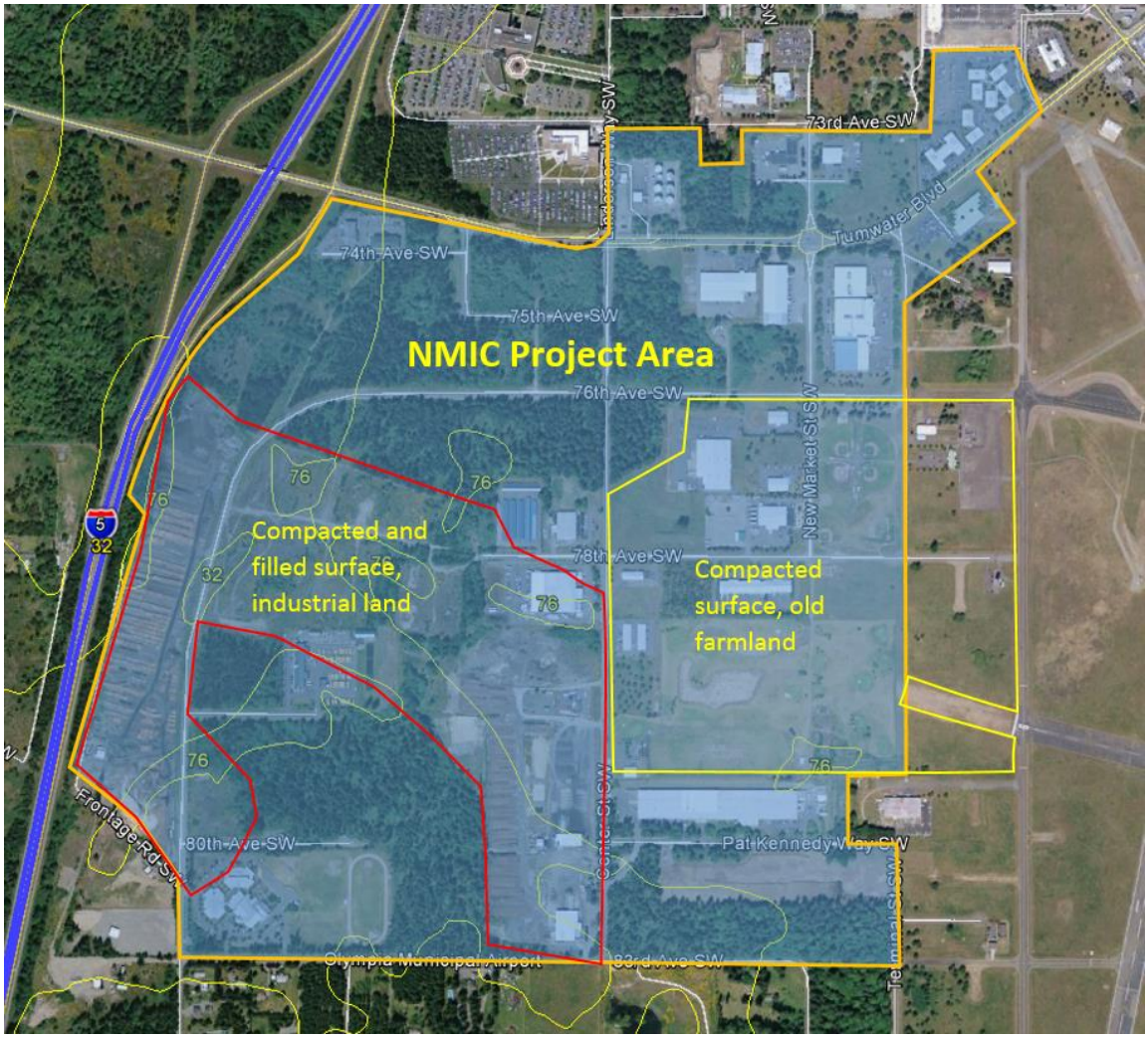
New Market Industrial Campus

Soils and Hydrology Assessment



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SCJ ALLIANCE
CONSULTING SERVICES

New Market Industrial Campus
Soils and Hydrology Assessment

Project Information

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Reviewing Agency

Jurisdiction:	City of Tumwater (primary) Ecology (state) Army Corps of Engineers (federal)

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1. EXECUTIVE SUMMARY

An onsite soils and hydrology investigation was done on January 16 and 20th, 2015 at the NMIC Project area. The purpose of the work was to document soil profiles, soil texture, and depth to current groundwater as might affect development potential within the New Market Industrial Campus (NMIC) and Tumwater Town Center project areas (Figure 1).

