ARCHAEOLOGICAL RESOURCES ASSESSMENT FOR THE KIMBERLY-CLARK WORLDWIDE SITE UPLAND AREA, EVERETT, SNOHOMISH COUNTY, WASHINGTON

REDACTED FOR GENERAL DISTRIBUTION

March 25, 2013

Report Number 24976

SWCA/NORTHWEST ARCHAEOLOGICAL ASSOCIATES
SEATTLE, WASHINGTON

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ABSTRACT

The Kimberly-Clark Worldwide (K-C WW) upland area was developed for historical pulp and paper manufacturing and the area is contaminated as a result of the industrial operations. The existing pulp and paper mill will be demolished to prepare the upland area for cleanup and eventual land use change. The Department of Ecology and K-C WW, Inc. have executed an Agreed Order to complete studies related to future cleanup as well as opportunistic interim action cleanup activities during demolition of the mill. As required by the Interim Action Plan, which is Exhibit C to the Agreed Order, SWCA Environmental Consultants has assessed the probability for encountering archaeological deposits or objects during cleanup of the contaminated K-C WW upland area, concentrating on 11 areas called out in opportunistic cleanup plans. This assessment includes background information on the setting of the project area, expectations for buried cultural resources based on previous investigations in the vicinity, and a GIS-based probability map showing areas with low, medium, and high potential to harbor significant archaeological materials in the entire K-C WW Upland project area. Areas with high probability for buried cultural resources will be addressed during future project construction and a monitoring and discovery plan will be developed for use during opportunistic cleanup.

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Cover: Overview of Port Gardner waterfront, looking north from approximately Hewitt Ave, showing the project area. Photograph by R. King and D.W. Baskerville, taken March 1, 1892. Everett Public Library, King and Baskerville Collection, Image 0065.

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INTRODUCTION

The Department of Ecology (Ecology) and Kimberly-Clark Worldwide (K-C WW), Inc. have executed an Agreed Order to complete studies for future cleanup as well as interim cleanup activities within the K-C WW Upland Area on the Everett waterfront at 2600 Federal Avenue. The most recent mill on the property has since closed and the mill structures will be demolished in preparation for land use change. The area was contaminated by past industrial operations with petroleum, heavy metals, and volatile organic compounds that warrant remediation opportunistically during mill demolition. K-C WW has contracted with Aspect Consulting LLC (Aspect) to plan the mill cleanup efforts and Aspect retained SWCA Environmental Consultants (SWCA) to assess the probability for encountering archaeological deposits or objects during the interim action cleanups. This assessment includes background information on the natural and cultural setting of the project area, expectations for buried cultural resources based on previous archaeological and geotechnical investigations in the K-C WW upland area vicinity, and a probability map showing areas with low, medium, and high potential to contain significant archaeological materials.

Project Location and Description

The project is in Section 19 of Township 29 North, Range 5 East, Willamette Meridian (Figure 1). The K-C WW property includes about 56 acres of uplands and 12 acres of adjacent tidelands. The west property boundary is adjacent to the East Waterway in Port Gardner Bay of Possession Sound and the east property boundary is at the BNSF Railroad right-of-way. The north project boundary is at the foot of 21st Street and the south project boundary is at the foot of Everett Avenue.

In December 2012, an Agreed Order was signed by Ecology and K-C WW, Inc. in order to complete this project. The Agreed Order requires a Remedial Investigation and Feasibility Study (RI/FS) and a Cleanup Action Plan (CAP) prior to the start of final cleanup of the K-C WW Upland Area. The Agreed Order allows for opportunistic cleanup of contamination, called interim action, during mill demolition that will occur while the RI/FS is underway. The Agreed Order only covers the upland portion of the property, so no cleanup activities are currently planned for the 12 acres of tidelands on K-C WW's property. The tidelands will be addressed under a separate future Agreed Order. K-C WW, Inc. is now conducting the studies needed to draft the Cleanup Action Plan and would like to complete opportunistic cleanup interim actions while the studies are carried out, since the mill structures are being demolished (Figure 2). At the time of this assessment, 11 specific areas are identified where opportunistic cleanup will occur, including the Naval Reserve Parcel UST area (1), Xylene UST 29/Latex Spill (2), Rail Car Dumper Hydraulic System Building (3), Diesel UST 70 (4), Bunker C USTs71/72/73 (5), Boiler/Baghouse Area (6), Heavy Duty Shop sump (7), GF 11 (8), Diesel AST Area (9), Bunker C ASTa (10), Bunker C ASTb (11) (Figure 3). Additional areas may be identified for opportunistic cleanup as demolition proceeds.

Most of the contamination to be cleaned up is within historical fill, but some cleanup excavations will penetrate into underlying naturally deposited sediment. Because all the contaminated areas to be targeted during interim action are not currently known, excavation quantities and dimensions cannot yet be estimated. No vegetation removal or in-water work, including dredging, drilling, dumping, filling, mining, bulk-heading, pile driving, or piling removal will occur during the opportunistic interim action cleanup efforts.

Regulatory Context

The project is subject to the Washington State Environmental Policy Act (SEPA) that requires the project proponent to identify any places or objects listed on, or eligible for national, state, or local preservation

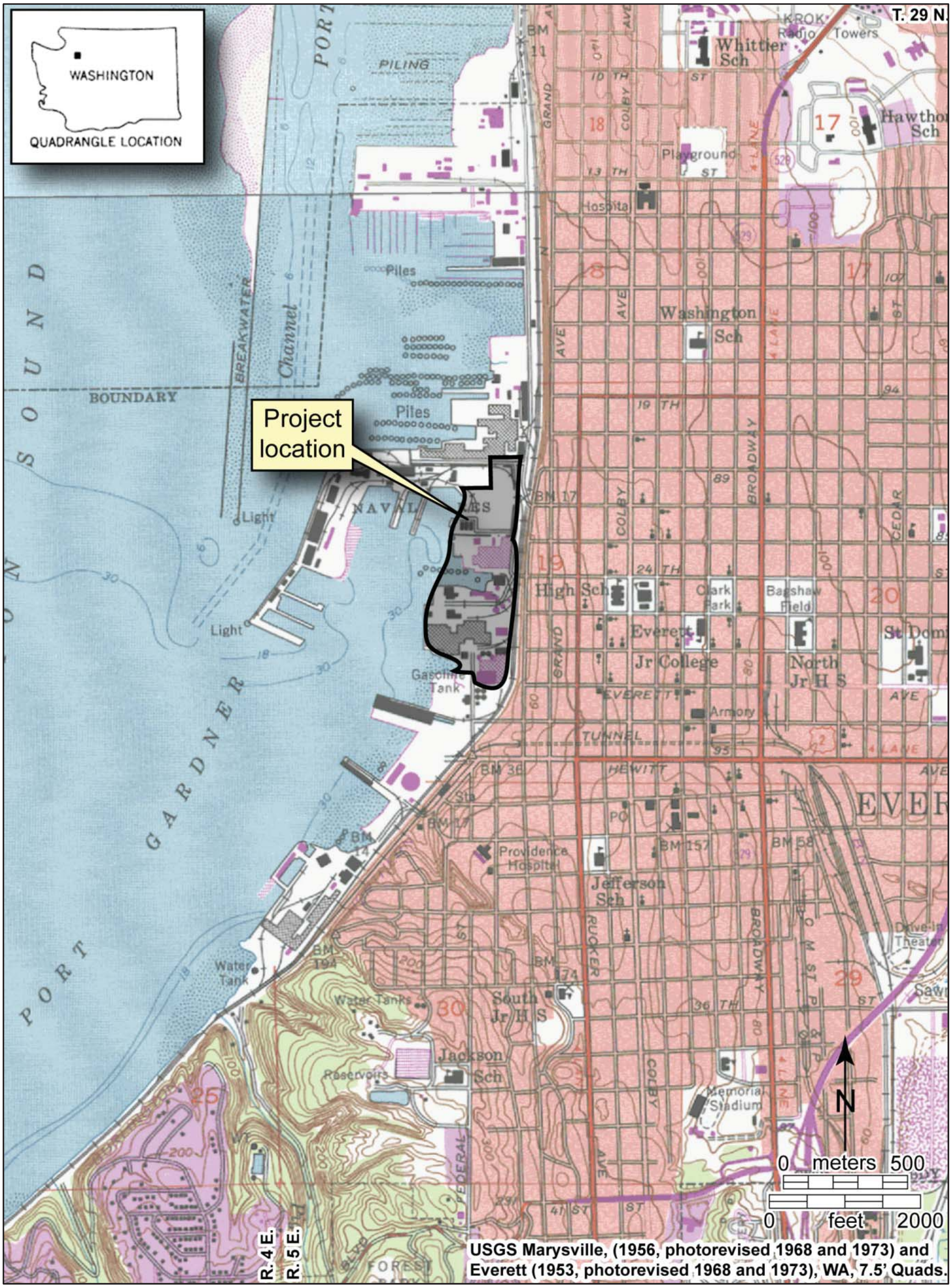


Figure 1. Project location.

