Memorandum

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Subject: Information for DEQ Regarding HydroAnalysis Technical Memorandum

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This memorandum is a follow-up to my telephone call on Tuesday, 21 April with Jim Orr of DEQ regarding the 16 March 2020 technical memorandum from HydroAnalysis of Acton, Massachusetts on behalf of the Five Tribes involved with the Portland Harbor Superfund Site. It provides additional information on a few of the points we discussed. This memorandum does not constitute a complete response to the comments contained in HydroAnalysis' memorandum but focuses on key points for discussion.

Preferential Pathway. HydroAnalytics' comment 9 suggests that a preferential pathway for groundwater and contaminant flow may exist associated with the former Gatton Creek, which is mapped as having flowed through the area prior to filling and industrial development.

A preferential pathway requires a subsurface feature that is physically extensive on the scale of the problem being evaluated, with substantially higher permeability (hydraulic conductivity) than the surrounding aquifer material. In other words, a small pocket of higher permeability material, surrounded by aquifer material showing more typical permeability for the area, will not function as a preferential pathway because it is not physically extensive. Similarly, a geologic or depositional feature that exhibits a similar permeability to the surrounding aquifer material will not function as a preferential pathway because it has the same or similar hydraulic properties to the surrounding aquifer material.

When the question of the former Gatton Creek first arose, the Northwest Pipe project team evaluated its potential significance in the context of groundwater flow and contaminant migration. To do that, we considered the situation that existed before hydraulic fill was placed at the site to facilitate industrial development for WWII government production. This is shown schematically in Figure 1.

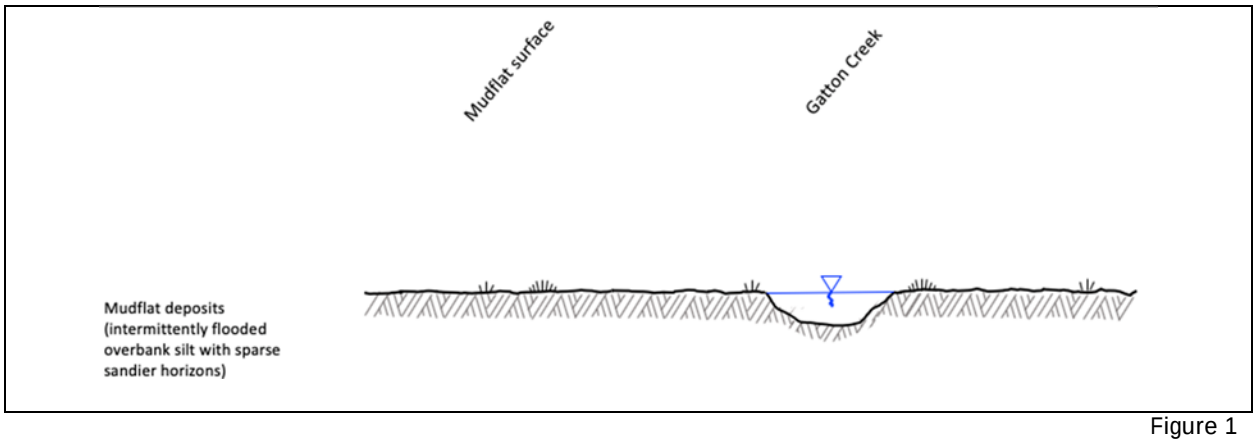

Figure 1
Pre-1940 Schematic Profile of Burgard Area

Based on the topography of the area, which consisted of flat, floodplain overbank deposits with standing water mapped in several parts of what is now the Burgard industrial area, it is reasonable to assume that Gatton Creek would have been a slow-moving stream, possibly meandering over time, with limited sediment carrying competence. This is supported by historic topographic maps showing several areas of "wetland" near Gatton Creek. For example, Dunne and Leopold[1] note that the grain size of sediment in a stream bed tends to decrease along the flow path, with coarser materials in the upland, hilly or mountainous reaches, to medium-grained materials in the middle section, to finer sand or silty sand further downstream. The Northwest Pipe site is close to Gatton Creek's mouth at the Willamette River. Accordingly, the stream bed material of Gatton Creek would likely have been composed of silt and fine sand, since slow moving water flowing across relatively flat ground would have insufficient velocity to carry coarser material such as coarse sand and gravel. In short, it is not likely that the streambed material of a creek such as Gatton Creek would have contained coarse, high-permeability sediment in the Northwest Pipe/Burgard area.