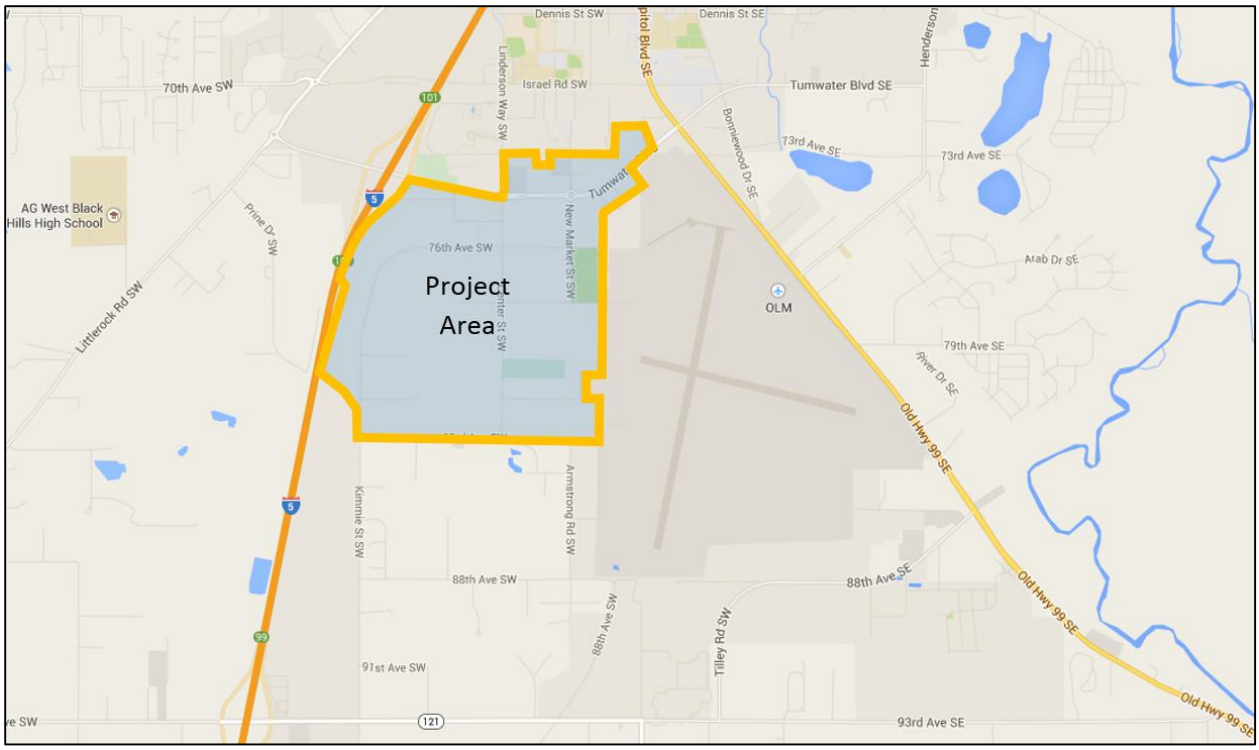

Figure 1. Project Vicinity Map

This report provides a planning level assessment and description of natural resources within the project area, specifically targeting soil and hydrology conditions that affect wetlands, stormwater design, and Mazama pocket gopher habitat. Results of January, 2015 field work indicated that the GeoData High Groundwater Hazard Areas map units (HGHAs, mapping developed circa 1996) and wetland inventory map units (mapping completed circa 1990) were in areas with significant (3-4 ft depth) surface fill and compaction. The same compacted fill areas had hydric (wetland) soil map units (from NRCS[1] soil mapping carried out in the 1970s), but at slightly different locations than the HGHA and wetland map units. These areas mapped as wetland or as high groundwater hazard areas indicated the potential for shallow groundwater or surface water in that part of the project area.

The January 2015 field work documented that there is no near-surface hydrology in most of the areas that were previously mapped as having surface water, and further documented that there was a current groundwater table at an average of 13 feet depth across the project area. In other areas that had not

[1] Natural Resources Conservation Service, formerly the Soil Conservation Service

been previously mapped as having surface water, there was current surface water, but perched on top of compacted fill.

These results documented inconstancy and variability in the location of surface ponding conditions, and in particular, indicated that it only occurred in industrial areas where surface soils had been compacted, filled and/or extensively regraded. This indicates that both past and present surface ponding is at least partially an artifact of human activities rather than from natural soil hydrology conditions. This outcome has an impact on how these areas are regulated and managed.

1.1 Wetlands Mapped in Areas with Surface Compaction

NMIC project area wetland map units in the Thurston County GeoData system occur only in areas with human-caused surface compaction. The surface compaction caused past and present surface ponding, and was a result of industrial land use activities, most commonly from log-stacking yards associated with long-term Port tenants (Figure 2). ***Aside from this ponding associated with compacted fill, there is no other surface- or near-surface hydrology within the NMIC project area.*** Regulatory staff from the U.S. Army Corps of Engineers (ACOE), the Washington State Dept. of Ecology (Ecology) and the City of Tumwater met on site in February 2015, where they were able to view the compacted areas, including areas mapped in the past as wetlands or hydric soils.