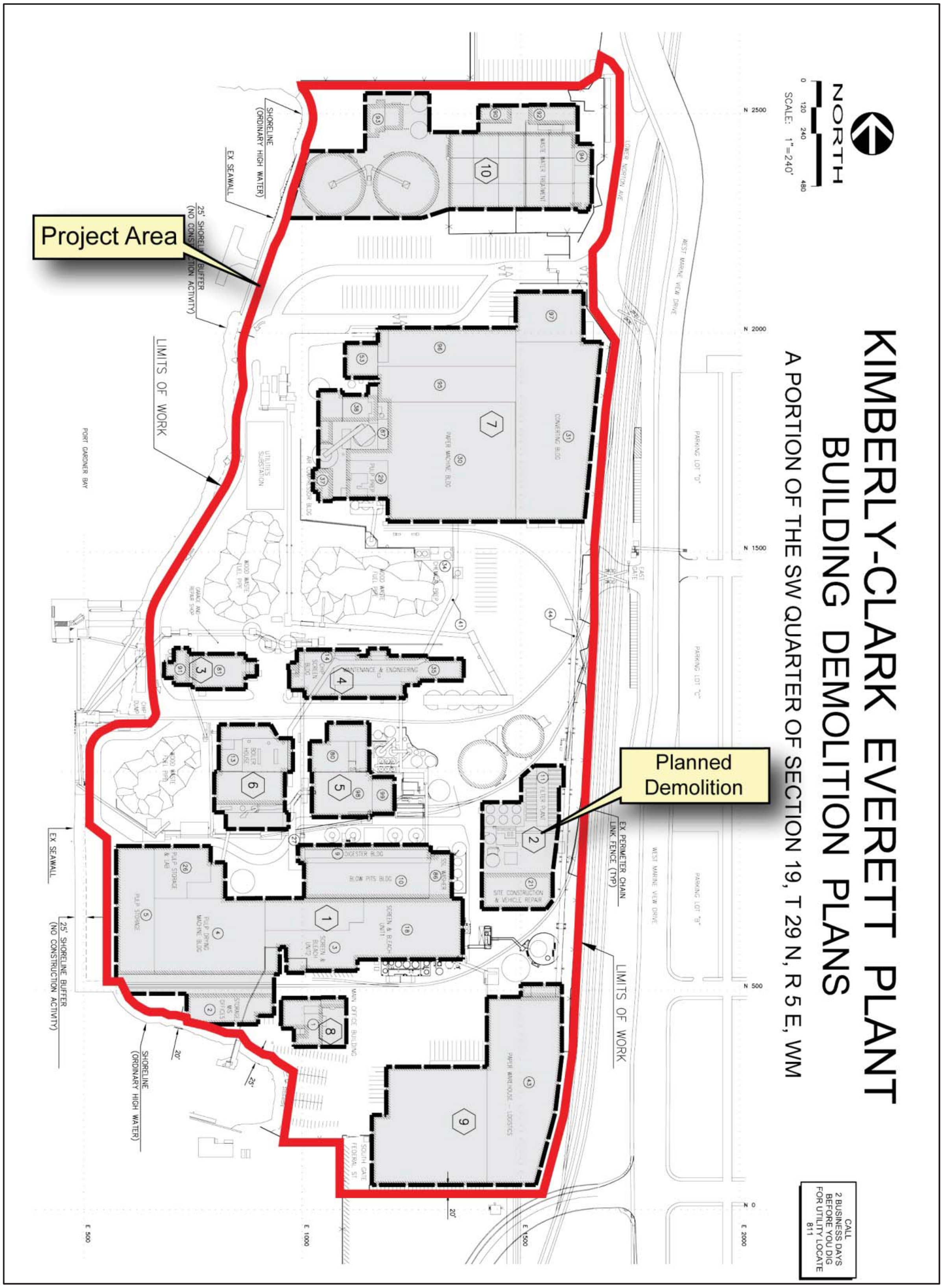


Figure 2. K-C WW upland project area showing the uplands, tidelands, and mill structures demolished during interim action cleanup efforts.

Figure 3. Proposed opportunistic cleanup locations in the K-C WW upland area.

registers in the vicinity of the project. The regulation also requires proponents to describe evidence for sites of historic, archaeological, scientific, or cultural importance in the vicinity of a project, and describe proposed measures to reduce or control impacts to those sites. Agencies are encouraged by SEPA to consult with others to find acceptable ways to avoid or mitigate any adverse impacts that may be caused by the project. Ecology prepared a SEPA checklist to identify potential project impacts to the surrounding environment in 2012 and determined the environmental cleanup will have no probable significant adverse impacts.

The project is also subject to several Washington state laws pertaining to archaeological cultural resources. For example, the Archaeological Sites and Resources Act [RCW 27.53] prohibits knowingly excavating or disturbing prehistoric and historic archaeological sites on public or private land. The Indian Graves and Records Act [RCW 27.44] prohibits knowingly destroying American Indian graves and provides that inadvertent disturbance through construction or other activities requires re-interment under supervision of the appropriate Indian tribe. In order to prevent the looting or depredation of sites, any maps, records, or other information identifying the location of archaeological sites, historic sites, artifacts, or the site of traditional ceremonial, or social uses and activities of Indian Tribes are also exempt from disclosure [RCW 42.56.300]. One goal of this assessment is to assist Aspect, Ecology, and K-C WW, Inc. in complying with these state laws and regulations.

Tribal Coordination

The current work at the K-C WW upland area is part of the Puget Sound Initiative (PSI) and Ecology has engaged the Tulalip Tribes about the PSI in the past. Ecology has developed contacts with cultural and natural resource staff members within the tribal community and has met with them to discuss PSI cleanup sites and cultural resources. Most of this communication has been in relation to other cleanup efforts in Port Gardner, but the Tulalip Tribes have been provided with specific information concerning the K-C WW upland area, as well. [redacted]

[redacted]

SETTING

Port Gardner is a shallow saltwater embayment on the northwest tip of the Everett Peninsula at the mouth of the Snohomish River. The Port is partially separated from Possession Sound by Jetty Island, a 2-mile-long, narrow, manmade island that blocks the dredged East Waterway of the Snohomish River mouth from being naturally filled with sediment. Port Gardner has been influenced by geologic events and geomorphologic changes throughout its history, including ice sheet glaciation, tectonic activity, climate change, and sea-level rise, and these processes have shaped the modern topography of the area. Human settlement and subsistence pursuits within the project area were structured by the attraction of and ease of access to abundant natural resources in the lowland delta, shoreline, and estuarine environments of the Snohomish River delta. Environmental diversity and a variety of natural resources concentrated in the project vicinity created an ideal location for both pre-contact and early Euroamerican populations. Ethnographic and historic records provide complementary information about more recent native cultural land use practices. Historical development of Port Gardner, especially dredging and filling, altered the natural geomorphology of the project vicinity.

Natural Setting

The environmental setting of the project area informs our expectations for cultural resources that may be found in its vicinity. Archaeological evidence indicates that people were living in what is now Washington by at least 13,800 years ago (Waters et al. 2011). Sea level fluctuation, climate variation, and tectonic activity have been the dominant forces of environmental change since the end of the Pleistocene. These environmental changes have affected the potential distribution of resources used by people as well as the suitability of particular landforms for human occupation throughout the Holocene. Other changes in the preservation and visibility of the archaeological record can be attributed to more recent development of the vicinity.

Geology

The Project is in the Puget Lowland, a large structural trough between the Cascade Range and the Olympic Mountains (Orr and Orr 1996). The Puget Lowland developed as a fore-arc basin during early subduction of the Juan de Fuca tectonic plate beneath the North America plate. More specifically, the project vicinity is bounded by active fault zones in the Everett Basin (Golder Associates, Inc. 2007). The Tertiary period sedimentary bedrock that is buried deep below the project area is covered by thick (305 to 945 meters) unconsolidated sediment that mainly originates from glacial ice (Johnson et al. 1996, 2001; Jones 1999; Mosher et al. 2000).

The modern topography and surficial geology of the Puget Lowland is the result of multiple continental glaciations that extended south from what is now British Columbia during the Pleistocene, between 1.8 million and 10,000 years ago. The last glacial maximum, known regionally as the Vashon Stade of the Fraser glaciation, began about 25,000 years ago and ended abruptly with the onset of climatic warming at the end of the Pleistocene (Easterbrook 2003). The Cordilleran Ice Sheet reached its maximum extent near the present town of Tenino, 83 miles (134 kilometers) southwest of the K-C WW upland area, about 16,950 calibrated years before the present (BP) during the Vashon Stade. The ice over the project area was about 1,300 meters (4,265 feet) at its thickest (Clague et al. 1980; Thorson 1989). The ice sheet retreated rapidly from the Puget Lowland after about 13,650 years ago if expressed as an uncalibrated radiocarbon date (Menard 1985; Porter and Swanson 1998; Thorson 1989). Large glacial lakes commonly formed along the ice front as the ice sheet retreated, inundating the land in the Puget Lowland that was not covered by ice. Most of the surficial deposits east of the project area were deposited during the Fraser glaciation, including glacial till that was deposited directly by ice and outwash that was deposited by glacial meltwater (Armstrong et al. 1965; Booth 1994; Booth and Goldstein 1994; Booth et al. 2004; Johnson et al. 2001; Menard 1985; Polenz et al. 2005).

Incision occurred when the Cordilleran Ice Sheet overrode the outwash, creating a number of large deep troughs and meltwater channels. As a result, the geomorphology of the Lowland is now dominated by well-defined, north-south-trending ridges that are separated by extensive uplands blanketed by glacial drift or till. The surfaces of the uplands commonly have topographic depressions that are occupied by small lakes and bogs (Mullineaux 1970). Much of the upland surfaces have not been extensively modified by postglacial erosion, except where streams have carved short, steep-sided canyons down to the Puget Sound. Pigeon Creek, which empties into Possession Sound just south of the K-C WW upland area, is an example of a creek that drains the glacial upland.

Global sea level was about 119 meters (390 feet) below the present shoreline during the last glacial maximum because of the large amount of water locked up in the ice. Global sea level rose rapidly as ice sheets around the world melted at the close of the Pleistocene. Marine water flooded the Puget Lowland after the ice sheet retreated past Admiralty Inlet, connecting the Puget Sound to the Pacific Ocean. Continued global sea level rise raised sea level to between 55 and 73 meters (180 and 240 feet) in elevation around 13,500 BP (Anundsen et al. 1994; Blunt et al. 1987; Booth et al. 2004; Carlstad 1992; Dethier et al. 1995, Easterbrook 2003, 1966; Kovanen and Slaymaker 2004; Polenz et al. 2005; Porter and Swanson 1998; Swanson 1994; Thorson 1980, 1981). The K-C WW upland area is at a very low modern elevation, so the entire project area would have been inundated during this marine high stand.

