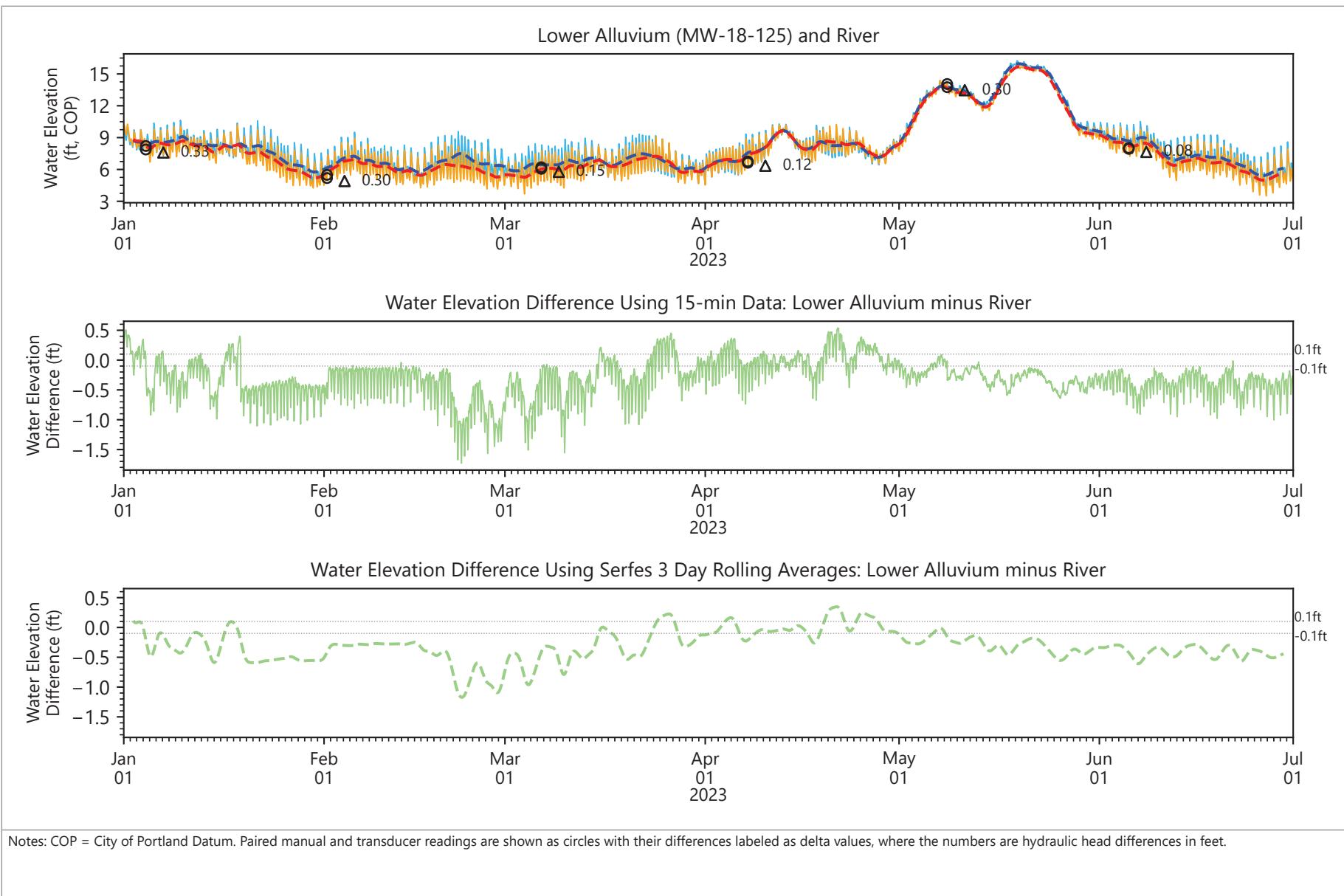
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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

**Piezometer Flooded
above 13.79 feet COP**

Figure 4.46
Groundwater Elevation Differences
 NW Natural Gasco Site

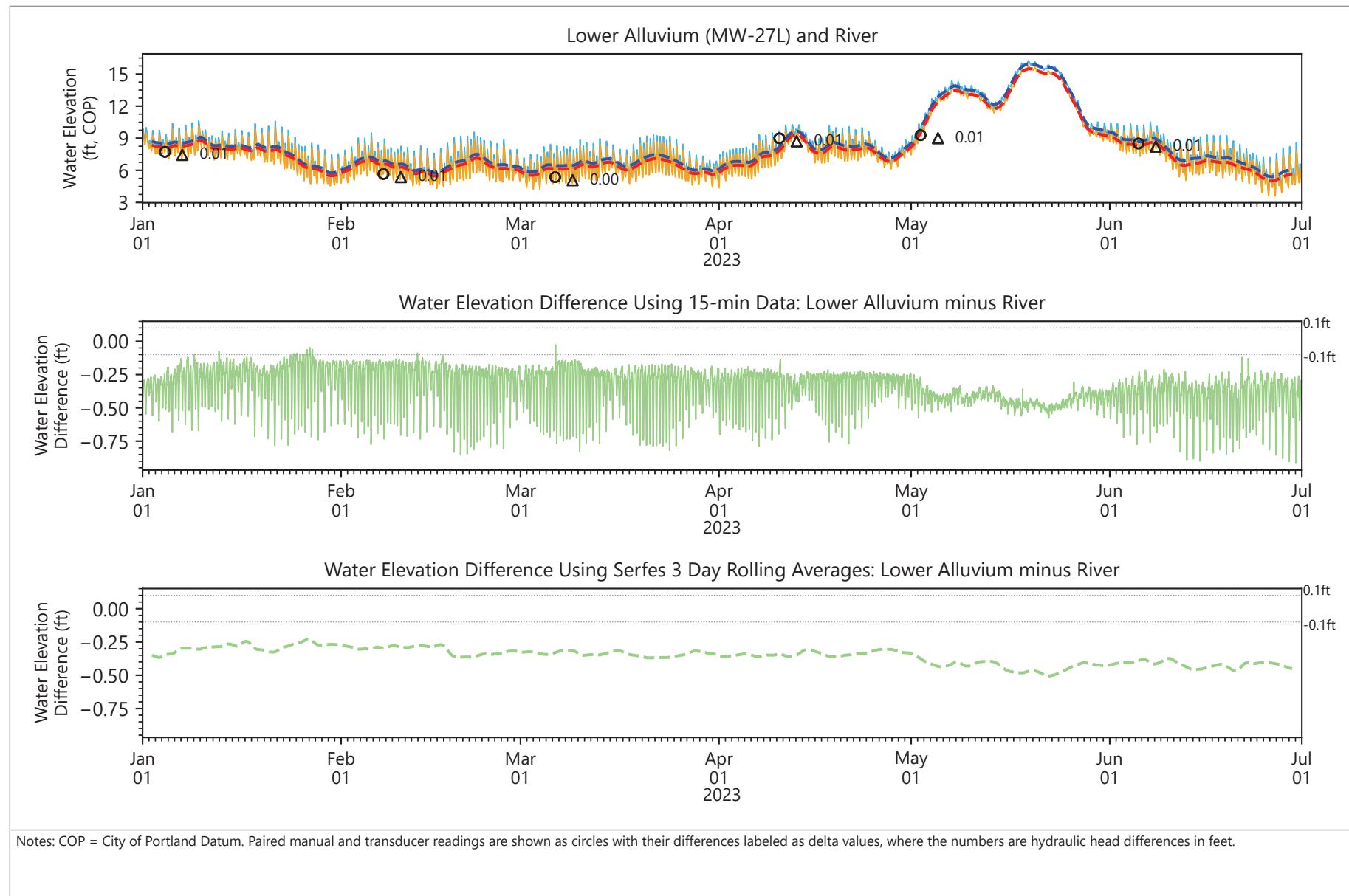


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.47
Groundwater Elevation Differences
 NW Natural Gasco Site

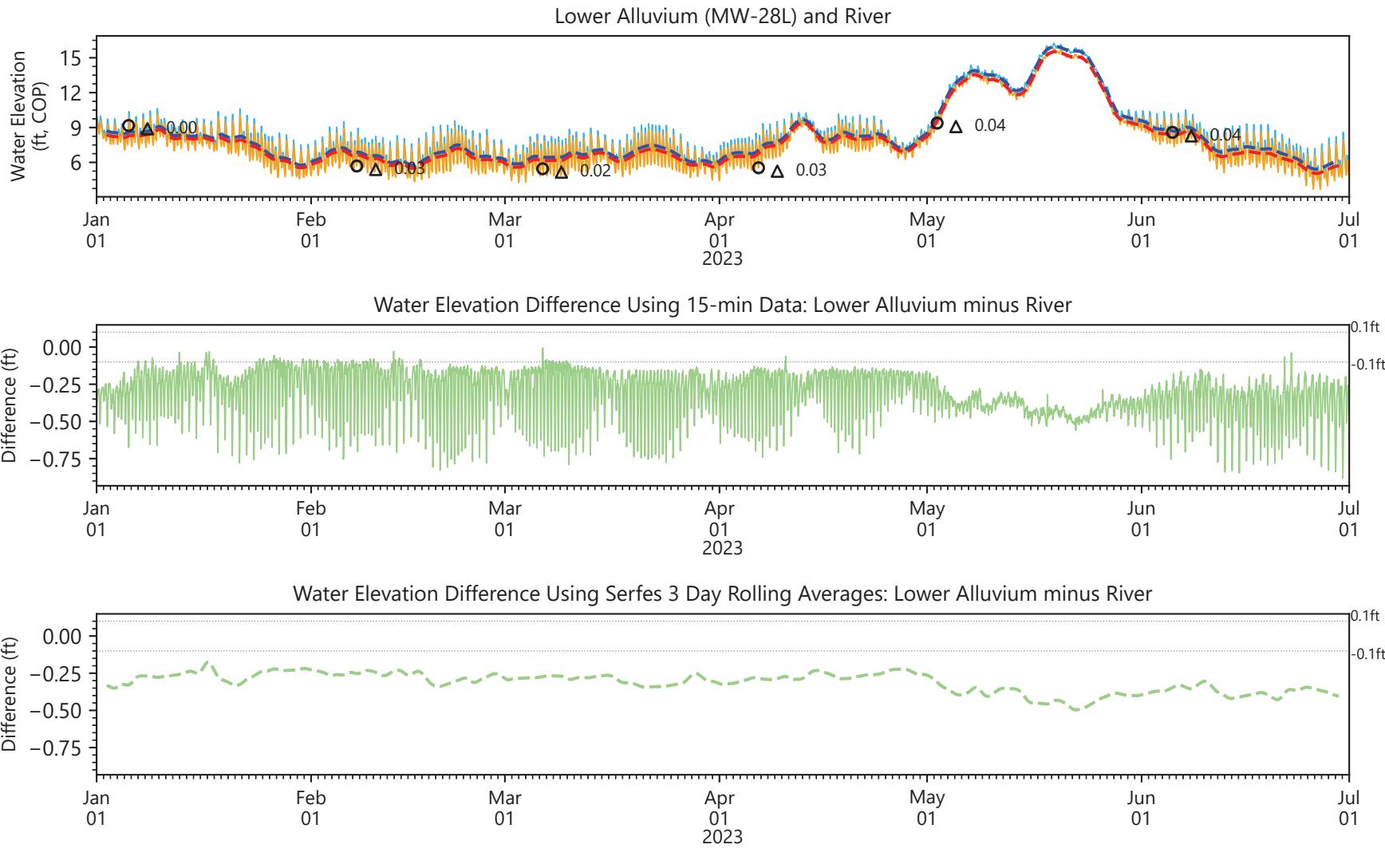


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.48
Groundwater Elevation Differences
 NW Natural Gasco Site



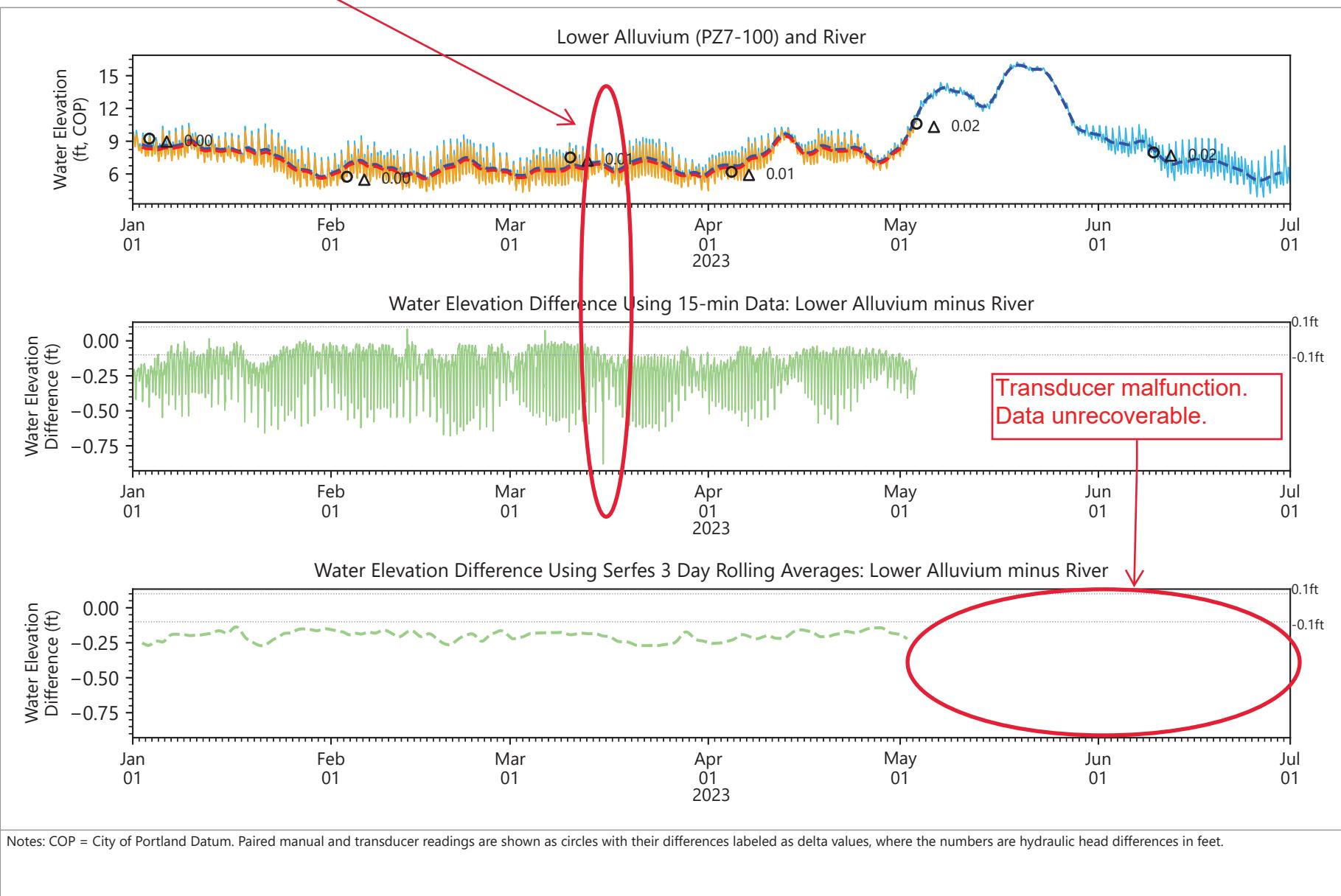
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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.49
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

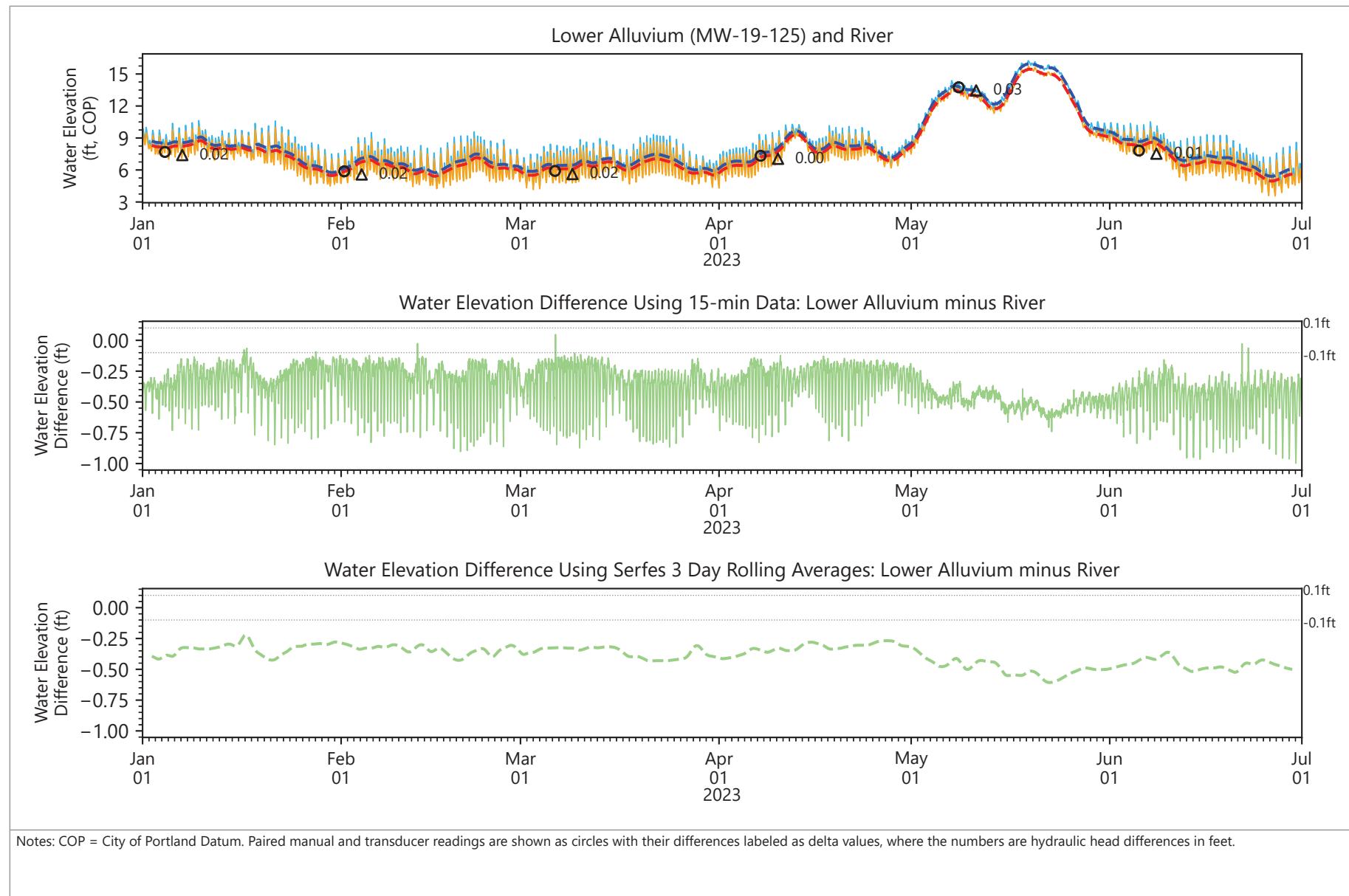


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.50
Groundwater Elevation Differences
 NW Natural Gasco Site

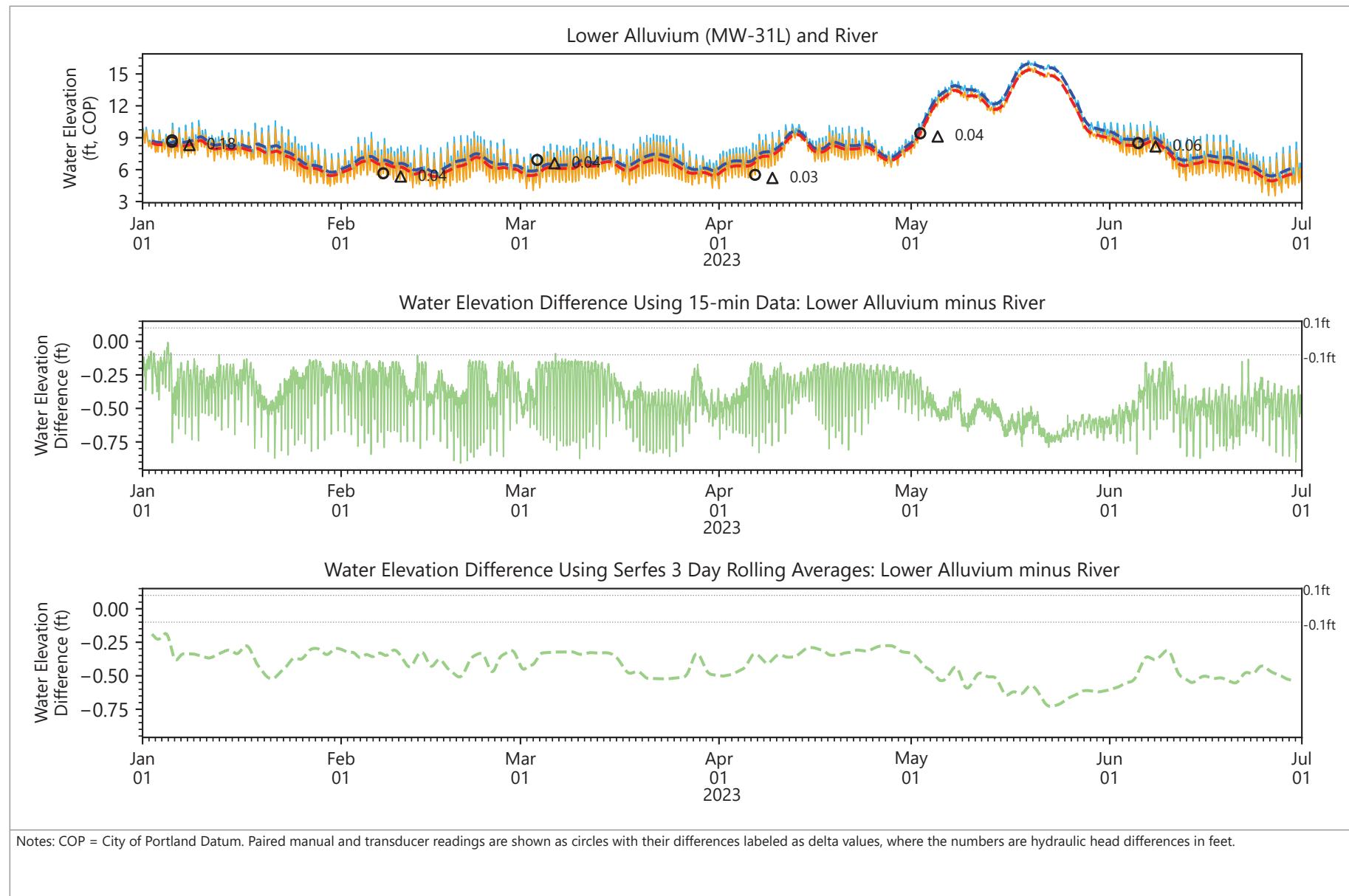


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.51
Groundwater Elevation Differences
 NW Natural Gasco Site

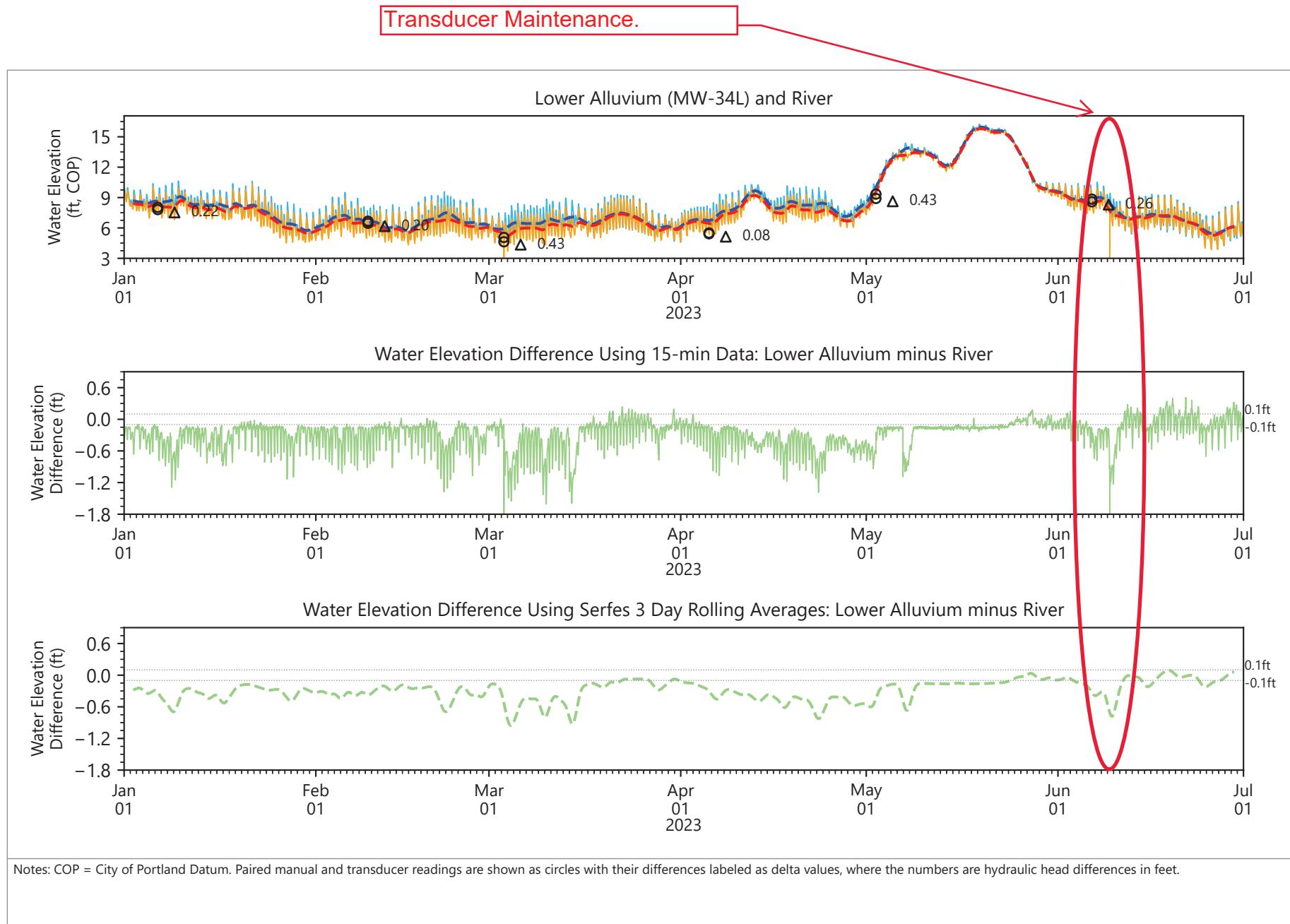


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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.52
Groundwater Elevation Differences
 NW Natural Gasco Site



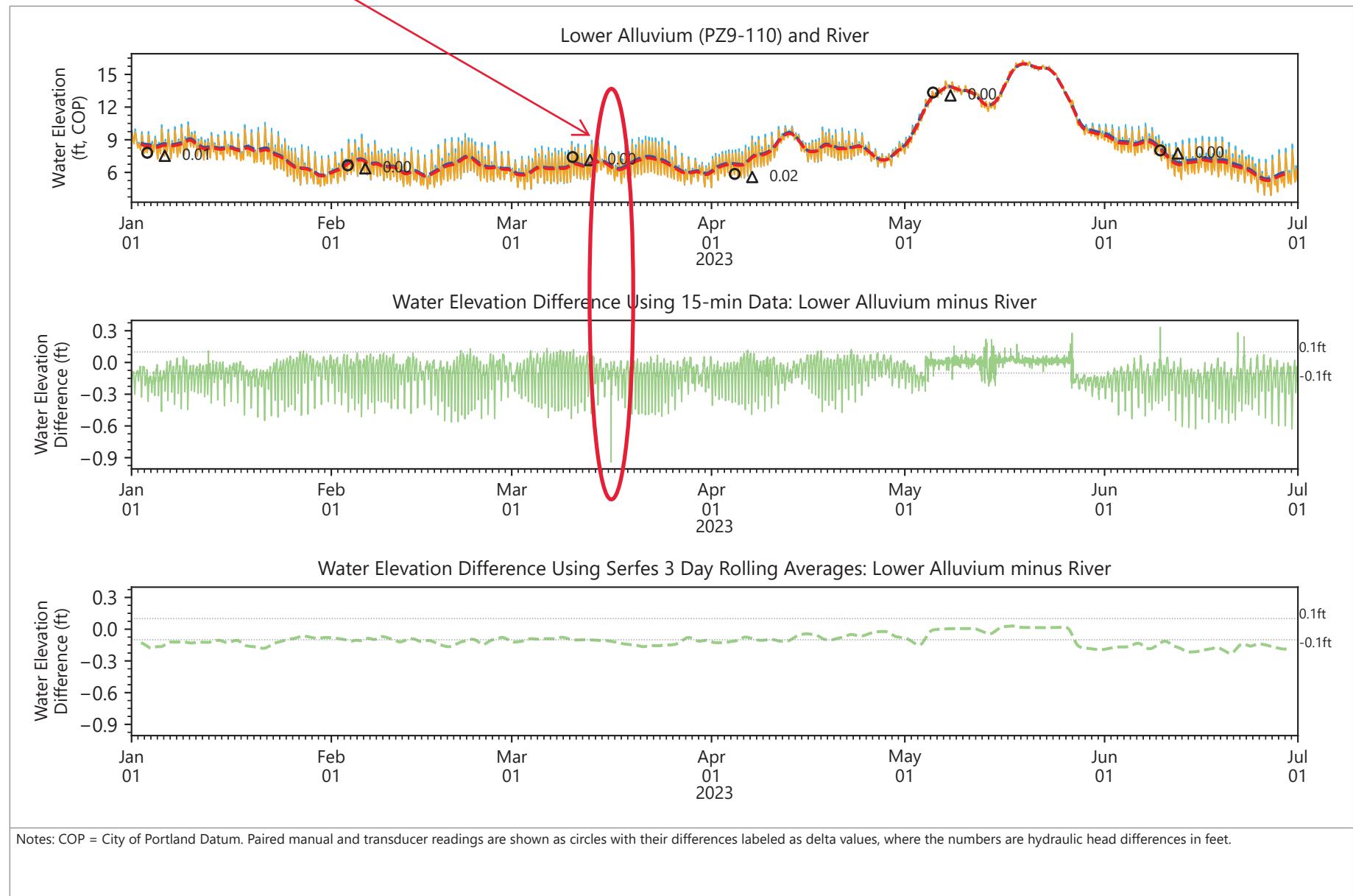
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|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.53
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

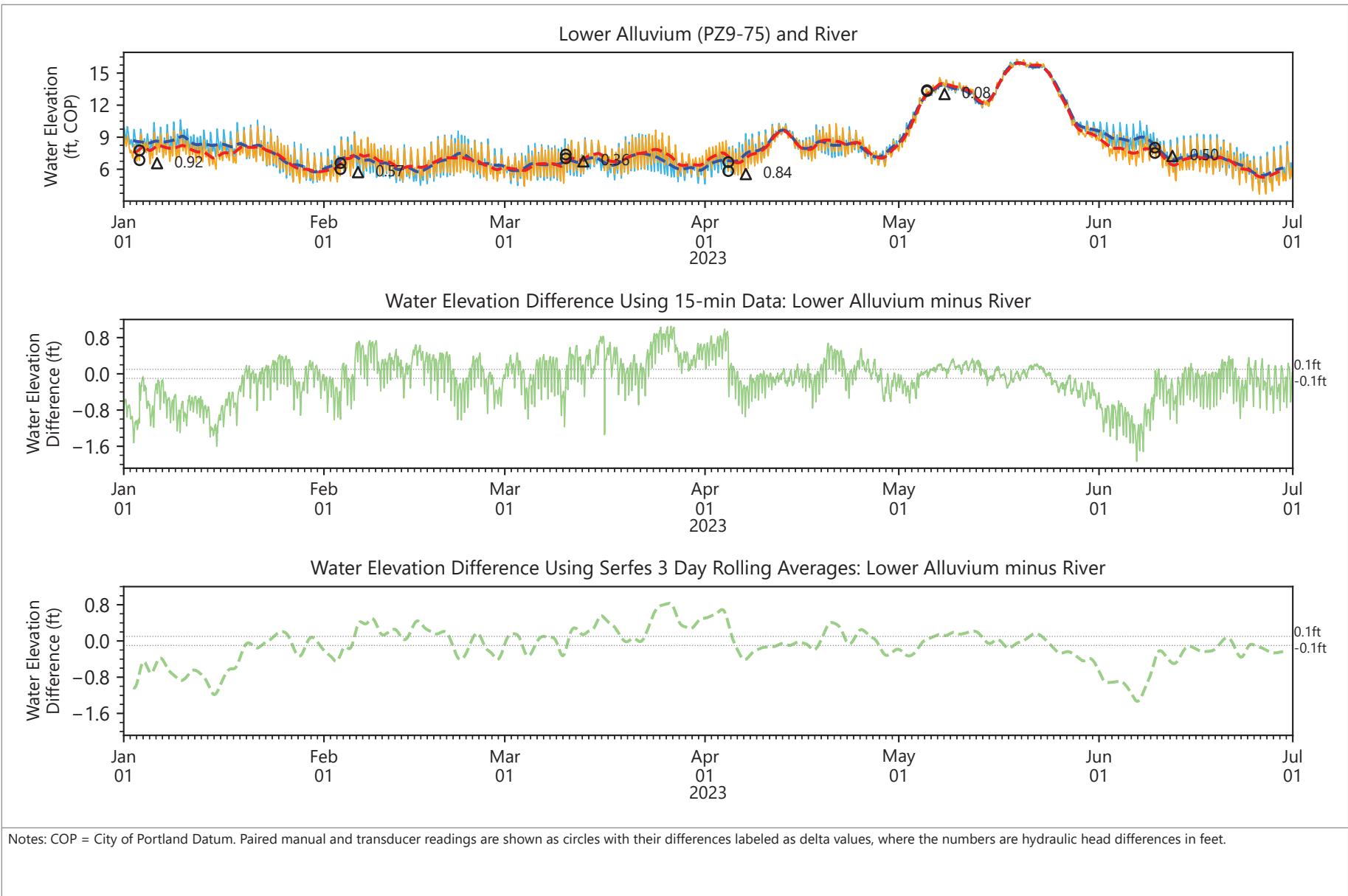


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.54
Groundwater Elevation Differences
 NW Natural Gasco Site



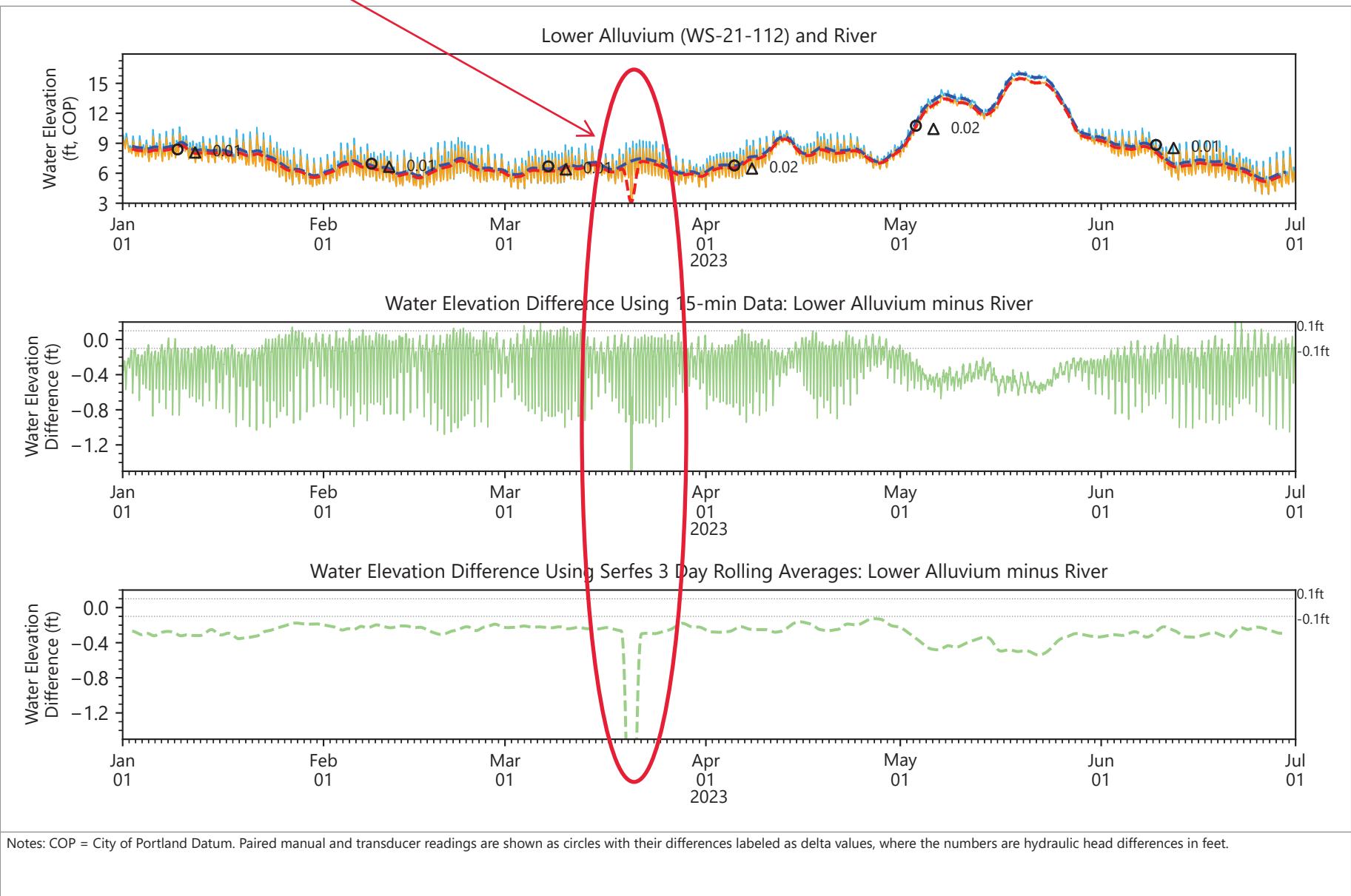
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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.55
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling