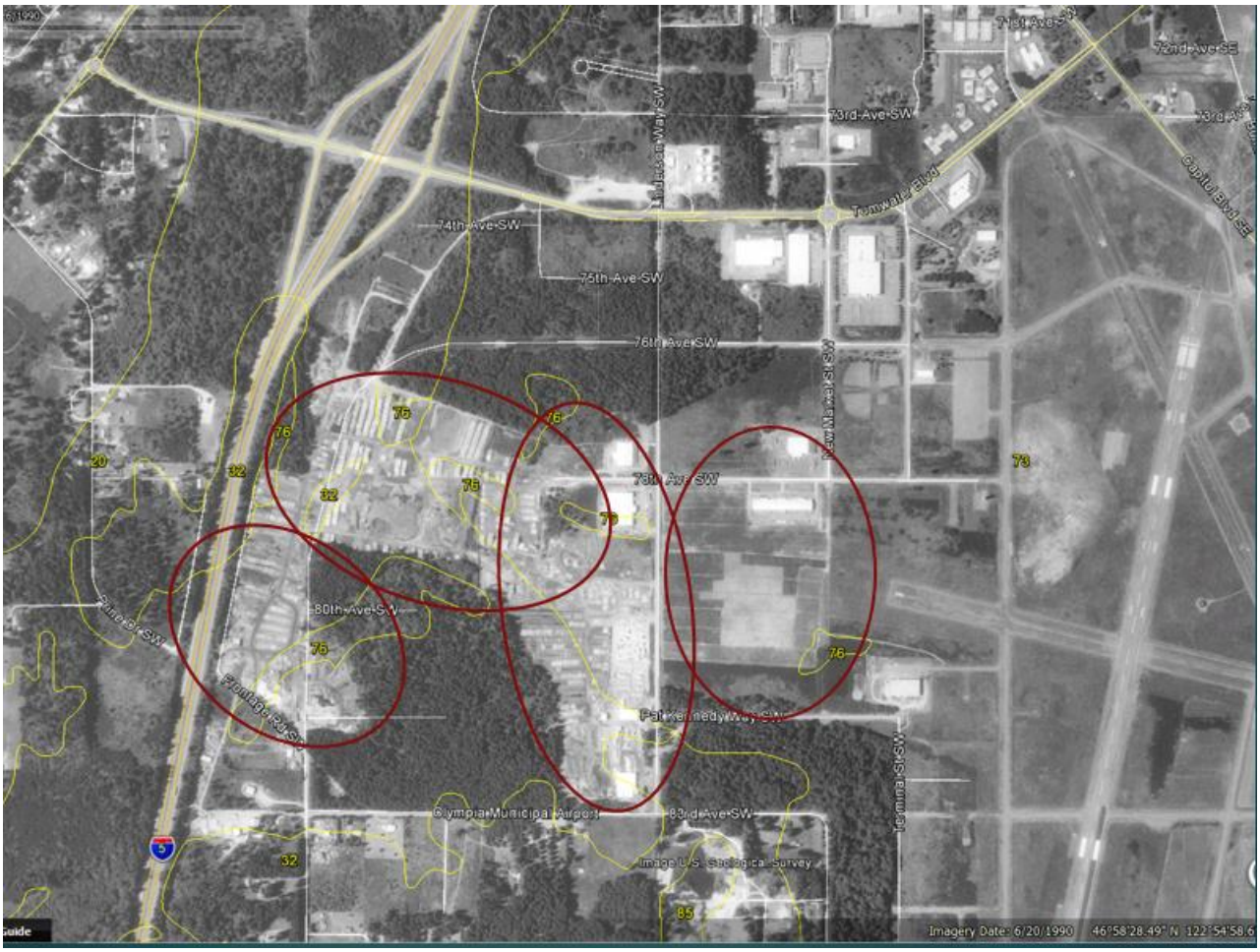

Figure 2. 1990 aerial photo showing areas with surface compaction and fill from past land use.

These regulators have been asked to provide a determination as to whether there are any jurisdictional wetlands onsite. To assist with this determination, we provide some background conditions (see discussion in main report below) describing why the various isolated areas with surface water are isolated, and thus not regulated as wetlands.

1.2 Stormwater Facility Design in High Groundwater Hazard Areas

Stormwater facility design in the area is greatly limited by historic high groundwater flooding events that occurred in the late 1990s across the western NMIC complex and to the south in the Salmon Creek Basin. As a result of that flooding, local jurisdictions cooperated to develop a High Groundwater Hazard Area (HGHA) map layer on the Thurston County GeoData (GeoData) system based on surface water ponding documented from a mid-winter aerial photo flight during flooding events.

In response to the flooding, the City of Tumwater adopted the Salmon Creek storm water regulations and Thurston County added "High Groundwater Hazard Areas" (HGHAs) into their critical areas ordinance after the winter of 1998-1999. Thurston County regulates HGHAs areas by limiting proximity and elevation of adjacent development, in general by requiring that development be located 50 feet horizontally away from the HGHA edge and be built 2 feet higher in elevation. The City of Tumwater regulates the areas by adopting the Salmon Creek Basin Development Standards related to stormwater facility design, which are also informed by other sections in the Thurston County Stormwater and Drainage Design Manual. In general, the standards require a minimum of 3-6 feet vertical separation (depending on reliability of groundwater elevation data) between a stormwater facility base and the 1999 high groundwater elevation (documented or modeled), and if less than the minimum soil depth is available, a groundwater mounding analysis may be required.

Therefore, current stormwater regulations require that stormwater facilities be designed to store and treat for the high groundwater condition, not the lower, long-term average groundwater elevation condition. Thus, in NMIC project areas where groundwater ponded above the surface during the 1996 and 1998 flooding events, a subsurface stormwater facility would not be feasible from a design standpoint.

Groundwater monitoring well data from that time period as well as more recent well data is being assessed to determine whether some or all of the surface water ponding documented from the 1996 aerial photo was from groundwater flooding rather than from surface water ponding over compacted fill. Preliminary results indicate that at least some of the HGHA map units were higher than the documented high groundwater surface – and thus were not a reflection of groundwater. Specifically, the HGHA/wetland map unit near the curve at Kimmie and 76th Avenue was a few feet higher than the groundwater elevation during the flooding events. In addition, the **duration** of surface water ponding in the HGHAs and wetland map units appears to have been longer than the duration of groundwater flooding. Final results of these additional groundwater studies are provided in the NMIC project Hydrogeology Report.

1.3 Groundwater and Compaction Effects on Mazama Pocket Gopher Habitat

Mazama pocket gopher (MPG) habitat is also limited by the surface compaction and fill as well as by depth to groundwater. Pocket gophers require uncompacted, sandy to gravelly sandy soils with a grass and forb-dominated vegetation community at the surface, and with a seasonal water table at more than 4 feet depth. Forested plant communities or broad cleared areas with deep quarry spalls fill and soil compaction at the surface cover most of the project area. In combination, these conditions greatly limit

potential for robust gopher habitat in most of the NMIC project area. Please refer to the Mazama Pocket Gopher Habitat Assessment Report for details.