Relative sea level in the Puget Sound remained elevated and in sync with global sea level trends until the land in the Pacific Northwest began to rebound from the weight of the ice sheet (Thorson 1989). Depressed land areas uplifted up to 80 meters (260 feet) in the northern Puget Lowland, with the amount of uplift decreasing to the south where the ice was thinner. Uplift in the Everett vicinity is estimated at approximately 40 meters (130 feet) (Thorson 1989). Rebound of the land outpaced global sea level rise between about 12,000 and 9,000 years ago. The K-C WW upland area would have been exposed above the shoreline during the period of rebound. Rebound was complete by about 9,000 years ago and global sea level rise was once again the dominant geologic force in the region. Continued sea level rise quickly drowned the earliest Holocene shorelines again after about 9,000 years ago and renewed deltaic sedimentation and formation of deltas in Puget Sound embayments, such as the Snohomish River delta in Port Gardner (Crandell 1963; Dragovich et al. 1994). After 7,000 years ago, the rate of global sea level rise began to slow. Relative sea level was about 5 meters (16 feet) below the modern shoreline by about 5,000 years ago (Dragovich et al. 1994).

The Puget Lowland is geologically active due to structural deformation associated with the Cascadia Subduction Zone. Research on the Snohomish River delta, about 2 miles (3.2 kilometers[km]) north of the K-C WW upland area, found evidence for at least five episodes of plate movement since about AD 800 that resulted in three episodes of liquefaction, at least one abrupt subsidence event, and at least one tsunami (Bourgeois and Johnson 2001). The evidence for tectonic activity could be linked to a number of different fault zones and known tectonic events in the Lowland. Faulting on the Utsalady strand of the Darrington-Devils Mountain Fault Zone (DDMFZ), 21 miles (34 km) northwest of Everett on Camano Island, at least twice within the last 2,200 years may be responsible for some evidence for plate movement recorded in the Snohomish delta sediments (Johnson et al. 2003, 2004). Tectonic activity on the Seattle Fault Zone (SFZ), 26 miles (39 km) to the south, is known to have occurred in the past 1100 years and may also be responsible for signals of delta subsidence (Johnson et al. 2004). At least some of the Snohomish delta evidence also relates to tectonic activity along the South Whidbey Island Fault Zone (SWFZ), which crosses the Puget Sound just south of the project area (Johnson et al. 1996). Movement along these boundaries affects the condition and location of archaeological materials buried within the Snohomish River delta. Because movement along the fault zones differ in direction and magnitude during each event it is unclear just how much vertical offset the project area has experienced throughout the Holocene. One of the consequences of the vertical movement is the possibility of deeply buried archaeological sites in Snohomish River delta and floodplain sediments, especially if subsidence has governed. Sudden subsidence may preserve archaeological sites by quickly burying them through bank sloughing or sedimentation along the shoreline. A landslide appears to have occurred east of the K-C WW upland area in the past, based on the slumped nature of the bluffs to the north in historic documents and the now relatively gentle slope from the upland to the shoreline. Sediment composing the bluffs backing the coast probably collapsed into the sea, burying the shoreline.

Geomorphology

The East Waterway was historically dredged between the mainland shoreline and the mouth of the Snohomish River. The dredge was used as fill, called “Tract O,” which maintained separation between the Snohomish River channel and the waterway that reaches a depth of 30 feet below mean lower low water (MLLW) (Eldridge and Orlob 1951). The K-C WW upland area is on the east side of the East Waterway. The surficial geology of the entire project area is mapped as artificial fill (Qf) (Menard 1985). This means fill is present across the entire surface of the K-C WW upland area, but the fill is of varying thicknesses, depending on the underlying landform. It is probable that some of the fill came from dredging the waterway or other dredging that commonly took place on the delta. It is also probable that the fill in the project area originated as mill waste and was dumped directly into Port Gardner from the shoreline (Orlob and Eldridge 1954).

A small bench of sandy advance outwash (Qgat) is mapped along the hillside at the east edge of the project. These outwash deposits are very old, representing the transition from the Fraser glacial period to pre-Fraser deposition, and they predate the arrival of humans to the region. The bench may be a landslide deposit that sloughed off of the bluffs and into Port Gardner during the Pleistocene. Vashon till (Qgt) is mapped to the east of the project boundary on the glacial upland at Everett (Menard 1985). Soils mapped in the project vicinity reflect the glacial origin of the sediments they formed within. For example, soils along Grand Avenue at the east edge of the project are mapped as Alderwood-Urban land complex (Debose and Klungland 1983). Alderwood soils form in glacial drift on glacially modified foothills and valleys. Everett soils, which form in glacial till, are mapped on the uplands east of the project (Debose and Klungland 1983). Cultural materials, if present, would not be deeply buried within the glacial soils and sediments. The project area is classified by soil scientists as Urban Land (NRCS 2013). There is potential for cultural materials to be buried deeply below fill along the historical shoreline where beach alluvium is below the urban land. The glacial sediment bench is a unique feature along the Puget Sound coastline between Mukilteo and Everett, which is mainly characterized by steep bluffs. The gentler slope in the project vicinity would have provided easier access down to the waterfront from the uplands.

Puget Sound shorelines are typically low-energy environments and are composed of mixed sand and gravel beaches. A beach profile that consists of one part gravelly or coarse sandy steep foreshore and one part low-gradient sandy or muddy low-tide terrace is typical of the region. Most of the sediment that has collected on the beach berm and backshore is too coarse to be carried by waves or tidal currents on a daily basis because it was deposited during winter storms. Sediment on the upper foreshore is moved little by little along the shoreline because it is the right size to be carried as bedload in the swash zone of waves. Tidal currents and waves carry finer-grained sediment down the coastline in suspension following longshore drift currents, dropping the silts and clays on the tideflat and in marshes when energy slows. The major source of sediment coming in to the project area before historical filling began was probably derived from the surrounding bluffs. The large variation in buried beach deposits in the project area attests to the glacial source of the beach sediment. Wave-induced erosion and the toe of the bluffs and gravity would have dislodged and reworked till, outwash, glaciomarine, and glaciolacustrine deposits in the vicinity into a heterogeneous beach. Another source of sediment into the project area would be the Snohomish River, which empties into Port Gardner and forms a wide delta just north of the project. Prevailing winds arrive from the south east, so waves would push sediment from the river into the project area. Even with such vast sediment sources, the Everett coastline in the project vicinity appeared to have been relatively straight without barrier or accretionary landforms. The wide berm in the project area is evidence for healthy past sources of sediment.

The Snohomish River Delta

The Snohomish River begins at the confluence of the Skykomish and Snoqualmie Rivers near Monroe, WA and ends in Port Gardner Bay. About 7.5 miles (12 kilometers) upstream from Port Gardner, the main channel of the Snohomish River splits into four distributaries including Ebey, Steamboat, and Union Sloughs and the Snohomish River channel mainstem. The distributaries of the Snohomish River occupy the entire bottom of the wide valley, which is bounded to the north and south by glacial moraines. The river delta filled in this valley forming the flat deltaic plain that the Snohomish River runs across today. Channel migration has reworked the delta plain resulting in a floodplain environment with wetlands transitioning downstream into estuaries that are heavily influenced by tides (Snohomish County Public Works Department 1991). Port Gardner Bay communicates with Possession Sound, which is bounded by the Everett mainland on the east and Whidbey Island on the west and it opens to Puget Sound on the south and to Port Susan and Saratoga Passage at the north.

Lower sea-levels during the early Holocene drove the Snohomish River to cut down through glacial sediment to reach a lower base-level. Elevated mid-Holocene sea level resulted in sedimentation in the valley bottom and infilling of the valley that was incised just a few thousand years earlier. Sedimentation in the valley bottom led to delta progradation at the river mouth. Port Gardner filled with sediment and the low-lying Holocene shorelines were buried. The lower Snohomish River valley filled from south to north with the oldest alluvium around Lowell and the youngest near Everett and then from east to west to reach around the Everett peninsula (Armstrong et al. 1965). The Snohomish River channels matured over time and developed meanders, levees, and sloughs in which they deposited gravels, sand and silt. The delta had been aggrading at a relatively constant rate until historic logging practices altered natural processes in the basin. The 1 to 4 meters of sediment exposed in the main river channel and slough cut banks in the lower delta typically reveal deposits accumulated during the last 1500 years (Bourgeois and Johnson 2001). According to Bourgeois and Johnson (2001), the Snohomish River delta channels and marshes have not migrated laterally since about 800 AD. The delta continued to grow west and curved around the Everett Peninsula throughout the late Holocene. Today, the very edge of the delta is just north of the project. The delta has not filled in Port Gardner in the vicinity of the project, so there is very deep water in the bay just west of the shoreline that is useful for harboring ships. The delta did provide alluvial sediment south of its proximal margin during the late Holocene and Snohomish River alluvium contributed to widening of the marsh and tideflats in the project vicinity.

Flora and Fauna

Vegetation across the Puget Lowland has changed significantly since the end of the Pleistocene. Lodgepole pine colonized newly deglaciated surfaces, followed quickly by Douglas fir, spruce, and alder. The climate of the Pacific Northwest was warmer and drier than today between about 10,000 and 6000 BP, with drought-like conditions in the summers (Whitlock 1992). Forests were more open and prairies were common throughout the Puget Lowland. Conditions similar to those today developed after 6000 BP as temperatures cooled and precipitation increased. Closed-canopy forest of western red cedar, western hemlock, and Douglas fir had become established in the Puget Lowland by about 5000 BP. Climate and vegetation have remained generally stable in western Washington since the mid-Holocene (Whitlock 1992).