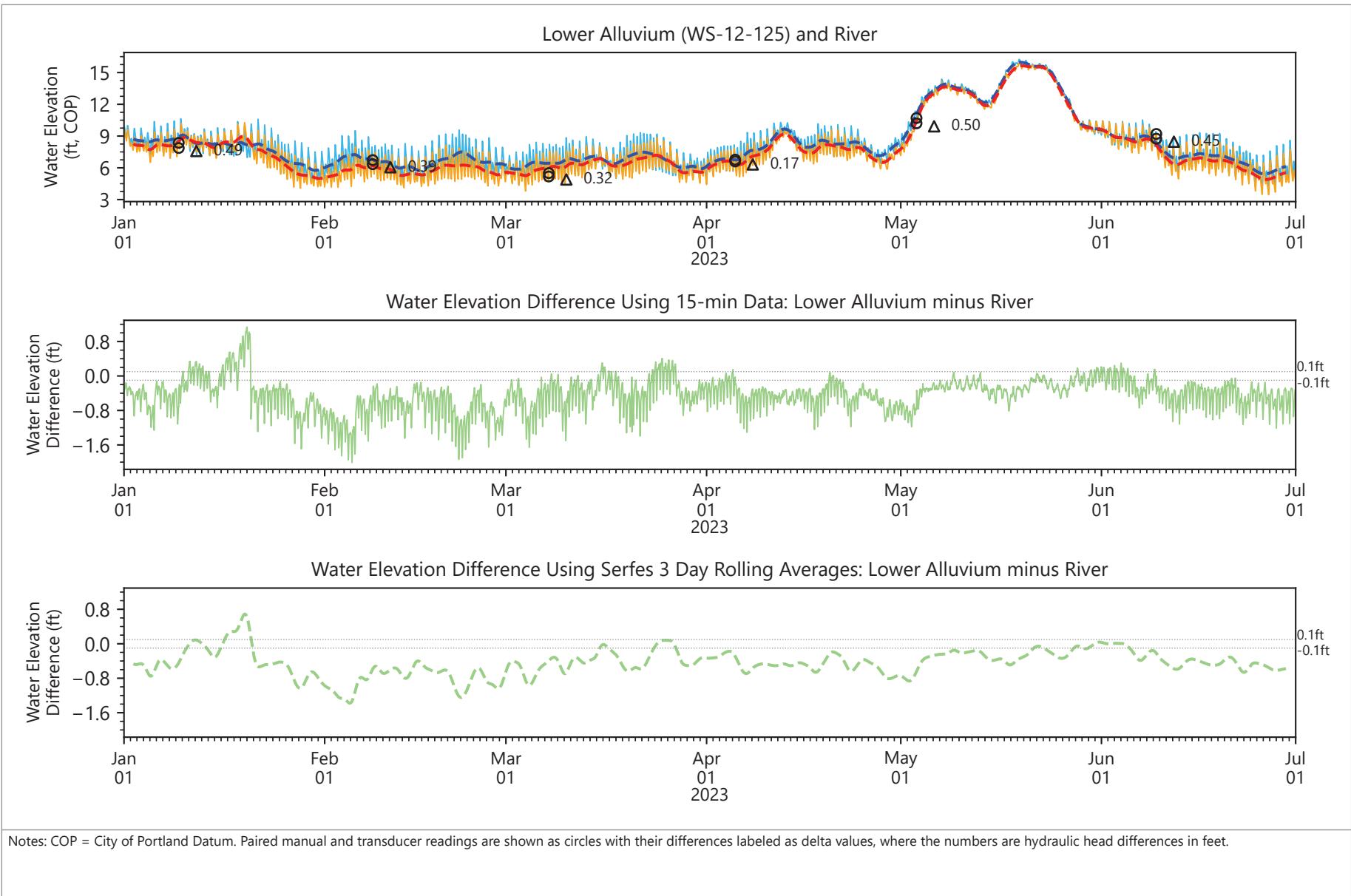
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Legend for Figure 1:

- Lower Alluvium: 15-min Data
- Lower Alluvium: Serfes Averages
- River: 15-min Data
- River: Serfes Averages
- Water Elevation Difference: 15-min Data
- Water Elevation Difference: Serfes Averages
- 0.1 ft Total Potential Uncertainty

Figure 4.56 Groundwater Elevation Differences NW Natural Gasco Site

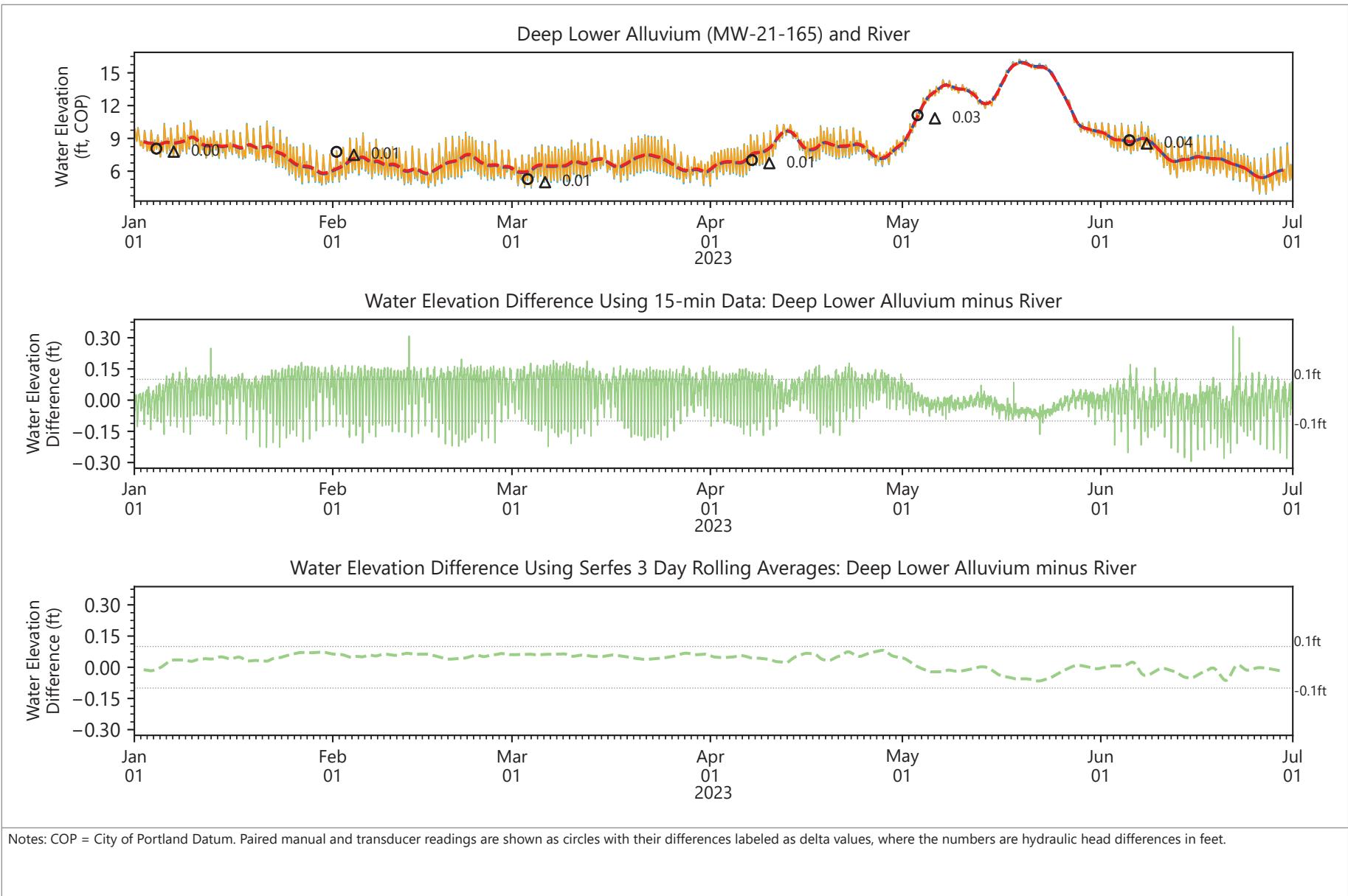


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- | | |
|---------------------------------|---|
| Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.57
Groundwater Elevation Differences
 NW Natural Gasco Site

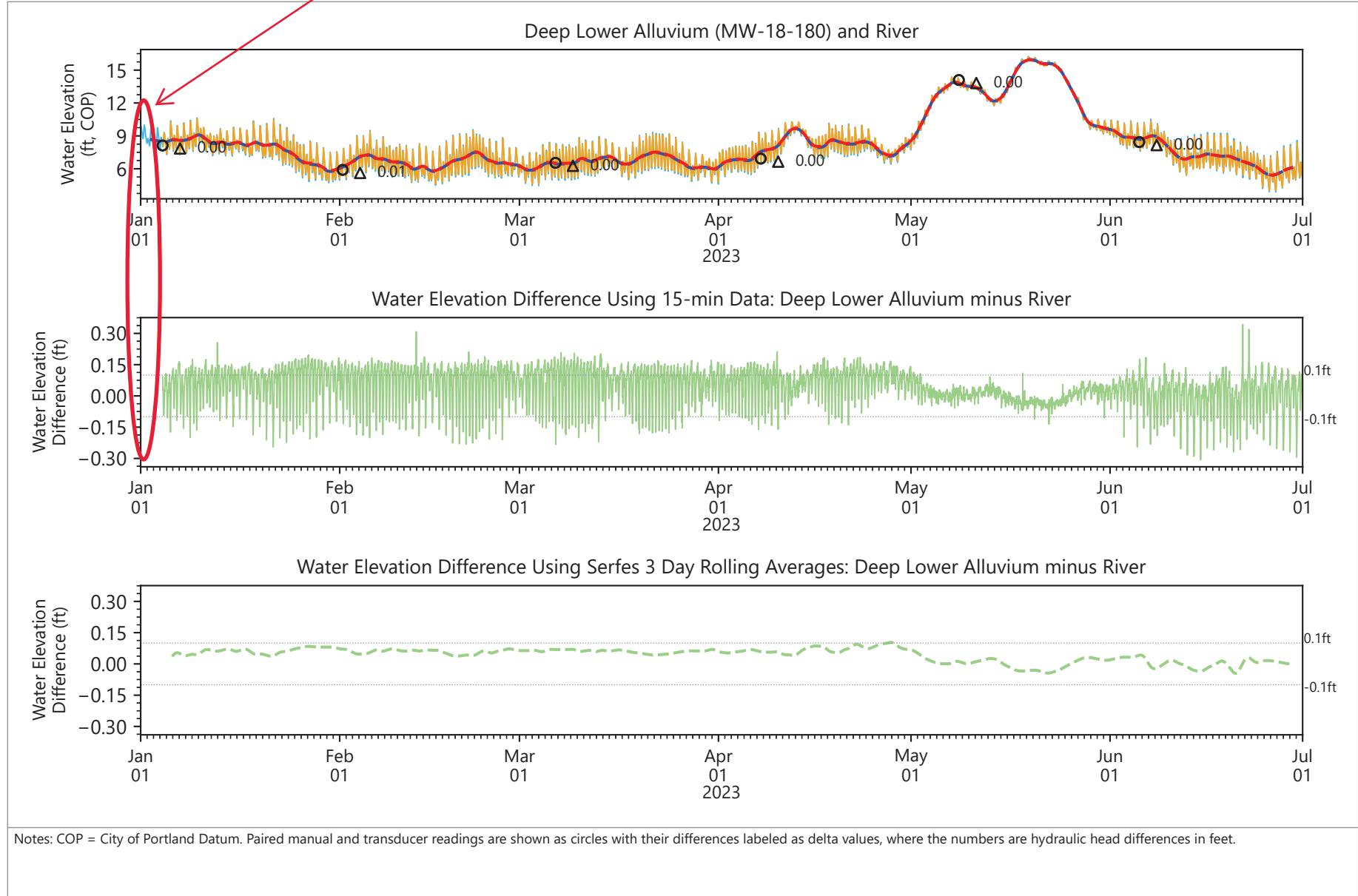


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- | | |
|--|---|
| — Deep Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Deep Lower Alluvium: Serfes Averages | — Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| — - - River: Serfes Averages | |

Figure 4.58
Groundwater Elevation Differences
 NW Natural Gasco Site

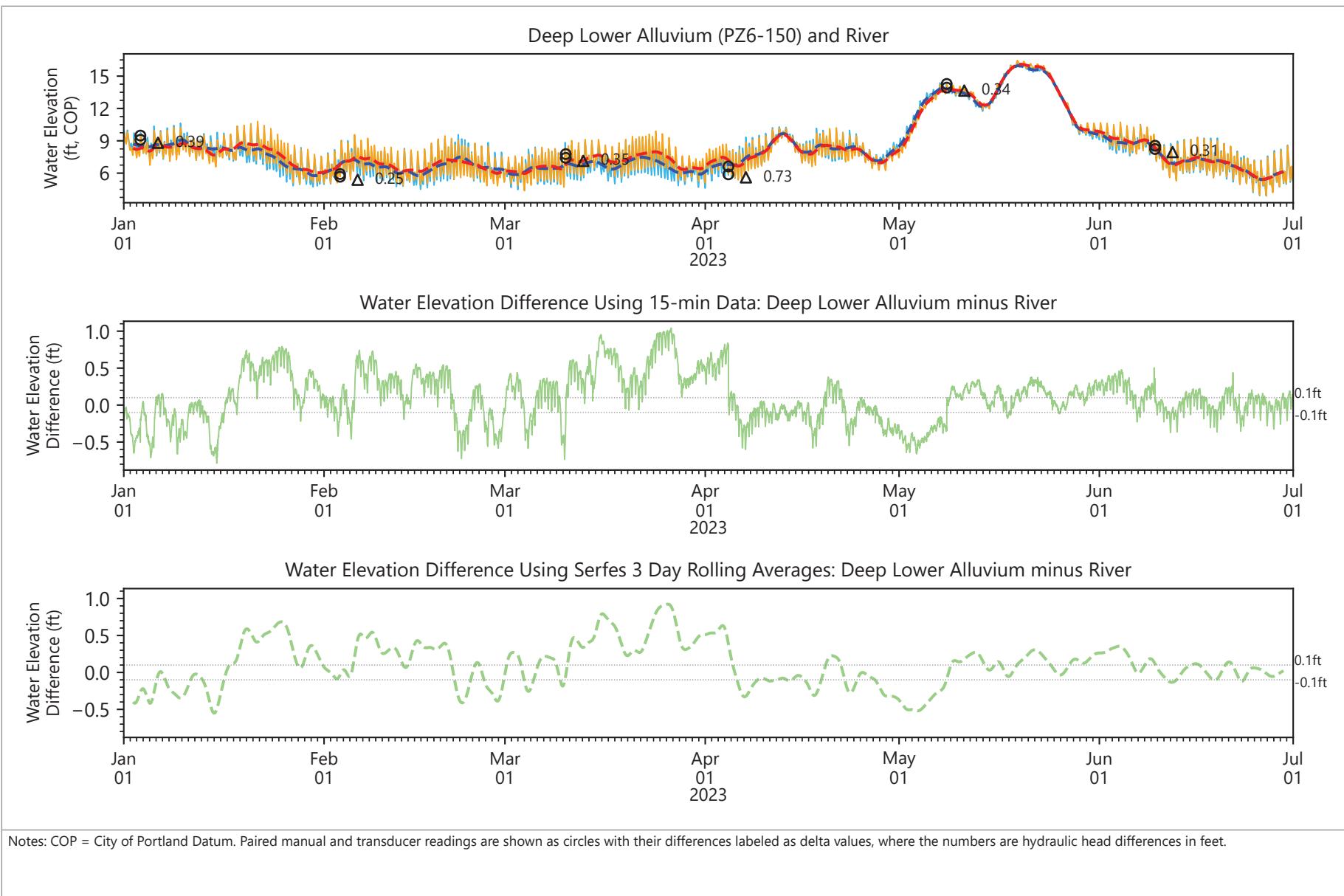


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|--|---|
| — Deep Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Deep Lower Alluvium: Serfes Averages | - - - Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | — 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.59
Groundwater Elevation Differences
 NW Natural Gasco Site

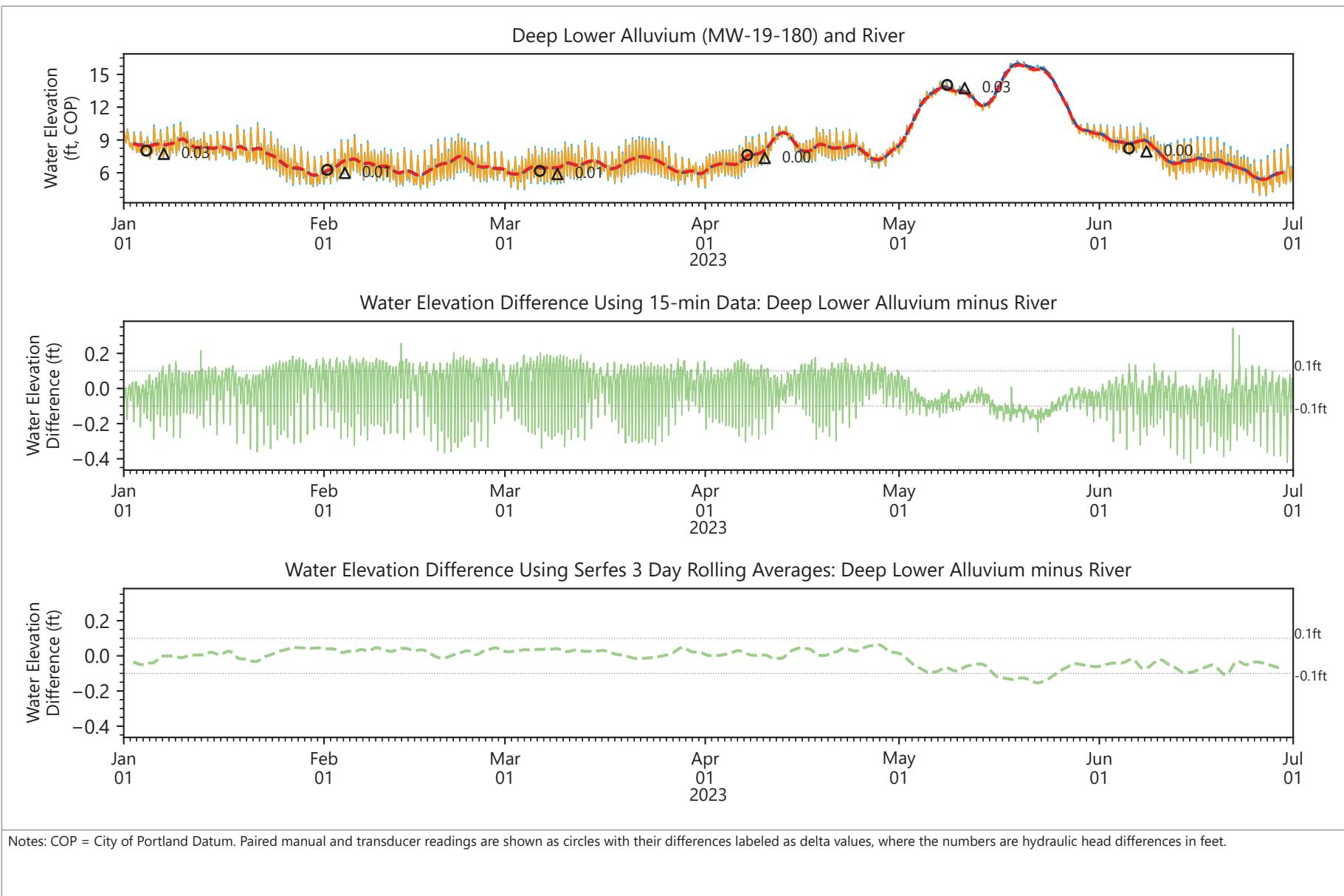


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- | | |
|--------------------------------------|---|
| Deep Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Deep Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.60
Groundwater Elevation Differences
 NW Natural Gasco Site



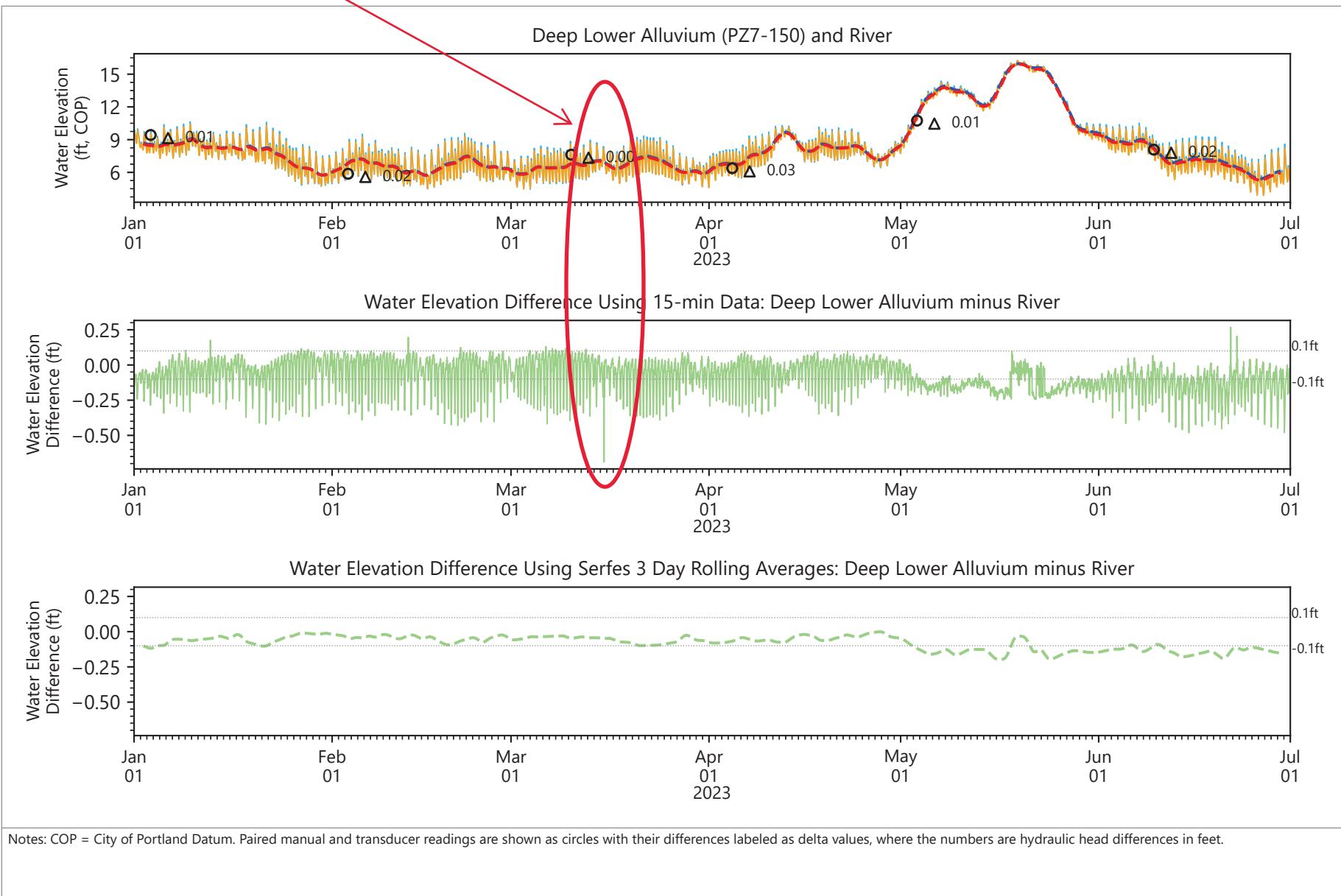
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- | | |
|--|---|
| — Deep Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Deep Lower Alluvium: Serfes Averages | — Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.61
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

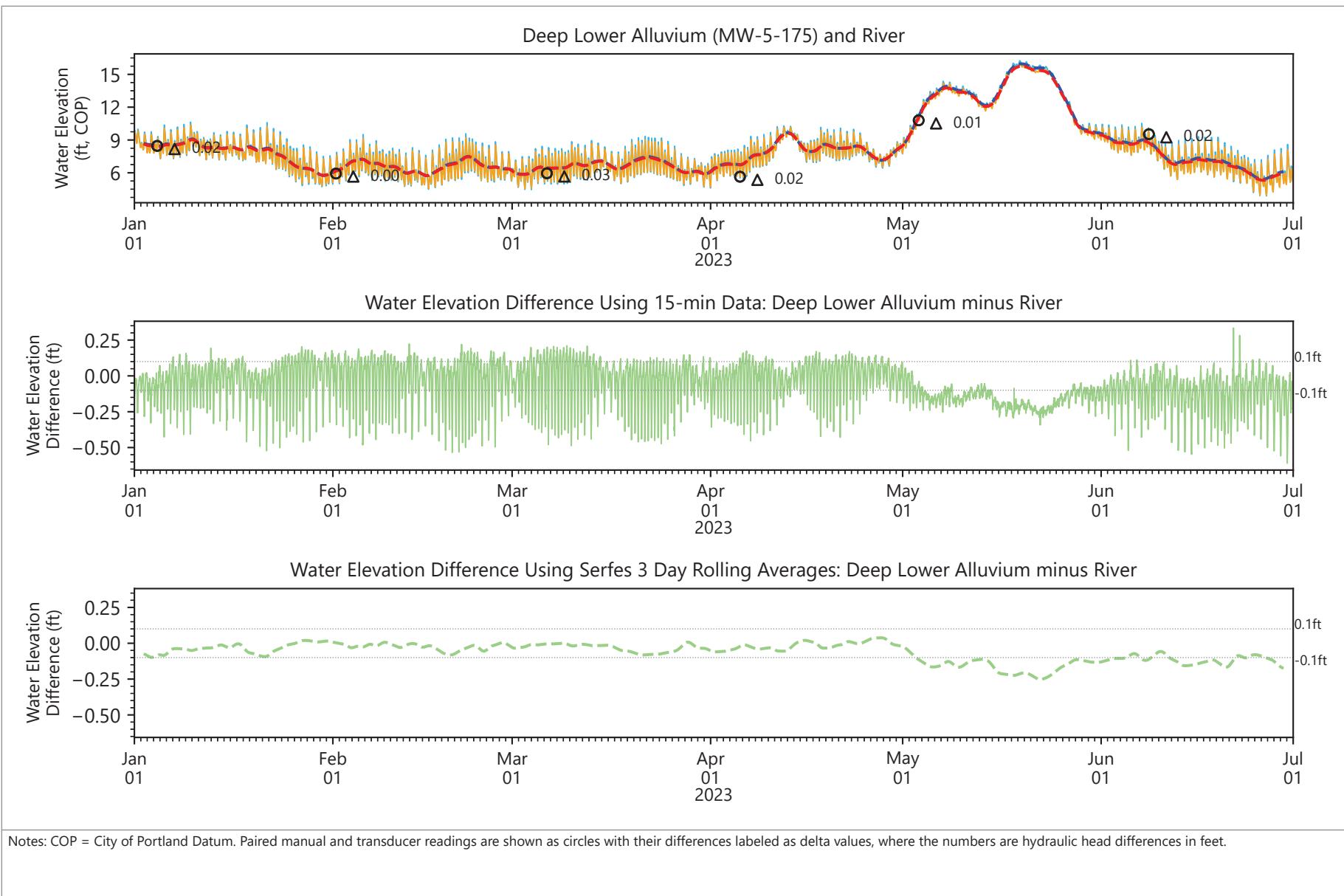


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|--------------------------------------|---|
| Deep Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Deep Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.62
Groundwater Elevation Differences
 NW Natural Gasco Site



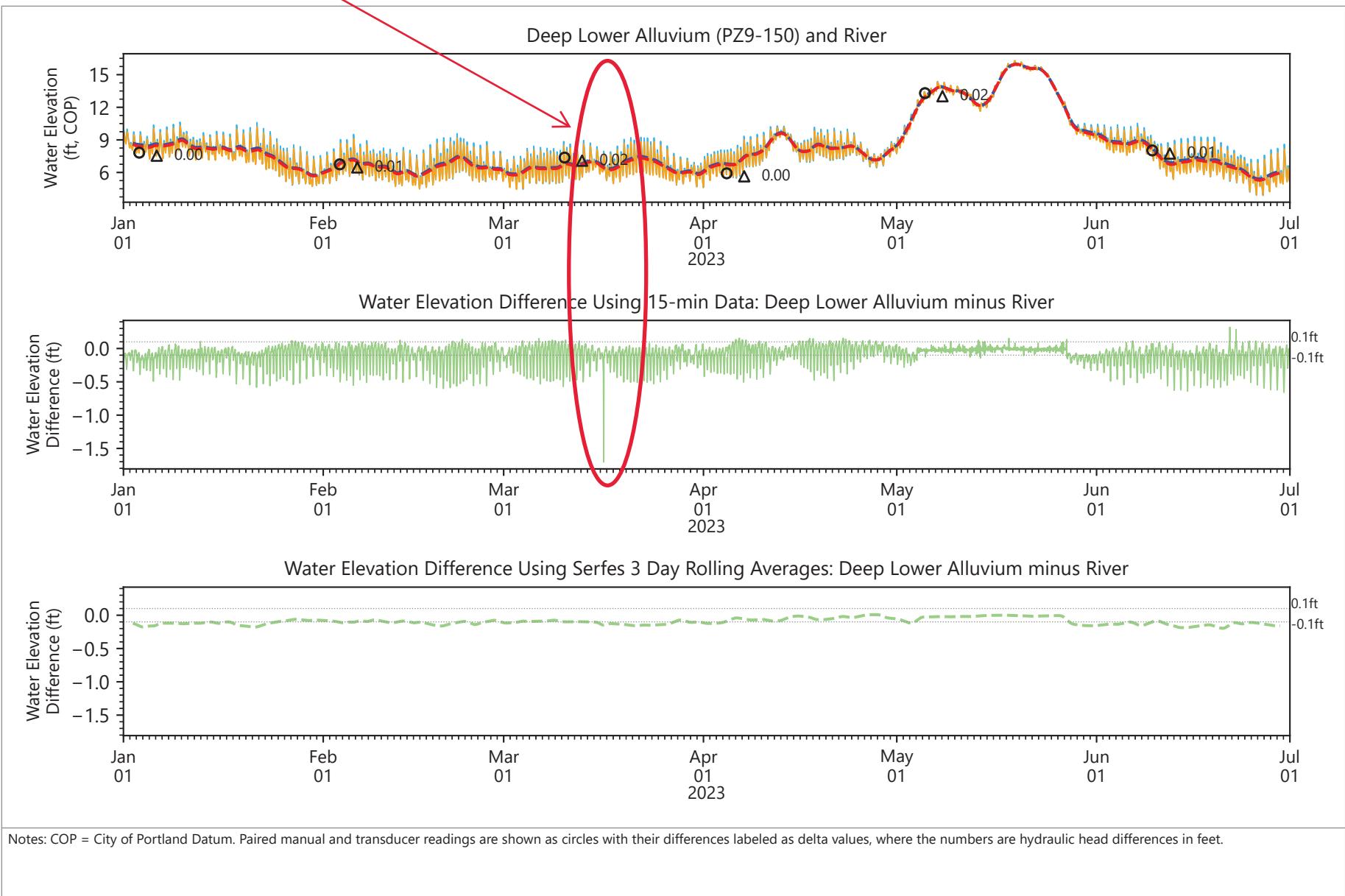
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|--|---|
| — Deep Lower Alluvium: 15-min Data | — Water Elevation Difference: 15-min Data |
| - - - Deep Lower Alluvium: Serfes Averages | — - - Water Elevation Difference: Serfes Averages |
| — River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| - - - River: Serfes Averages | |

Figure 4.63
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling

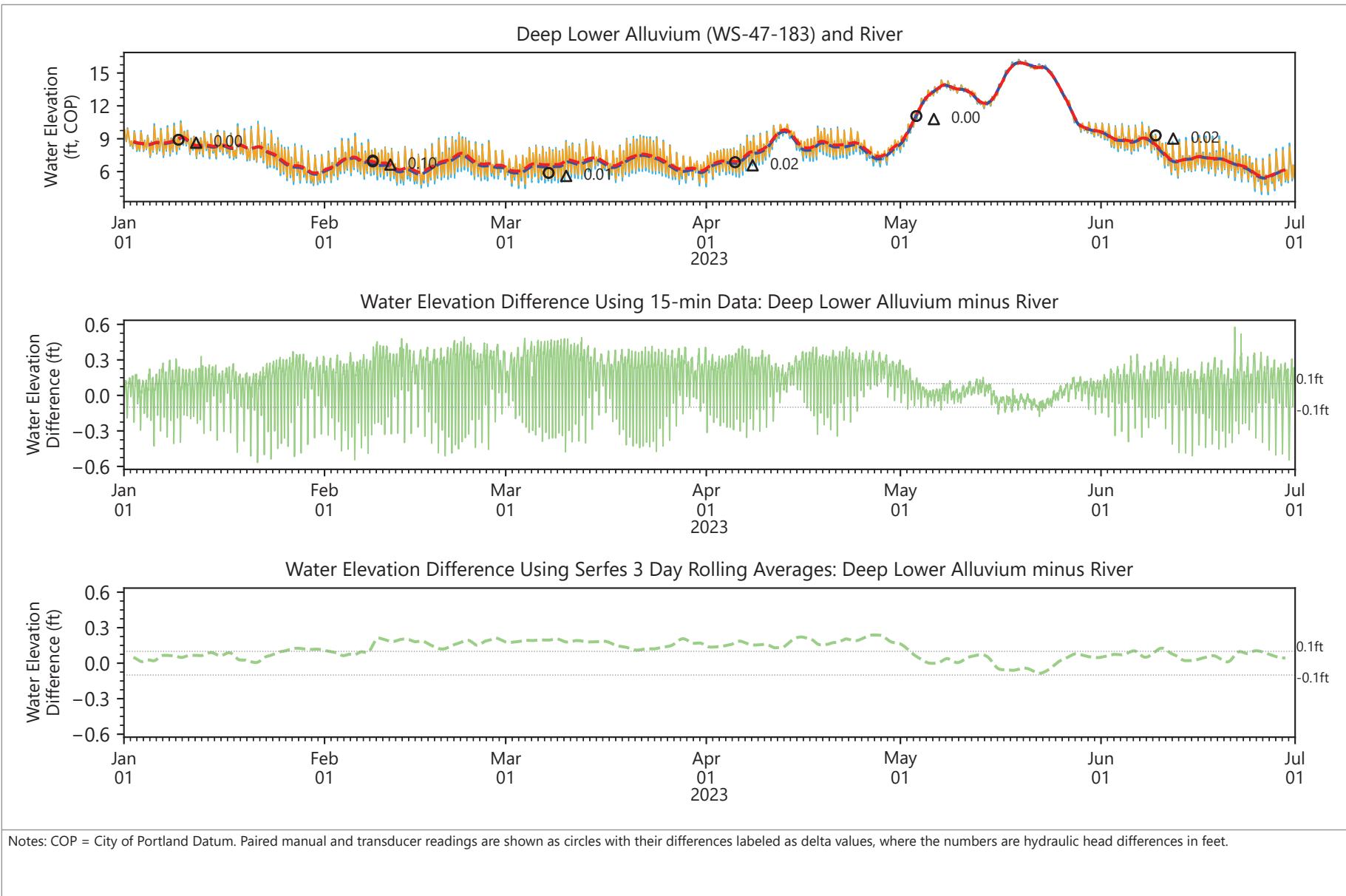


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- | | |
|--------------------------------------|---|
| Deep Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Deep Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.64
Groundwater Elevation Differences
 NW Natural Gasco Site

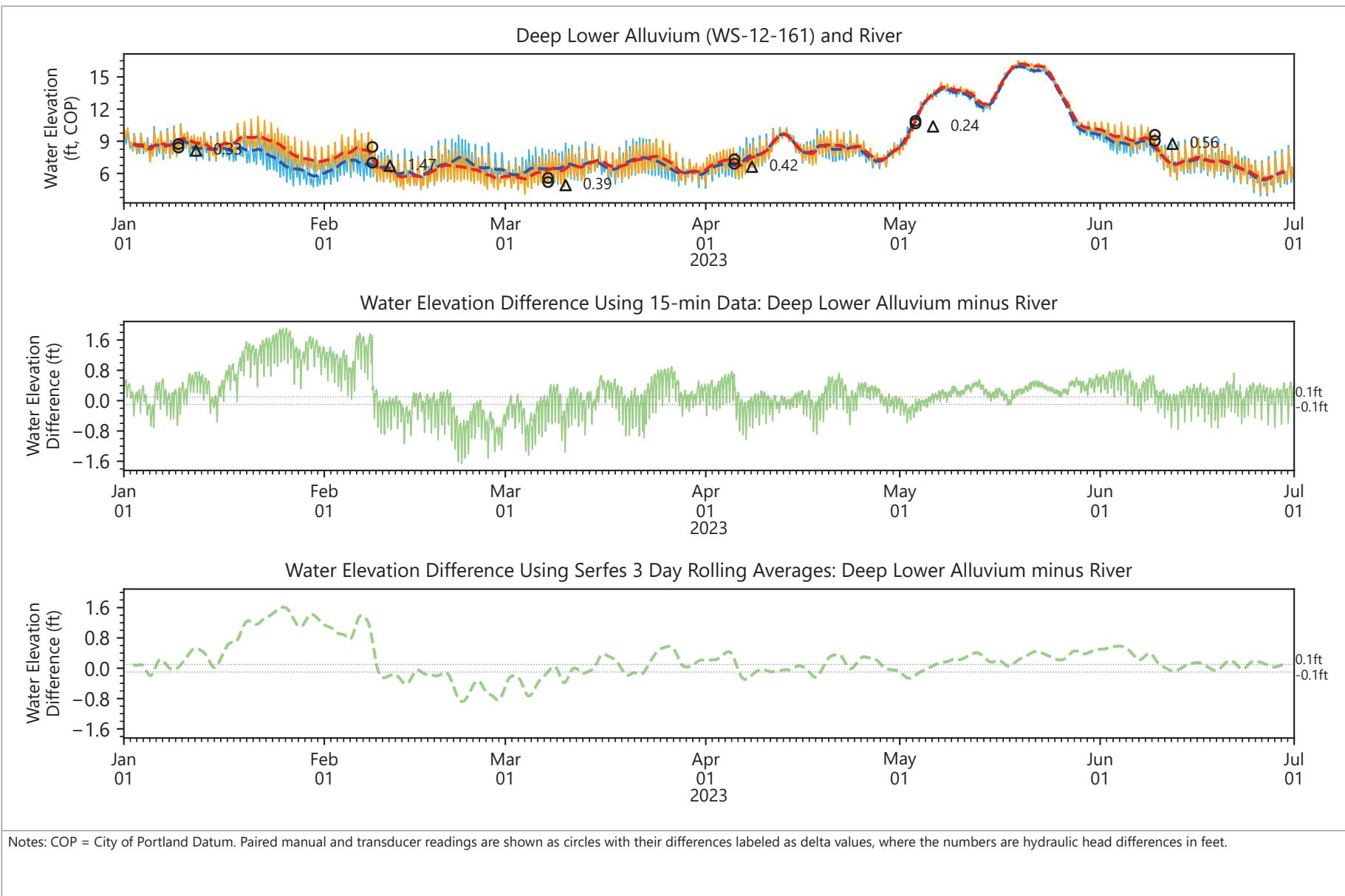


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- | | |
|--------------------------------------|---|
| Deep Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Deep Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.65
Groundwater Elevation Differences
 NW Natural Gasco Site