2. RESULTS AND DISCUSSION

2.1 *SOIL PIT AND HYDROLOGY INVESTIGATIONS*

A total of 20 soil pits were excavated and described to as deep as 16.5 feet (Figure 3).[2] Excavation was stopped at 4 feet depth in location 12, due to dense compacted fill refusing the backhoe. All other pits were excavated until a groundwater table was encountered and depth to groundwater was documented. Detailed soil profile descriptions were logged, including descriptions of soil color, soil

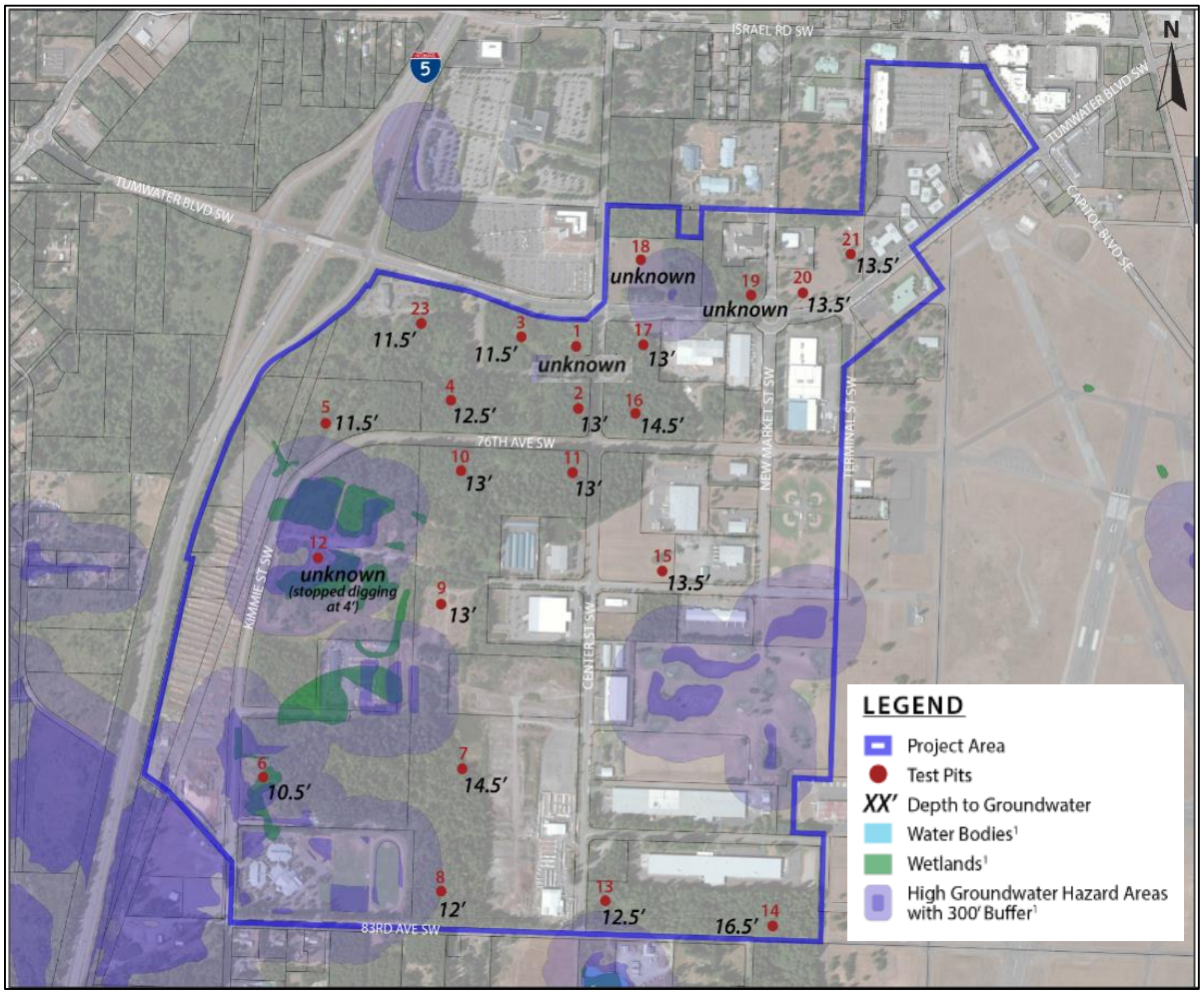

Figure 3. Soil pit locations and depth to current groundwater, overlays onto High Groundwater Hazard Areas and Wetland map units from the Thurston County GeoData system.

[2] 23 Original soil pits were proposed. No soil pits were dug at locations 1, 18 or 19; Pit 18 was behind a locked gate at old Texaco site; and soils were known to be fill; Pit 19 was close enough to Pit 20 that it was considered redundant; Pit 1 was close enough to Pit 3 that it was considered redundant.

texture, percent coarse fragments, and evidence of seasonal saturation. In addition to soil pit evaluation, other areas within the project area that had been mapped as hydric soils, wetlands, HGHAs, or areas with current surface water ponding (but not mapped as such), were evaluated for presence of jurisdictional wetlands – i.e., areas with wetland soil, wetland hydrology and wetland vegetation indicators.

2.2 *RESULTS OF FIELD ASSESSMENT IN COMPARISON TO GEODATA MAPPING OF SOILS, WETLANDS AND HIGH GROUNDWATER HAZARD AREAS*

Results indicated that wetland and soil mapping in the GeoData system was not correct, and that the High Groundwater Hazard mapping units were questionable, requiring further analysis to determine whether they were a reflection of surface flooding or groundwater flooding (from the 1996/ 1998 winter floods).

The surfaces in the vicinity of Soil Map Units indicating shallow groundwater depth (i.e., Cagey loamy sand and Norma silt loam soil series) did not exhibit a shallow groundwater condition. The soil pits were excavated and evaluated in mid-winter when typical rainy-season groundwater tables should be fully developed (Figure 4). However, there was no evidence of shallow groundwater conditions.