Today, the Puget Lowland is part of the *Tsuga heterophylla* (western hemlock) vegetation zone, which is characterized by forests of western hemlock, western red cedar, and Douglas fir (Franklin and Dyrness 1973). Ground cover in the western hemlock vegetation zone is typically comprised of dense shrub and herbaceous undergrowth of sword fern, salal, Oregon grape, ocean spray, blackberry, red huckleberry, and red elderberry. Big leaf maple, red alder, black cottonwood, and other riparian plants thrive on the Snohomish River floodplain to the northeast. Wetlands and marshes typically support willow, alder, reeds, wapato, nettles, grasses, and skunk cabbage and these species would be found in the project vicinity (Franklin and Dyrness 1973). Estuarine environments contain salal, tule, cattail, stinging nettle, and a variety of roots and bulbs (Deur and Turner 2005). Plants that may have been present in the K-C WW upland site vicinity prior to historical development that would have been useful for food include blackberry, serviceberry, cranberry, thimbleberry, huckleberry, bracken, wood, and sword ferns, wild carrots, rose hips, tiger lilies, and crab apples. Numerous other plants found in the region provided fuel, medicines, and materials for tools, shelter, and transportation (Gunther 1945).

Large terrestrial animals that were once or are still found in the K-C WW upland area vicinity include elk, deer, black bear, coyote, bobcat, and mountain lion. Smaller mammals, including rabbit, squirrel, chipmunk, raccoon, weasel, beaver, and river otter are also resident around the APE (Ingles 1965; Larrison 1967). Migratory birds, such as geese, ducks, swans, and other water fowl are seasonally abundant in saltwater bays, sloughs, and on the river delta in the project vicinity (Angell and Balcomb 1982). Marine animal resources in north Puget Sound include several species of salmon, steelhead, flounder, perch, rockfish, dogfish, lingcod, herring, smelt, and sole (Miller and Borton 1980). Five salmon species use the Snohomish River for spawning and rearing, including Chinook, coho, chum, pink, and sockeye salmon, and steelhead, rainbow trout, cutthroat trout, and bull trout also use the river and would have been available for local fishers (Snohomish Basin Salmon Recovery Forum 2005). Although the project area is saltwater, the salmon species would have entered the Snohomish River by passing through its mouth, which is adjacent to the K-C WW upland area. Herring populations spawned in shallows in the Port Gardner, making them important forage fish for salmon populations and humans (Washington State Conservation Commission 2000). Mussels, clams, oysters, sea urchins, and other shellfish are available in various intertidal environments in the vicinity as well (Kozloff 1996). Marine mammals including harbor seal, sea lion, porpoise, orca, and whales also frequent the Puget Sound seasonally or year-round (Kruckeburg 1991).

Cultural Setting

People have lived on the accessible shores of Port Gardner Bay [redacted] for thousands of years. Native people used the [redacted] shoreline for shellfish collection, hunting, plant gathering and fishing. [redacted]. The shorelines were developed quickly after the Euroamericans converted their interests in the region from exploration to settlement. The history of this area is one of changing economic strategies, residence patterns, and population growth.

Prehistory

Evidence for the first human presence in the region roughly corresponds with glacial retreat from the Puget Lowland (Carlson 1990). The earliest well-established cultural period in North America, designated the Paleoindian period, is poorly defined and is represented by a few archaeological sites. A small number of isolated fluted projectile points that are characteristic of the Paleoindian period have been found in western Washington (Avey n.d.; Carlson 1990; Kopperl et al. 2010; Meltzer and Dunnell 1987; Osborne 1956). Other evidence of possible early human occupation involving the pursuit of now-extinct fauna was found at the Manis mastodon site on the Olympic Peninsula, radiocarbon dated to about 12,000 years ago (Gustafson et al. 1979; Gustafson and Manis 1984; Kirk and Daugherty 1978). Inferences about Paleoindian lifeways have been limited to presumptions about activities based on the isolated stone tools and their rare association with large extinct mammals, with few additional insights on subsistence economy or other aspects of culture. The projectile point styles of the Paleoindian period apparently did not persist past 10,000 years ago as they were replaced by regional variants (Carlson and Dalla Bona 1996).

Holocene occupation of the Puget Sound region is better understood than occupation during the Paleoindian period. Archaeological sites that represent the Early period (8000 to 5000 BP) or Old Cordilleran culture are locally termed "Olcott," [redacted] (Butler 1961; Fladmark 1982; Kidd 1964; Mattson 1985). Typical Olcott artifacts are large stemmed or leaf-shaped points, scrapers, cobble flake tools and blade cores formed of basalt and dacite toolstone (Carlson 1990). Olcott sites are often located on glacial terraces or along lakes on glacial uplands (Wessen and Welch 1991). Many Olcott sites are classified as stone tool manufacturing sites because archaeological features with faunal and plant remains are ordinarily absent (Morgan 1999). Olcott assemblages are usually interpreted as evidence of an early, highly mobile hunting and gathering adaptation. Age estimates of Olcott sites have been inferred based on their similarity to dated components of assemblages from archaeological sites in British Columbia, as well as using projectile point cross-dating, obsidian hydration analysis, and luminescence dating of two archaeological sites [redacted] (Carlson and Dalla Bona 1996; Chatters et al. 2011). This land use pattern may have persisted for over 6,000 years and near its end is marked by increasing reliance on marine and riverine resources. Marine resource use may extend back farther in time, but evidence that might exist on early shorelines has been inundated by rising sea levels which reached near-modern elevations only about 5000 BP.

After about 5000 BP, larger populations organized in more complex ways to exploit a wide range of locally available resources including large and small mammals, shellfish, fish, berries, roots, and bulbs, with an increasing emphasis on salmon over time. Shell middens containing large quantities of shellfish remains and marine fish and mammal bone are common on the saltwater shoreline. Groundstone, bone, antler, and shell tools became increasingly common and more diversified through time. Full-scale development of marine-oriented cultures on the coast and inland hunting, gathering, and riverine fishing traditions as represented in the ethnographic record are apparent after about 2500 BP (Blukis Onat 1987). Large semi-sedentary populations occupied cedar plank houses located at river mouths and confluences and on protected shorelines. Artifacts made of both local and imported materials occur, indicating complex and diversified technologies for fishing, hunting, food processing, and storage. Wealth-status objects, status differentiation in burials, art objects, and ornaments are also represented during this period (Ames and Maschner 1999; Blukis Onat 1987; Matson and Coupland 1995; Fladmark 1982). Contact with Euroamericans in the late 18th Century lead to drastic changes in all Native American communities in the region, especially due to disease (Boyd 1998; Campbell 1989).

Ethnography

Ancestors of the Snohomish people lived in the project vicinity at the time of European contact. The traditional territory of the Snohomish stretched from the south half of Camano Island to the Snohomish River valley and along the mainland coastline from Mukilteo to Warm Beach (Baenen 1981; Indian Claims Commission 1974; Osmundson 1964; Ruby and Brown 1992). The *Sdo'hobc* band of the Snohomish lived along the lower Snohomish River [redacted]. The people [redacted] practiced a semi-sedentary, hunter-gatherer lifestyle that was oriented toward marine and coastal resources. They collected shellfish and fished for halibut, herring, smelt, eulachon, flounder, seal, and salmon (Baenen 1981; Haeberlin and Gunther 1930; Suttles and Lane 1990; Twedell 1974). They also hunted for deer and bear on the islands and uplands (Baenen 1981; Pembroke 1981).

Snohomish people resided in winter villages that consisted of large, multi-family plank houses [redacted]. Groups would leave the villages for shellfish, marine and freshwater fish, land game, waterfowl, sprouts, roots, bulbs, berries, and nuts during the spring, summer, and fall months and these resources were stored for winter, traded, or processed to be consumed (Suttles and Lane 1990). The project area would have provided numerous resources, predominantly marine fish and shellfish, but tules, cattails, and red cedar bark were also collected from marshes and used for making mats, rope, baskets, and other household items. Families would travel up the coast or across the Sound to establish their seasonal temporary camps (Baenen 1981; Deur and Turner 2005; Pembroke 1981; Smith 1941; Twedell 1974).

[redacted]

Isaac Ingalls Stevens, the first territorial governor and Superintendent of Indian Affairs, had a mandate to make treaties with the indigenous inhabitants of Washington to facilitate settlement of the region. Stevens negotiated a treaty with the Duwamish, Suquamish, Kikiallus, Stillaguamish, Snohomish, Skagit, Sauk-Suiattle, Swinomish and Lummi at Point Elliott in 1855 (Boswell 2007; Richards 1993). The treaty gave the tribes payment, retention of hunting and fishing rights, and services in exchange for lands (Lane 1973, 1975). The treaty also established the Port Madison and Snohomish (now Tulalip) Reservations where tribal members were supposed to move. The Tulalip Tribes are comprised of descendents of the Snohomish, Stillaguamish, Snoqualmie, Skykomish, Skagit, and Samish people (Ruby and Brown 1992:244; Swanton 1968). The Tulalip Reservation on the north side of Port Gardner Bay was carved out of Snohomish lands, so many Snohomish people chose to settle there. [redacted]

History

Historic settlement was slow to reach the heavily forested shoreline along Port Gardner Bay, but the abundant timber drew crews of loggers who supplied sawmills established along other parts of coastal Puget Sound as early as 1853. It was not until about 1861 or 1862, however, that the first non-Native settler, Dennis Brigham, claimed land along the shores of what is now the Everett peninsula. The former Massachusetts carpenter built a small farm and later filed for a homestead patent on a 160-acre parcel that includes a portion of the project area. The 1869 General Land Office (GLO) plat of the Port Gardner shoreline shows the Brigham property and the location of a building within the project area (Dilgard and Riddle 1973:5,8; LeWarne et al. 2005:66; Interstate Publishing 1909:I-314; O'Donnell 1993:6).