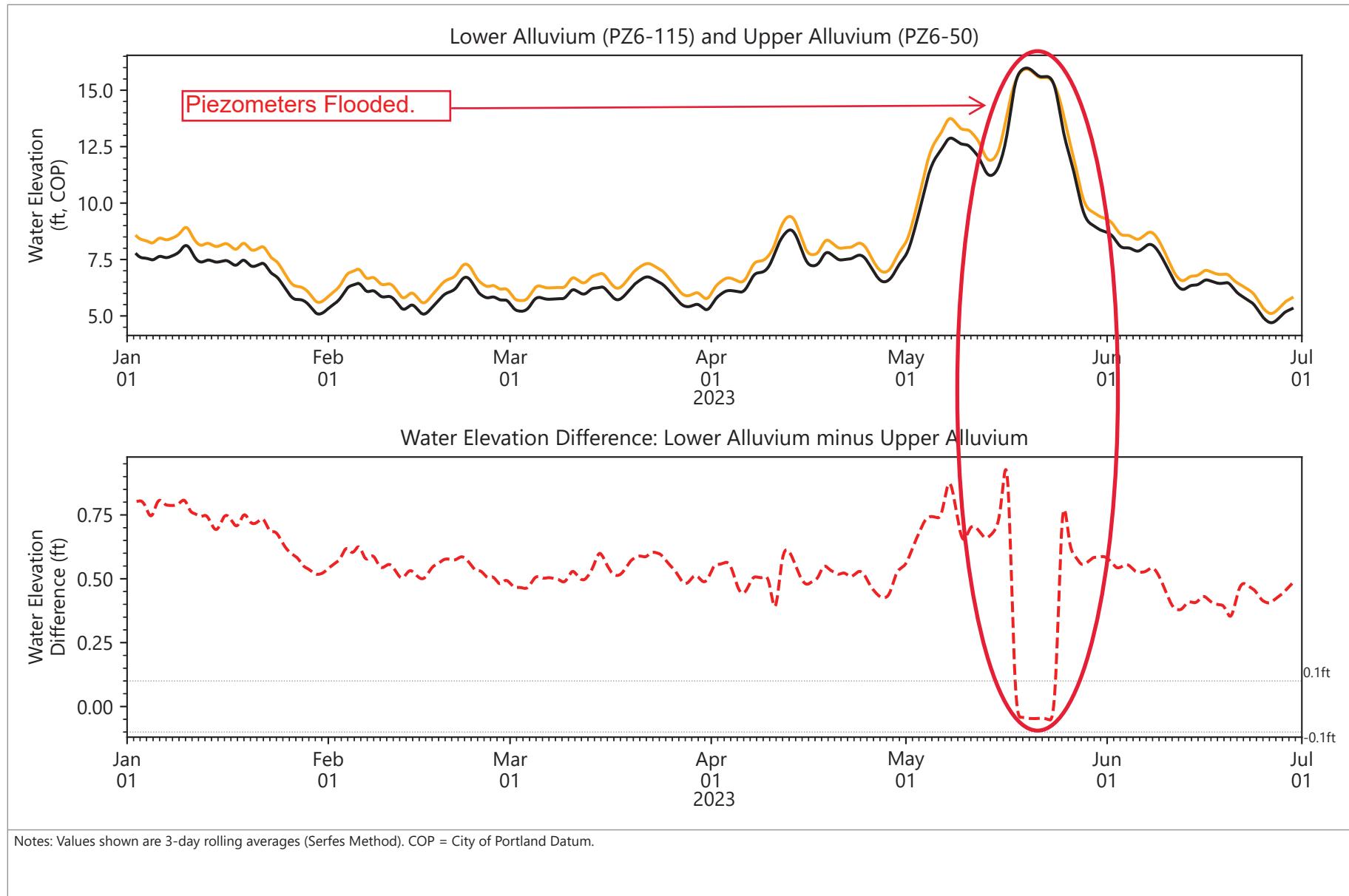


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- | | |
|--------------------------------------|---|
| Deep Lower Alluvium: 15-min Data | Water Elevation Difference: 15-min Data |
| Deep Lower Alluvium: Serfes Averages | Water Elevation Difference: Serfes Averages |
| River: 15-min Data | 0.1 ft Total Potential Uncertainty |
| River: Serfes Averages | |

Figure 4.66
Groundwater Elevation Differences
 NW Natural Gasco Site



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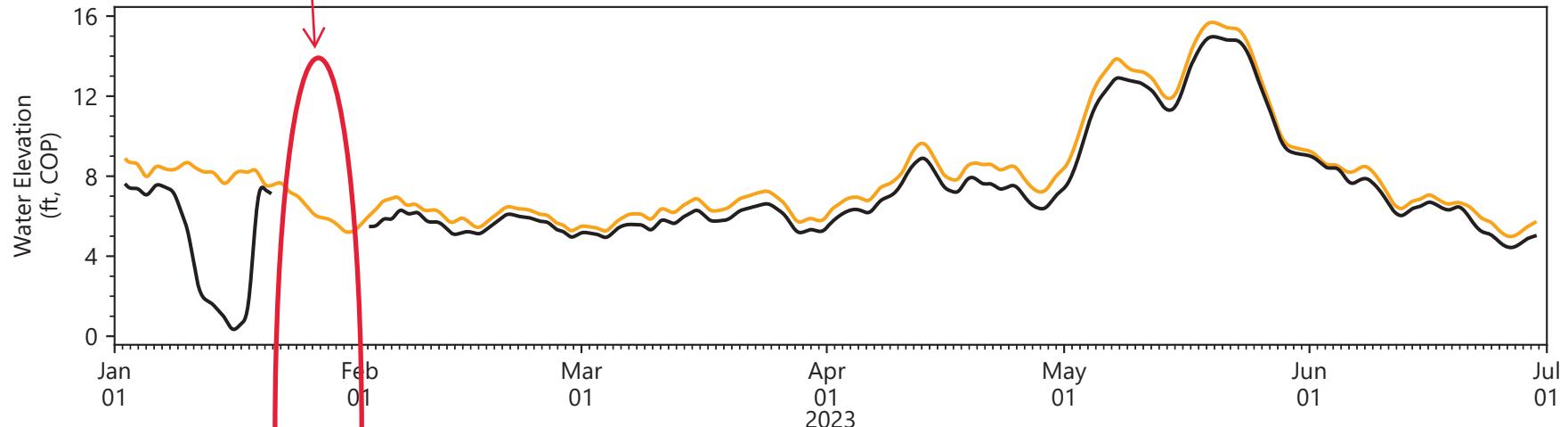
- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.1
Groundwater Elevation Differences
 NW Natural Gasco Site

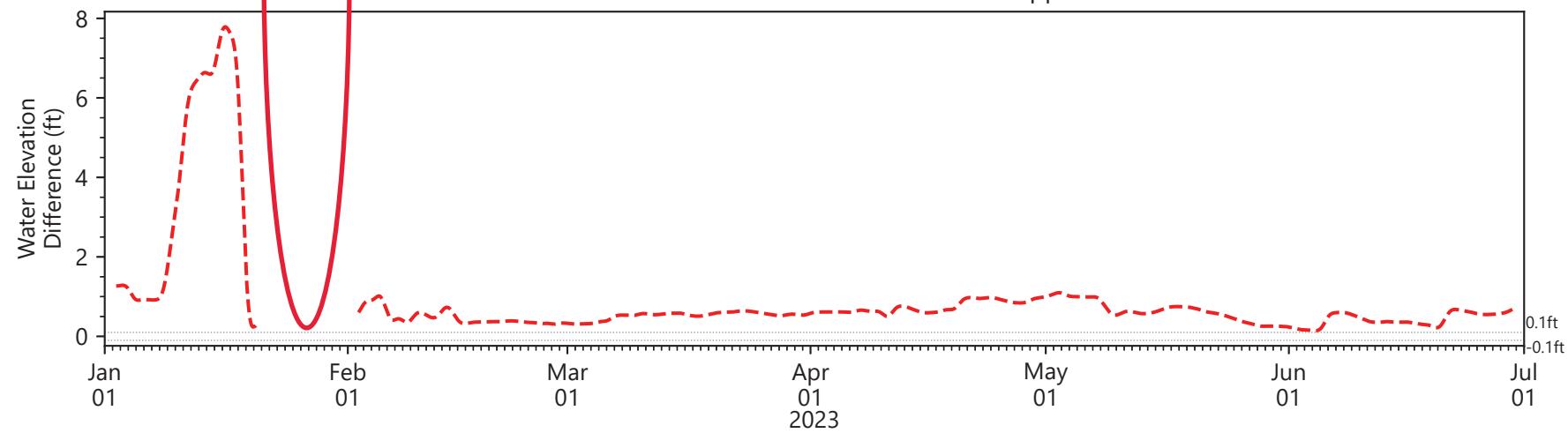
MW-16-65 Transducer

malfunction. Data
unrecoverable.

Lower Alluvium (MW-18-125) and Upper Alluvium (MW-16-65)



Water Elevation Difference: Lower Alluvium minus Upper Alluvium



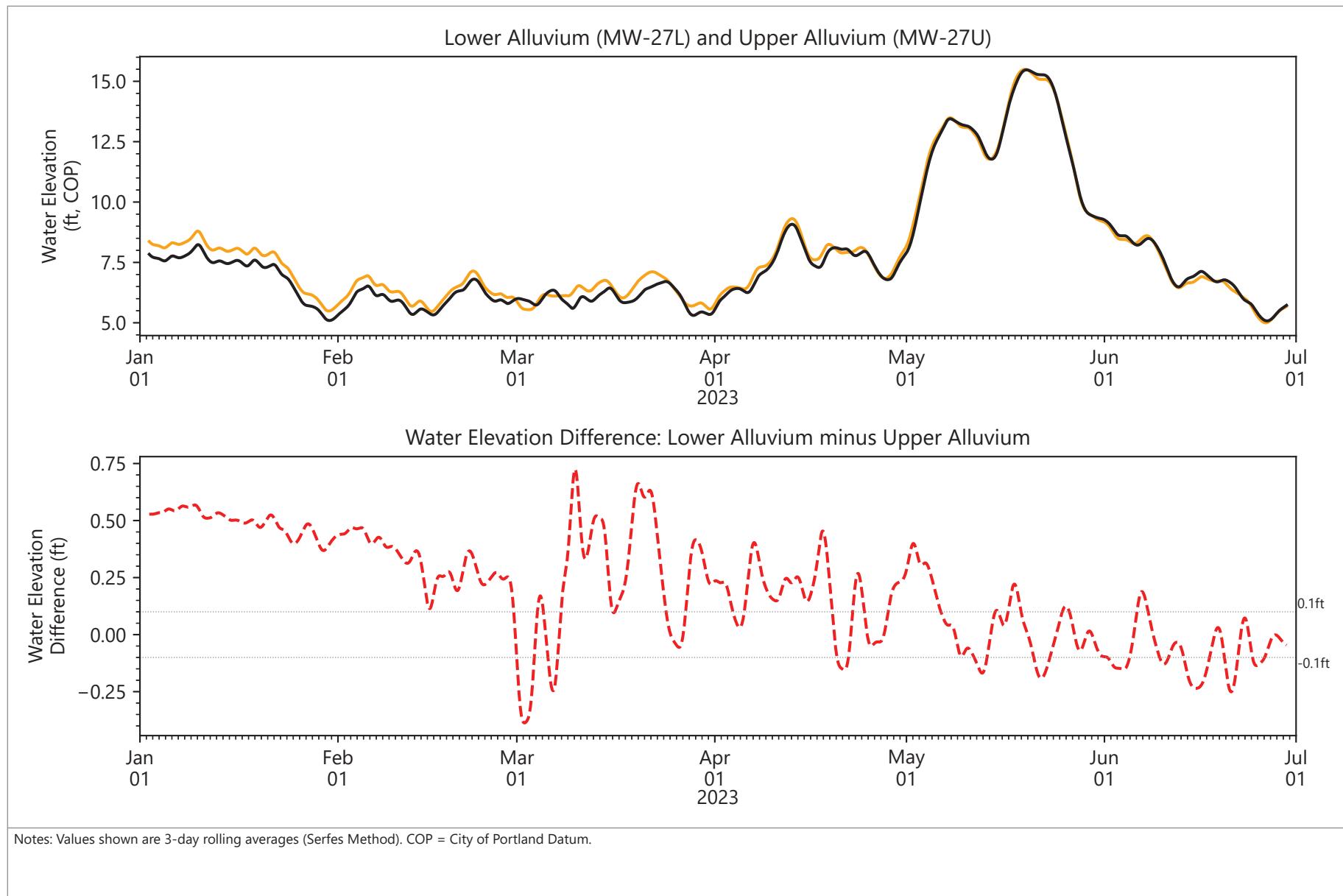
Notes: Values shown are 3-day rolling averages (Serfes Method). COP = City of Portland Datum.

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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.2
Groundwater Elevation Differences
NW Natural Gasco Site

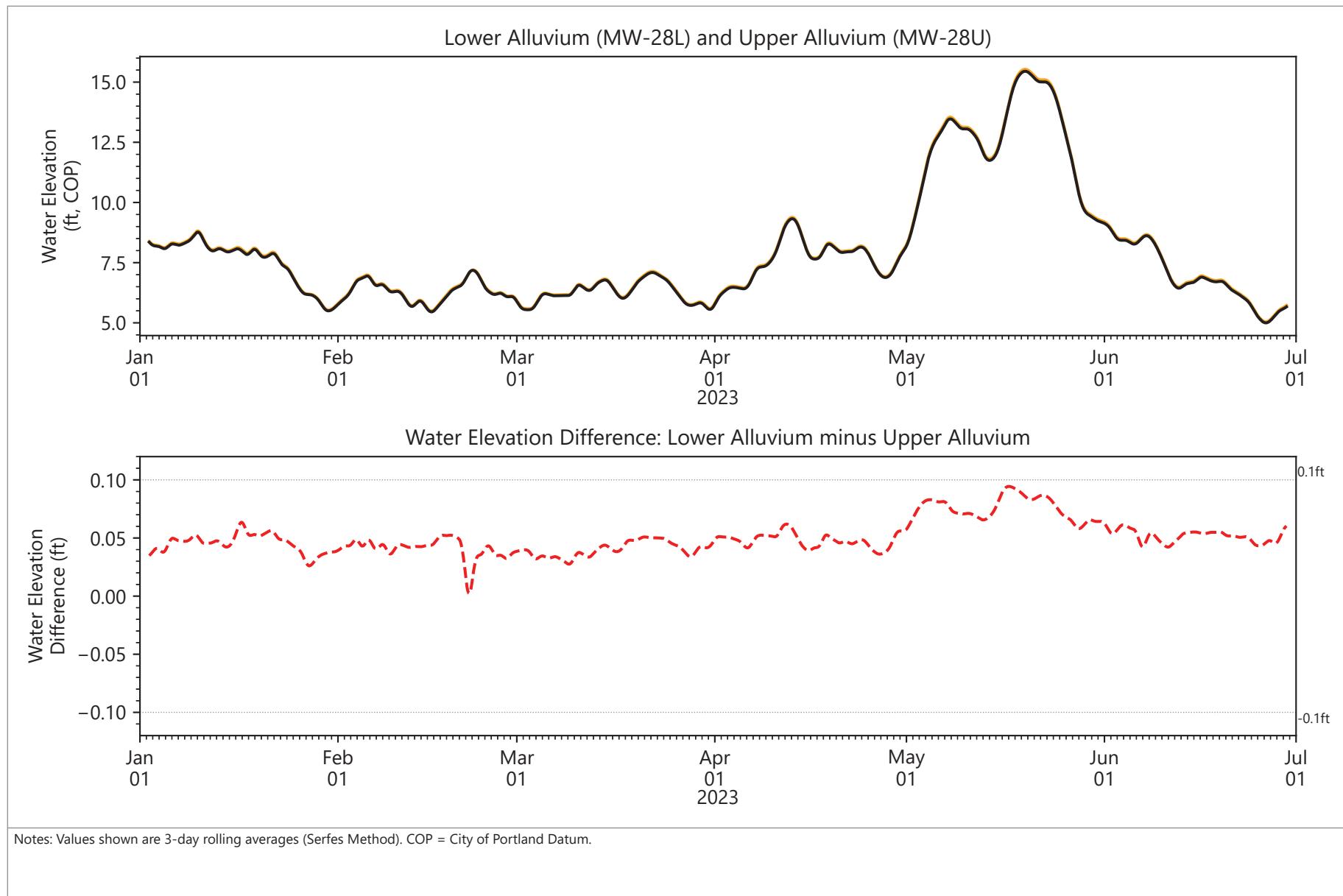


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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.3
Groundwater Elevation Differences
 NW Natural Gasco Site

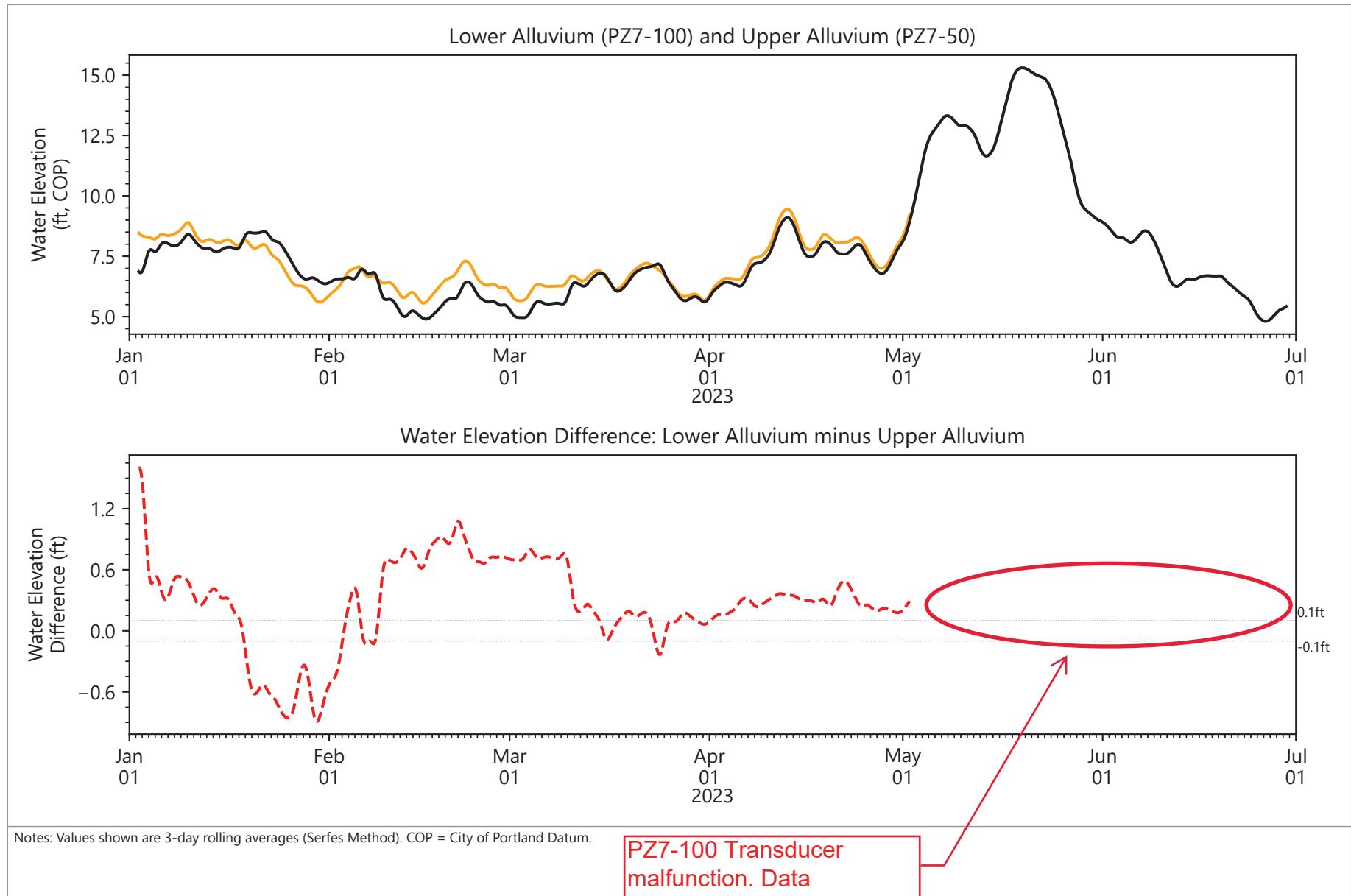


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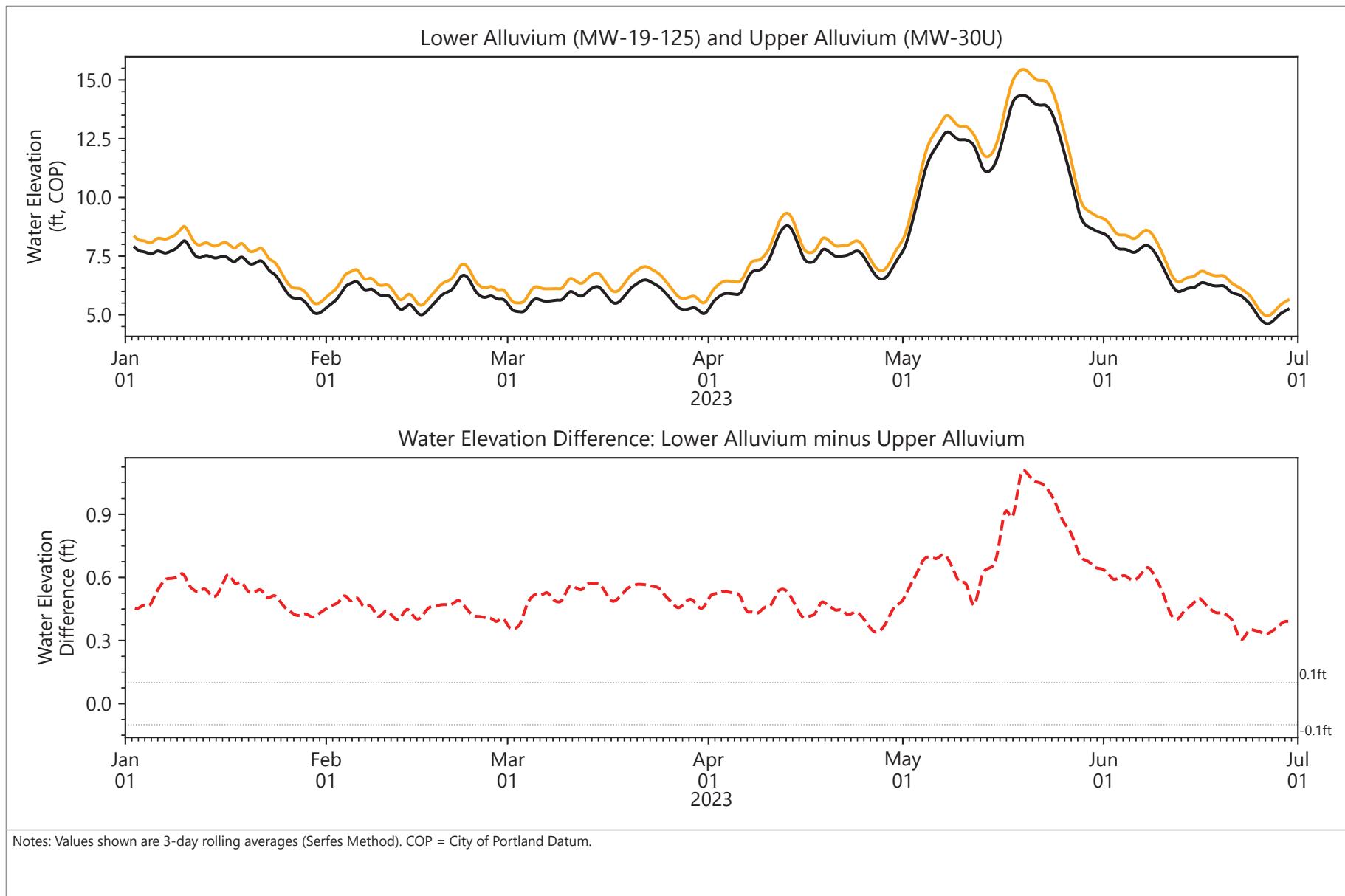
- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.4
Groundwater Elevation Differences
 NW Natural Gasco Site



—	Lower Alluvium
—	Upper Alluvium
- - -	Water Elevation Difference
-----	0.1 ft Total Potential Uncertainty

Figure 5.5
Groundwater Elevation Differences
NW Natural Gasco Site

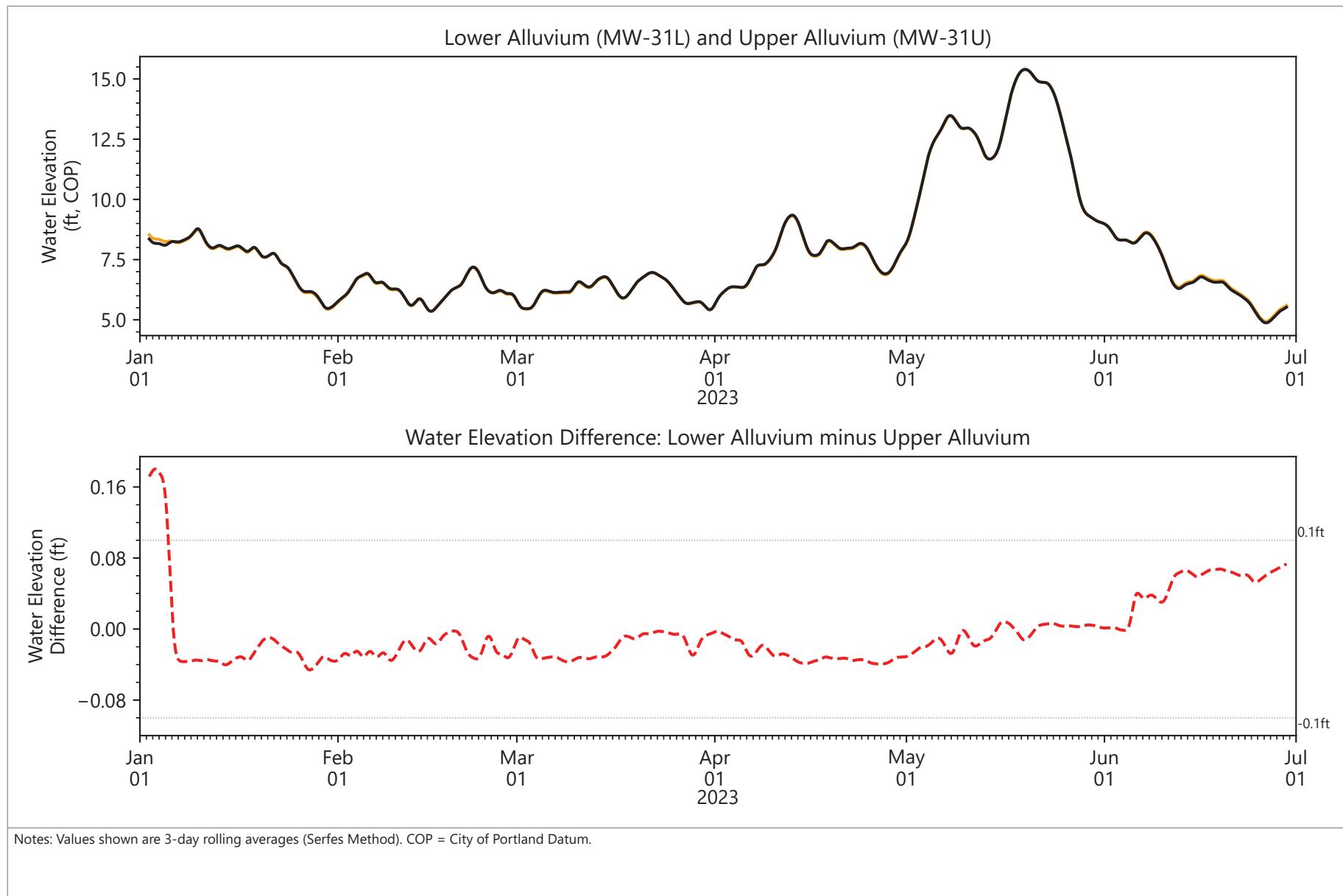


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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.6
Groundwater Elevation Differences
 NW Natural Gasco Site

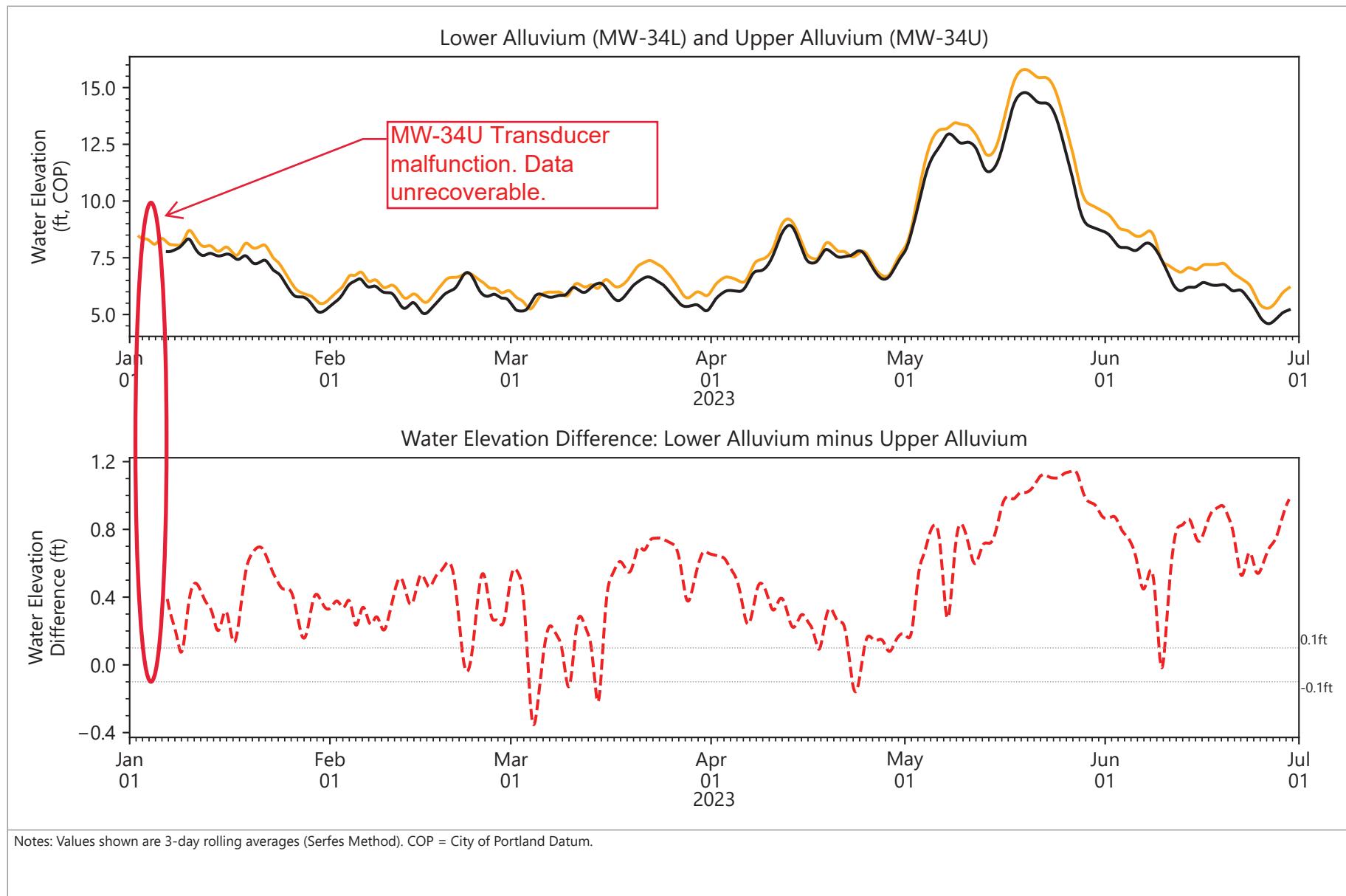


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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.7
Groundwater Elevation Differences
 NW Natural Gasco Site

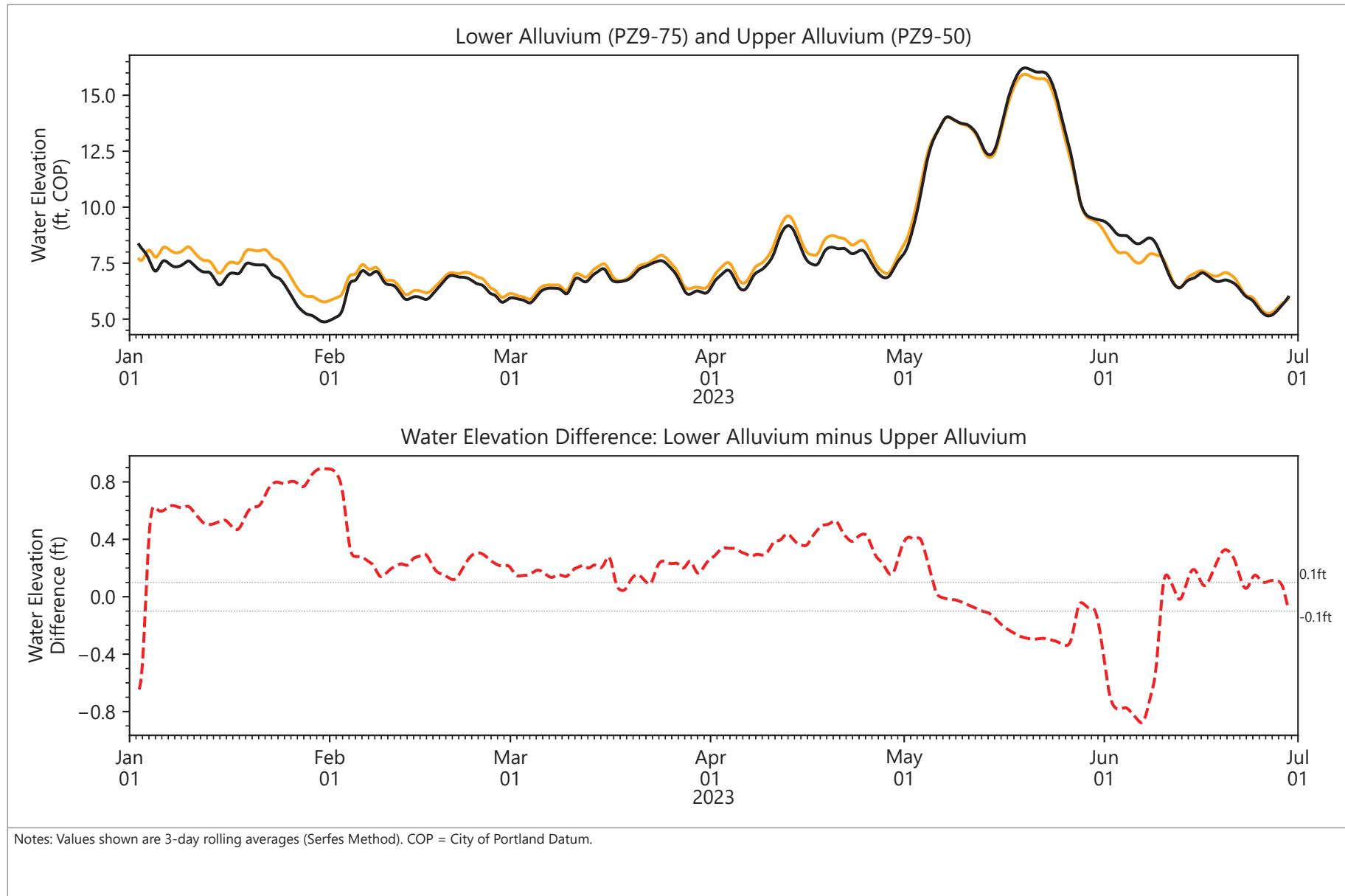


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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.8
Groundwater Elevation Differences
 NW Natural Gasco Site



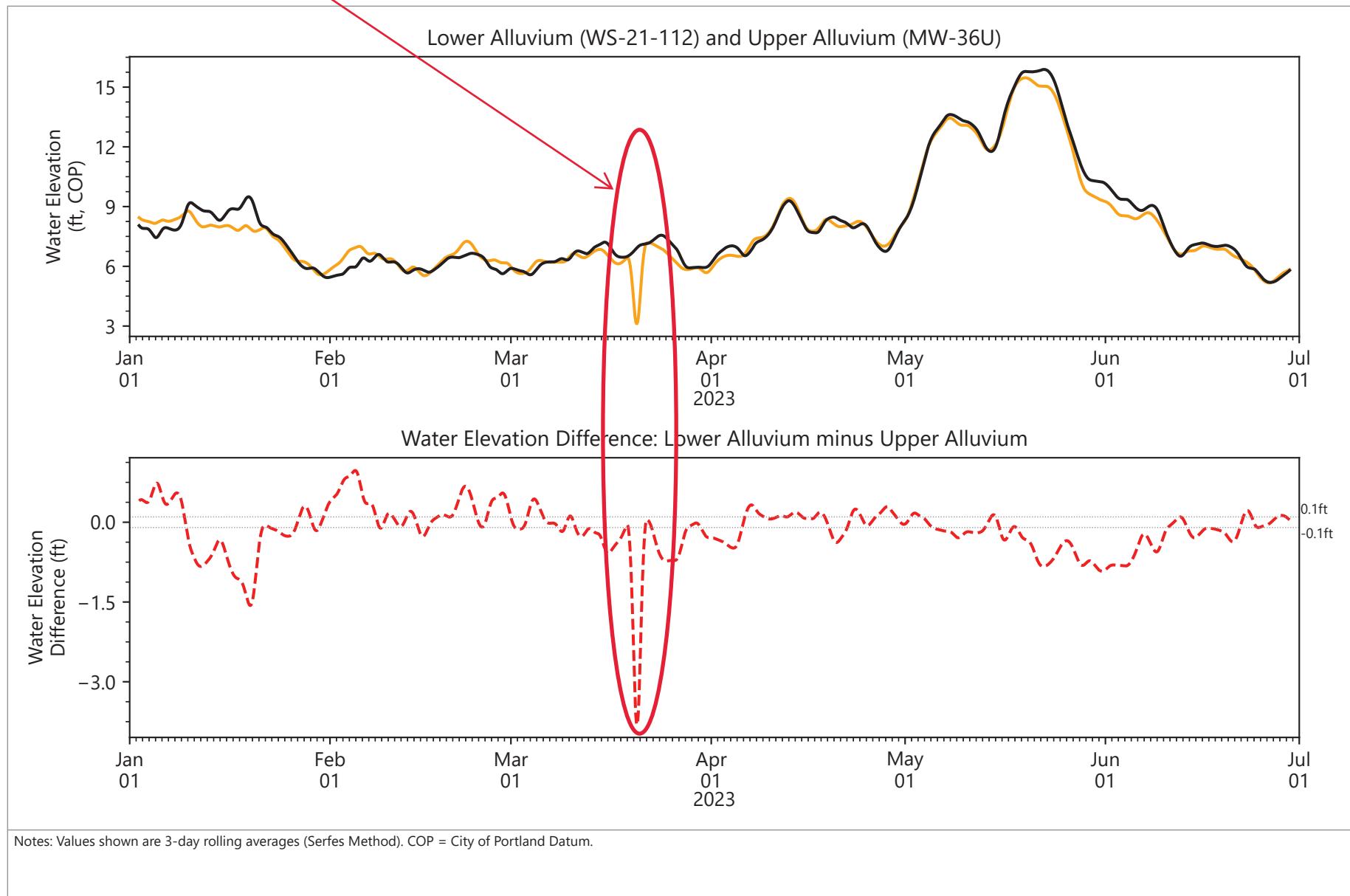
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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.9
Groundwater Elevation Differences
 NW Natural Gasco Site