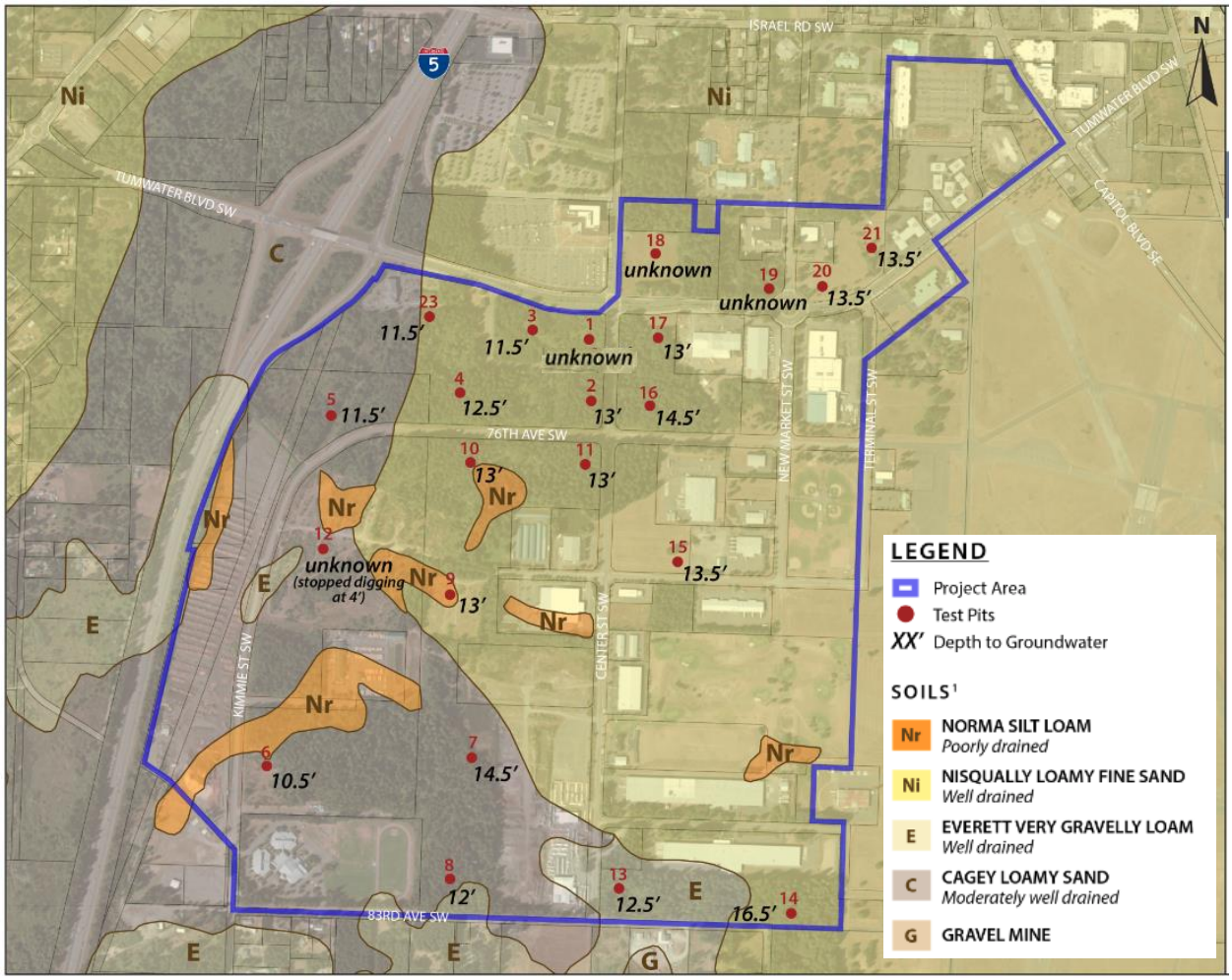

Figure 4. Thurston County Soil Survey of Project Area (mapped in mid-1970s)

Soil pits in areas mapped as Cagey loamy sand are expected to have groundwater at 3-6 feet depth; soils pits in areas mapped as Norma silt loam (a wetland soil) are expected to have a water table at or near the surface. Areas mapped as Nisqually loamy fine sand or Everett very gravelly loam are expected to have a water table deeper than 6 feet (the depth limit of soil mapping). However, the groundwater surface across the whole area was documented at an average of 13.1 feet depth (Table 1) – indicating that there are no areas with Cagey or Norma soil types.

We know that soil mapping of this area was carried out in the mid-1970s when surfaces in the areas mapped as Cagey and Norma were being actively managed as log storage yards, with extensive regrading and heavy equipment traffic during wet times of the year. Most NRCS soil mapping in the mid 1970s was focused on agricultural lands; therefore soil scientist mappers did not typically seek or have direct access to actively managed industrial areas for ground-truthing. For that reason, soil maps of industrial or urban areas often reflect observations of surface water or changes in a vegetation community visible on aerial photos or from roadside areas rather than onsite subsurface soil assessment. Historic aerial photos clearly document forest clearing and industrial land uses as early as the mid-1960s in the areas mapped as hydric soils or as having surface water ponding (HGHAs).

Table 1. Depth to current groundwater at various soil pits, and documentation of compacted soils, surface fill and ponded surface water.

Soil pit Number	Soil Map Unit	Depth to current groundwater (ft)	GeoData Surface elevation	Surface fill thickness (ft)	Surface hydrology
2	Nisqually	13	189	None	None
3	Nisqually	11.5	189	None	None
4	Nisqually	12.5	190	None	None
5	Cagey	11.5	190	None	None
6	Cagey/Norma	10.5	188	3 ft	**YES**
7	Cagey	14.5	189	None	None
8	Cagey/Everett	12	193	None	None
9	Norma	13	192	5 ft	**YES**
10	Norma/Nisqually	13	190	None	None
11	Nisqually	13	188	None	None
13	Everett	12.5	195	None	None
14	Nisqually	16.5	196	None	None
15	Nisqually	13.5	191	None	None
16	Nisqually	14.5	189	None	None
17	Nisqually	13	189	None	None
20	Nisqually	13.5	190	1.4 ft	None
21	Nisqually	13.5	190	None	None
22	Nisqually	16	200	None	None
23	Cagey/ Nisqually	11.5	191	None	None
AVERAGE		13.1 feet			
RANGE		10.5-16.5			

The current winter groundwater table across the entire project area was documented in mid-January, 2015 at depths ranging from 10.5 feet to as deep as 16.5 feet, averaging at 13.1 feet. No precise surface elevation information is available at the soil pit locations, but on average, GeoData aerial topography surface elevation across the entire project area ranges between about 188-190 feet – suggesting a relatively level current groundwater surface at about 175-177 feet elevation.