Several other settlers followed Brigham to this peninsula within a few years, including Erskine Kromer, who settled immediately to the south, and John King, who claimed land to the north. Kromer evidently worked for the telegraph company that planned to connect the United States with Europe from the west by running a line along the Pacific coast and then across the Bering Strait to Siberia and on through Russia (Figures 4 and 5). The Russian-American telegraph project, conceived by entrepreneur Perry Collins, was undertaken by the Western Union Company. A portion of the line was completed through

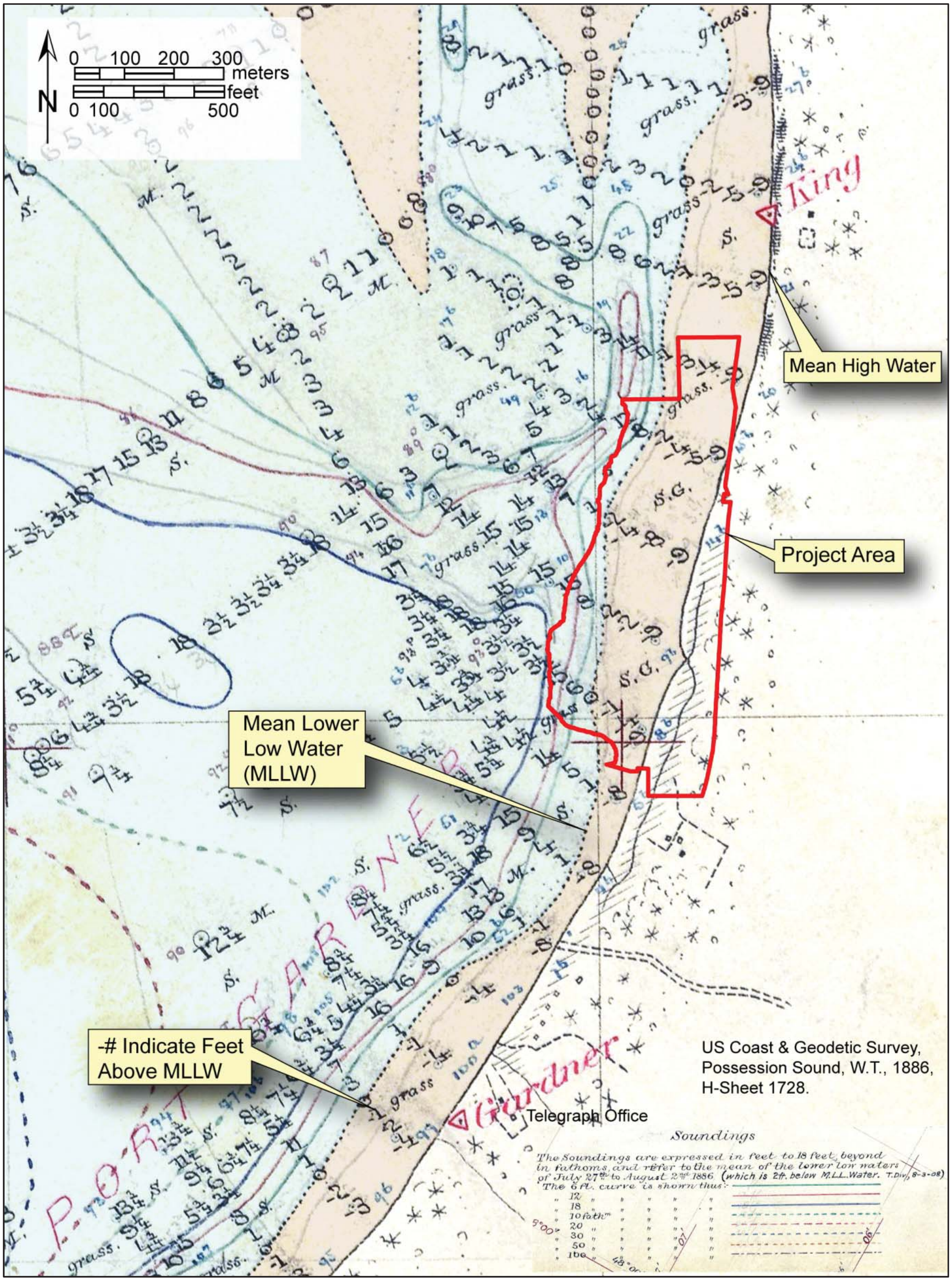


Figure 4. Historical H-sheet showing the mean historic shoreline and low water line; note the telegraph office and small structures shown just south of the project area in 1886.

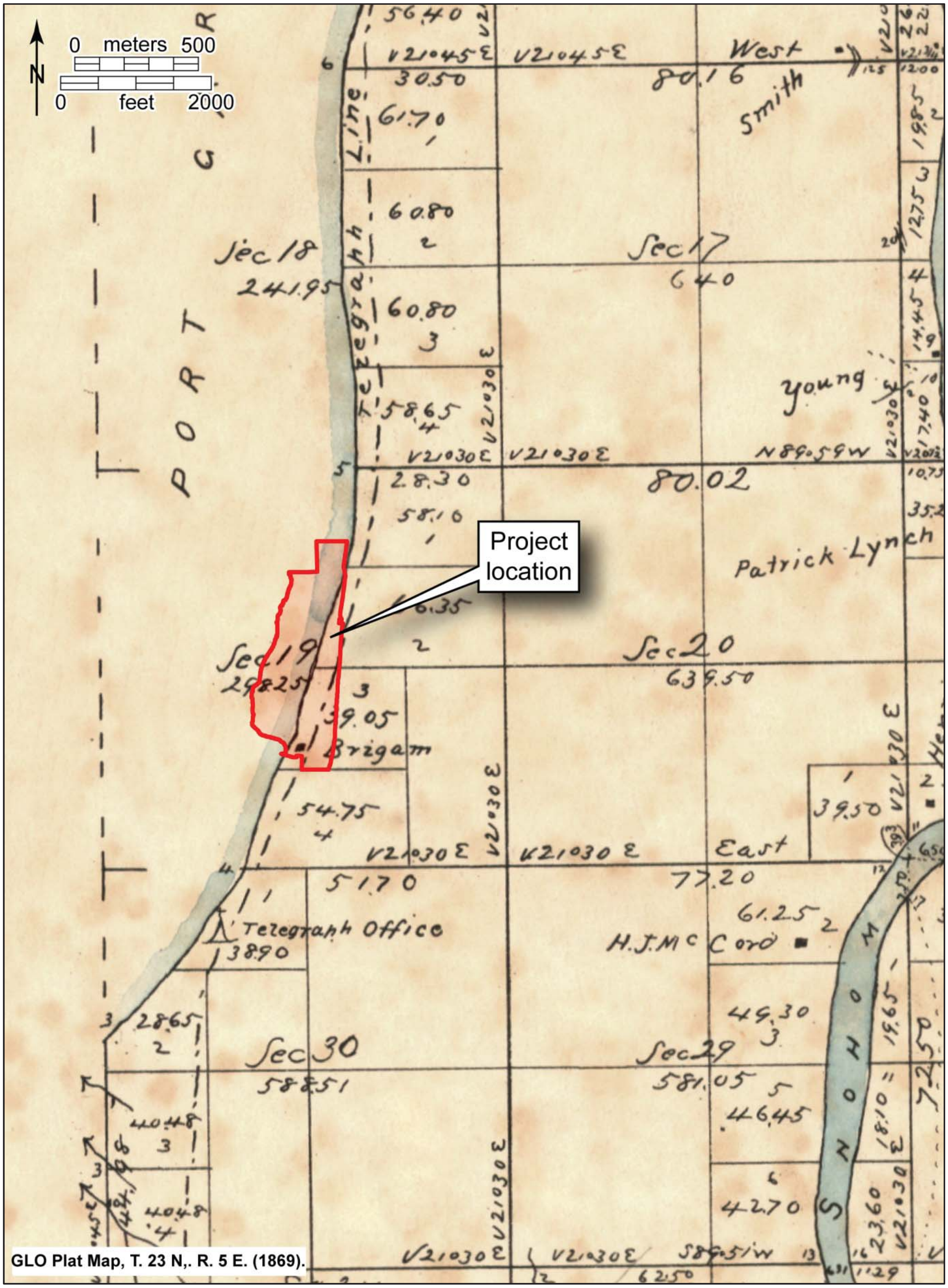


Figure 5. GLO plat map from 1869 showing Brigham's cabin mapped in the southern part of the project area and the telegraph line running through the east edge of the project.

Oregon, Washington and into British Columbia, but the effort was abandoned in 1867 after the transatlantic cable was successfully completed, offering a more direct link from the United States to Europe. The GLO map (Figure 5) shows that the Russian-American telegraph line extended along the Port Gardner Bay shoreline through the project area and that a building to the south on Kromer's property was used as a telegraph office (LeWarne et al. 2005:66; Ault 1975:3, 11-12).

The timber industry was the economic mainstay of the Puget Sound region during the early decades of development, and it became the focus of growth for Snohomish County when it separated from Island County in January 1861. Once transportation routes were established, the exploitation of the area's vast forest resources expanded quickly. Both logging and processing first began near coastal waterways, which provided easiest access, but then moved inland along rivers. Later, new roads and ultimately rail lines provided a means to transport logs as well as finished products (LeWarne et al. 2005:63).