1Q Groundwater Sampling
of WS-21-112

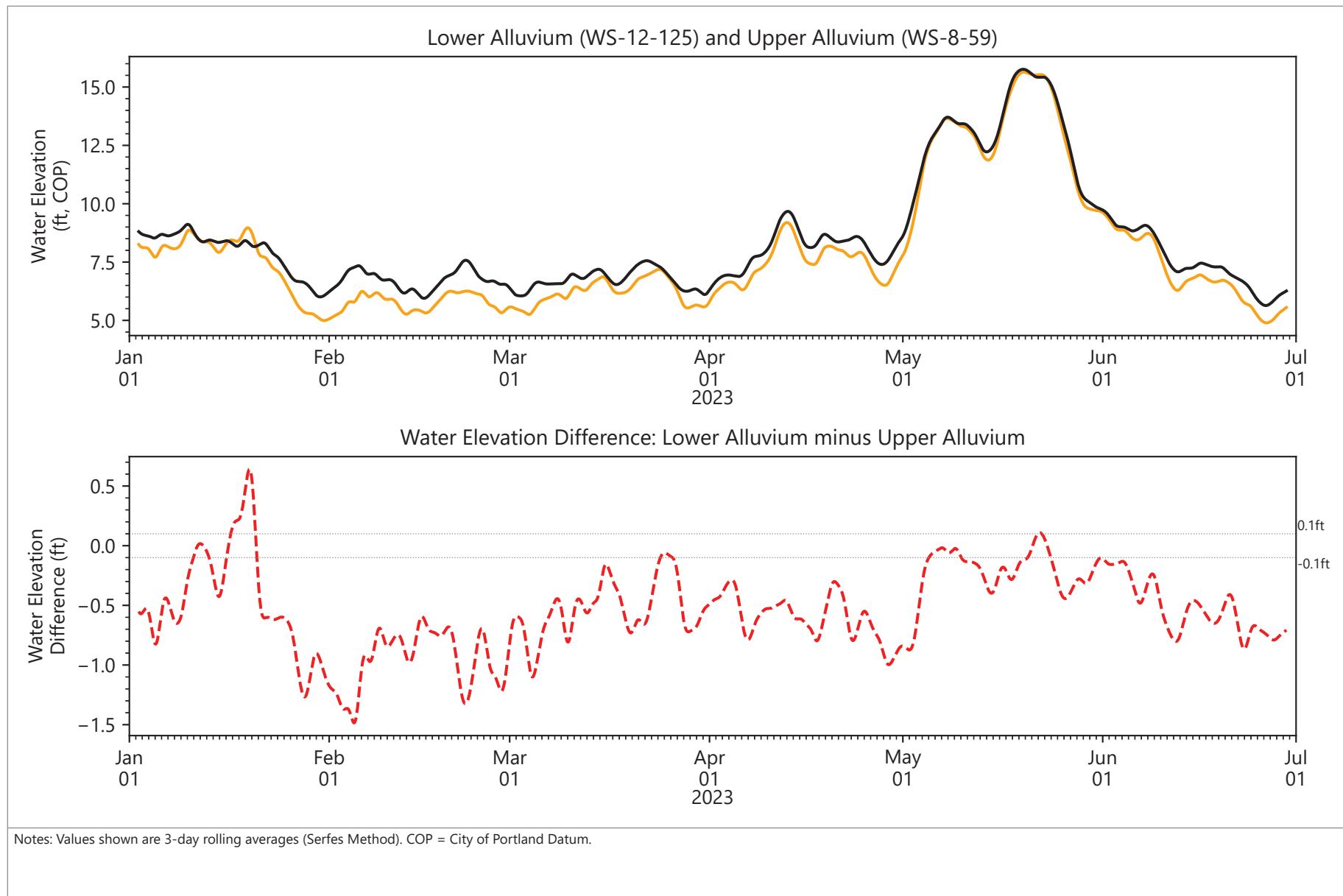


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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.10
Groundwater Elevation Differences
NW Natural Gasco Site

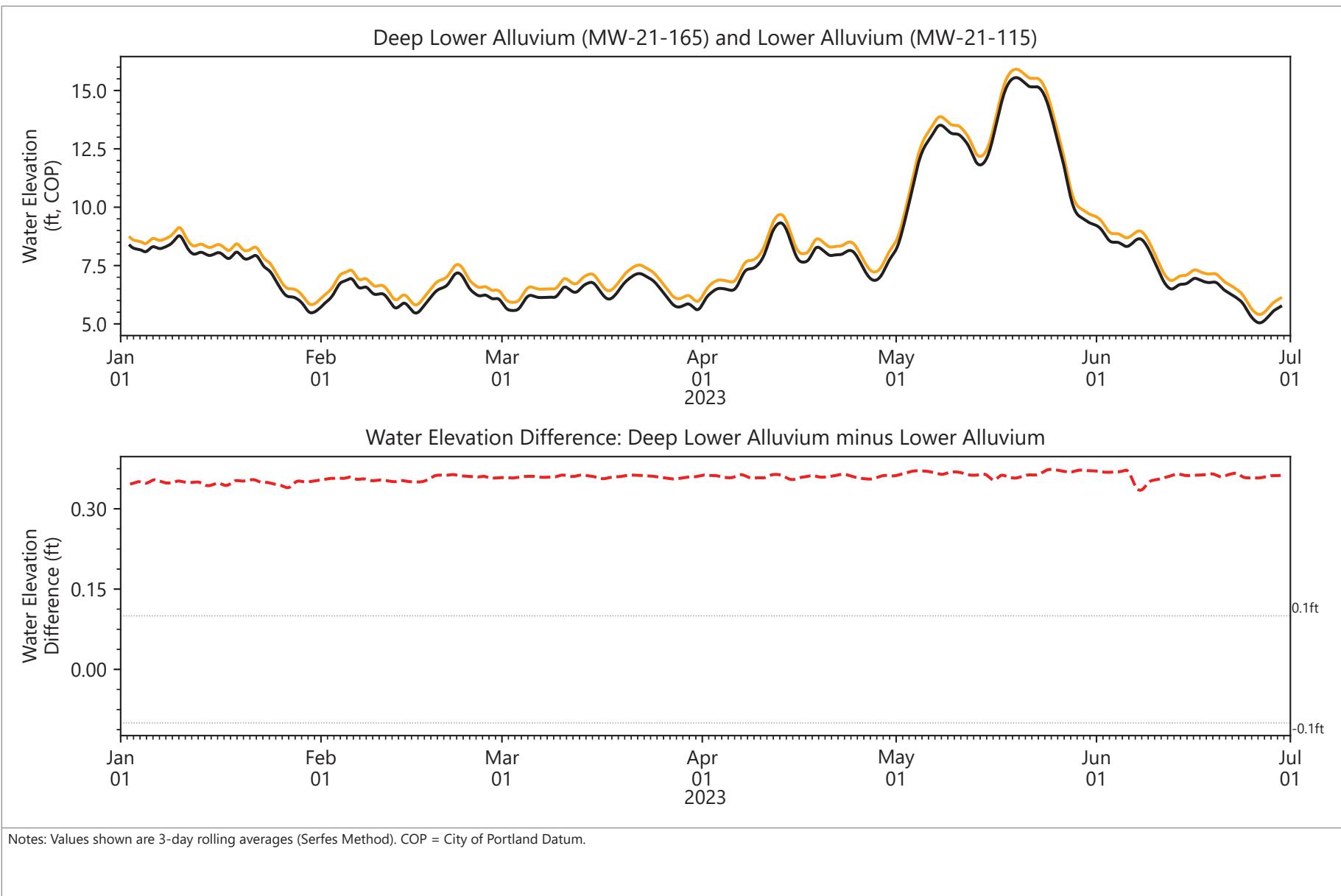


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- Lower Alluvium
- Upper Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.11
Groundwater Elevation Differences
 NW Natural Gasco Site

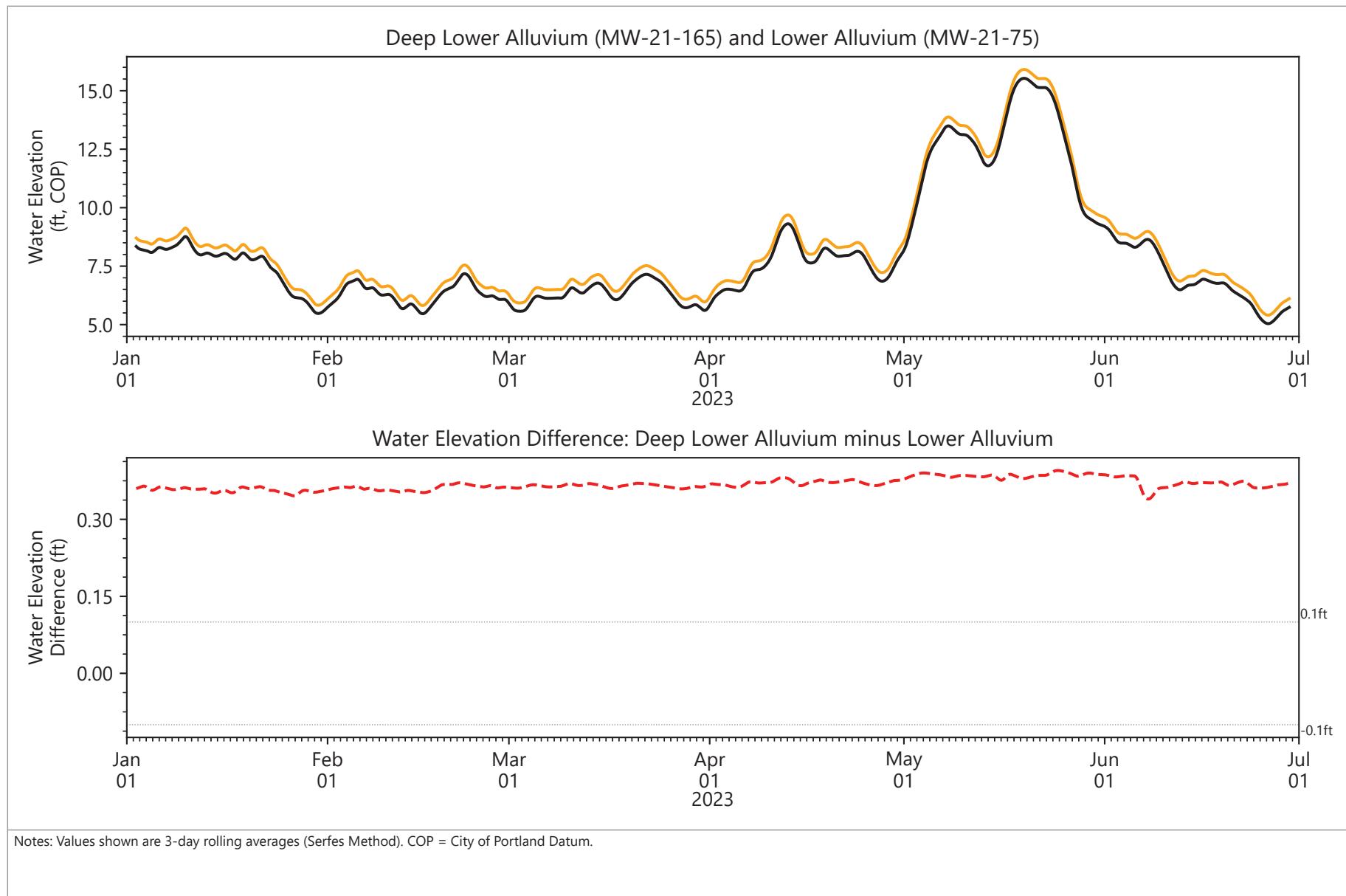


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.12
Groundwater Elevation Differences
 NW Natural Gasco Site

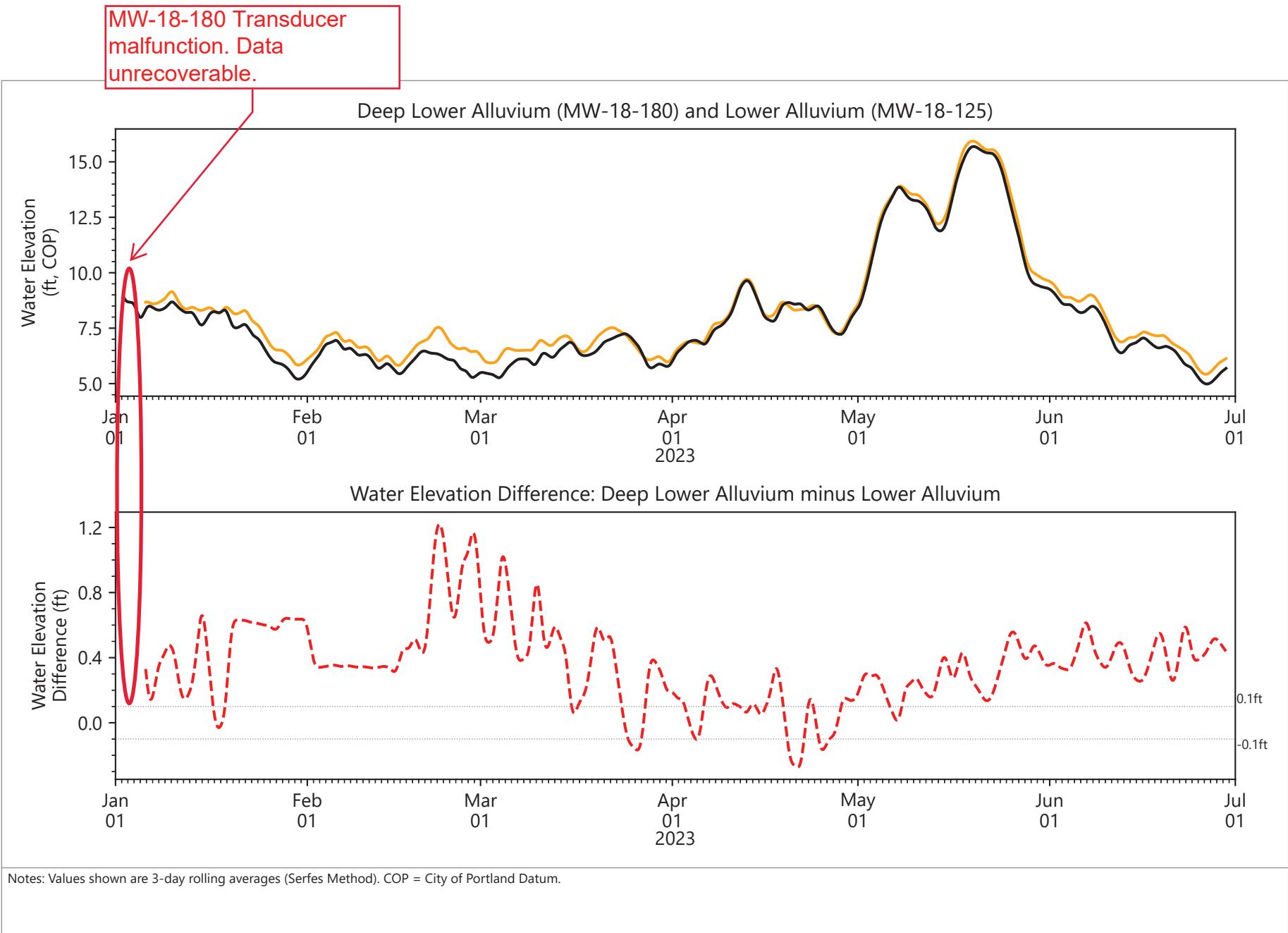


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.13
Groundwater Elevation Differences
 NW Natural Gasco Site

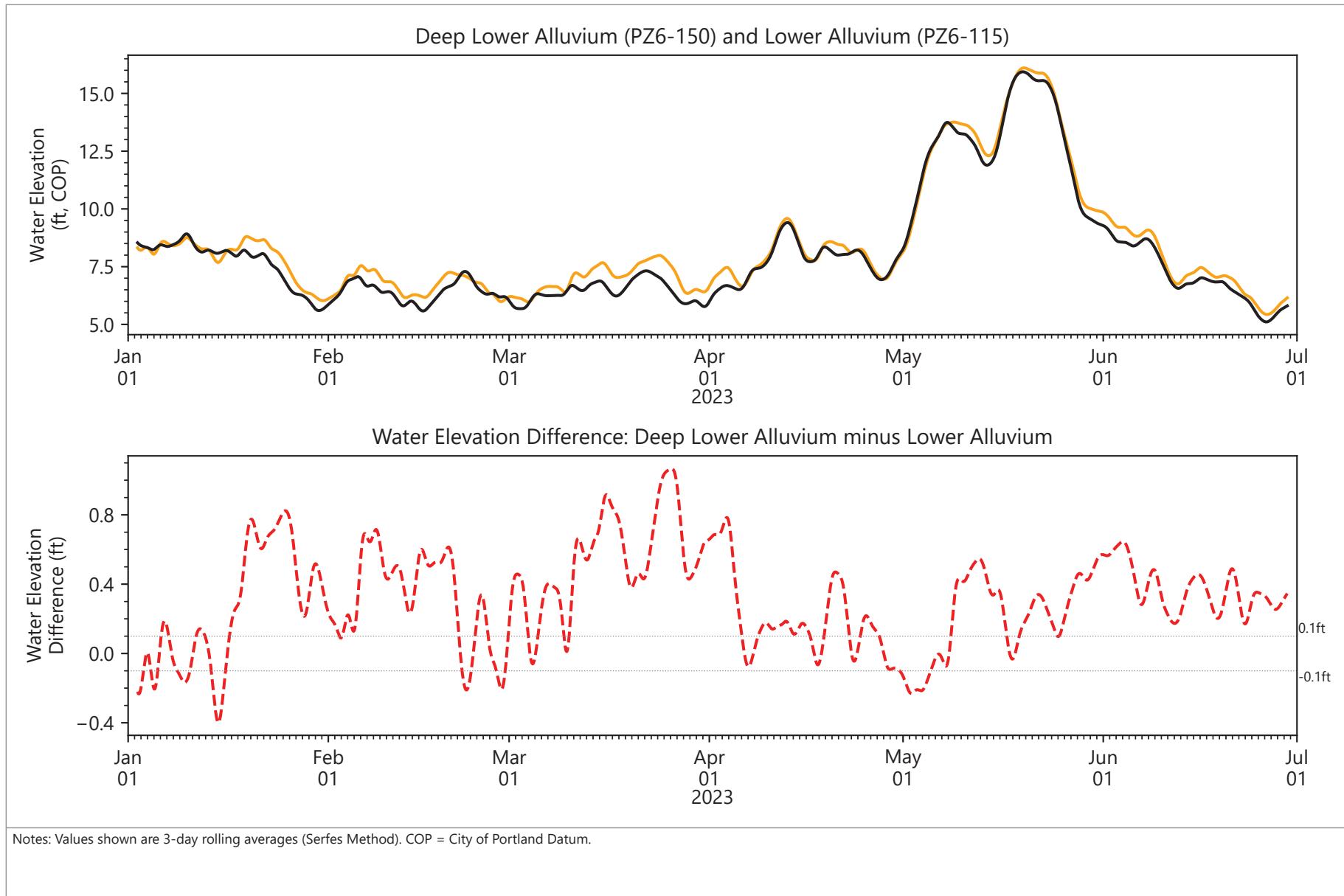


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.14
Groundwater Elevation Differences
 NW Natural Gasco Site

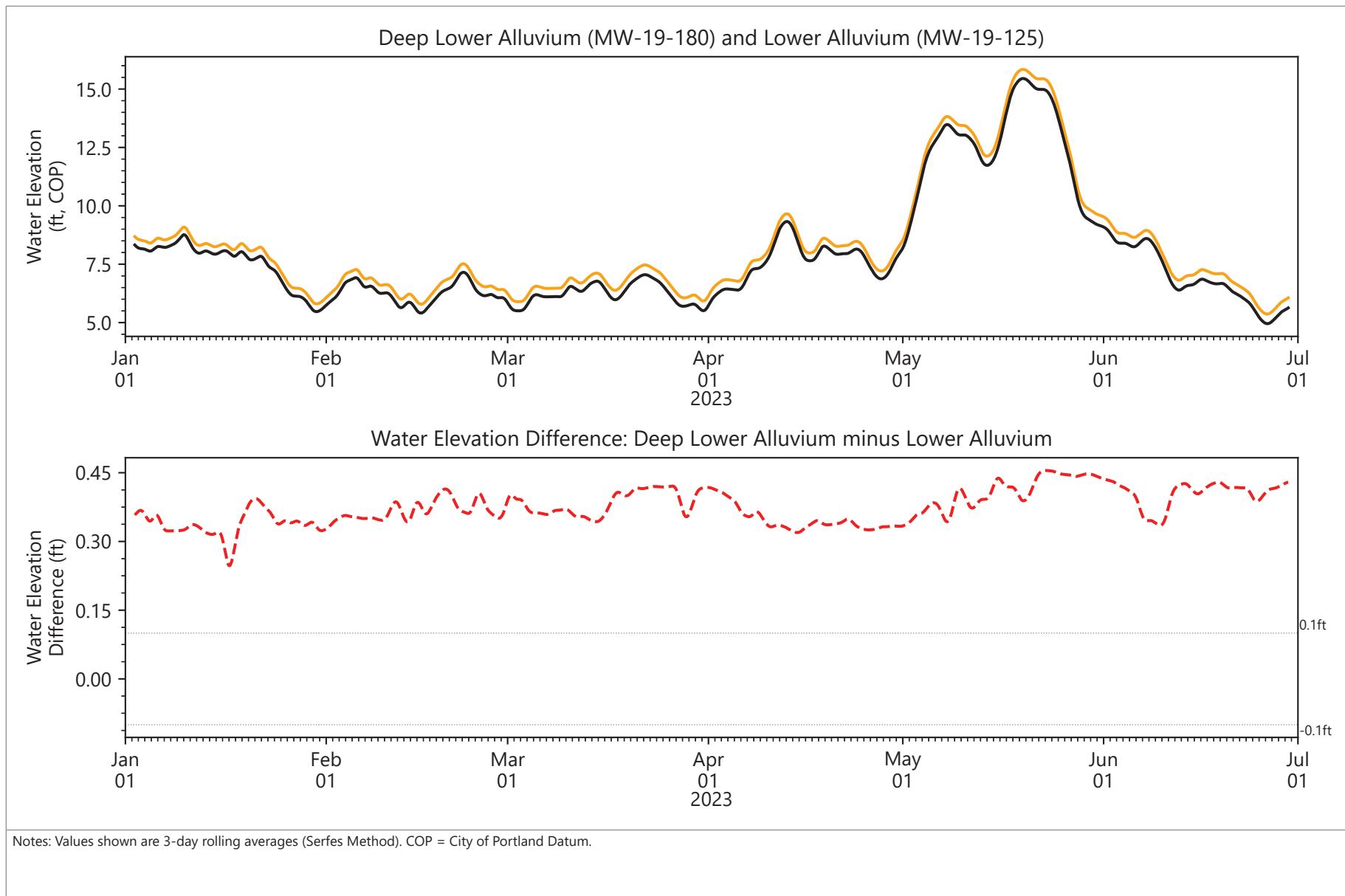


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.15
Groundwater Elevation Differences
 NW Natural Gasco Site

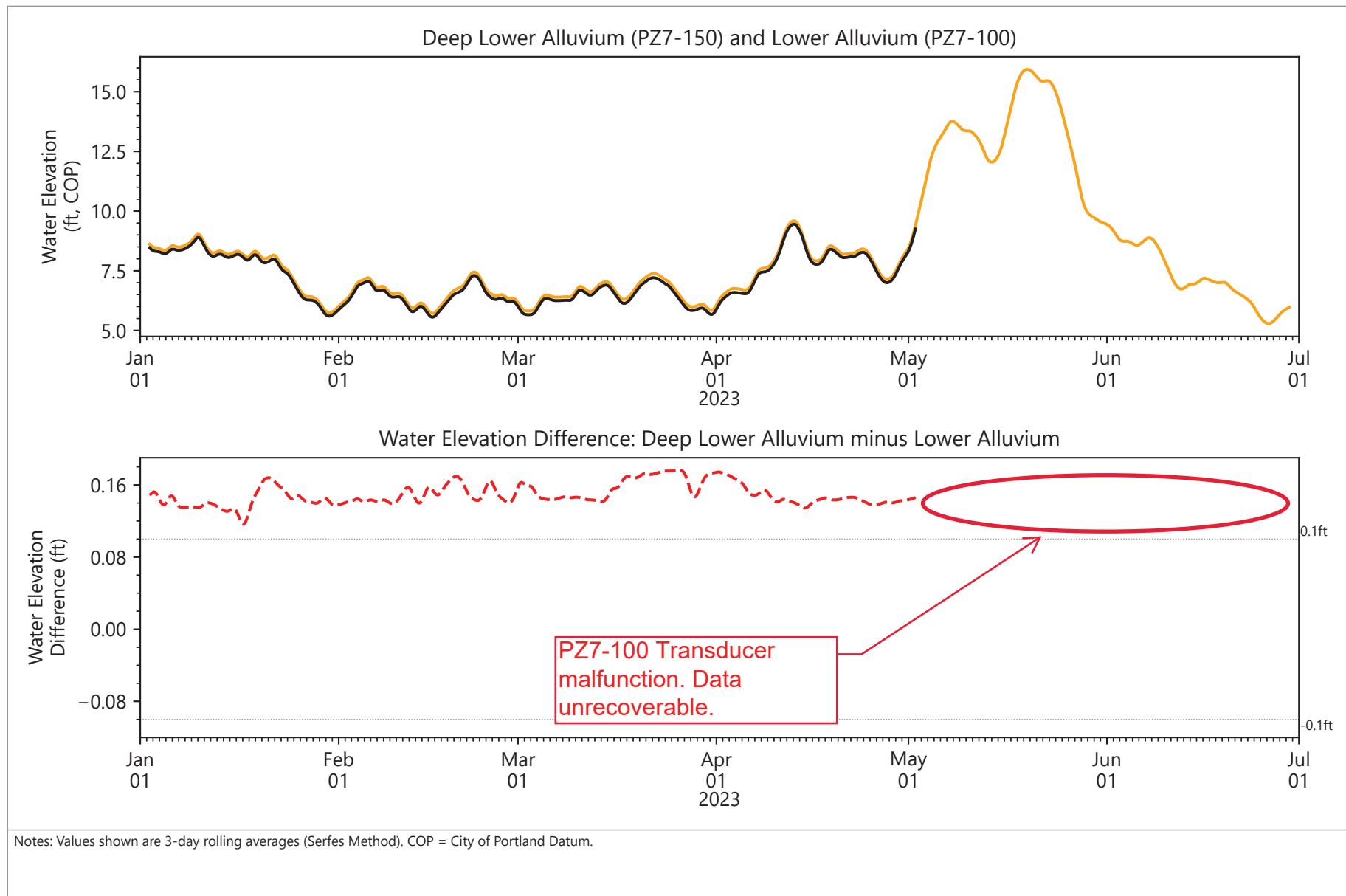


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.16
Groundwater Elevation Differences
 NW Natural Gasco Site

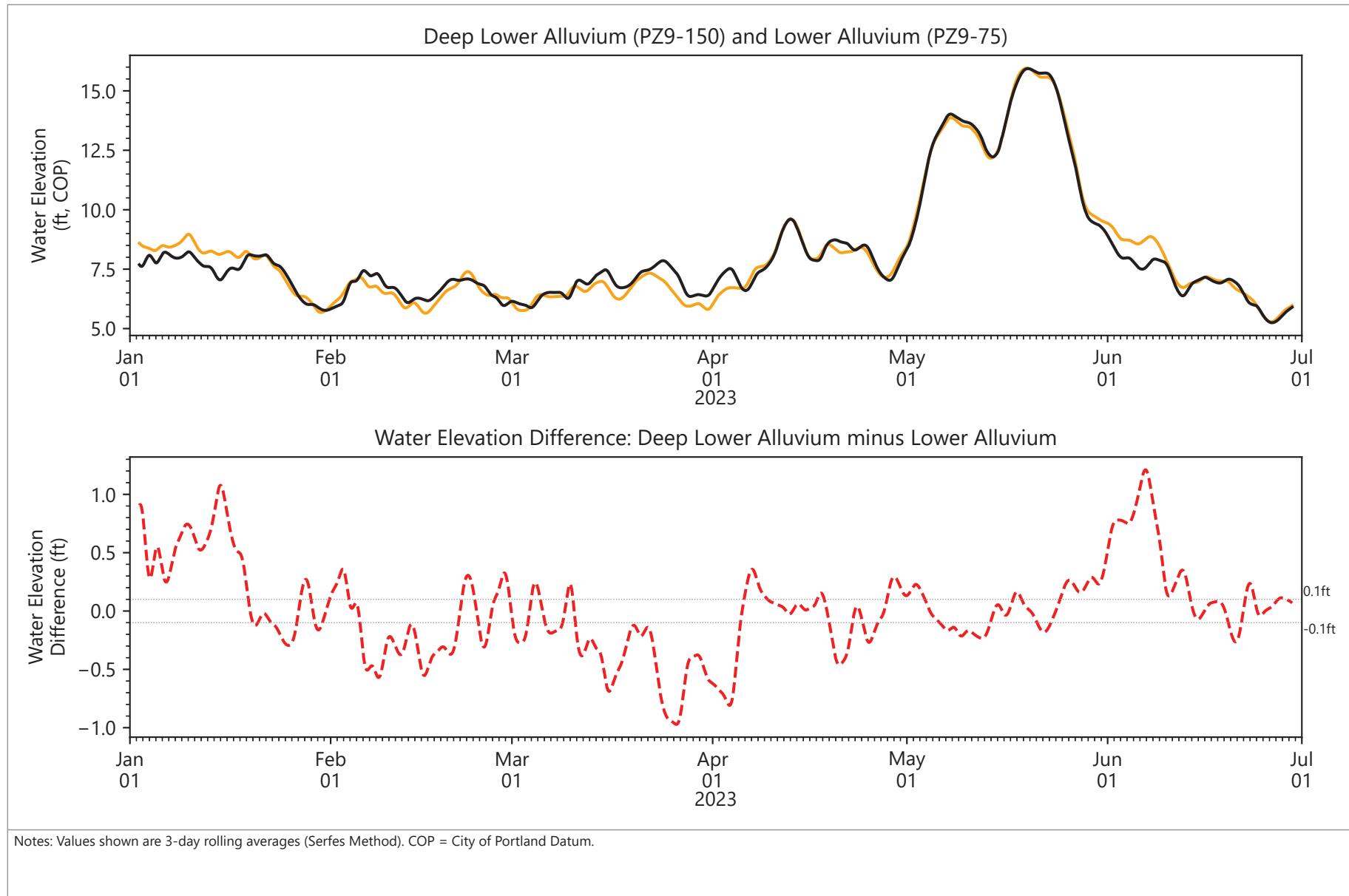


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.17
Groundwater Elevation Differences
 NW Natural Gasco Site

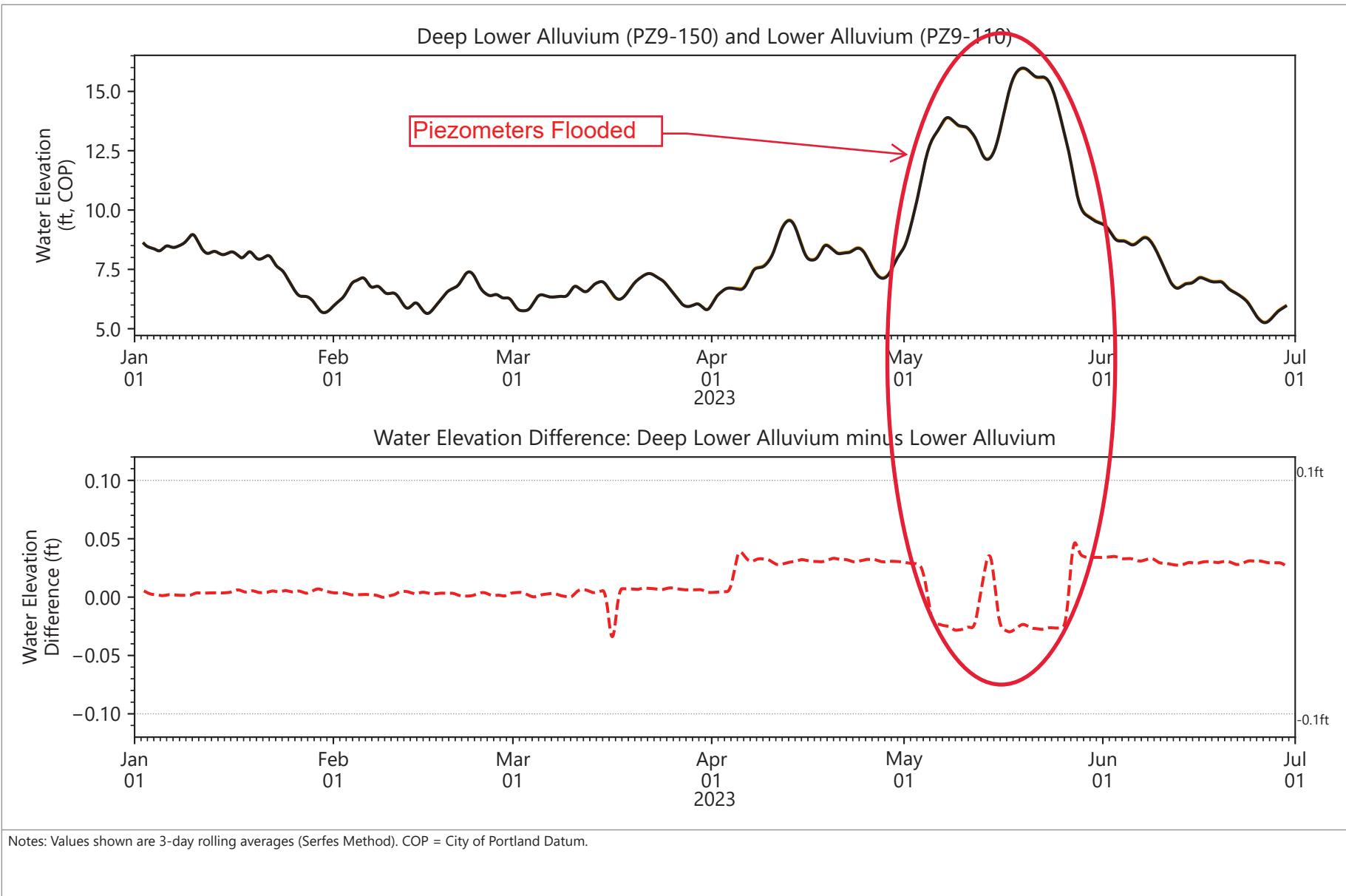


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.18
Groundwater Elevation Differences
 NW Natural Gasco Site

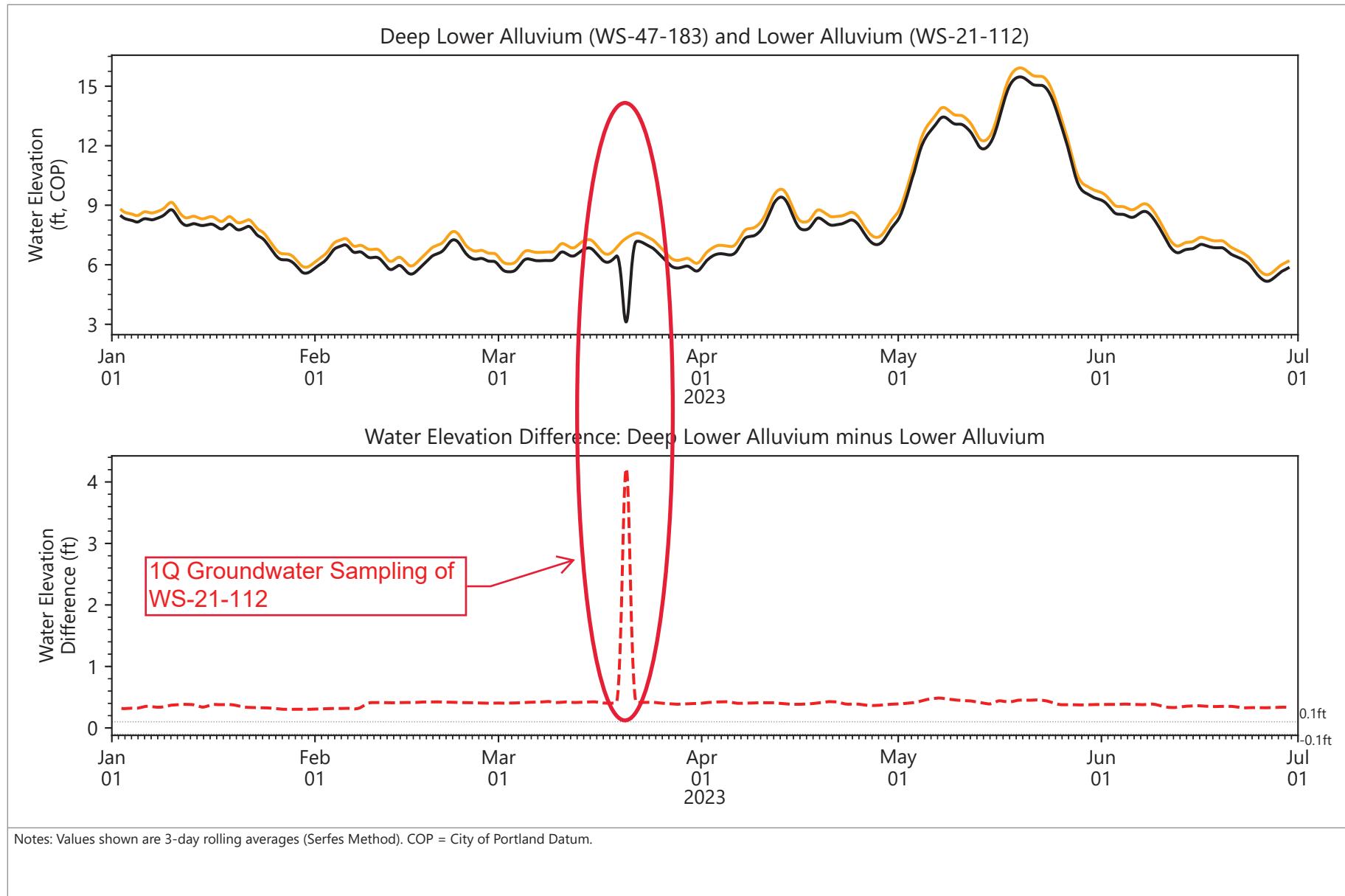


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.19
Groundwater Elevation Differences
 NW Natural Gasco Site