Surface water was observed at two of the soil pit locations (SP 9 and SP 6, Figures 7, 8 and 9), but in both cases, water was ponded on top of 3 to 5 feet of compacted surface fill. Soil textures below the fill were sandy and/or gravelly, and soils below the fill were dry and well drained, until reaching groundwater at 10.5 feet in SP 6 and 13 feet in SP 9. Loose, relatively uncompacted fill was documented to 1.4 ft depth at SP 20 (Figure 5), but with no surface ponding due to minimal compaction.

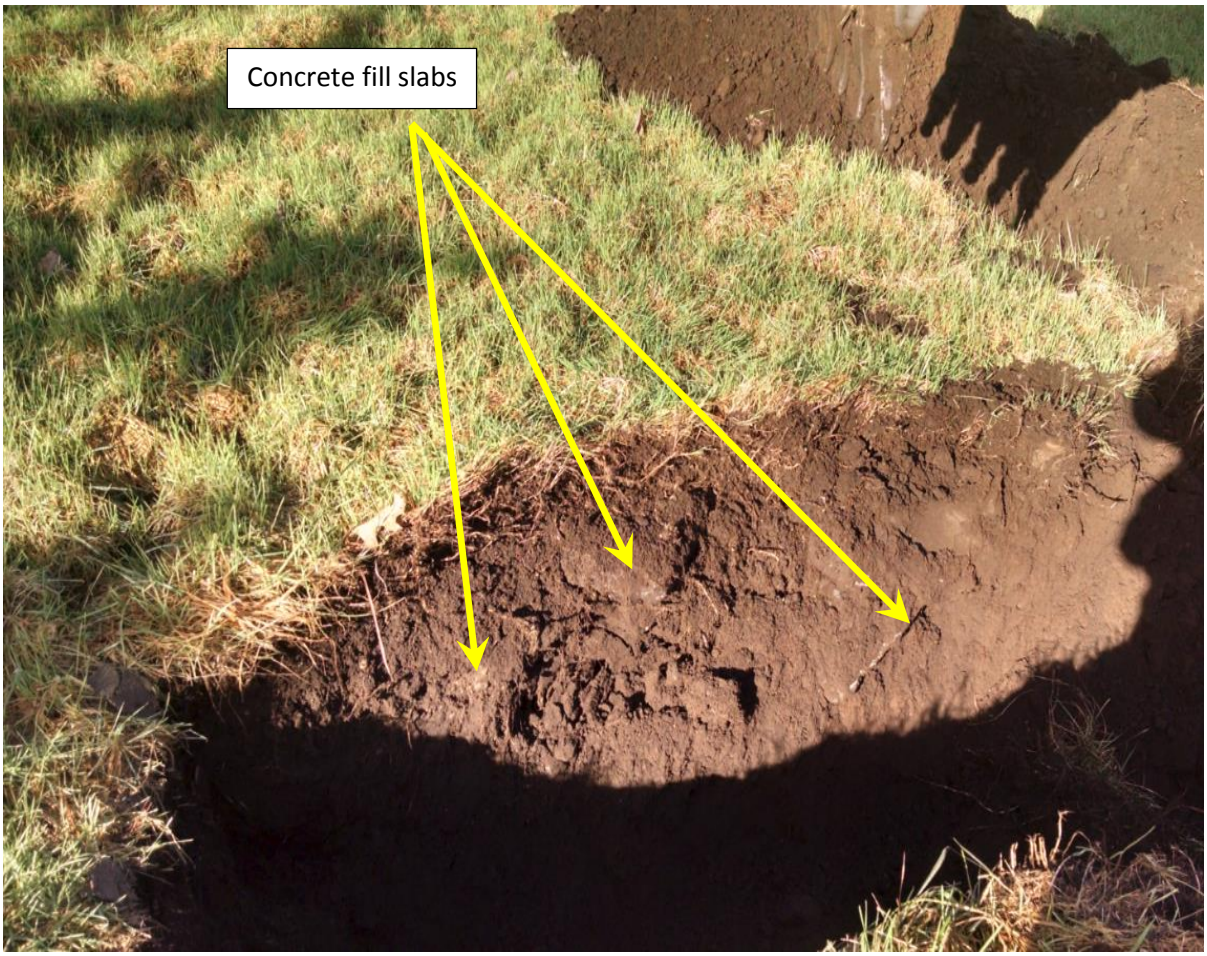

Figure 5. Soil Pit 20, with concrete slabs buried in upper 1.4 feet of soil profile.

Figure 6. Soil Pit 9, deep, well-drained sandy soils capped with 4+ feet of compacted fill.

Figure 7. Soil Pit 6, with compacted surface fill and ponded surface water, and with groundwater table at 10.5 feet depth. Note dry, brown sands in pit base and water seeping from surface ponding.

Figure 8. Soil Pit 9 to left; 13 feet to groundwater below compacted surface fill with surface water (ponded water in ruts shown above is at Pit 9).

Depth to groundwater in areas mapped as Cagey loamy sand ranged between 10.5 and 14.5 feet depth, much deeper than would be expected in a Cagey soil, which would have a winter water table at 3-6 feet depth.

Depth to groundwater in areas mapped as Norma silt loam ranged between 10.5 and 13 feet, much deeper than would be expected for the Norma soil, which is a wetland soil, and thus would have a winter water table at or near the surface. Aside from a small portion of a Norma soil map unit in the area around SP 9, none of the areas mapped as Norma currently exhibit wetland conditions at the surface – i.e., no near-surface hydrology.