Despite the advantageous location of the Everett peninsula, which was bounded by the bay and the Snohomish River, it took several more decades for a town to develop on the site. Not until 1889, the year that Washington became a state, did several entrepreneurs begin to accumulate land with the idea of platting a new city they planned to call Port Gardner. Brigham had sold his homestead along the bay in 1883 to Edmond Smith and by 1889 that parcel was purchased by Wyatt Rucker, who with his brother Bethel was a primary promoter of the new town. He and other investors acquired additional land that ultimately totaled approximately 800 acres (Interstate Publishing 1909:I-317) (Figure 6).

At the time that the Ruckers and their associates were involved in platting the townsite, a larger and more prominent group of investors also took an interest in the peninsula. The landscape had the natural characteristics of a profitable port with room for new industry but also proximity to the developing Monte Cristo mining district. A syndicate put together by Henry Hewitt of Tacoma and Charles Colby of New York obtained substantial backing from John D. Rockefeller and other Eastern investors and eventually purchased much of the Rucker group's interest in the site. The Everett Land Company was incorporated in November 1890 and in the following year began work to survey and lay out blocks of the new city to be known as Everett (Whitfield 1926:II-359, 361).

This development also coincided with the completion of the Seattle and Montana Railroad, a subsidiary of the Great Northern Railroad, which passed through Everett and connected Puget Sound with the Canadian Pacific Railroad. Several other towns along the Seattle and Montana right-of-way were platted at the same time, but it was Everett that eventually experienced the greatest growth. The Everett Land Company quickly attracted large industrial enterprises including a shipbuilding plant, a pulp and paper mill, a wire nail factory and several sawmills. Among these initial enterprises was the Parminter, Robinson and Company mill, which was located within the project area along Port Gardner Bay near the foot of 21st and 22nd Streets (Figure 7). The mill was in operation as early as 1892, and the complex included the first home of one of the mill owners, Thomas Robinson, and his family (Interstate Publishing 1909:I-326; Cameron et al. 2005: 108-109; Norman 2007) (Figure 8).

The prospect that the Great Northern's transcontinental line, which crossed the Cascade Mountains to the coast over Stevens Pass, would use Everett as its terminus fueled even more speculative interest in the future of the town. When the railroad was completed in 1893, however, James J. Hill chose Seattle as his line's main Pacific Coast port rather than Everett. The new city on Port Gardner Bay faced a short-term setback that was exacerbated by a severe nationwide economic downturn and disputes over tideland ownership. By 1897 the Everett Land Company had gone into receivership and industrial growth slowed considerably (Interstate Publishing 1909:I-326).

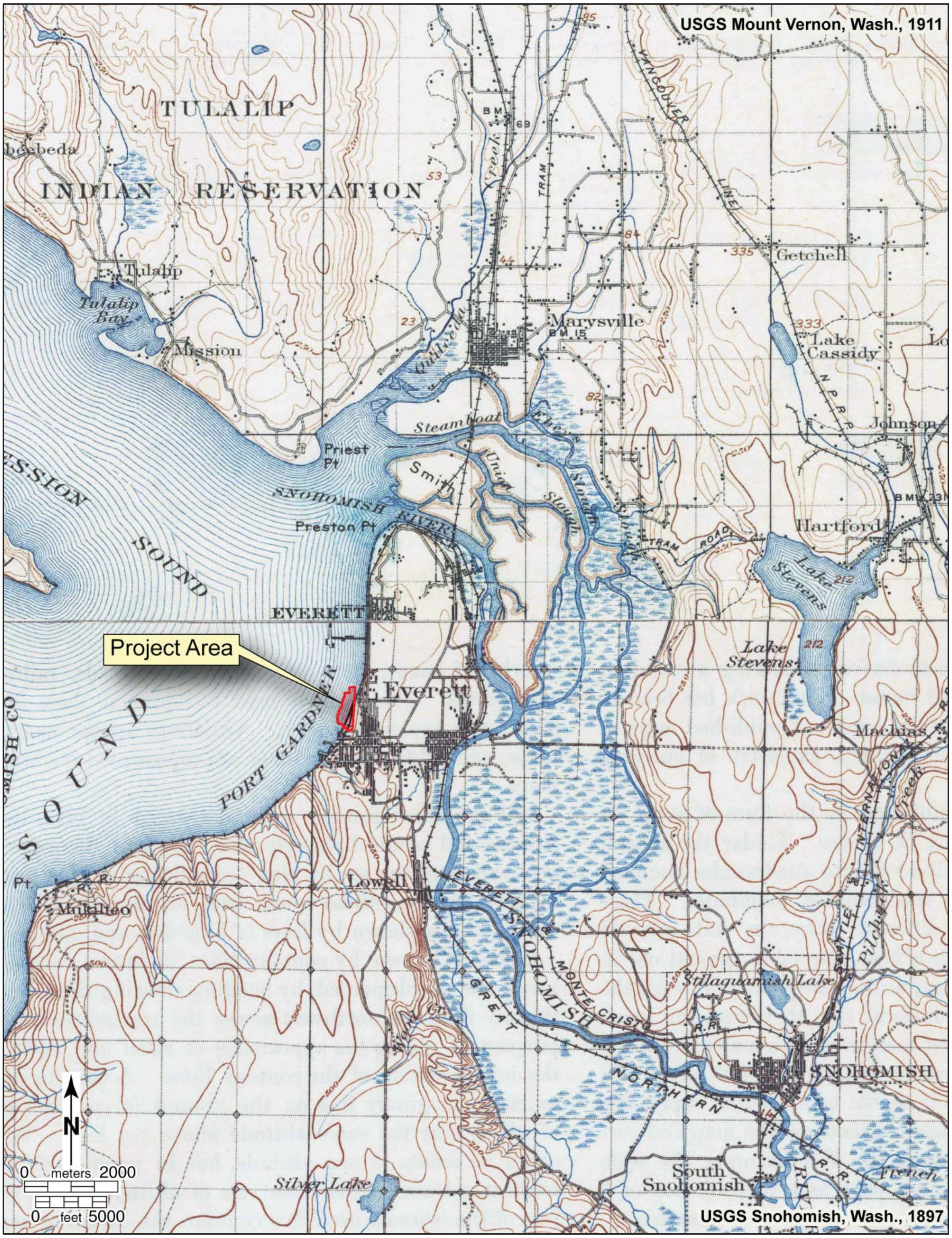


Figure 6. Early development in the vicinity of Everett, 1897 and 1911.

Figure 7. Birdseye view of the project area in 1893, showing the Parminter, Robinson Mill to the north and the Rucker Dock to the south.

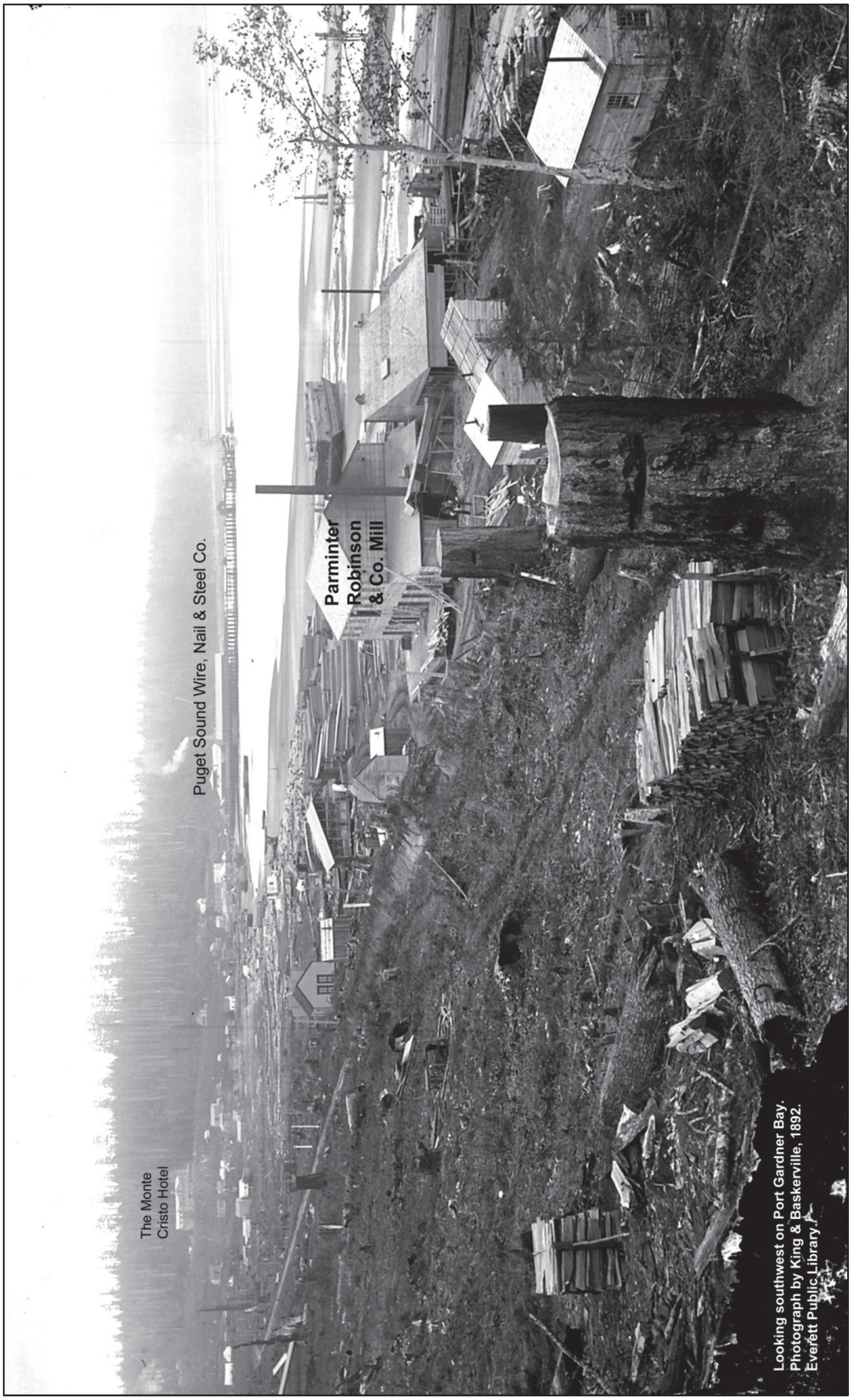


Figure 8. Overview of the project vicinity looking southwest from approximately 21st St and Grand Ave, 1892.