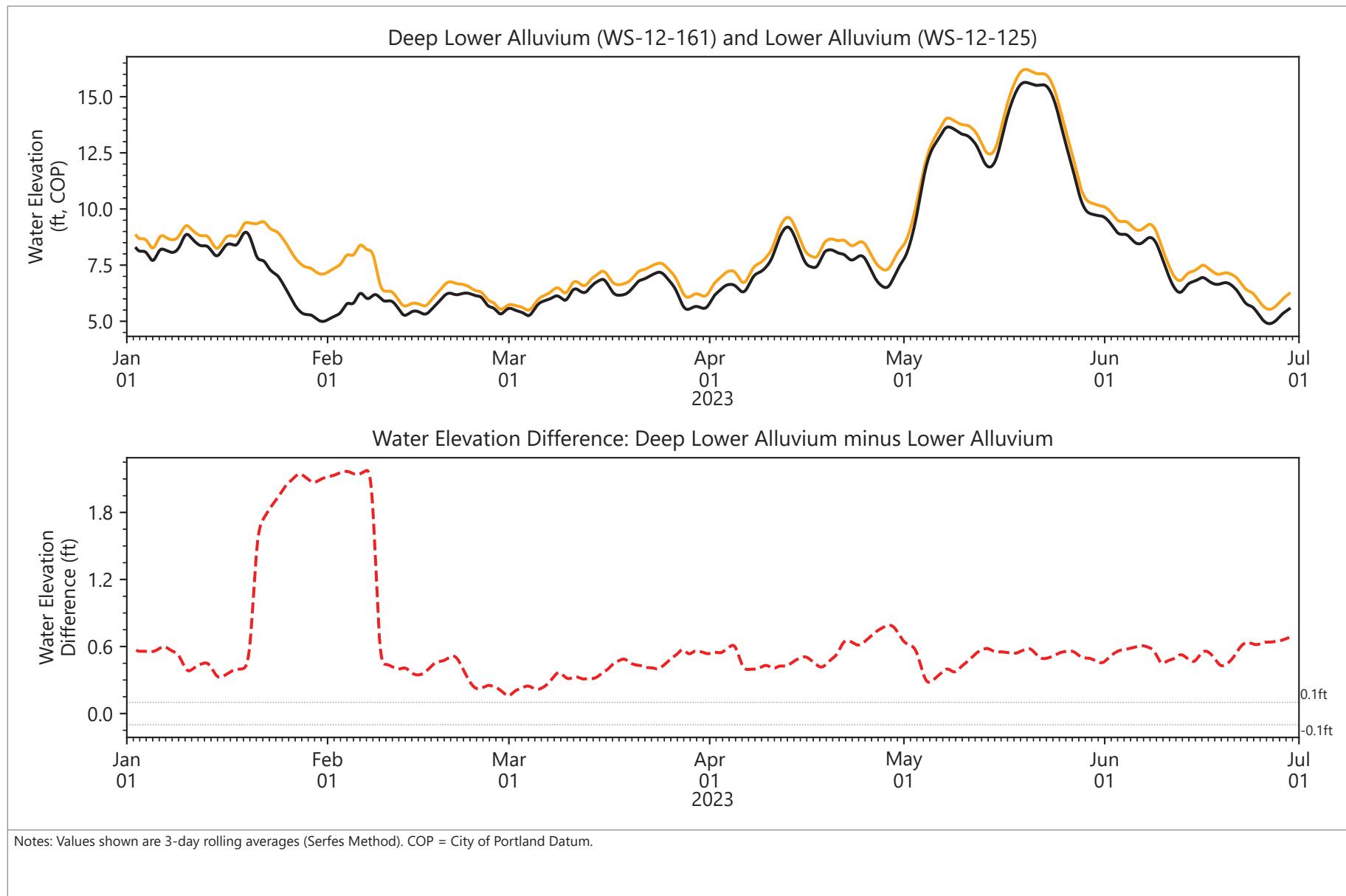


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- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

Figure 5.20
Groundwater Elevation Differences
 NW Natural Gasco Site

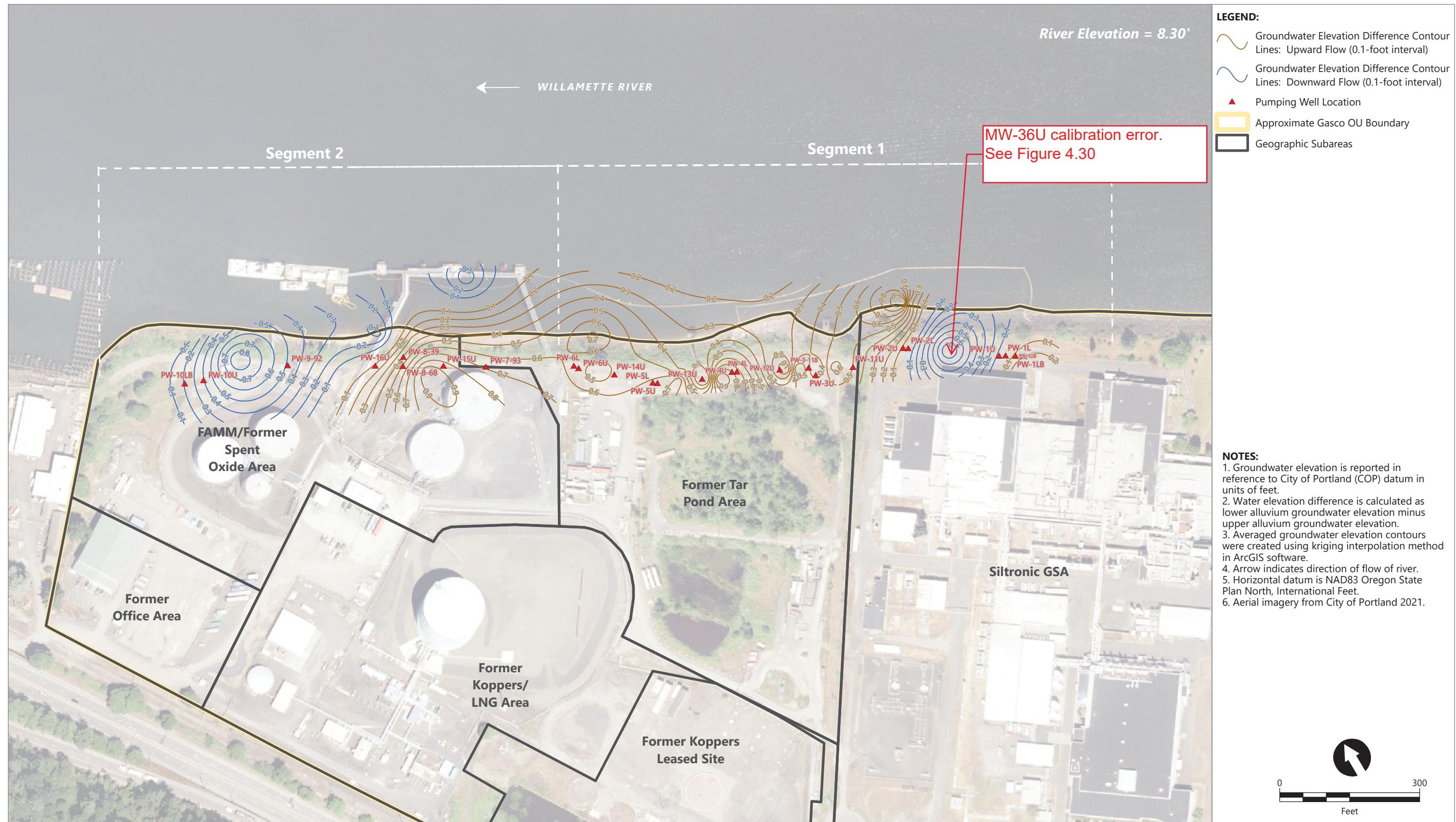


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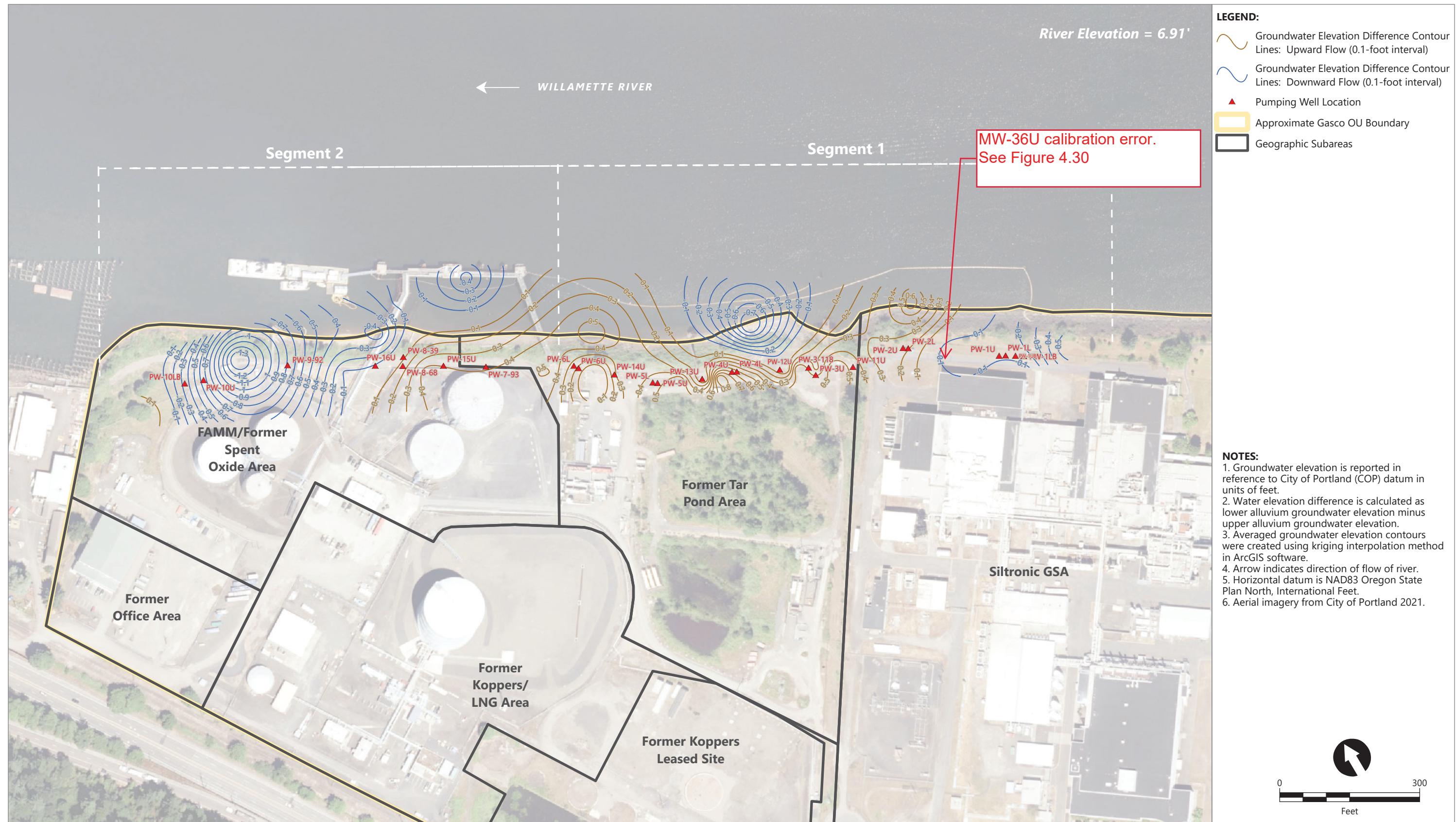


- Deep Lower Alluvium
- Lower Alluvium
- - - Water Elevation Difference
- 0.1 ft Total Potential Uncertainty

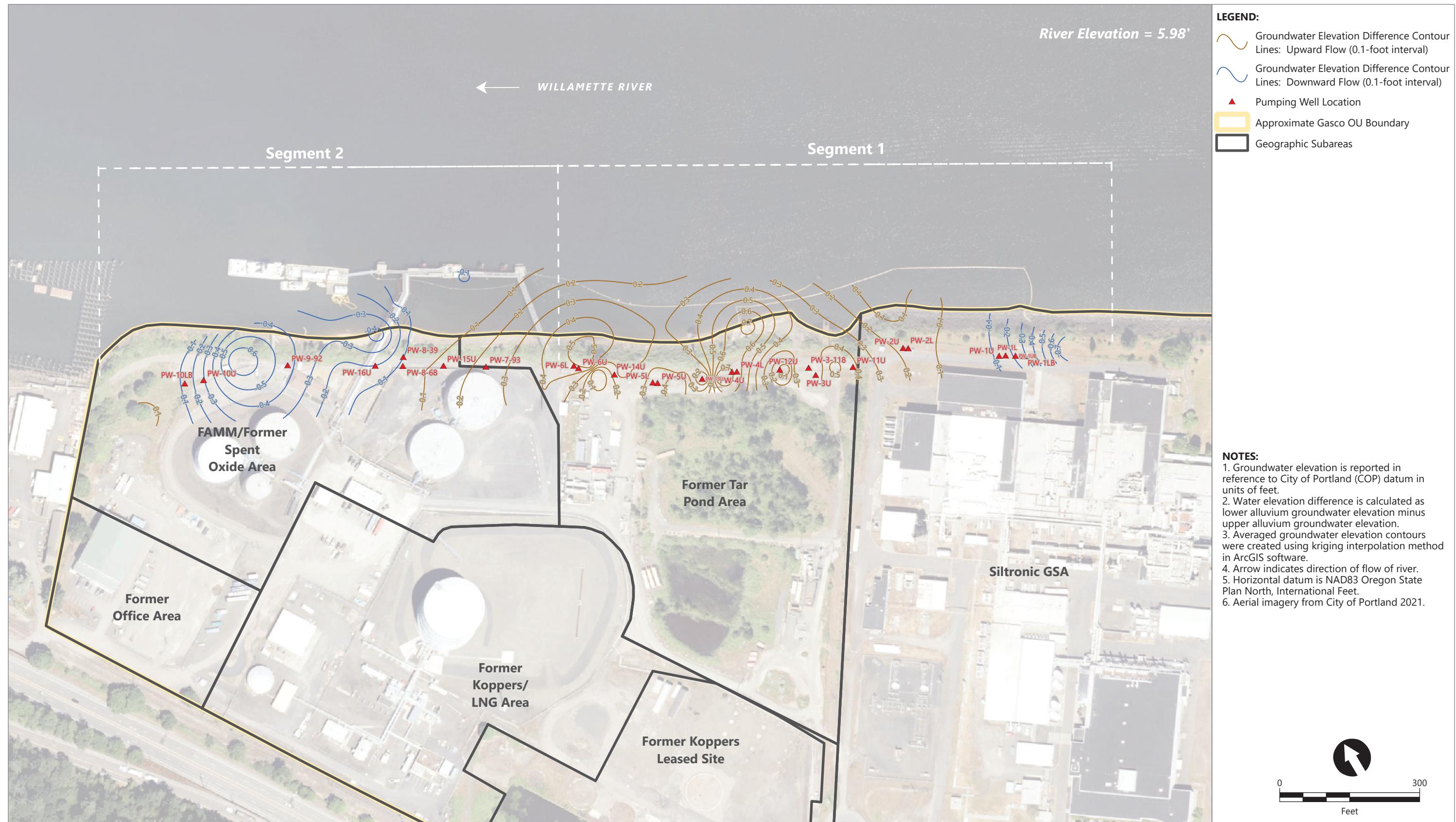
Figure 5.21
Groundwater Elevation Differences
 NW Natural Gasco Site



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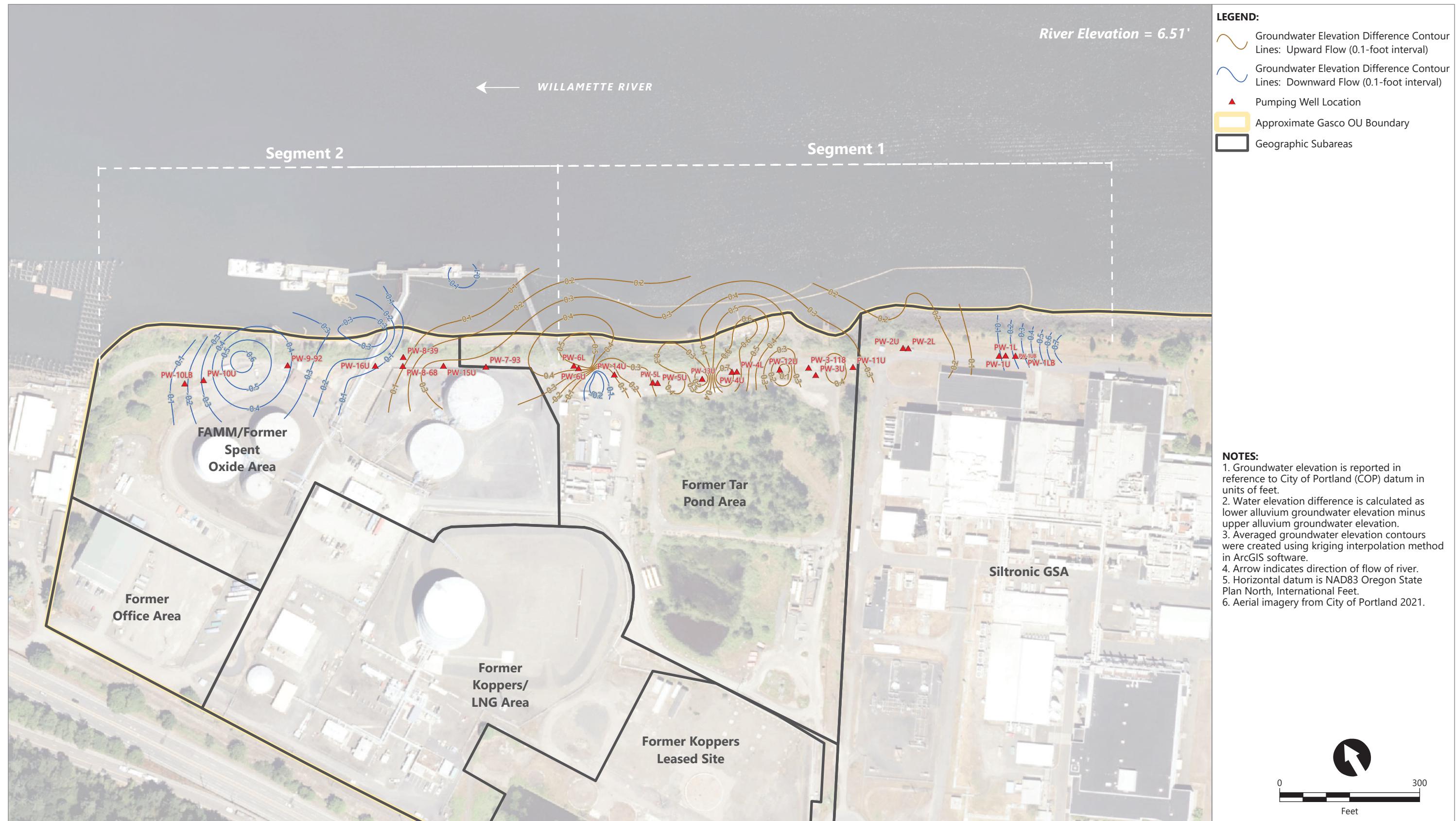


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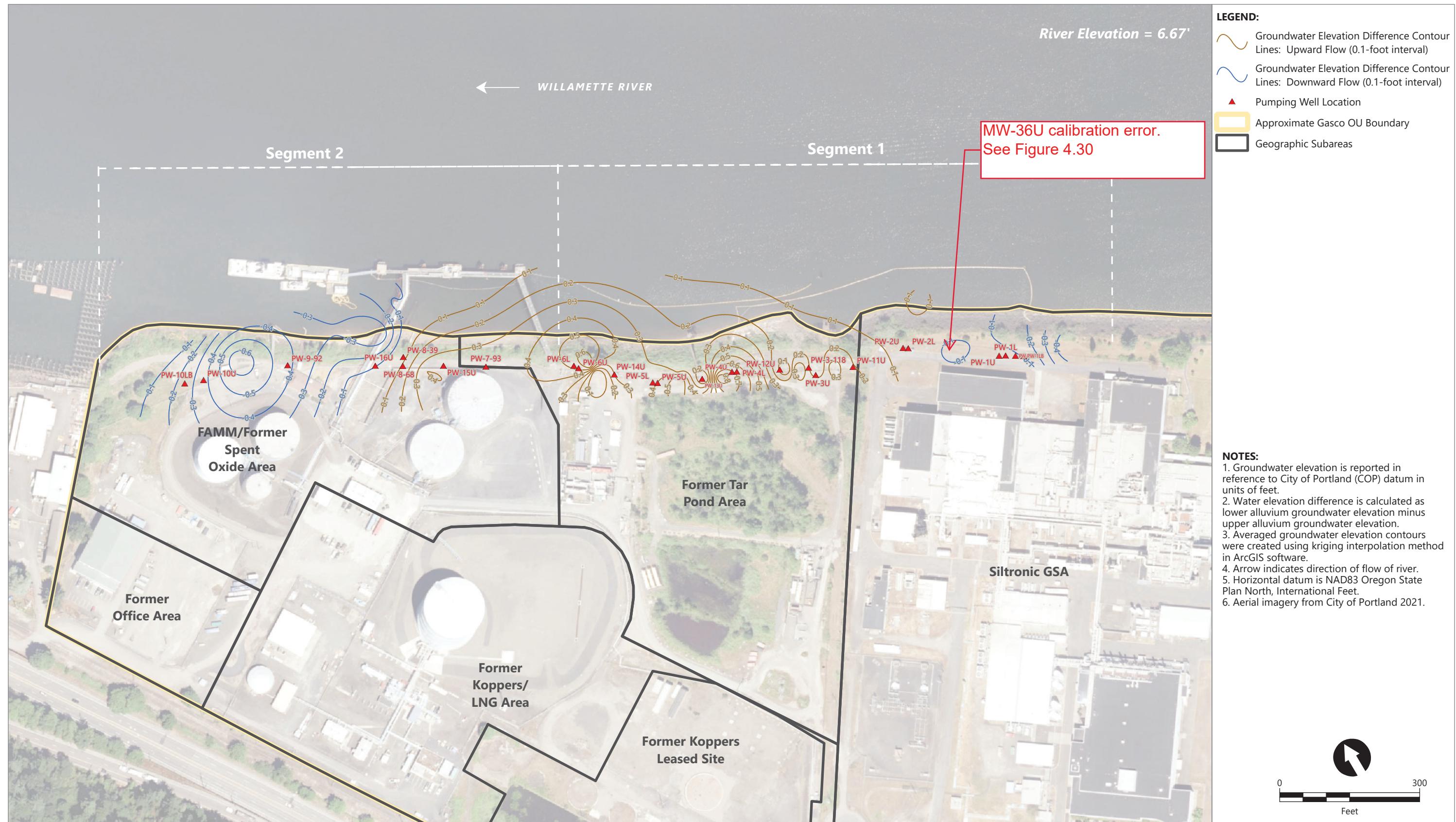


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Figure 6.3
Contours of Water Elevation Difference Between Upper and Lower Alluvium Using Serfes 3-Day Rolling Averages From 2/11/2023-2/13/2023

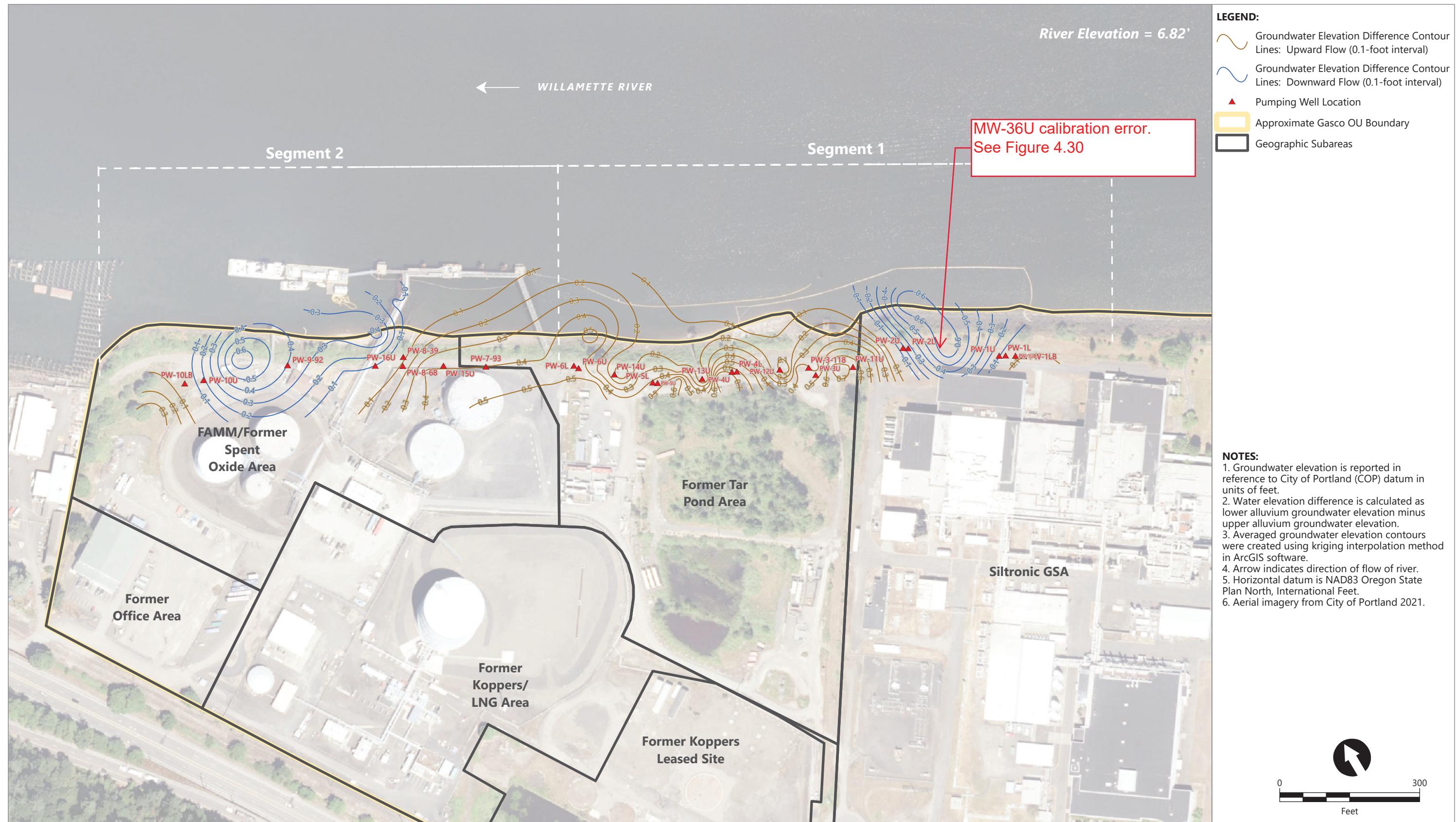


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Contours of Water Elevation Difference Between Upper and Lower Alluvium Using Serfes 3-Day Rolling Averages From 3/11/2023-3/13/2023



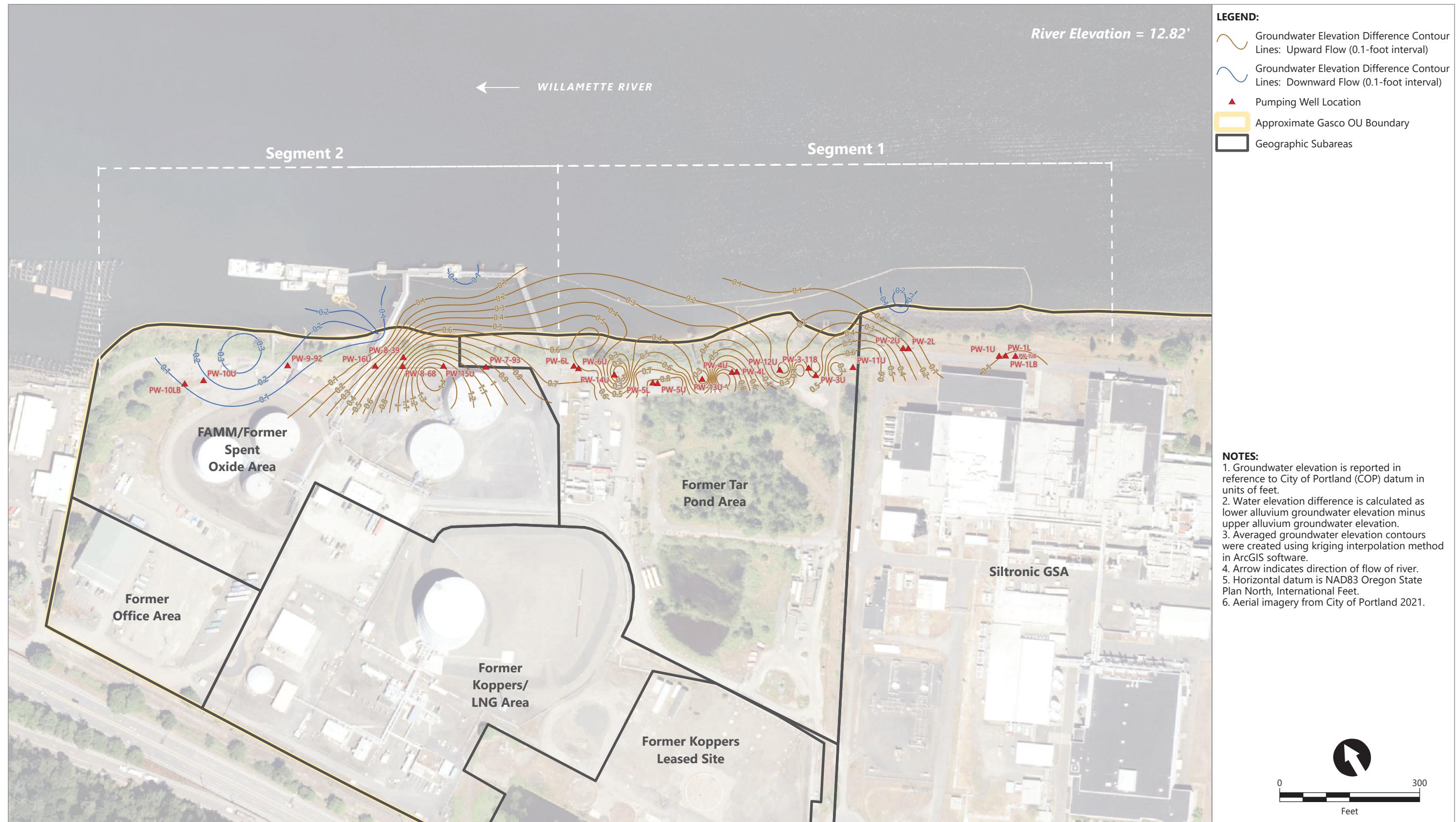
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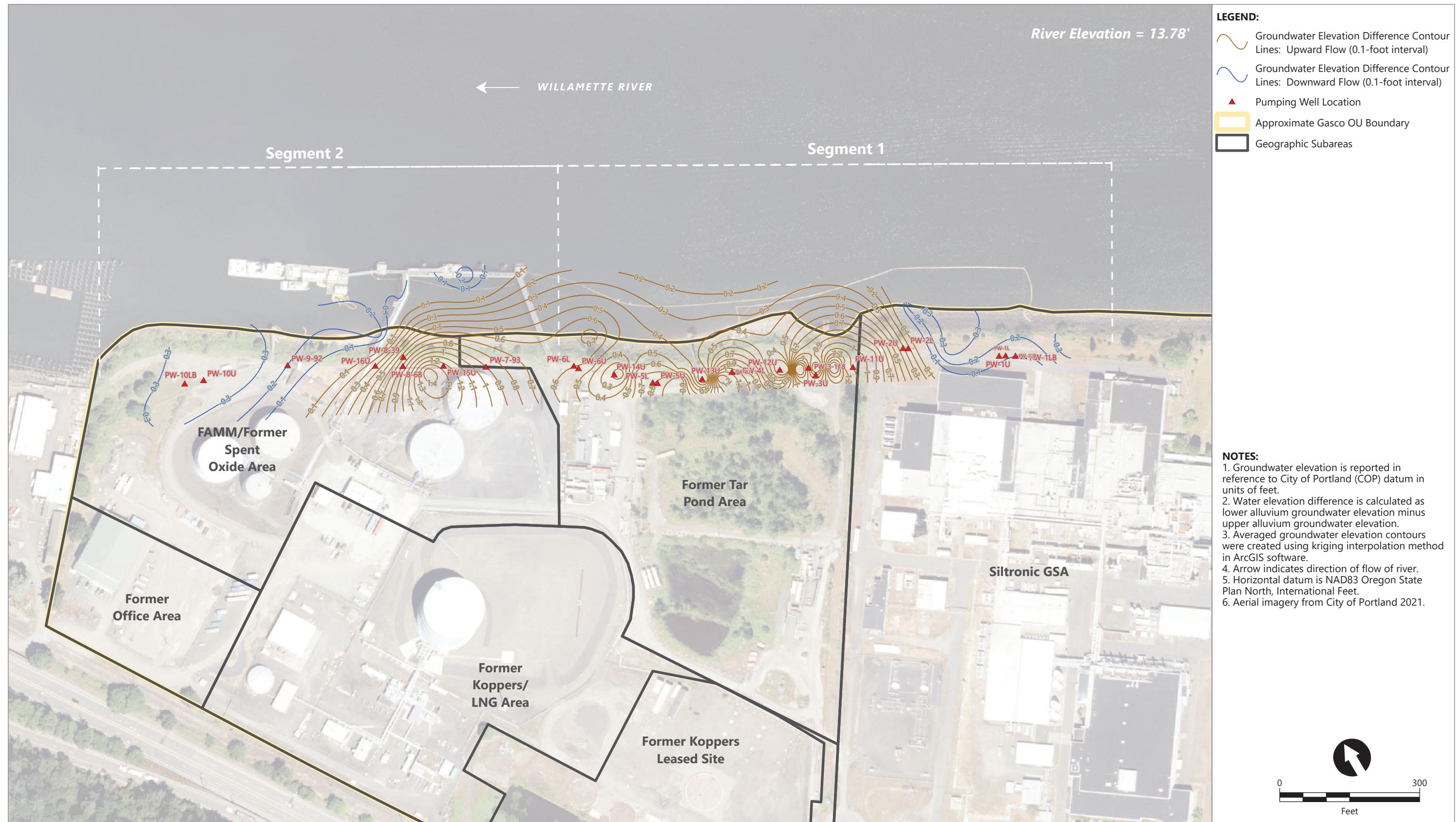


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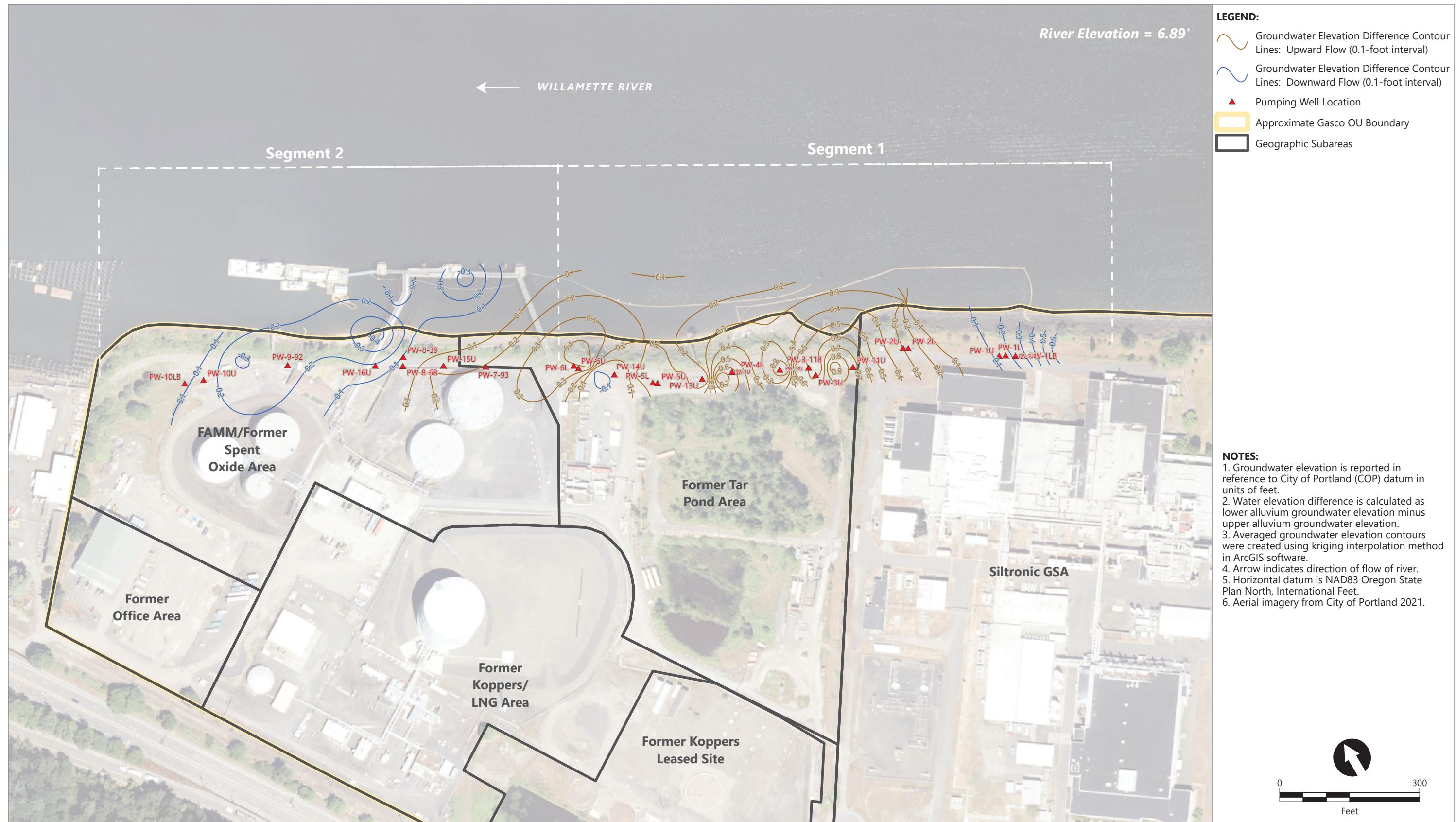