Figure 9. Areas near Pit 9 (above left) and Pit 7 (right and below left) with surface water over compacted fill.

Figure 10. SP11: groundwater at 13 feet

Figure 11. SP 13: groundwater at 12.5 feet

All areas with current surface water were found to be a result of a severely compacted soil surface and/or compacted fill in old roadways or in old log stacking yards (Figure 2 and Figure 9). The groundwater surface was documented well below the soil surface across the project area (Figure 10 and 11), including in areas with surface water ponding (Figures 7, 8, and 9).

These conditions indicate that areas mapped in the GeoData system as HGHAs are possibly a reflection of a surface fill and compaction condition. Preliminary results from assessment of monitoring well data from these areas indicates that at least some of the areas mapped as HGHA are in fact higher than the groundwater surface – and thus are not a reflection of groundwater flooding. Please refer to the Hydrogeology Report for details. In particular, the areas mapped as HGHA/wetland near the curve at Kimmie Street and 76th Avenue were found to be higher in elevation than the high groundwater elevation in that area, and duration of surface ponding also appears to be longer that duration of groundwater flooding in other areas onsite.

2.3 *REGULATORY ISSUES*

2.3.1 Mazama Pocket Gopher

The Mazama pocket gopher (MPG) was listed as Threatened by the Washington State Dept. of Fish and Wildlife (WDFW) in 2006, and by the U.S. Fish and Wildlife (USFW) in April, 2014. The greater airport area east of this study area (runway zone) is known to support populations of the MPG. The purpose of this soil and hydrology study was to provide information relating to potential habitat suitability within the study area, west of the runways.

Mazama pocket gopher (MPG) habitat within the NMIC project area is limited by extensive surface compaction and fill, and is potentially limited by depth to groundwater during rare groundwater flooding events. Pocket gophers require uncompacted, sandy to gravelly sandy soils with a grass and forb-dominated vegetation community at the surface, and with a seasonal water table at more than 4 feet depth. Either forested plant communities or broad cleared areas with deep quarry spalls fill and soil compaction at the surface cover most of the project area. In combination, these conditions greatly limit potential for robust gopher habitat in most of the NMIC project area. Only two small areas were found to contain potentially viable habitat. Please refer to the detailed report regarding MPG presence and habitat suitability within the NMIC project area.

2.3.2 High Groundwater Hazard Areas

Lands mapped as High Groundwater Hazard Areas (HGHAs) in the Thurston County GeoData mapping system have development constraints due to stormwater design regulations intended to minimize potential damage from periodic high groundwater flooding events, such as occurred in the late 1990s. For example, Thurston County regulations require a “no development zone” within 50 feet of the edge of the HGHA map unit, and both buildings and critical infrastructure within 300 feet of the HGHA edge must be at least 2 feet higher in elevation.

The City of Tumwater regulates the HGHAs by adopting the Salmon Creek Basin Development Standards, which provides standards for stormwater facility design, which are also informed by sections in the Thurston County Stormwater and Drainage Design Manual. In general, the Salmon Creek Basin Development Standards require a minimum of 3-6 feet vertical separation (depending on reliability of groundwater elevation data) between a stormwater facility base and the 1999 high groundwater

elevation (documented or modeled). If less than the minimum soil depth is available onsite, a groundwater mounding analysis is generally required to determine how effectively the stormwater sill infiltrate under limited conditions.

Therefore, City of Tumwater stormwater regulations require that stormwater facilities be designed to store and treat for the high groundwater condition, not the lower, long-term average groundwater elevation condition. Thus, in NMIC project areas where groundwater ponded at or above the surface during the 1996 and 1998 flooding events, a subsurface stormwater facility would not be feasible from a design standpoint due to not meeting the separation to **high** groundwater requirements.

Groundwater monitoring well data from that time period as well as more recent well data is being assessed to determine whether some or all of the surface water ponding documented from the 1996 aerial photo was from groundwater flooding rather than from surface water ponding over compacted fill. Preliminary results indicate that at least some of the HGHA map units were higher than the documented high groundwater surface – and thus were not a reflection of groundwater. Specifically, the HGHA/wetland map unit near the curve at Kimmie and 76th Avenue was a few feet higher than the groundwater elevation during the flooding events. In addition, the **duration** of surface water ponding in the HGHAs and wetland map units appears to have been longer than the duration of groundwater flooding. Even so, there was a shallow groundwater table below the NMIC project area during the late 1990s events, which will limit stormwater facility design and location choices. Final results of these additional groundwater studies are provided in the NMIC project Hydrogeology Report.

2.3.3 Wetlands

There are federal, state and local regulations defining and protecting wetland resources at various levels.

- The primary federal agency is the U.S. Army Corps of Engineers (COE), which regulates wetland fill under Section 404 of the Clean Water Act (CWA).
- The primary state agency is the Dept. of Ecology, which regulates wetland water quality under Section 401 of the Clean Water Act (CWA), but also potentially under other state laws that regulate stormwater quality.
- The primary local agency is the City of Tumwater, which regulates wetland and wetland buffer functions and values under the City of Tumwater Critical Areas Ordinance.

The definition of a wetland is identical between all 3 agencies, but the regulation details differ between agencies.

For regulatory purposes under the federal Clean Water Act (CWA), wetlands are defined as *"those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."*

Under Washington state regulations (adopted in City code), the Shoreline Management Act and Growth Management Act wetland definition adds this clarification:

"Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road,

street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands."