Hill helped the city to rebound when he acquired the Land Company's remaining property and in January of 1900 formed a new syndicate called the Everett Improvement Company under the capable direction of John McChesney. The Weyerhaeuser Company had just purchased more than 900,000 acres of Northwest timber land from the Northern Pacific Railroad, which Hill controlled, and both he and McChesney recognized Everett's prospects as a major milling center. Not only did Weyerhaeuser soon construct its first Northwest mill on Port Gardner Bay, but several other Midwestern lumbermen quickly built plants along the waterfront to take advantage of the region's extensive forest resources. A number of other manufacturing facilities were also located on the bay as well as "riverside" on the Snohomish River, but at the heart of Everett's development was the burgeoning timber-processing industry. The expansion proceeded so rapidly that by 1901 Everett had nine sawmills and thirteen shingle mills (Figure 9) (Cameron et al. 2005: 11-112, 119, 135-136; Interstate Publishing 1909:283-284).

Clark-Nickerson Lumber Company

Among the plants constructed during this period of unprecedented growth was the Clark-Nickerson Lumber Company, which was also backed by several prominent industrialists. The business was organized by David Clough, a former governor of Minnesota and acquaintance of Hill, who with M.J. Clark and E.A. Nickerson developed a large sawmill on 46 acres along the bay at the north end of the current project area. As with other businesses on the waterfront, the Everett Improvement Company donated this land to the company as long as a plant was built on the site. Originally some of this property had been given to the Thomas Robinson Manufacturing Company to erect a new sash and door plant, possibly on a portion of the original Parminter, Robinson mill site. When Clark-Nickerson expressed interest in the same location, Robinson agreed to move onto a parcel immediately to the north, just outside the current project area (Whitfield 1926:II-360-361; *Pacific Lumber Trade Journal* 6(6) Oct 1900:23)

Construction of both new plants began almost immediately. On its property Clark-Nickerson built a state-of-the art sawmill and planing facility that was in operation by September of 1901. According to trade journals, the mill had a capacity of 300,000 feet when running three shifts and could plane more than 100,000 feet per day. Once the mill was operational the company expanded the yard to 200 by 500 feet and work also continued work on a new dock that would provide deep-water moorage (*Pacific Lumber Trade Journal* 6(6) Oct 1900:23*; Columbia River and Oregon Timberman* II (2) Dec. 1900:7). By the following spring Clark-Nickerson installed a new gang flooring machine and also an electric light plant. The company was evidently shipping its lumber to California, Mexico, Hawaii and South Africa, so it further improved its wharf for larger ocean-going vessels. Contracts were let to dredge a channel around the dock, removing 50,000 yards of sediment and leaving a channel 24 feet deep at low tide and 200 feet wide (see Appendix C, Map 2) (*Pacific Lumber Trade Journal* 6(12) April 1901: 15; 7(2) June 1901: 15).

The company's major stockholder, E.A. Nickerson, sold his shares in the spring of 1901 to another Midwest industrialist, D.M. Robbins, who was the brother-in-law of David Clough. With the new management, trade journals reported that development plans included construction of large yards so that the company could maintain a stock of 15,000,000 to 20,000,000 feet of lumber at any time. In order to accomplish this goal it was necessary to fully utilize its site, which had expanded to 54 acres, by driving piles and filling a much large area. There were also rumors that the company had purchased a steamer line between Washington and California (*Pacific Lumber Trade Journal* 7(4) August 1901: 18).

E. A. Nickerson, the former head of Clark-Nickerson, became a half owner of the nearby Robinson Mill, which was renamed the Robinson Manufacturing Company. With the new infusion of capital the

Figure 9. The Port Gardner waterfront in 1902.

company made improvements to its sash and door factory and began to fill more of the tidelands around the site to build a substantial wharf. Evidently the first step was to build a retaining wall around the property and then to erect a flume that was connected to the Clark-Nickerson sawmill. The flume, which began operation in the fall of 1901, carried the mill's sawdust and waste for use as fill for Robinson's wharf. According to one publication, "Within a few months the entire site will be filled, thus preventing destruction by teredo, and making a good foundation for future buildings" (*Pacific Lumber Trade Journal* 7(7) Nov. 1901:15; *Pacific Lumber Trade Journal* 7(5) Sept 1901: 15).

At the same time, Clark-Nickerson also made improvements to its plant. The company constructed a new brick and stone building to house two 150-horsepower boilers for the planing mill and dry kiln. Work began soon thereafter on a new dry kiln and also the installation of a complete sprinkling system. The Sanborn Fire Insurance map of the Clark-Nickerson complex in 1902 shows that much of the plant was built on a wharf extending at a southwesterly angle from the shoreline with the sawmill, machine shop, lath mill and other associated buildings on the wharf's southwest section. The dry kiln and planing mill were located on what was called the Upper Wharf to the north, and lumber was stored in sheds and on piles and timbers (see Appendix C, Map 2). During this period the company was expanding its shipping in the cargo trade to Africa, Asia and Australia, and despite its dredged dock space, some vessels evidently anchored offshore in deep water opposite the Clark-Nickerson Mill where they were not as severely affected by the tides (*Pacific Lumber Trade Journal* 7(5) Sept 1901: 15; 7(9) Jan 1902: 15; 7(11) March 1902: 14; Sanborn 1902).

Clark-Nickerson was initially the largest mill on the waterfront, but over time other mills surpassed it in size. By 1910 the number of timber-related industries in Everett had grown to 11 lumber mills, 16 shingle mills and 17 combination plants, spread out along the bay as well as riverside (Cameron et al. 2005:136) (Figure 10). Historian Norman Clark identified a "sawdust baronage" of powerful entrepreneurs who ran these plants, led by David Clough who went on from Clark-Nickerson to build "a galaxy of milling and logging outfits" in which many of his extended family members were involved (Clark 1970:59-60). To keep pace in the industry, Clark-Nickerson expanded and made improvements to its plant, adding lumber yards that extended north to the property line with the Robinson mill as well as east along the railroad. In addition, several fuel bins and a large refuse burner were installed along the south side of the sawmill (see Appendix C, Map 4) (Figure 11) (Sanborn 1914).

Everett Flour Mill

With new wood products facilities springing up along the bay, other industries were also attracted to the site. By the fall of 1900 the Everett Flour Mill Company had begun building a facility on what a newspaper called "…a desolate stretch of bog land on the shore of the bay, about 1000 feet south of the big lumber mill of Clark-Nickerson and Co…." The Everett Improvement Company donated nearly four acres in what is now the project area to the mill owners with the provision that a facility would be built capable of producing at least 600 barrels per day. A 50 by 225-foot area was filled as a base for the five-story plant and adjacent buildings, which were completed in early 1901. The main mill building was set on concrete piers and was a prominent landmark along the water front. At a point along mean high tide a structure for shavings and sawdust was also erected and eventually Great Northern railroad spurs provided access for shipping (see Appendix C, Map 1) (Whitfield 1926: II-361; *Seattle Times*, Sept. 13, 1900:; Sanborn 1902).

By 1914 a grain elevator and a flour and feed warehouse had been added inland from the main building. The company produced a popular brand of flour known as "Best Ever-ett" and remained in operation until the 1920s (Figure 12) (see Appendix C, Map 3). The facility was purchased by Sperry Flour