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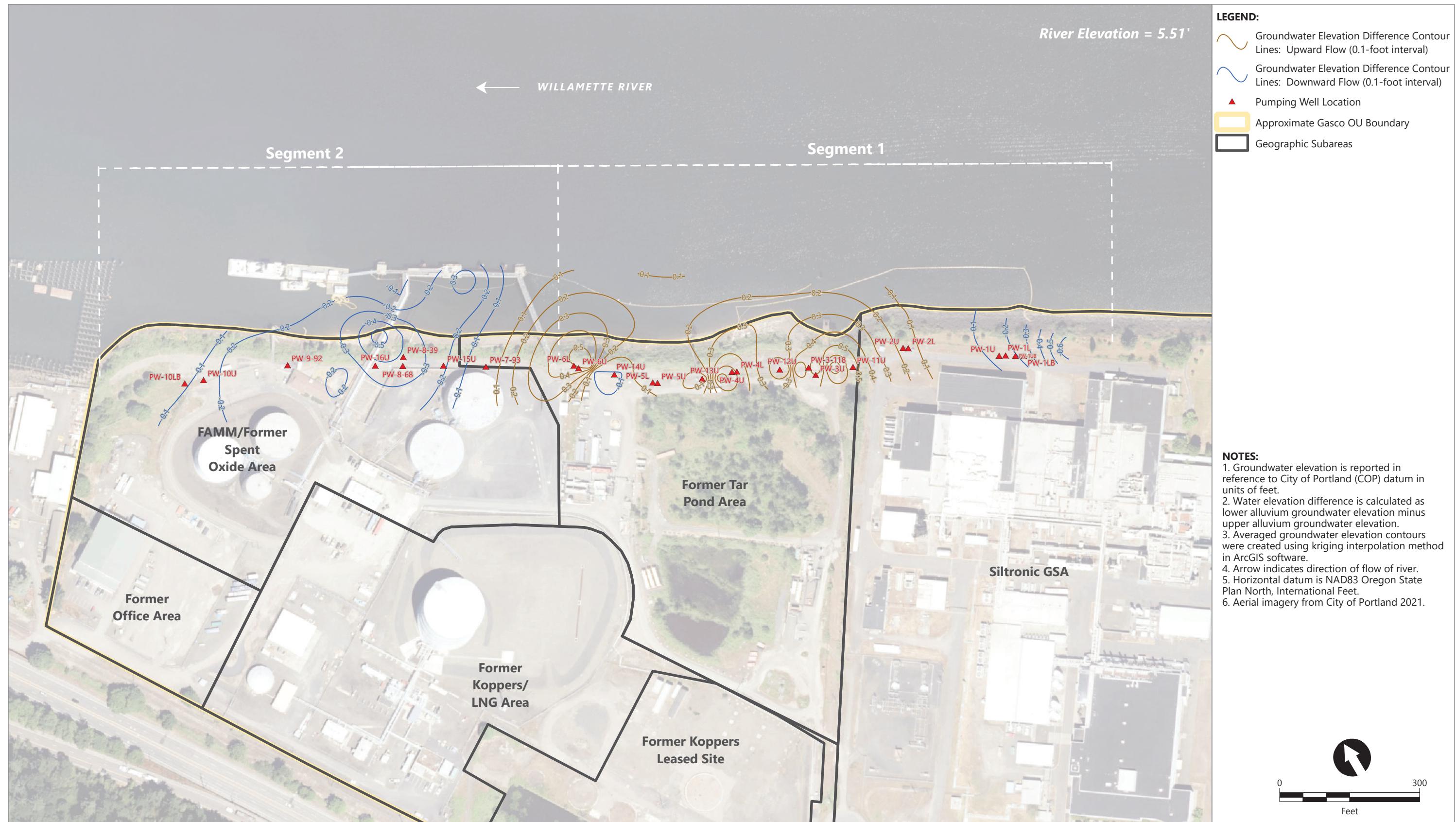
Figure 6.9
Contours of Water Elevation Difference Between Upper and Lower Alluvium Using Serfes 3-Day Rolling Averages From 5/11/2023-5/13/2023



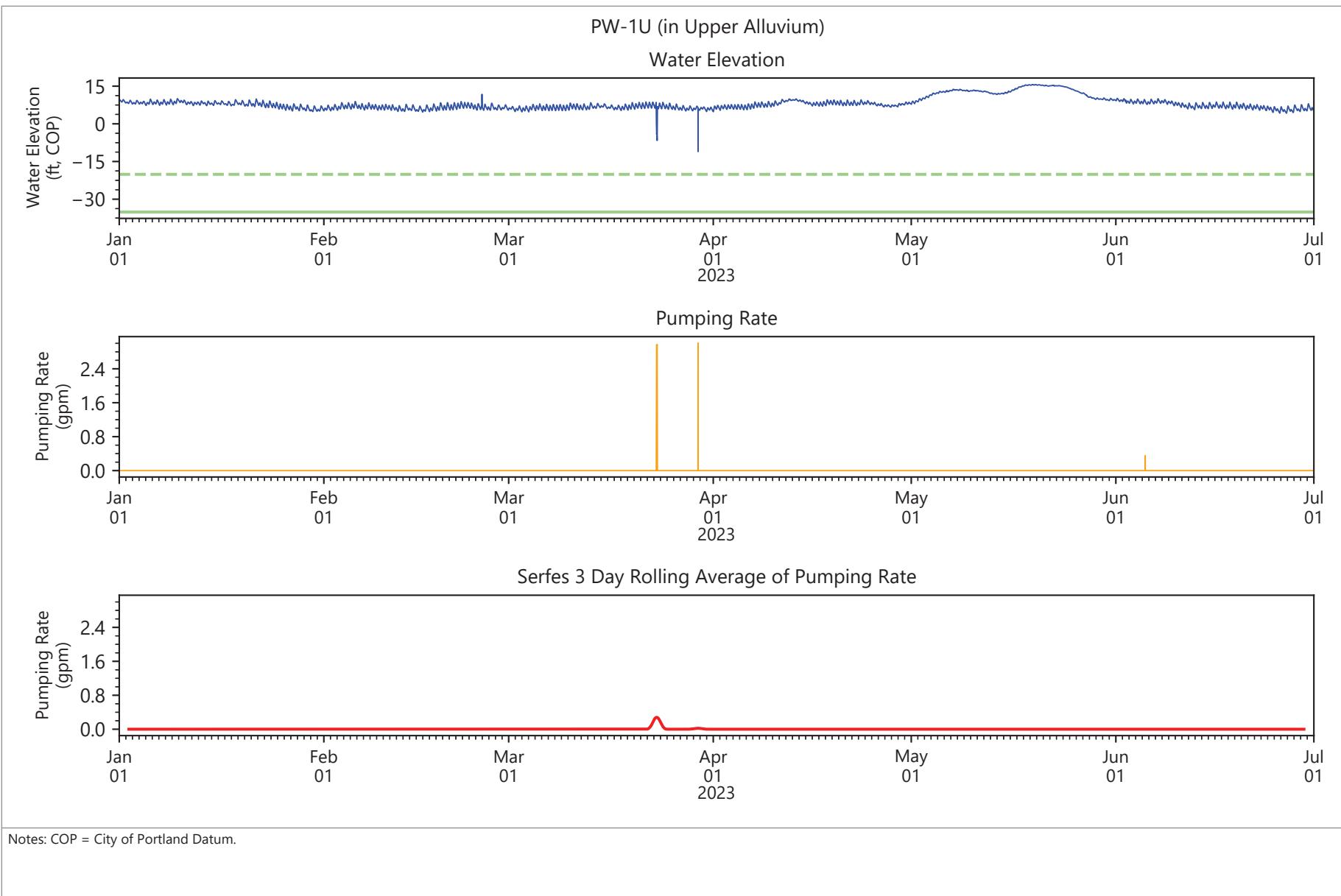
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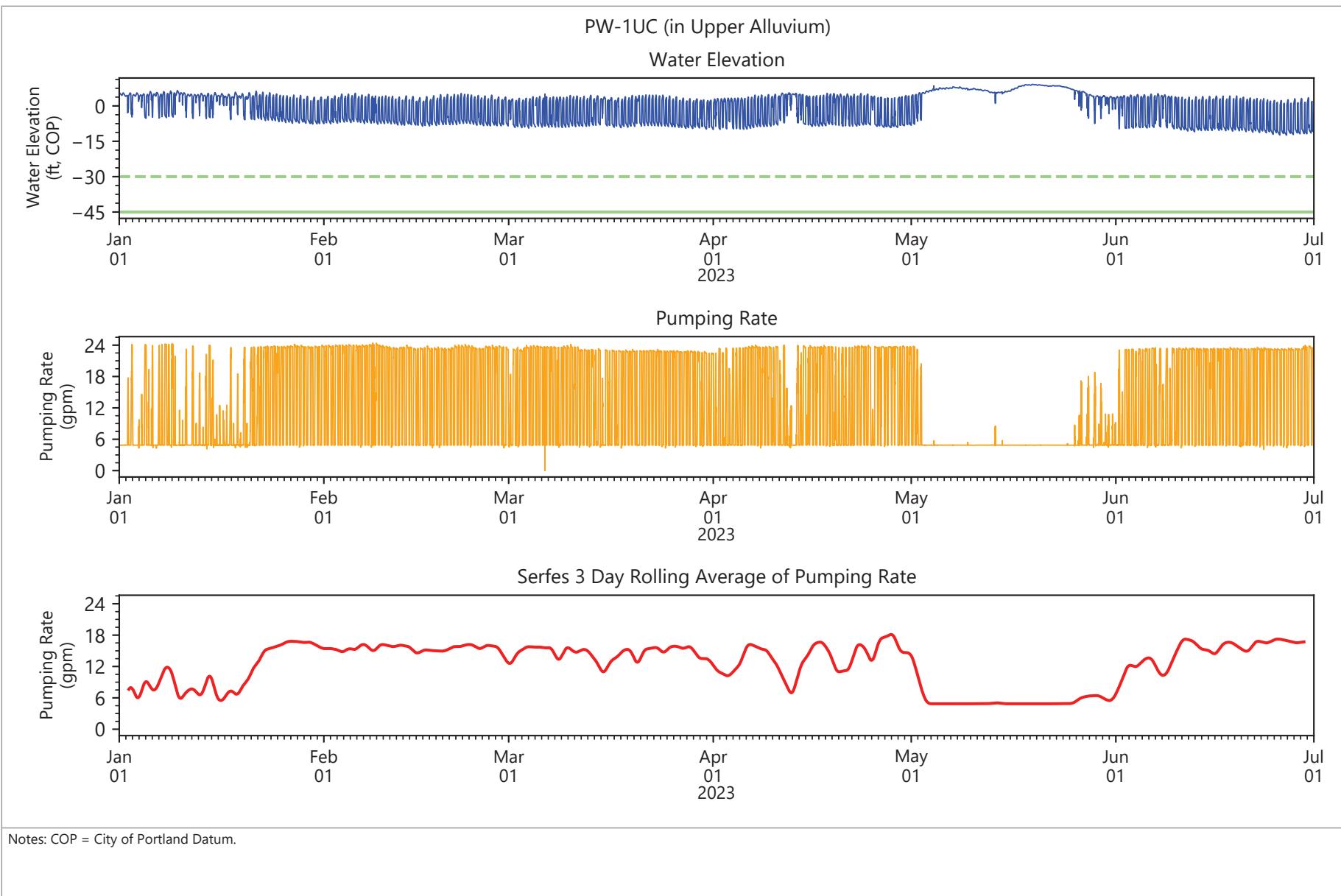


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.1
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site



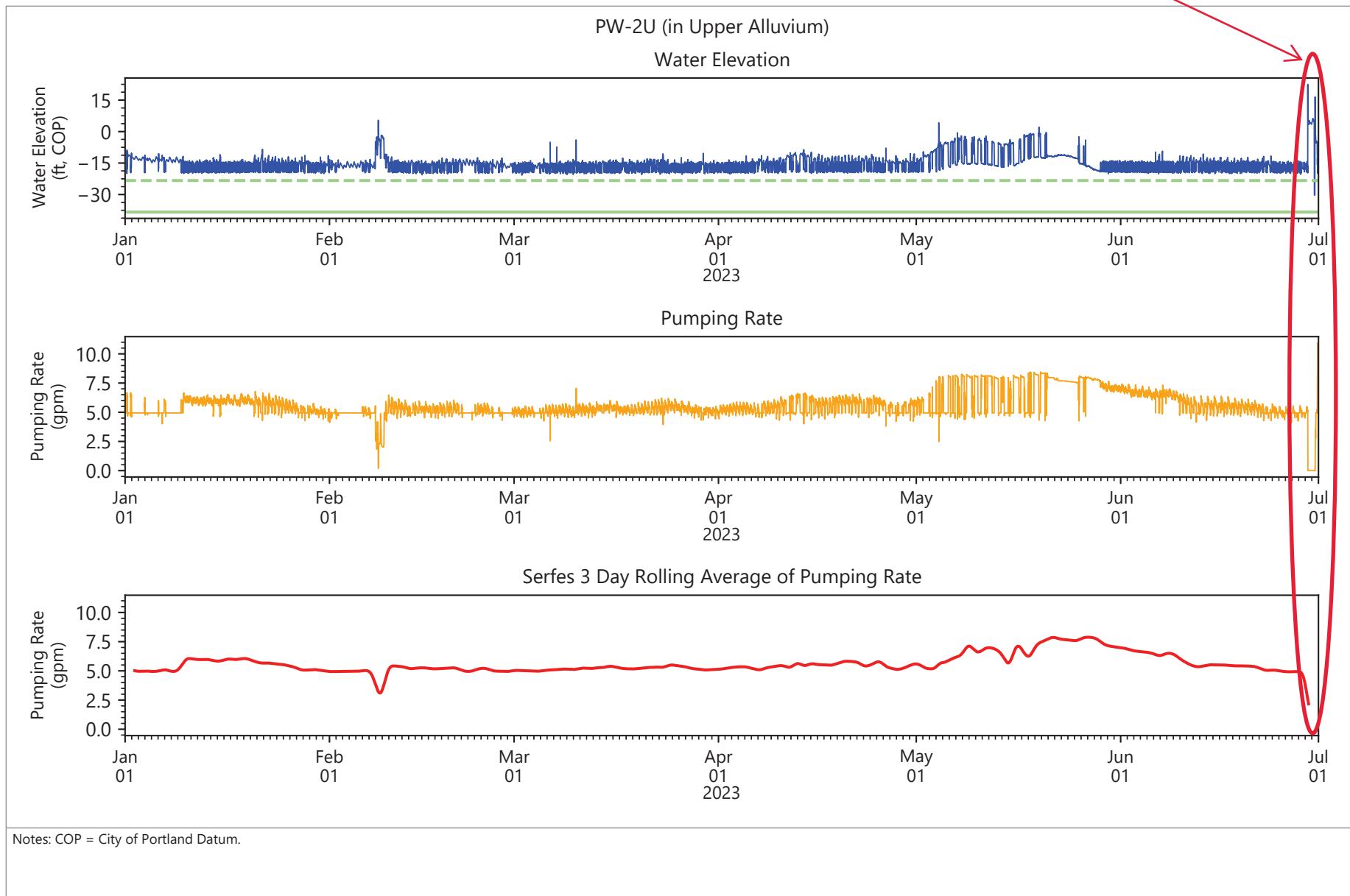
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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.2
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 6/29

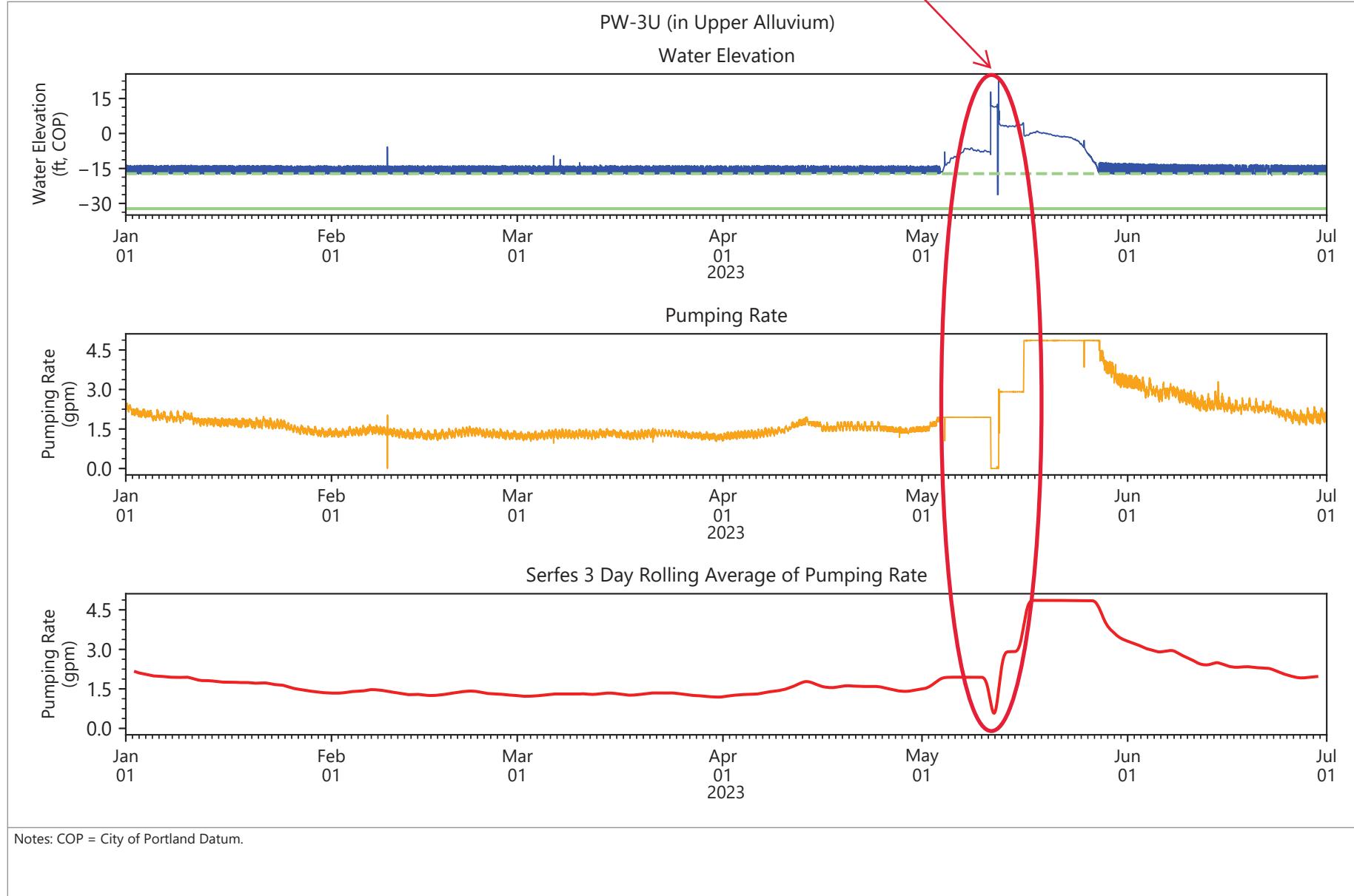


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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.3
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

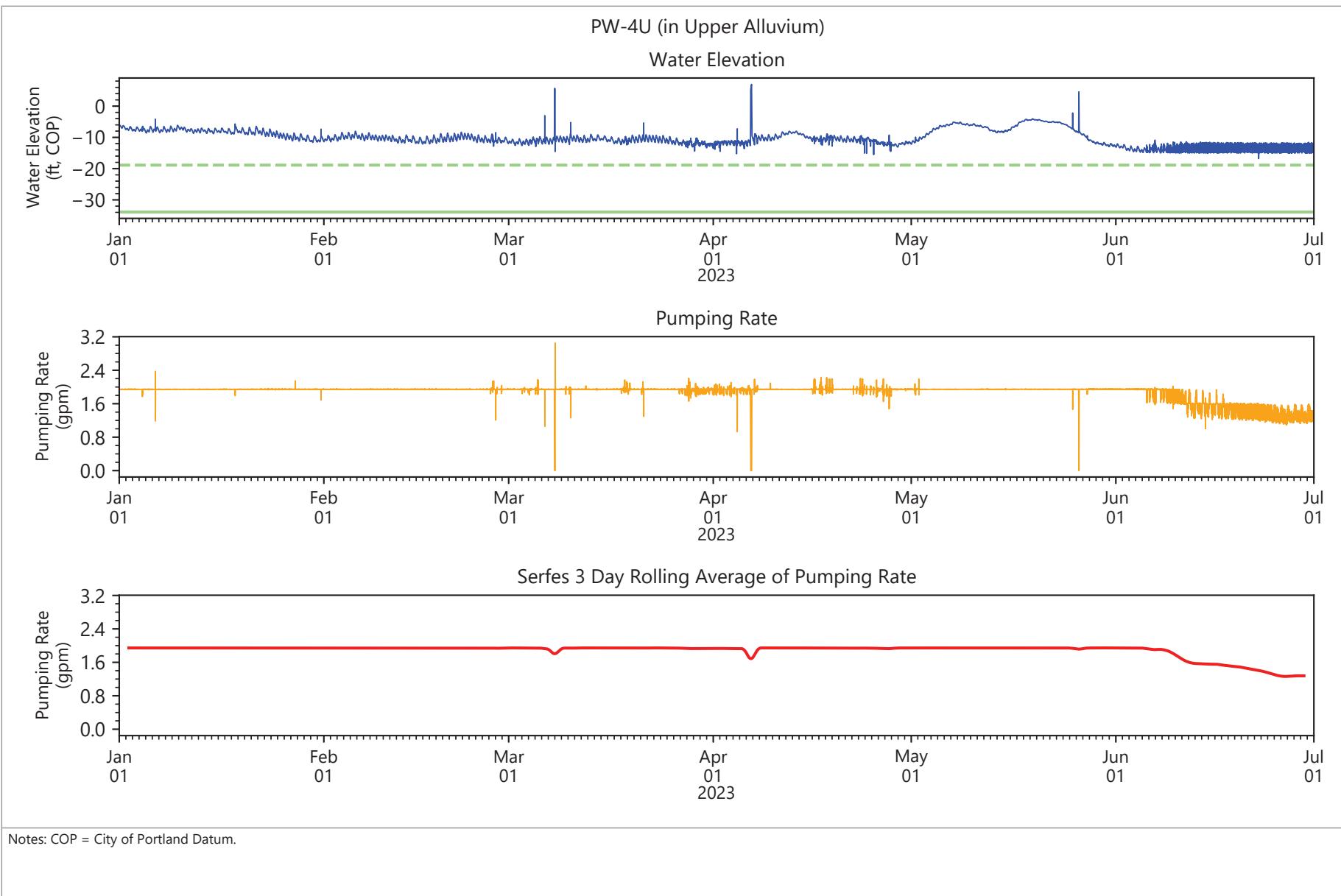


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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.4
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site



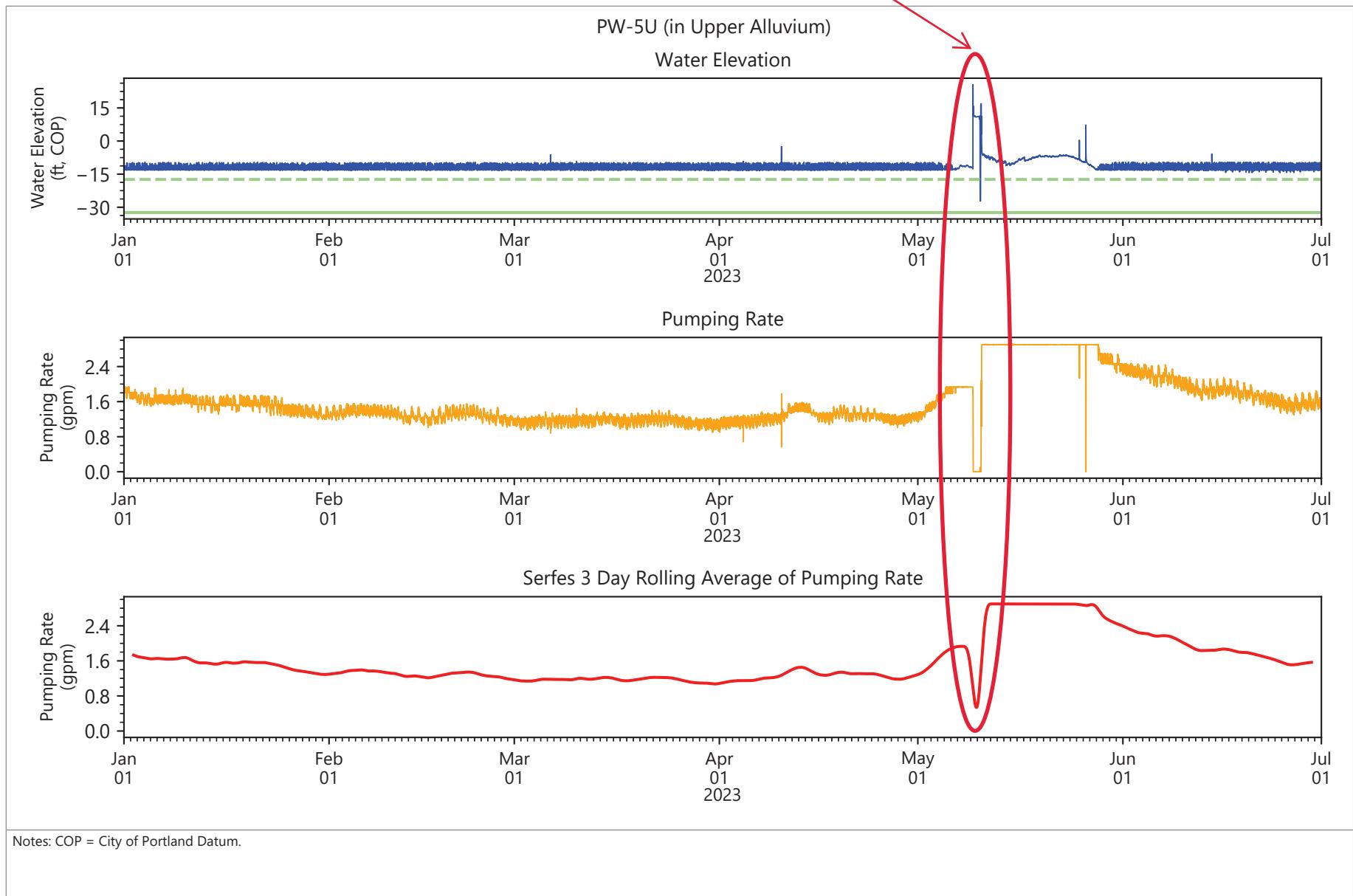
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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.5
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 5/9



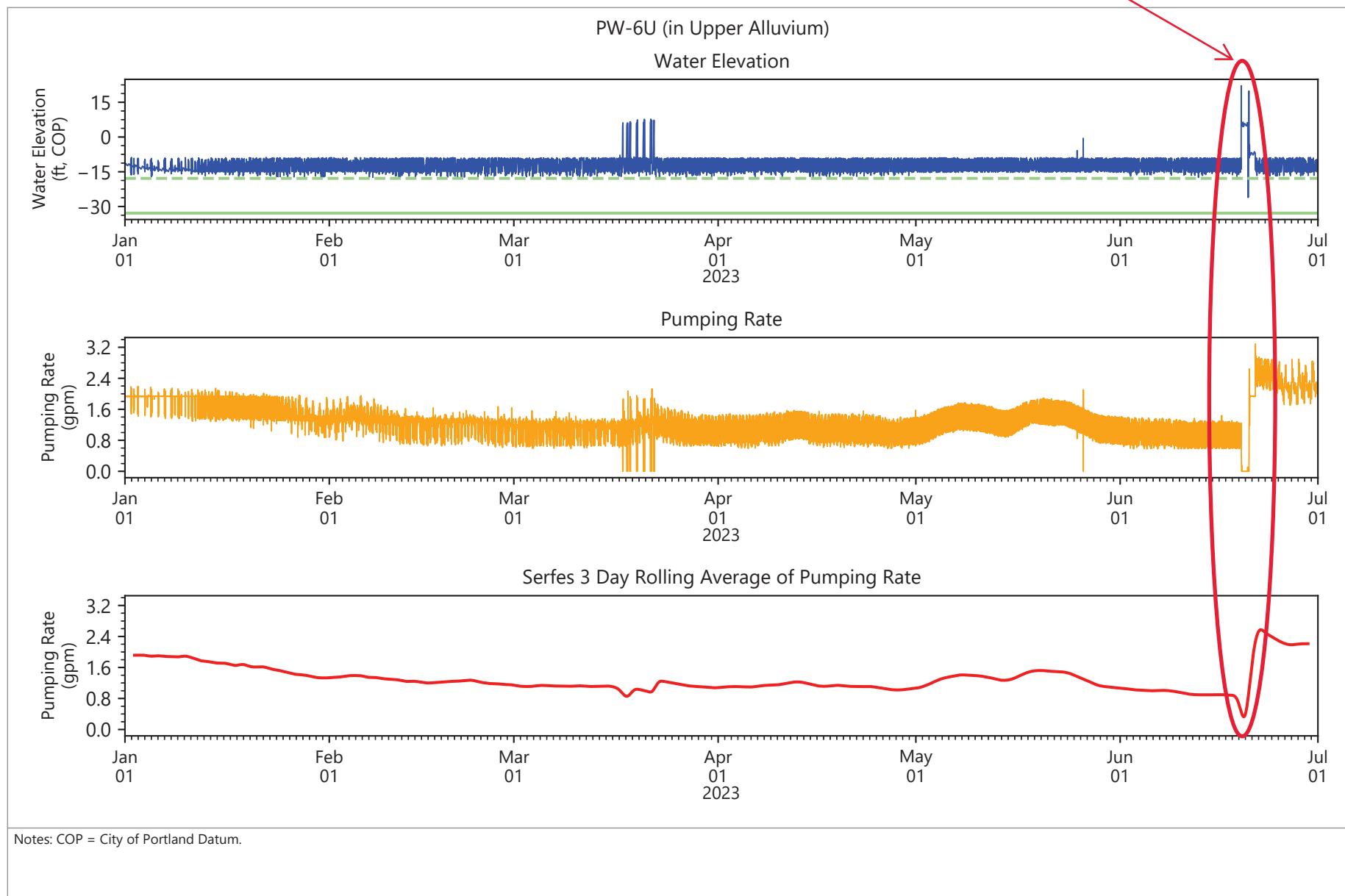
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.6
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 6/21

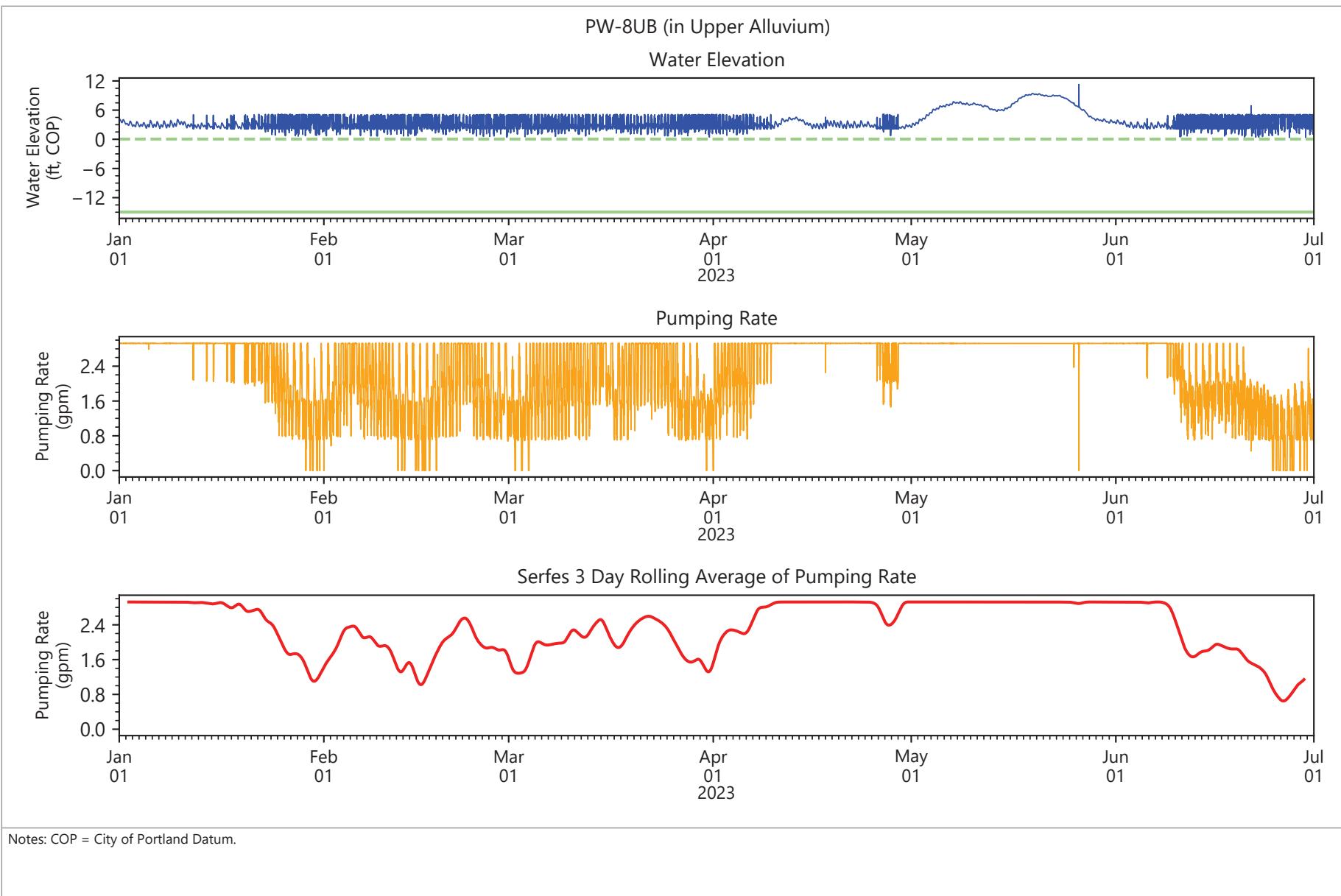


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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.7
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

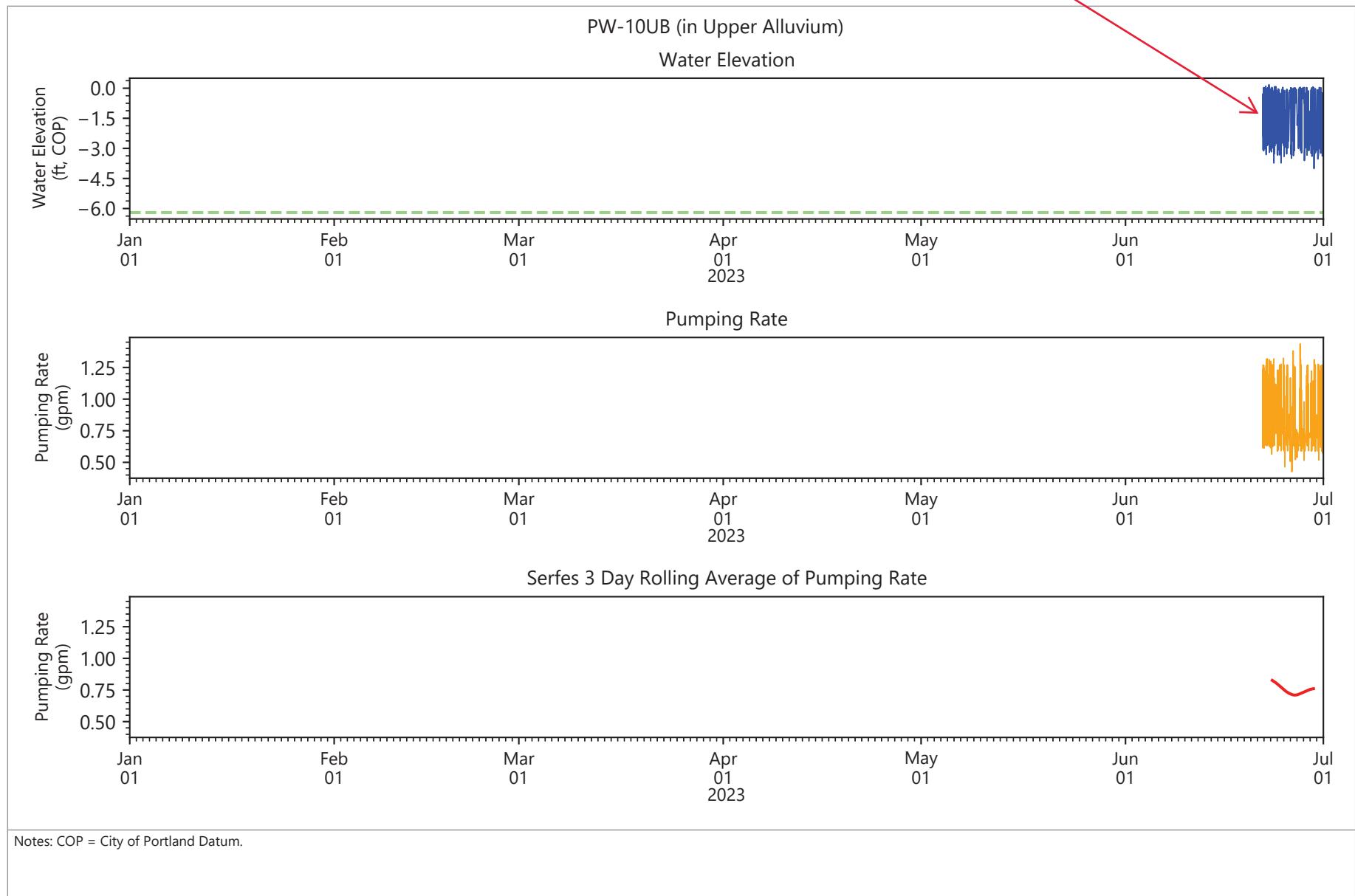


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.8
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