Technical guidelines detailed in the federal manual are provided to assist with determination of wetland conditions in the field. They require that a wetland area, under normal circumstances, meets three criteria[3]:

1) There must be a wetland plant community (Defined in official federal hydrophytic plant species list)
2) There must be hydric soils (Soils with characteristics that only develop under conditions of long-duration saturation)
3) There must be wetland hydrology (In this region, in general, this means a long-duration water table that persists at 12 inches or less for **at least** a few weeks through the late winter and into the early the growing season)

Generally, areas that pond surface hydrology as a result of human-caused compaction – such as road surfaces or parking areas – are not regulated as wetlands. In addition, under Section 404 of the CWA, the COE does not regulate "isolated" wetlands, i.e., those wetland that do not drain to other Waters of the United States. However, only the COE can make that official "non-jurisdictional" determination in regard to federal law.

All of the areas with current surface water ponding as well as those areas mapped as having past surface ponding (hydric soil map units or HGHA map units) within the NMIC project area are "isolated", in that they do not drain to other Waters of the United States. If the COE determines that the ponded areas meet the federal definition of "isolated", then the COE would not regulate the areas with current or past surface water ponding as wetlands, and Ecology would not regulate under Section 401 of the CWA. The discussion below is provided to assist with this determination.

There are no surface drainage features between the areas with current or past ponded surface water and other "Waters of the U.S.". The nearest possible Water of the U.S. (i.e., another wetland or stream) is about ¾ mile to the south or southwest, or over a mile away, to the east. The possible wetland areas to the south and southwest are higher in elevation, and in another drainage basin (Salmon Creek). The 4-5 possible wetland areas to the east are in the base of glacial kettles, and include several lakes (Munn Lake, Susan Lake, and Trails End Lake). These wetlands and lakes have a surface elevation ranging between 145-175 feet (i.e., 20 to 45 feet lower in elevation than the project area surfaces), and are not connected to overflow from the NMIC area via surface or piped drainage systems. These wetlands and lakes are associated with the Deschutes River, which flows north about ½ mile farther east at an elevation of about 136 feet. There are no apparent berms that would block natural surface flow, aside from localized random soil mounding from grading in the disturbed industrial areas.

The source of wetland hydrology within the NMIC project study area is limited to groundwater (documented at an average of 13 feet depth) and directly incident seasonal precipitation. The project area is on a broad, flat surface forming the drainage divide between the Deschutes River Basin to the east and the Black Lake/River basin to the west. The drainage divide to the Salmon Creek basin cuts across the far southwestern corner of the project area.

The land surfaces between the NMIC project area with ponding and the downslope wetlands to the east and west are highly developed. The airport covers most of the area to the east, with Old Highway 99

[3] Defined in more detail in federal manuals

running along the far eastern edge of the airport, then with residential and industrial development farther east of Old Highway 99 to the top of terrace adjacent to the Deschutes River. Interstate 5 forms the NMIC project area boundary to the west, with dense industrial land along the southern edge of the western perimeter, and upland forested areas to the northwest. Farther to the north, northwest and northeast, development includes hotels, the Washington State Labor and Industries complex, and the developed northern portions of the New Market Industrial Complex.

These conditions, in addition to results of this soils and hydrology investigation, indicate that the current ponded areas are isolated systems and rather than being formed from natural hydrology, are instead artifacts of human impacts, and thus would not be regulated by the COE.

The City of Tumwater uses the same regulatory guidelines to define jurisdictional wetlands, and therefore would typically agree with the federal and state agencies in relation to making a determination that the ponded areas over compacted fill are not jurisdictional wetlands.

3. SUMMARY

The areas previously mapped as wetland or hydric (wetland) soil within the NMIC project area either no longer have wetland hydrology or only have near-surface hydrology due to compacted fill. Areas with **no** current hydrology would not be regulated as wetlands, nor would areas **with** current hydrology caused by compacted fill, because the ponded water is not a result of natural hydrology conditions.

In addition, the ponded areas perform few if any wetland functions. They provide minimal water quality treatment function, because the water overlays compacted fill, and there is no infiltration through subsoils. They provide minimal water storage function, because there are no large depressions, and surface water ponding is typically less than 2 inches deep. They provide minimal wildlife habitat function because the deepest ponded areas are in roadway ruts, and surrounding vegetation is sparse and often weed dominated. Furthermore, these areas are surrounded by heavily traveled roads and industrial lands, and do not provide protected surface corridor connections to other habitats.

Working with the agencies described above, SCJ Alliance met onsite in late February, 2015 with Federal, State and City regulators to review site hydrology conditions, and to provide formal determination of jurisdictional status. Preliminary discussion indicates that the agencies are in agreement with the conclusion of this study, i.e., the hydrology is isolated and is not natural, and therefore, the ponded areas are not jurisdictional wetlands and would not be regulated as wetlands under federal law. We expect to receive formal determinations from the three regulatory jurisdictions soon.

The groundwater table across the entire project area ranges between 10.5 and 16.5 depth, averaging 13.1 feet. These depths are representative of the long-term “normal” winter water table conditions. There is no detailed surface elevation information, but GeoData aerial topography maps indicate that surface elevation is mostly between 188-190 feet. There are some areas with mounded soils from past grading activities, but most natural surfaces within the NMIC project area are relatively flat. This flat surface terrain makes stormwater design challenging, particularly due to pond design requirements driven by the short-term high groundwater elevations from the late 1990s rather than the average, long-term deeper water elevations. We are working with a hydrogeologist to assess data from local groundwater monitoring wells to provide context for the areas mapped as HGHA, to determine whether these areas were instead a result of surface ponding – not groundwater flooding, and to determine the duration of groundwater flooding in the NMIC project area.

Due to a combination of forested plant communities in some areas and compacted surface fill in some areas, the only land within the NMIC project area that was considered to be potentially suitable MPG habitat was in the vicinity of soils pits 15, 20 and 21. There was fill at the surface in Pit 20, but the soils were not compacted, and it was deemed possible for a gopher to tunnel around the fill.

Figure 12. Pile of excavated quarry spalls from Pit 9.