Figure 2 depicts a schematic profile of the same area after filling.

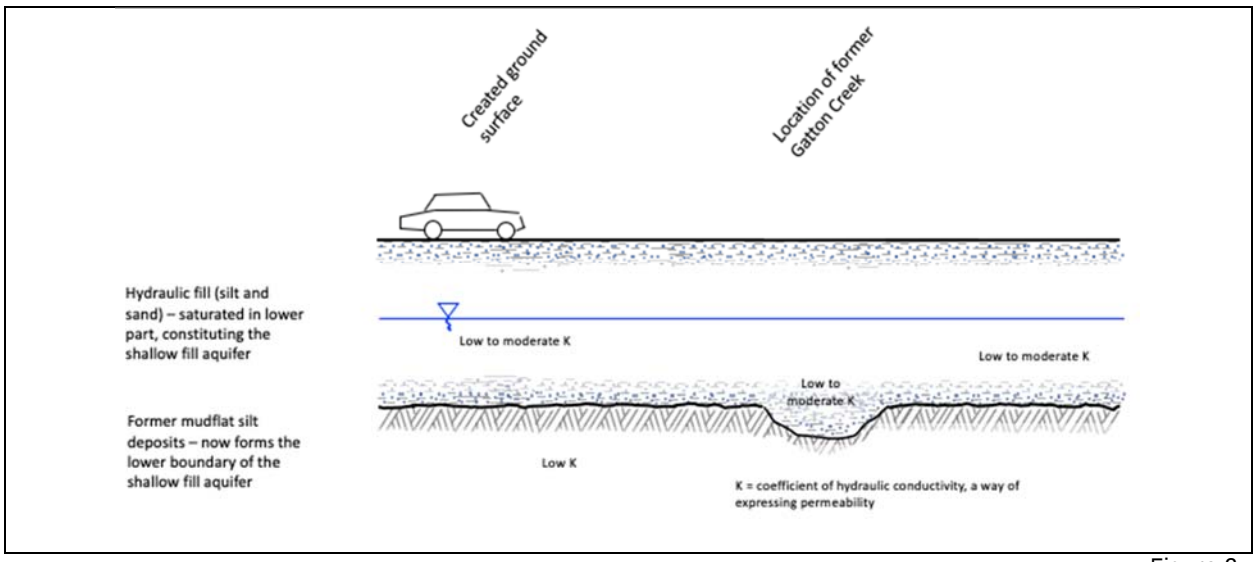

Figure 2
Post-1940 Schematic Profile of Burgard Area
Northwest Pipe Company, Portland, Oregon

As Jim and I discussed, the bed of Gatton Creek after the area had been filled to grade would have contained the same general material as used to fill the entire area: hydraulic dredge spoils. This fill material would be expected to vary somewhat in hydraulic properties from location to location based on factors such as what the source area was for the fill material used at different times of the filling process. For example, dredge material obtained from the sandier navigation channel of the Willamette River would be expected to be coarser and exhibit higher permeability than dredge material obtained from excavating into the silt overbank deposits, as would have been necessary to create the shipyard Outfitting Bay (now called the International Terminals slip). This variation probably is an important factor in why the observed hydraulic conductivity of the shallow fill aquifer varies with location.

However, because the Gatton Creek channel would have been filled at the same time and with the same general types of material as used to fill the surrounding area, and later create the shallow fill aquifer, it would

[1] Dunne, T. and L.B. Leopold .1978. *Water in Environmental Planning*. San Francisco: W.H. Freeman and Company, p. 622.

be expected to have the same range of hydraulic properties as the rest of the fill aquifer. Consequently, a zone of substantially higher-permeability material capable of forming a preferential pathway over an extensive area capable of preferentially allowing flow downgradient over a substantial distance, is not expected to be associated with the former channel of Gatton Creek. The zone of higher permeability noted by aquifer testing at MW-05 may be an artifact of a pocket of slightly coarser material having been used as a fill source in that area, such as from the Willamette River navigation channel.