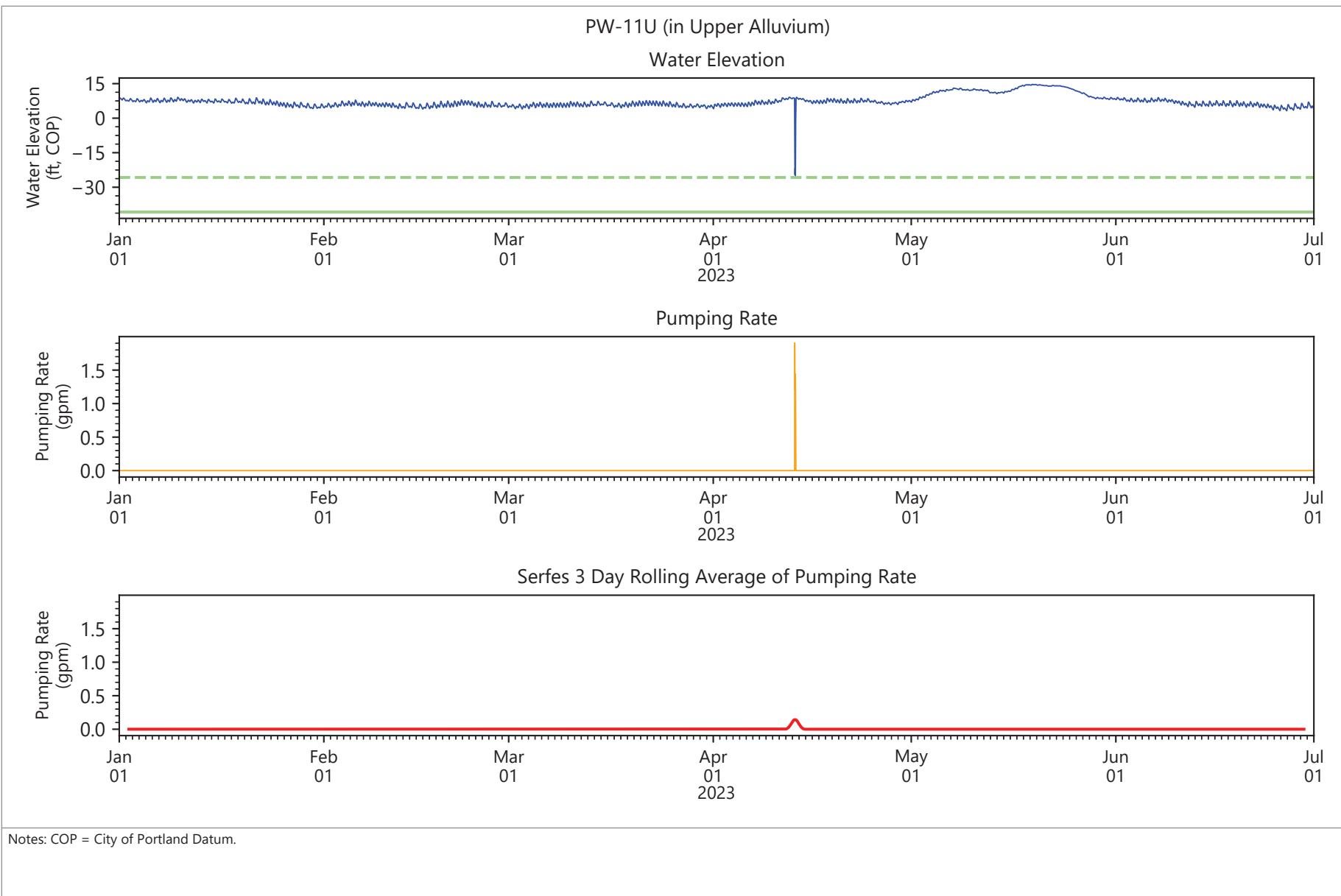


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.9
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site



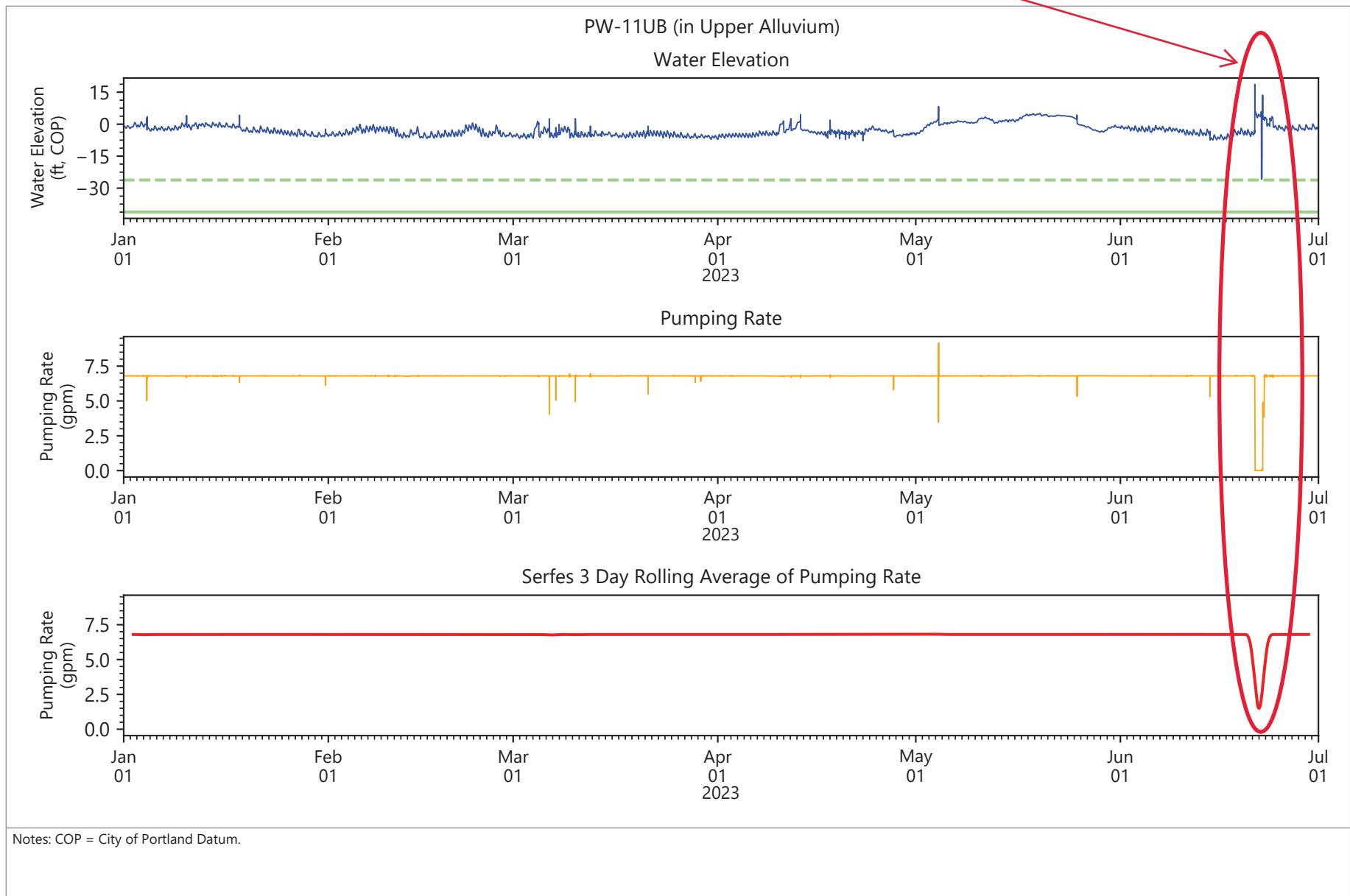
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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.10
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 6/21



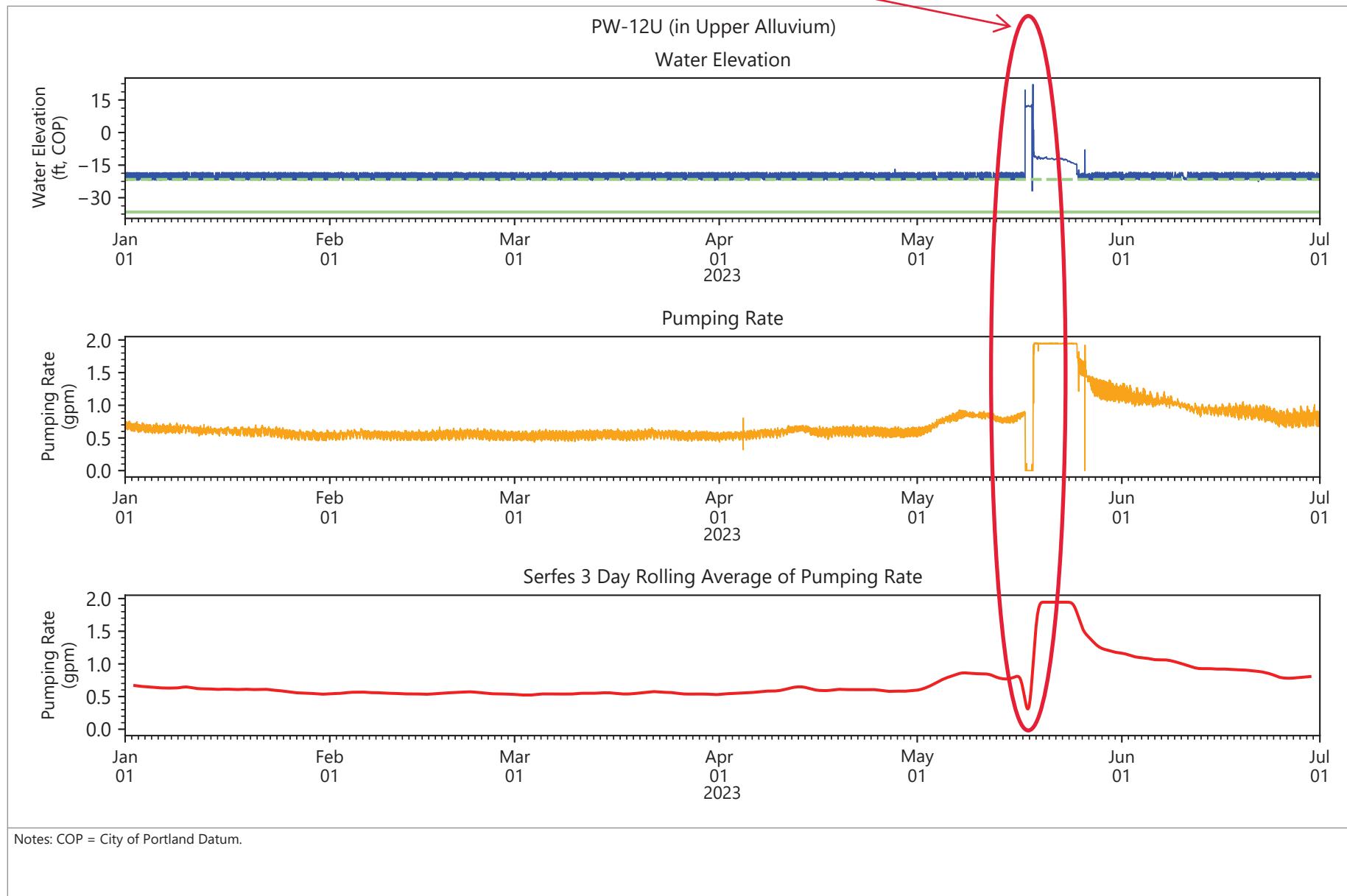
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.11
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site

Well Screen Maintenance 5/17



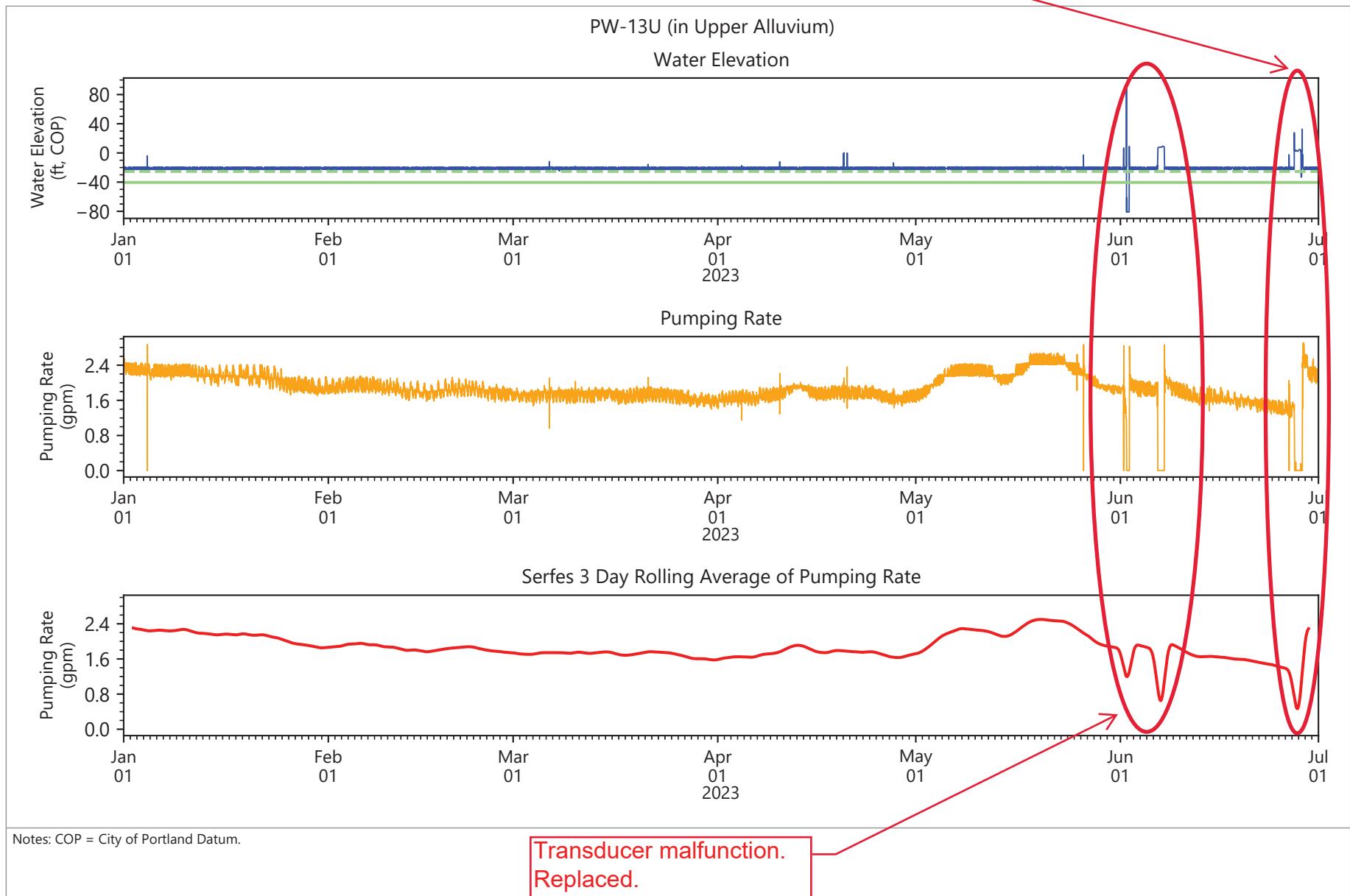
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.12
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 6/27

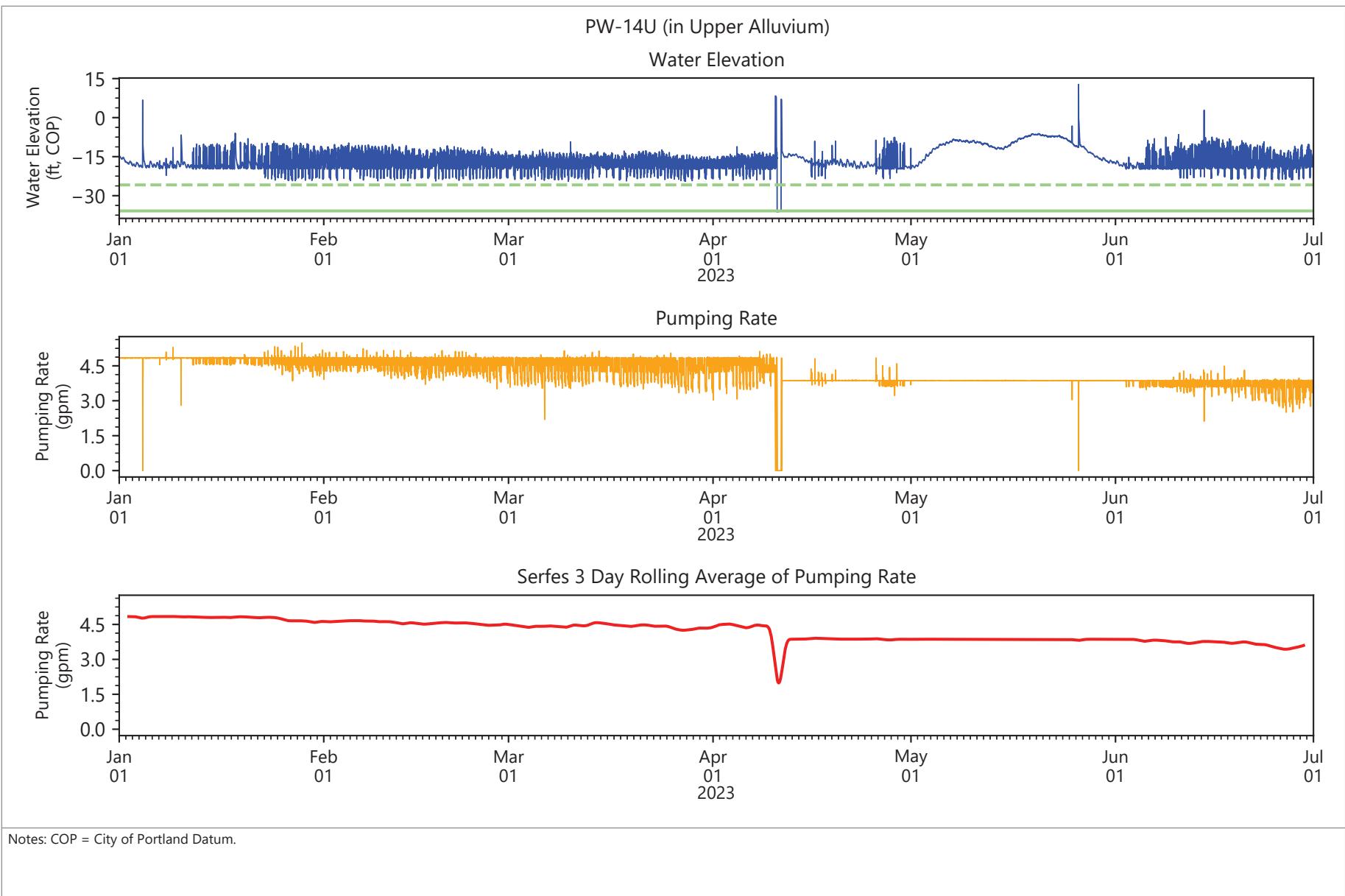


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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.13
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

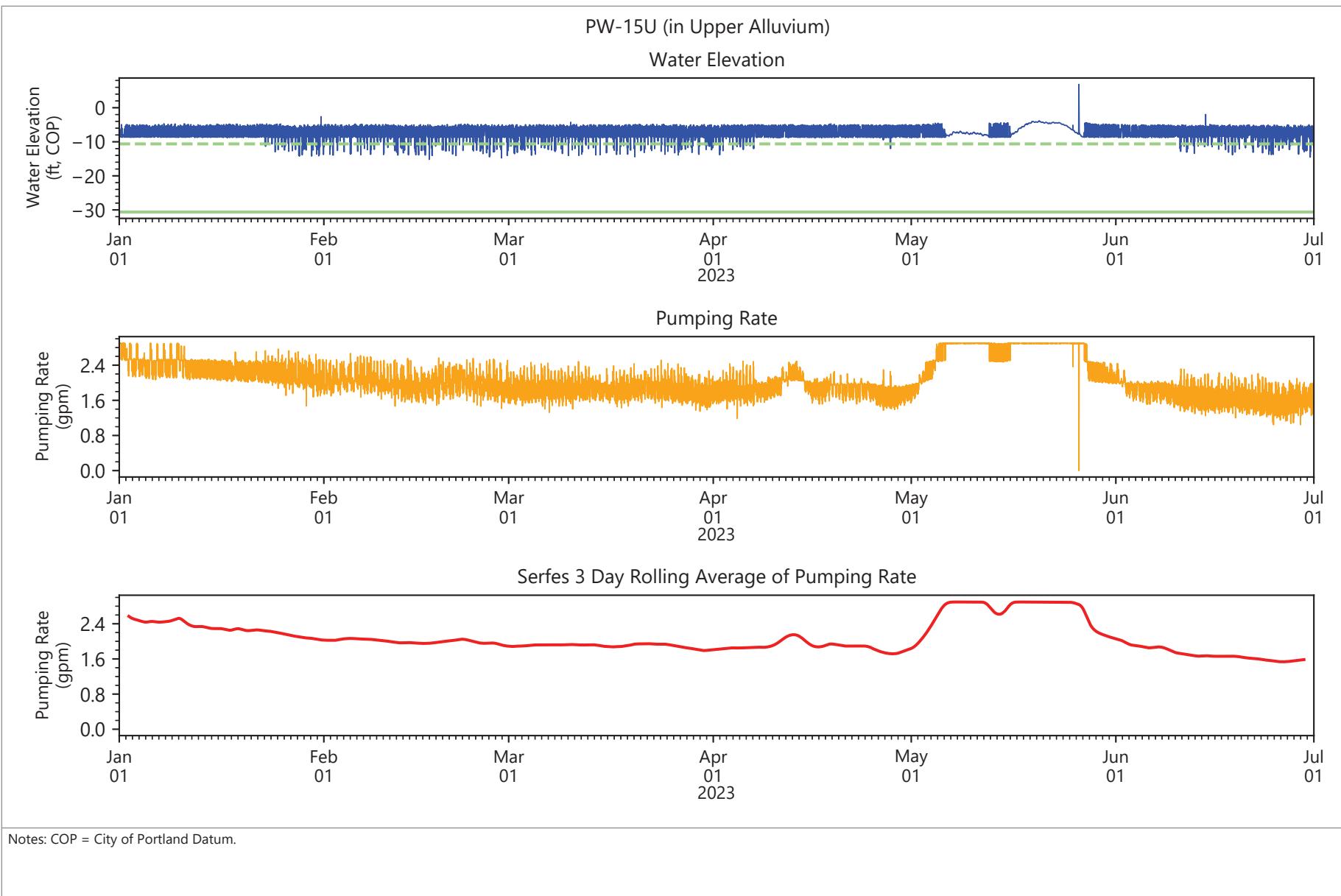


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.14
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site



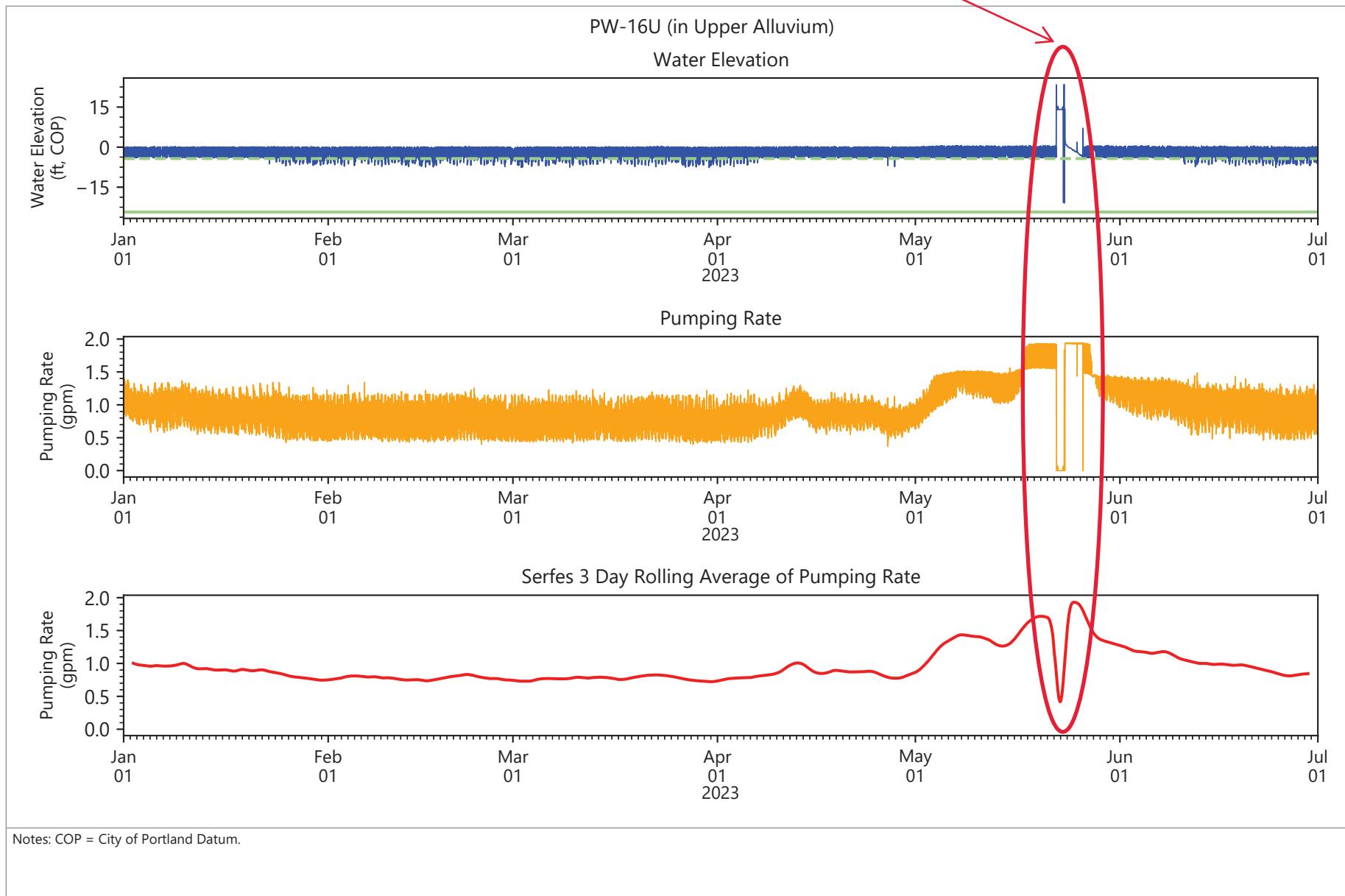
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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.15
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 5/22



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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.16
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site



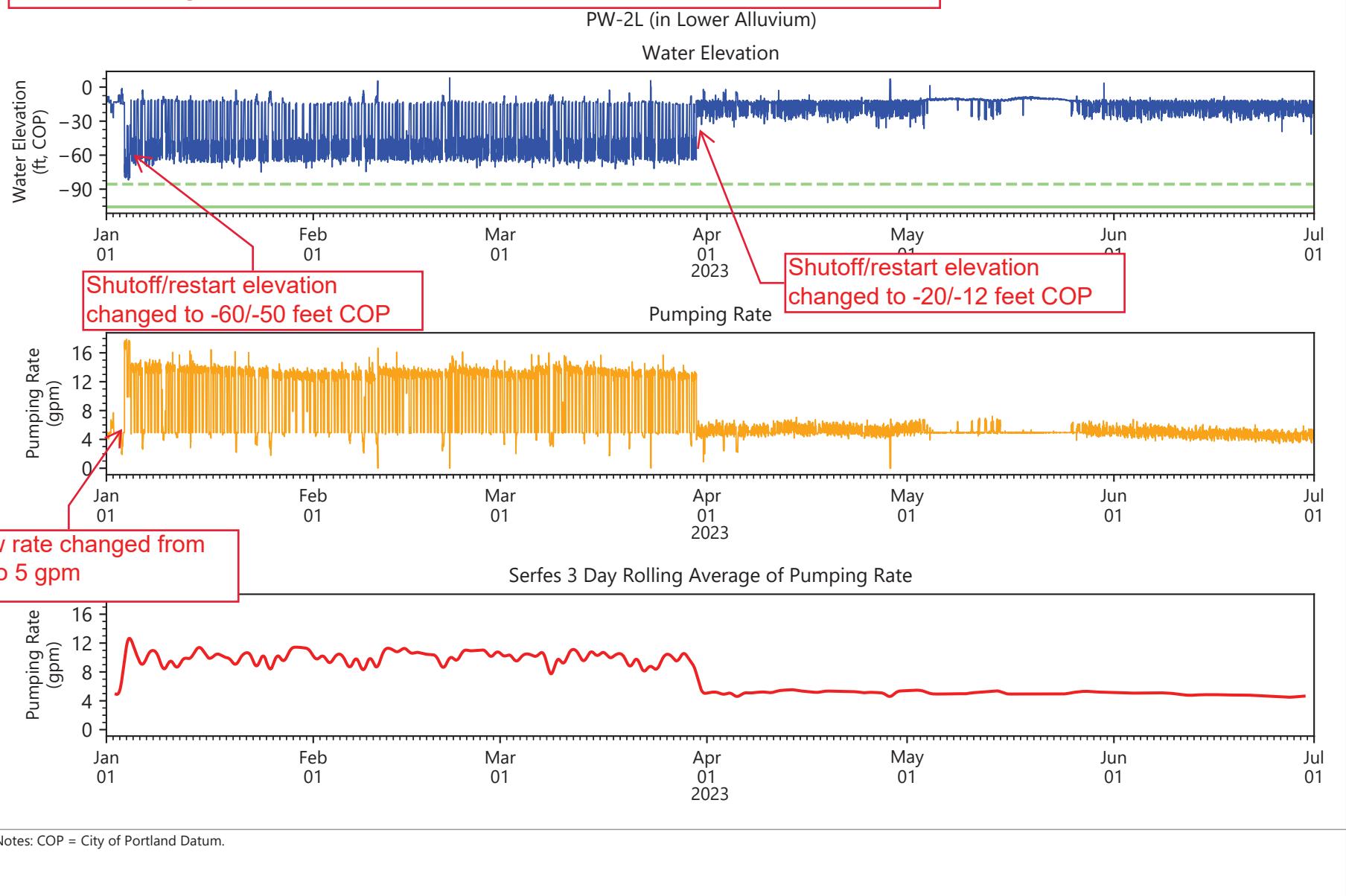
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.17
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site

Operational changes were made to improve vertical gradients in the area of the PW-2U and PW-2L extraction well pair, effectively decreasing overall pumping from PW-2L relative to PW-2U

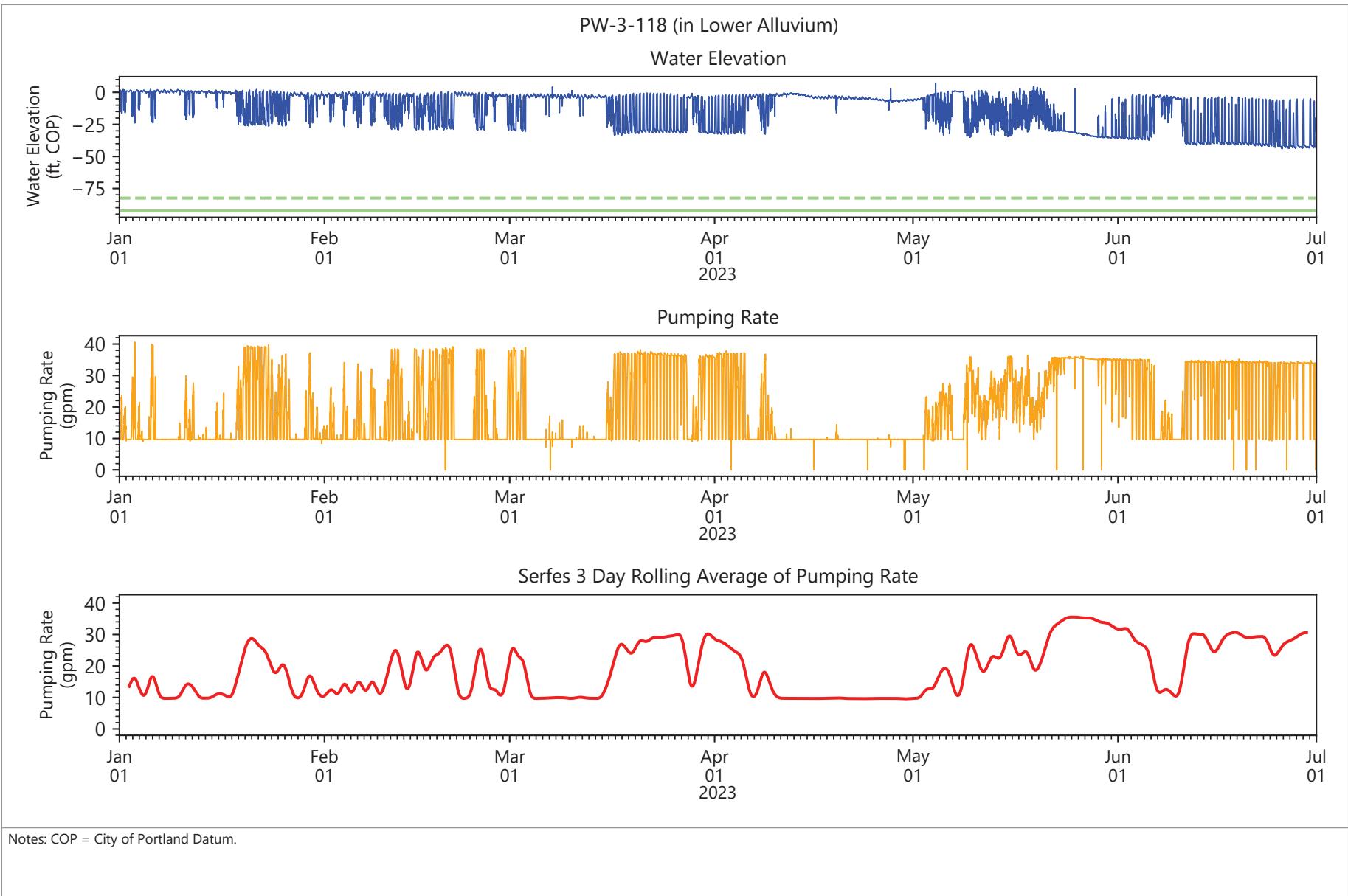


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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.18
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

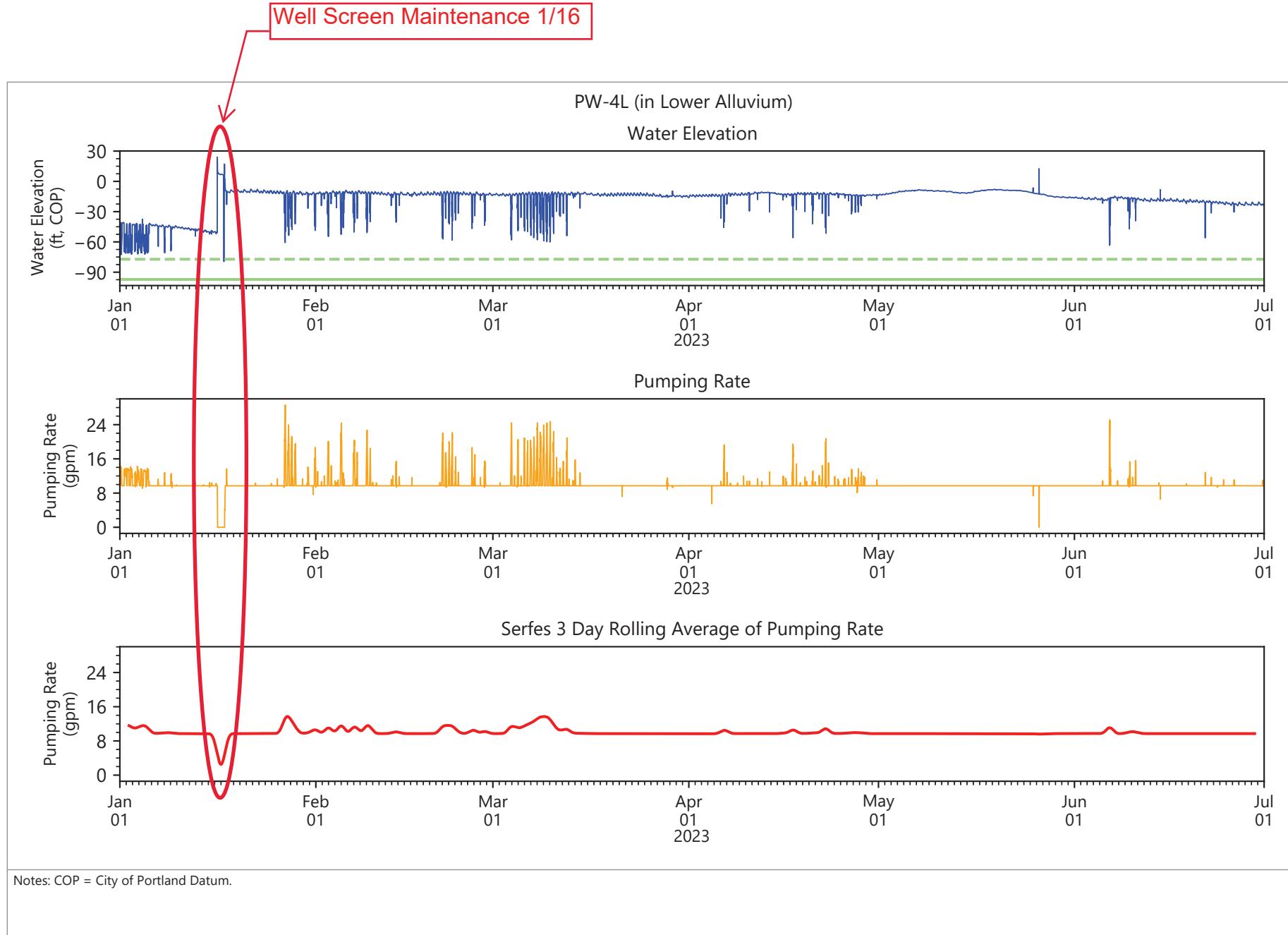


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.19
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site



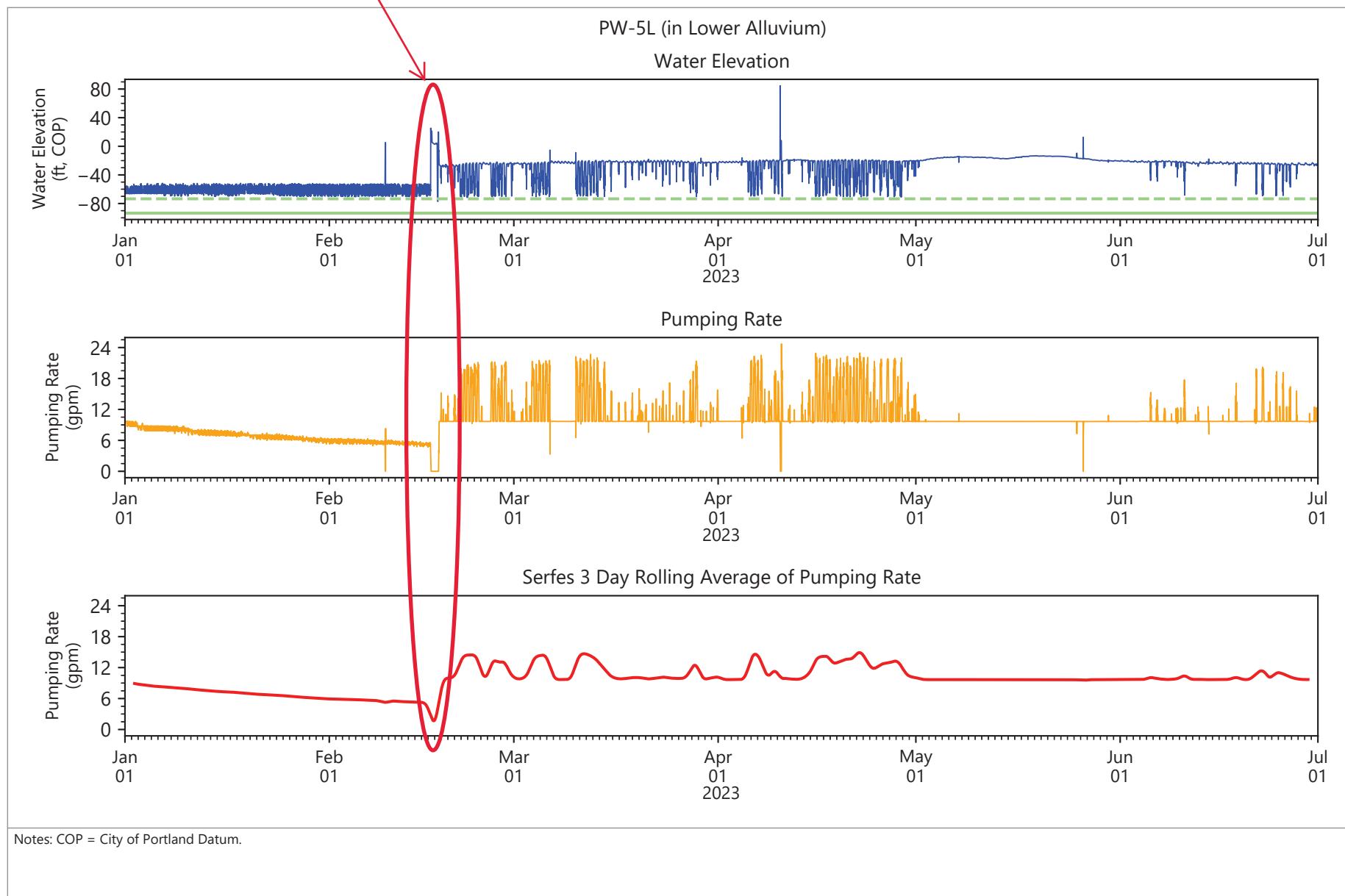
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.20
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site

Well Screen Maintenance 2/16



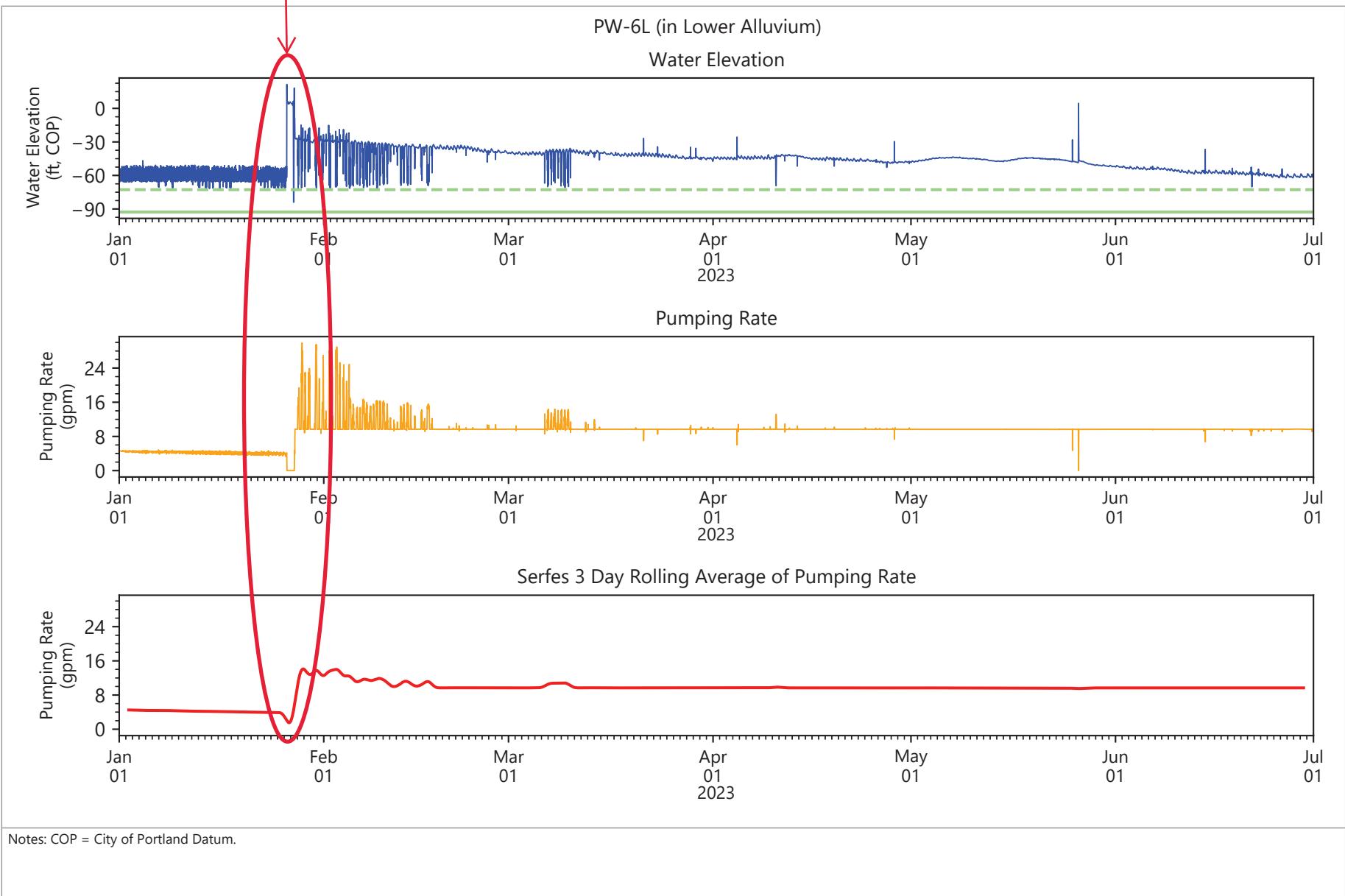
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.21
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 1/26



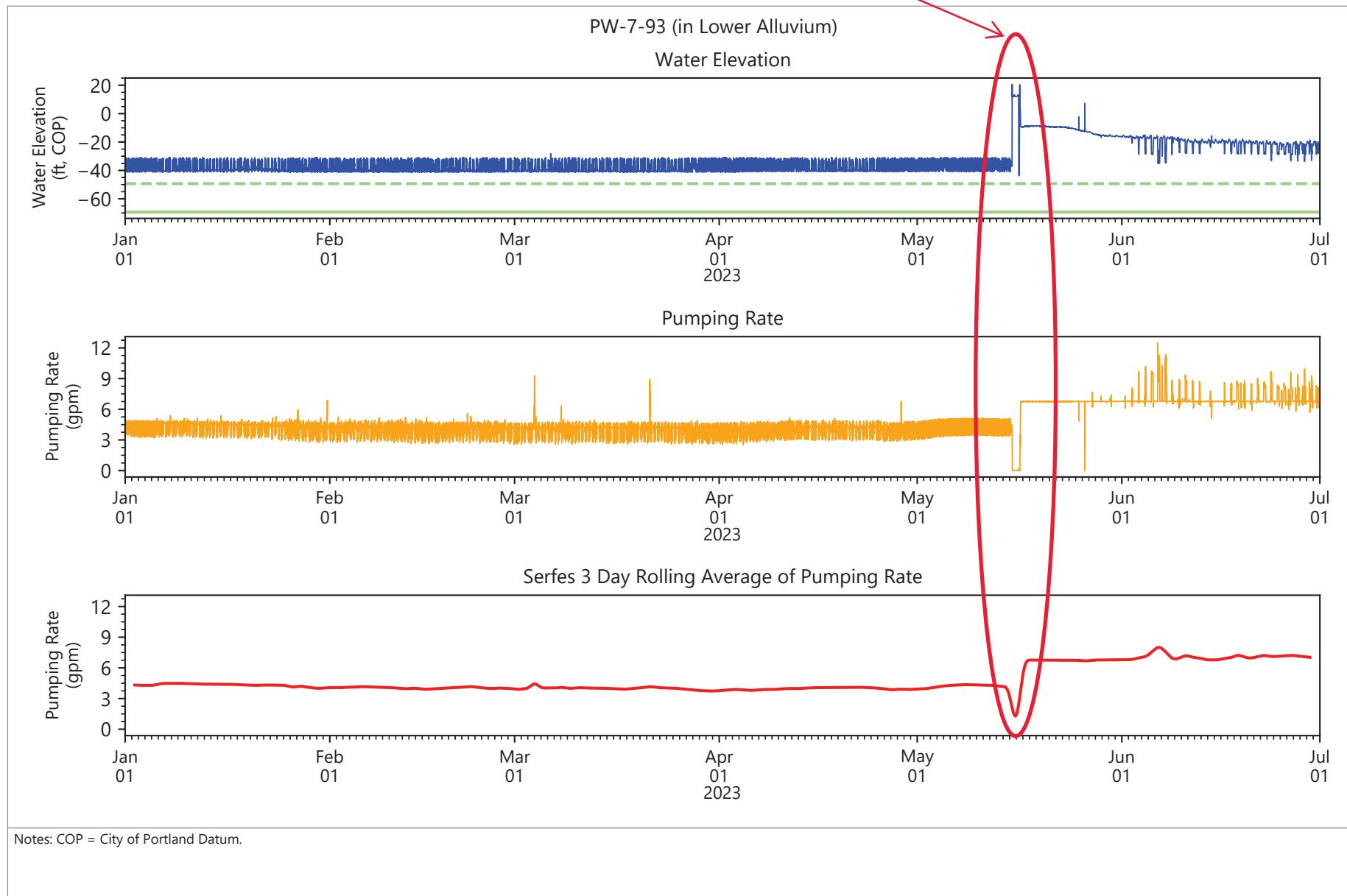
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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.22
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

Well Screen Maintenance 5/15

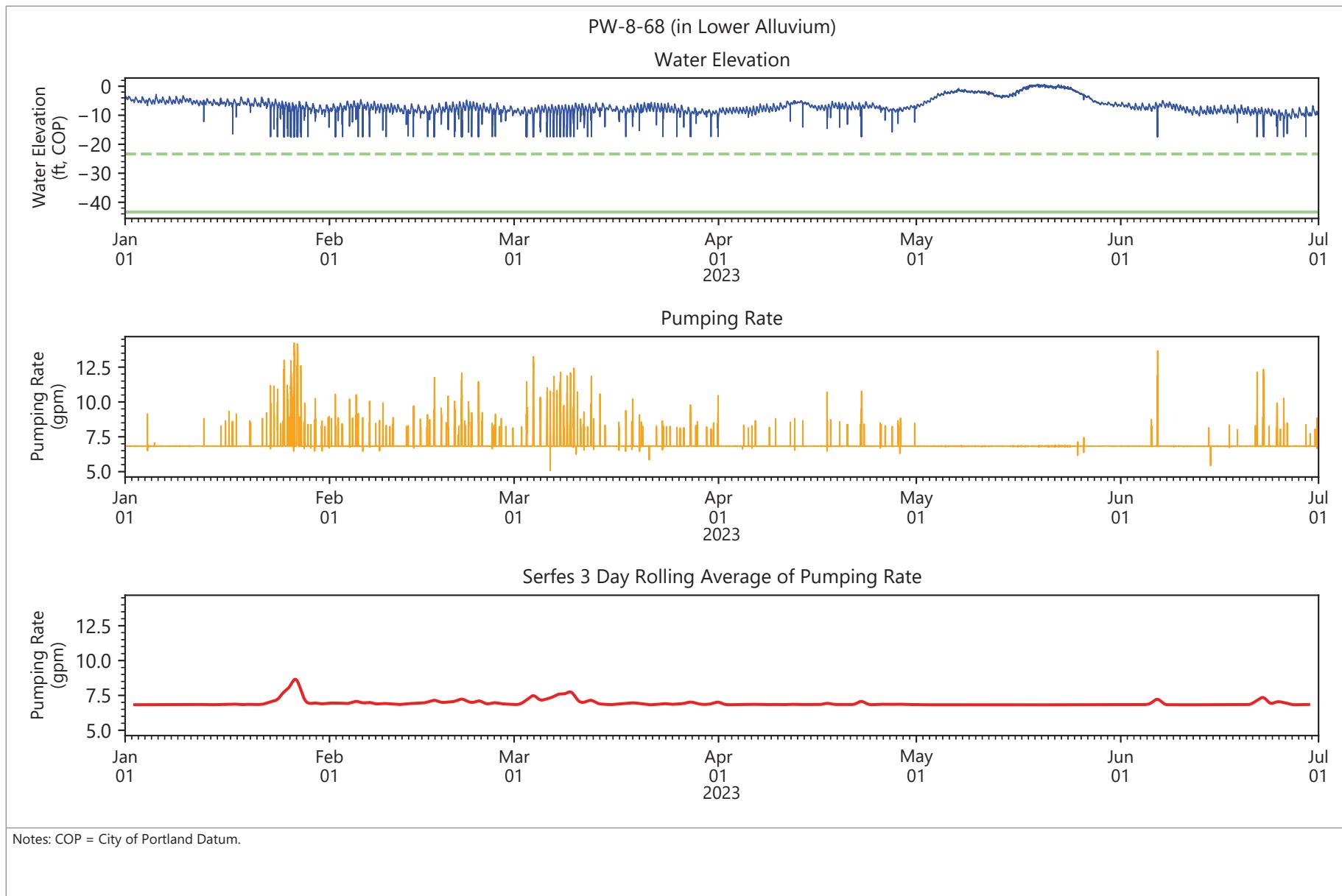


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.23
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

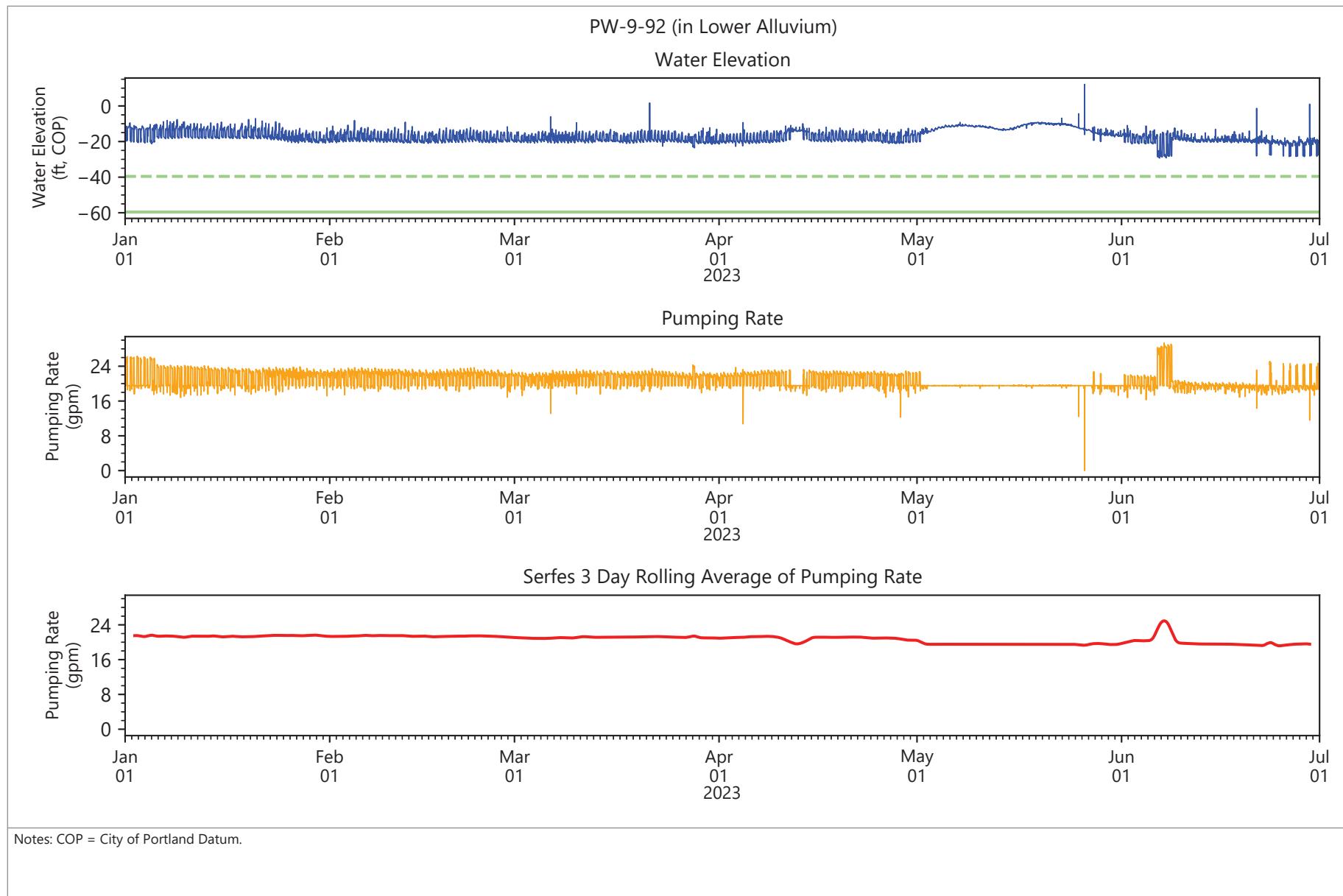


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- Groundwater Elevation
- Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.24
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site



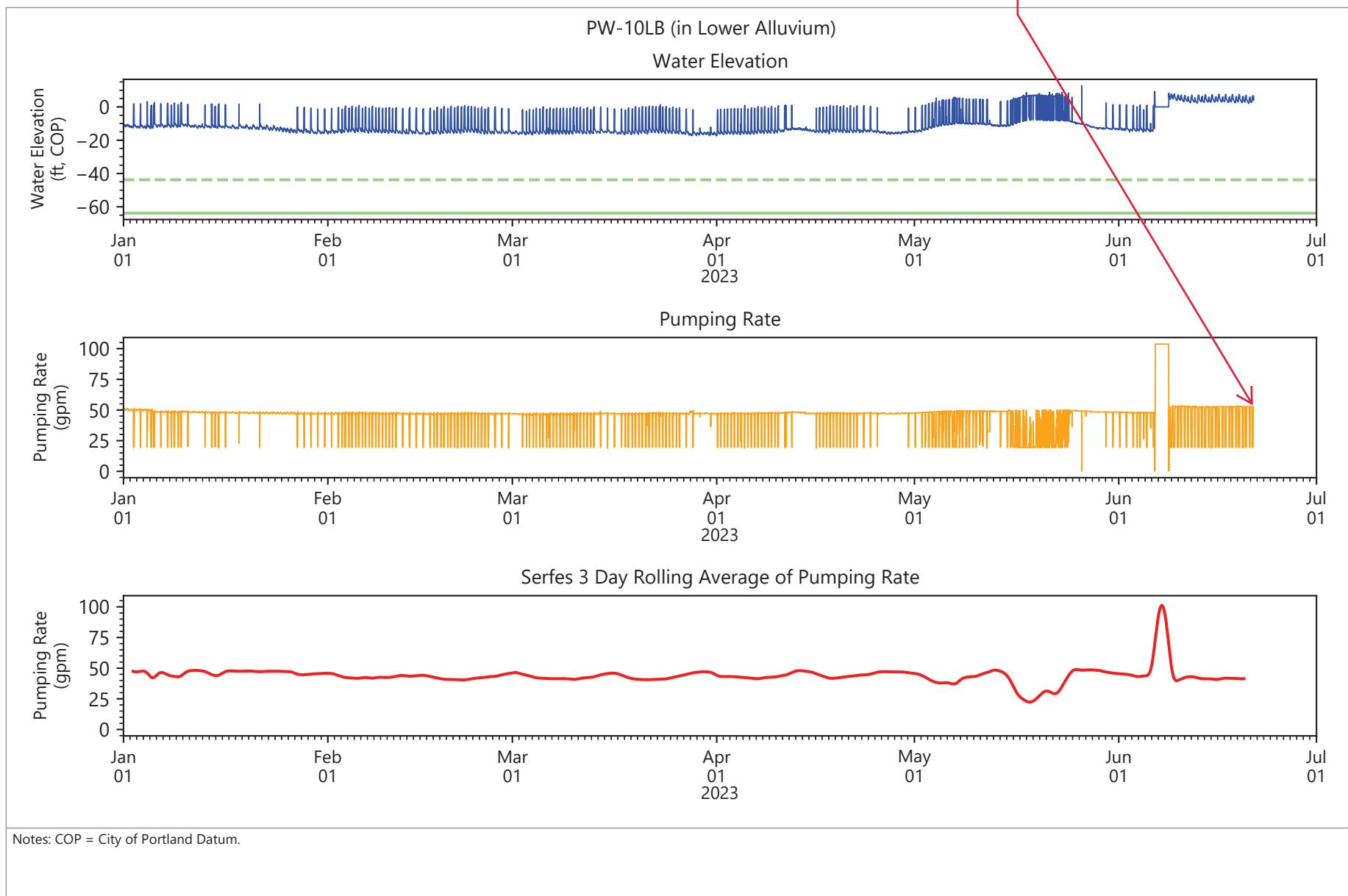
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.25
Groundwater Elevations and Pumping Rates at Pumping Wells
 NW Natural Gasco Site

PW-10LB taken out of service, replaced with PW-10Lc



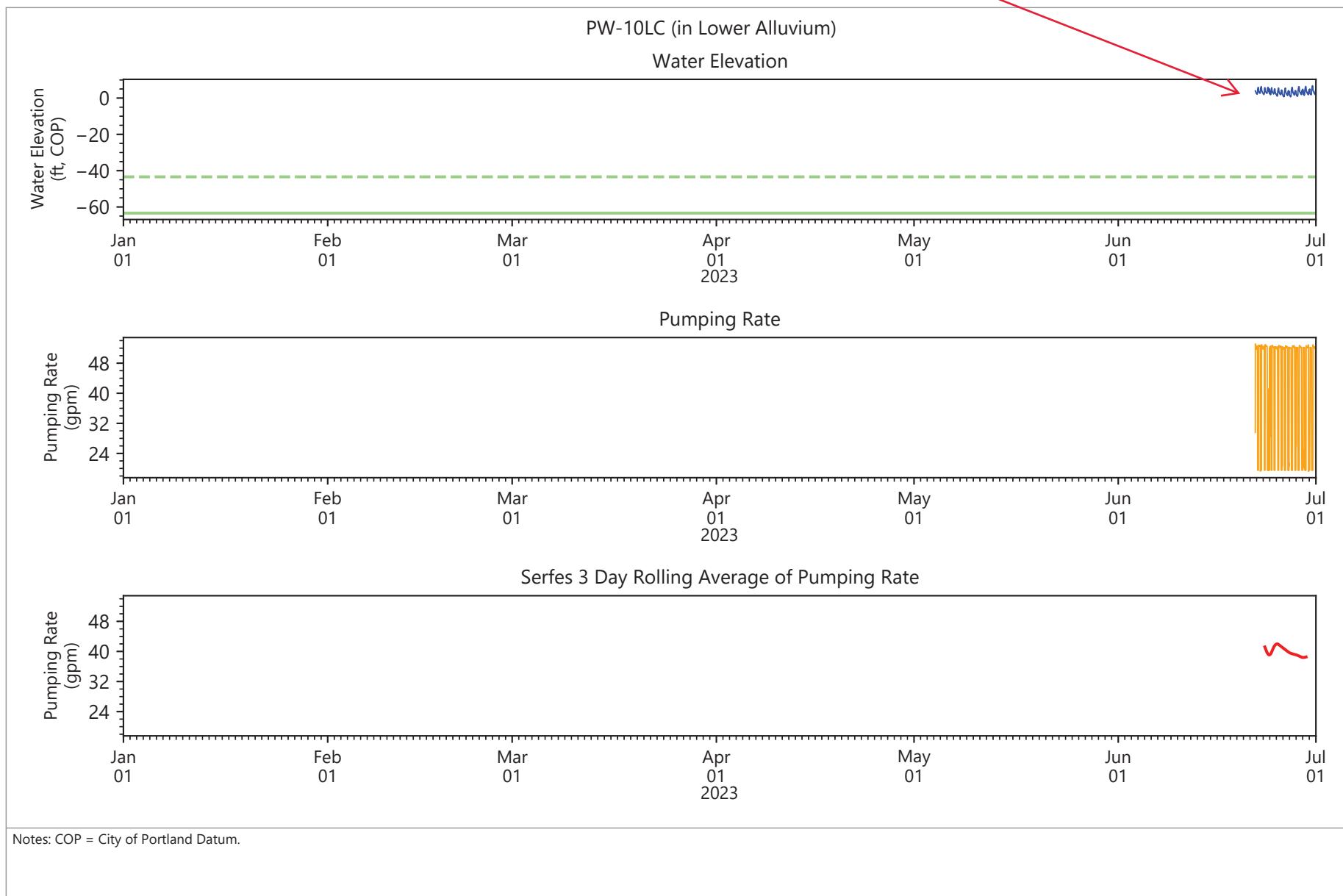
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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.26
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

PW-10LC online 6/21

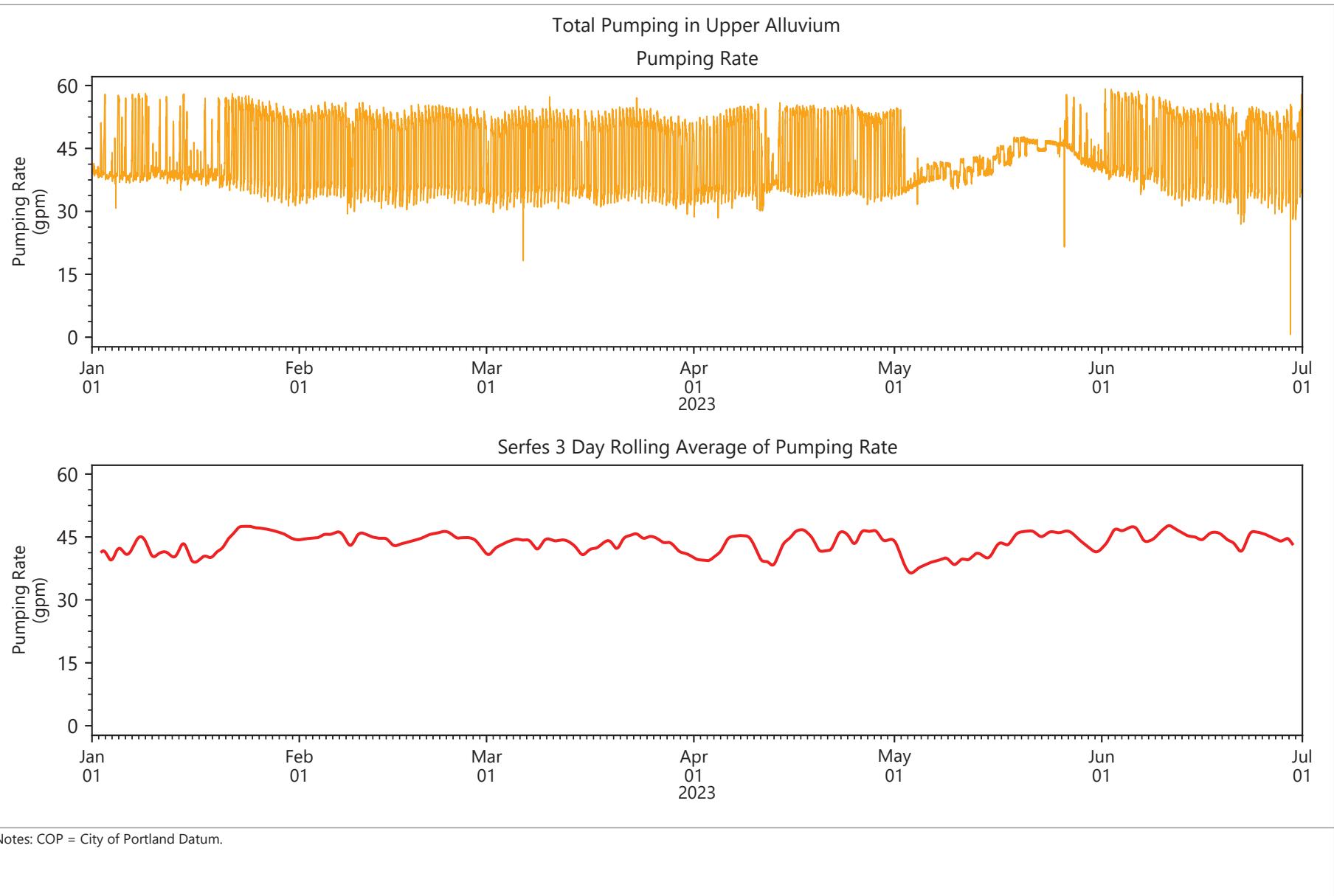


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- Groundwater Elevation
- - - Top of Screen Elevation
- Bottom of Screen Elevation
- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.27
Groundwater Elevations and Pumping Rates at Pumping Wells
NW Natural Gasco Site

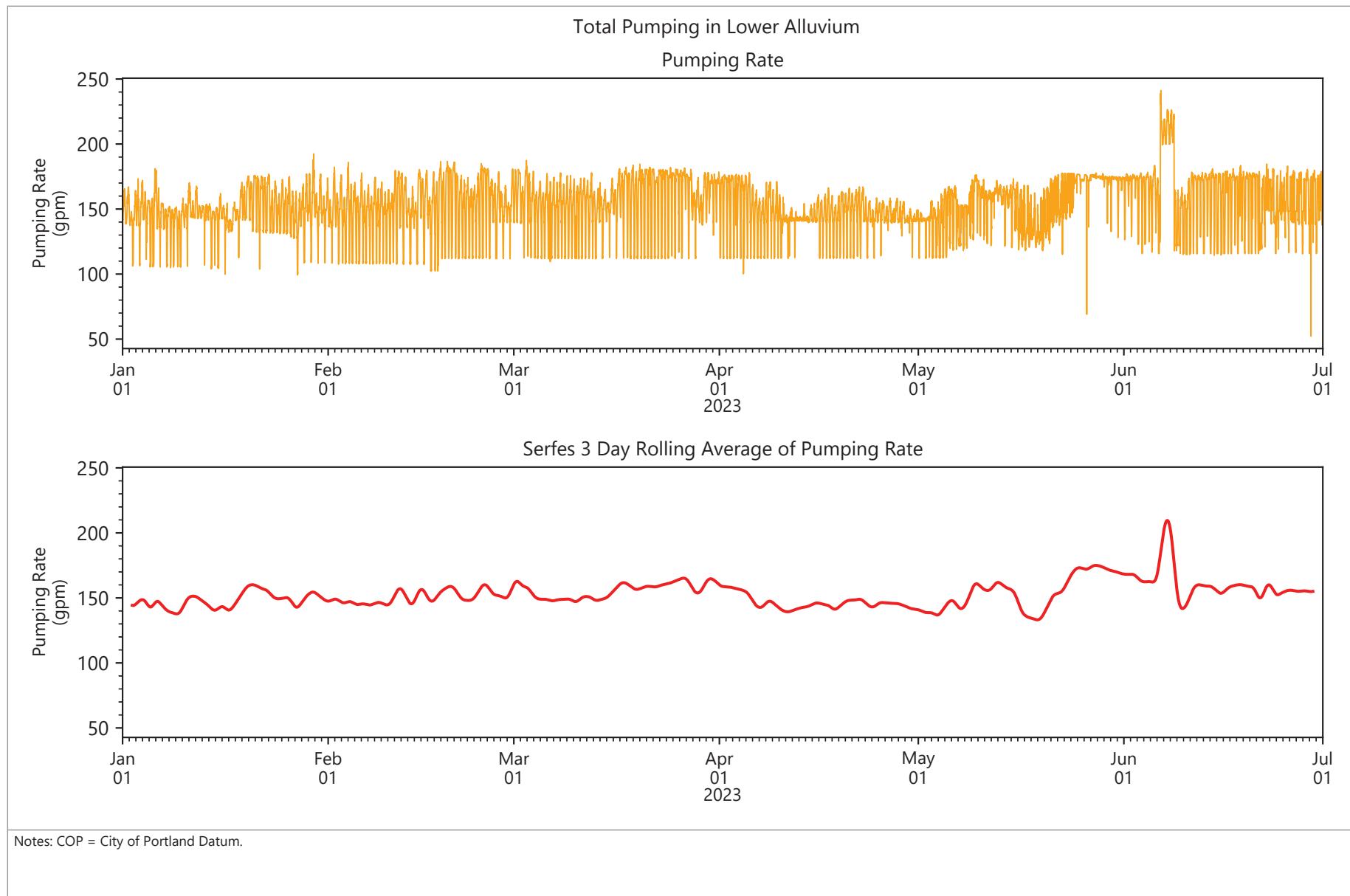


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- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.28
Pumping Rates at Pumping Wells
NW Natural Gasco Site

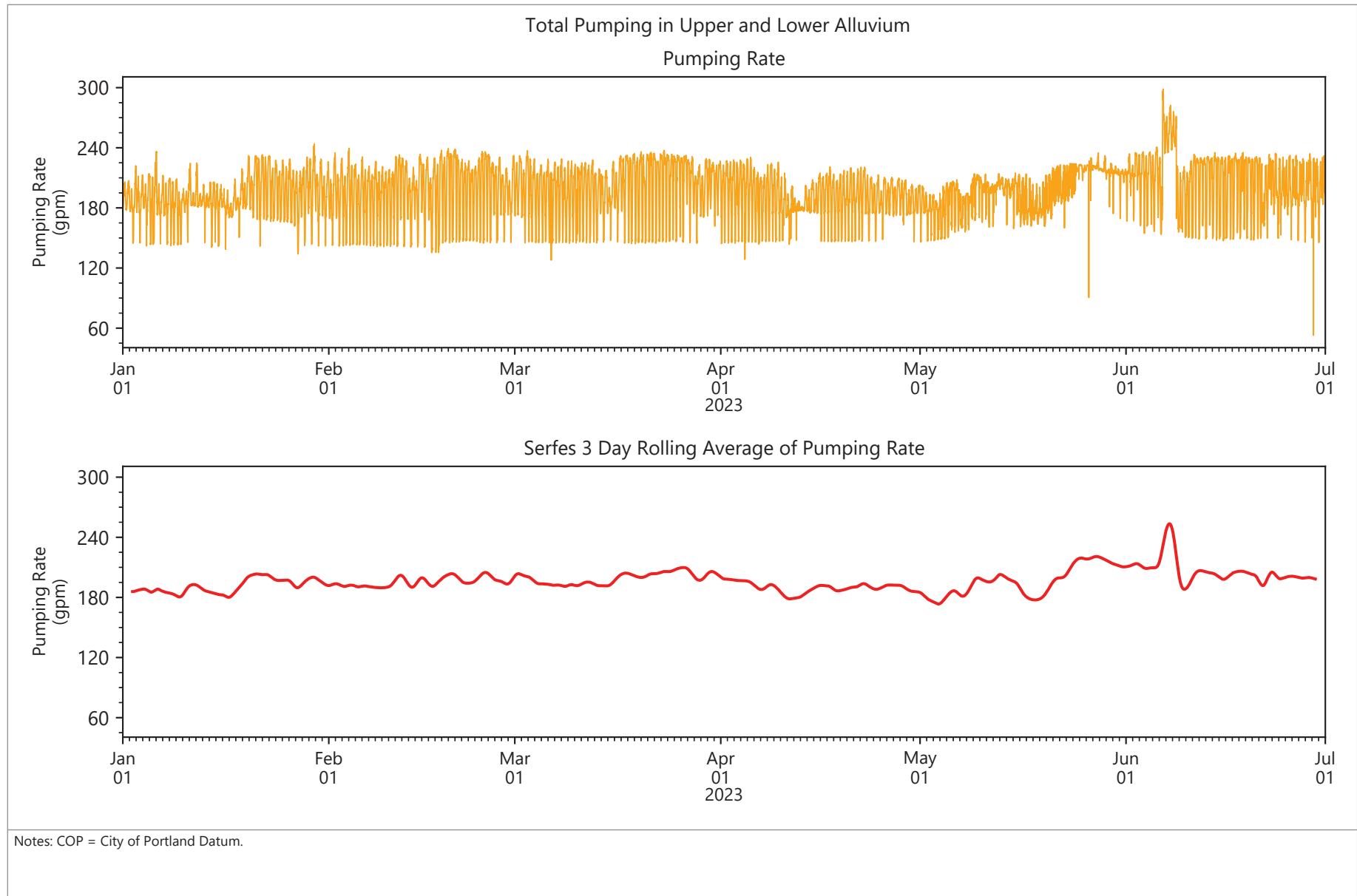


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- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.29
Pumping Rates at Pumping Wells
 NW Natural Gasco Site



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- Pumping Rate: 15-min Data
- Pumping Rate: Serfes Averages

Figure 7.30
Pumping Rates at Pumping Wells
NW Natural Gasco Site