DNAPL. The source of volatile organic compounds (VOCs) at the site is understood to be a former 250-gallon above-ground waste oil tank that contained waste oil with some commercial cleaning product residues containing chlorinated solvents. This tank was identified during the late 1980s pre-lease environmental assessment work conducted by Northwest Pipe and was described as being located above ground on a steel frame. The tank was removed from the site and a surface and subsurface soil removal effort was conducted to address the identified contaminated soil, potential source material, associated with the tank.

There is no known record indicating that large quantities of chlorinated solvents were used at the site. The conceptual model of the source of VOCs at the site involves small quantities of solvent-containing degreasers used incidentally as part of surface preparation prior to coating or lining. If phase-separated oil or solvents were present in the subsurface from spills or leaks from the waste oil tank, it would be reasonable to expect them to be small in quantity, consistent with past practices at the site.

The removal action conducted at the time the waste oil tank was decommissioned would have addressed the known and accessible potential source material (that is stained soil). Available data indicates that the remaining VOC plume in groundwater degrades to below levels of concern identified in the Record of Decision prior to reaching the Willamette River, therefore the need for further investigation or treatment of a source is not indicated. Rather, Northwest Pipe agrees with DEQ and EPA that expanding the groundwater monitoring program to provide additional certainty regarding the protectiveness of the proposed monitored natural attenuation (MNA) remedy is the best path forward. This expansion will be informed by a planned passive soil gas investigation to identify areas with elevated VOC concentrations, if any, downgradient of the site. DEQ comments on the soil-gas work plan are currently being evaluated and the soil gas investigation is planned to occur in 2020, subject to agency approval.

In comment 12, HydroAnalysis describes the Interim Final Draft 1997 EPA directive on the agency's policy for MNA as "guidance," quoting a sentence that states, *"Because of the nature and the distribution of these compounds* [i.e., chlorinated solvents*], natural attenuation may not be effective as a remedial option*." While this sentence appeared in the Interim Final Draft directive issued in 1997, it was removed after further review and comment and does not appear in EPA's final 1999 directive on its policy for MNA. Rather, MNA has been commonly applied at sites containing chlorinated solvents, as scientific, regulatory, and industry experience with MNA on chlorinated plumes has progressed in the more than two decades of work since that directive was finalized.

Regional Deep Groundwater VOC Plume. In comment 13, HydroAnalysis suggests that the description in Jacobs' Remedial Investigation and Source Control Evaluation report (2020) prepared for Northwest Pipe Company and related to low concentrations of VOCs in the deep aquifer beneath the site "lacks credibility."

To the contrary, the presence of a diffuse, low-concentration VOC plume in deep, regional groundwater has long been well-known in the Portland area. For example, its presence has been noted at in deep groundwater samples from the 1990s from the Merit Truck Stop site near Force Lake (ECSI 1091), located about 3.8 miles northeast and likely upgradient from Northwest Pipe) and was a particular point of interest in the various investigations conducted for St. Johns Landfill (located 0.7 miles east and probably upgradient from Northwest Pipe) in North Portland (ECSI 164), as documented in its Remedial Investigation report (2015). In 1996, VOCs were detected in an onsite drinking water well at the BPA St. Johns substation (ECSI 1858)

(located 0.5 miles northeast). Jim may recall that when the remedial investigation for St. Johns Landfill was initiated in 2005, DEQ's Environmental Cleanup Division had retained a temporary employee to compile and evaluate regional information on the deep groundwater VOC plume in North Portland, as it has been widely detected in the area.

Downgradient Characterization. As discussed with Jim, many of HydroAnalysis' comments expressing concern about the area downgradient of the site and about the possibility that the former Gatton Creek channel may be a preferential pathway should be addressed by the upcoming passive soil gas sampling program and subsequent monitoring well installation effort. This work will help convert the existing groundwater well network, which was installed for investigation purposes, into a groundwater monitoring well network better suited for monitoring the groundwater remedy at the site.