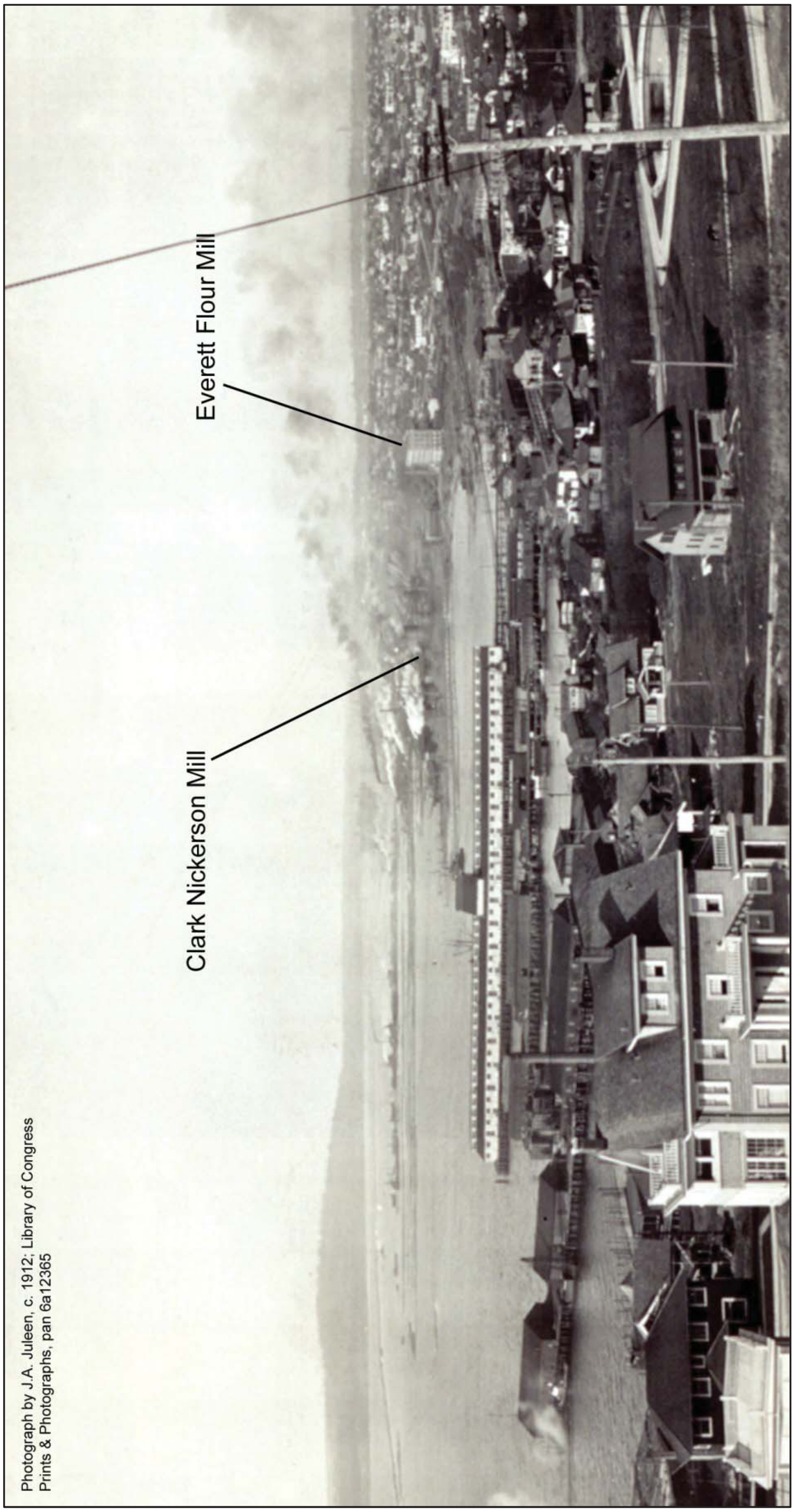
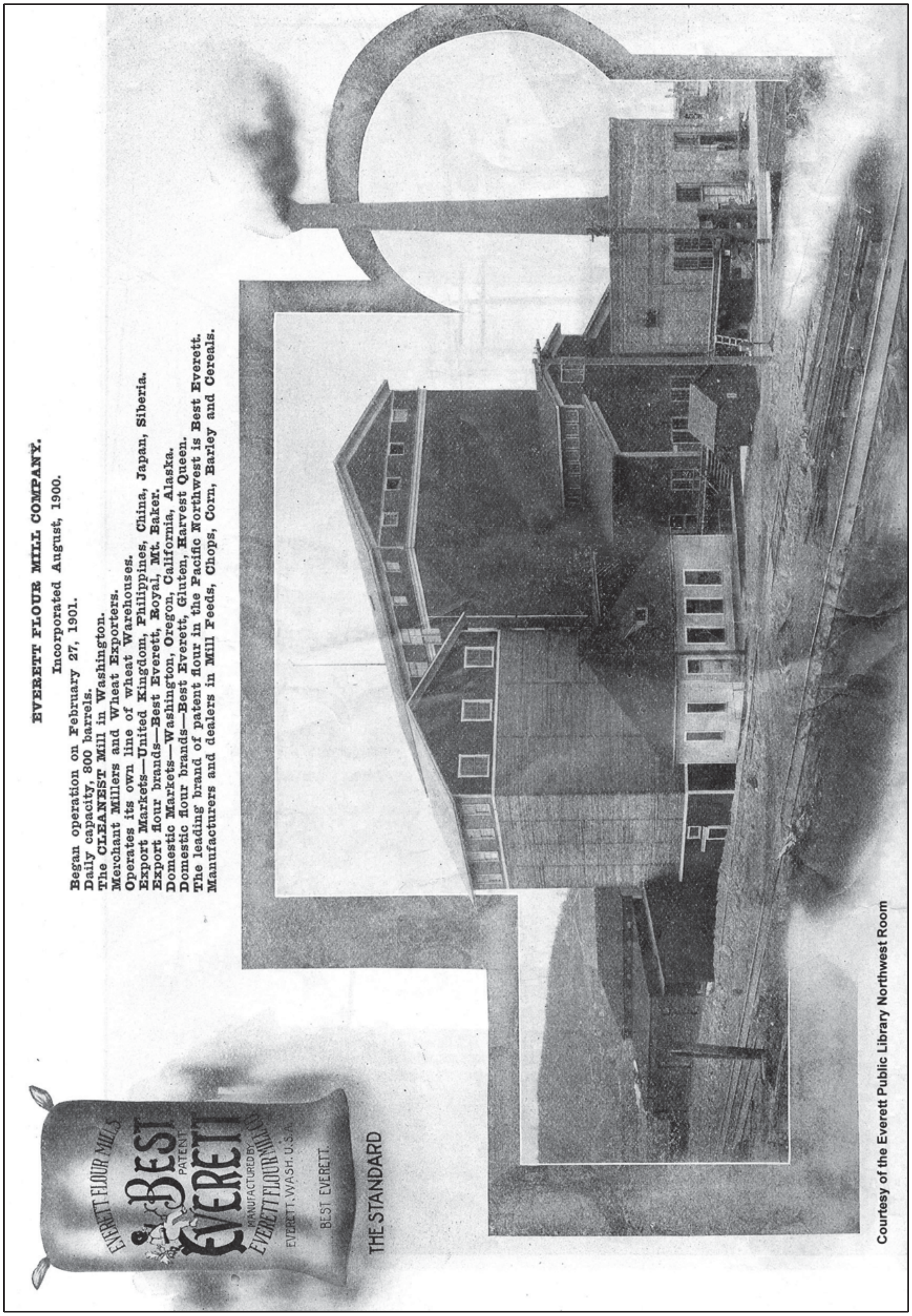


Figure 10. Overview of Port Gardner showing the Clark-Nickerson Mill and the Everett Flour Mill, c. 1912.

Figure 11. Overview of the Clark-Nickerson Mill, c. 1927.



Courtesy of the Everett Public Library Northwest Room

Figure 12. Advertisement showing the Everett Flour Mill, c. 1915.

Company, which operated the mill for a few years. In 1926 the old mill buildings were dismantled and removed and Sperry moved to a new location (Sanborn 1914; Whitfield 1926:II-361).

In addition to these industrial plants, the waterfront in the project area was lined with small cabins and houses that the Sanborn map of 1902 identified as "Squatters' Shacks." Stretched along the high tide line south of the Everett Flour Mill as well as east of the Clark-Nickerson wharf near the railroad tracks, these small dwellings likely housed waterfront workers, sailors and other laborers and their families (see Appendix C, Maps 1, 2). Little is known about these people, but by 1914 Sanborn maps show no more of these dwellings, so possibly these squatters were forced out through legal action initiated by the Everett Improvement Company (see Appendix C, Maps 3, 4). The tideland areas at the base of 24th or 25th streets south of the flour mill and also at the foot of Everett Avenue were popular public bathing beaches before later industrial development took place (Figure 13). Sanborn maps and photographs show one or two small bathhouses and boat rentals that were interspersed with the other dwellings along this part of the waterfront in the project area (see Appendix C, Maps 1, 2) (Sanborn 1902; 1914; Dilgard and Riddle 1973: 40).

Low wages, dangerous working conditions and repeated rises and falls in the lumber market made life difficult for industrial workers, some of whom likely lived in the squatters' shacks in the project area. All of Snohomish County became strongly unionized in the early twentieth century, and industry leaders like Clough used whatever tactics necessary to keep profits high and stem the influence of organized labor. A shingleweavers' strike in 1916 ultimately led to tragic clash between union members and the police that resulted in seven deaths and became known as the Everett Massacre (O'Donnell 1993: 38-40).

American participation in World War I soon caused significant changes along the waterfront. The government's need for vessels as part of the defense effort led private investors to construct a shipyard on Port Gardner Bay between the base of Everett Avenue and 25th Street south of the Everett Flour Mill site in the project area. The Norway-Pacific Construction and Dry Dock Company, with modern facilities to build steel ships, was completed in the fall of 1918. Despite some contracts in hand, the company's timing was extremely poor. The signing of the Armistice in November of 1918 caused demand for ships to collapse and the company soon faced bankruptcy. By 1925 the plant was dismantled and the shipyard's main building was torn down (Whitfield 1926:I-404; Polk 1919:742).

A more successful wartime measure was the establishment of the Port of Everett. The business community saw a port district as the means to encourage new commercial and industrial enterprises along the waterfront. In a special election held in July of 1918 the public overwhelmingly agreed. During the boom years of the 1920s annual shipping tonnage climbed sharply, and many new businesses located along the waterfront while some of the established ones expanded or became more diversified. Near the end of this huge growth period, the land south of the Clark-Nickerson mill, including the property on which the Everett Flour Mill and the Norway Pacific shipyard had once stood, was sold to a new enterprise called the Puget Sound Pulp and Timber Company (Whitfield 1926:I-404).

Puget Sound Pulp and Timber Company

Much of the following discussion on Puget Sound Pulp and Timber Company and its successor companies was developed as part of the Level II Documentation for the Kimberly-Clark Mill Site Main Office Building (Boswell and Sharley 2012). The Puget Sound Pulp and Timber Company was incorporated in 1929 and had an initial valuation of $12 million, all privately financed by investors who planned to build a large state-of-the-art pulp plant in Everett. Its principals were from the Pacific Coast and had been active in various areas of the forest products industry for several decades. The president,

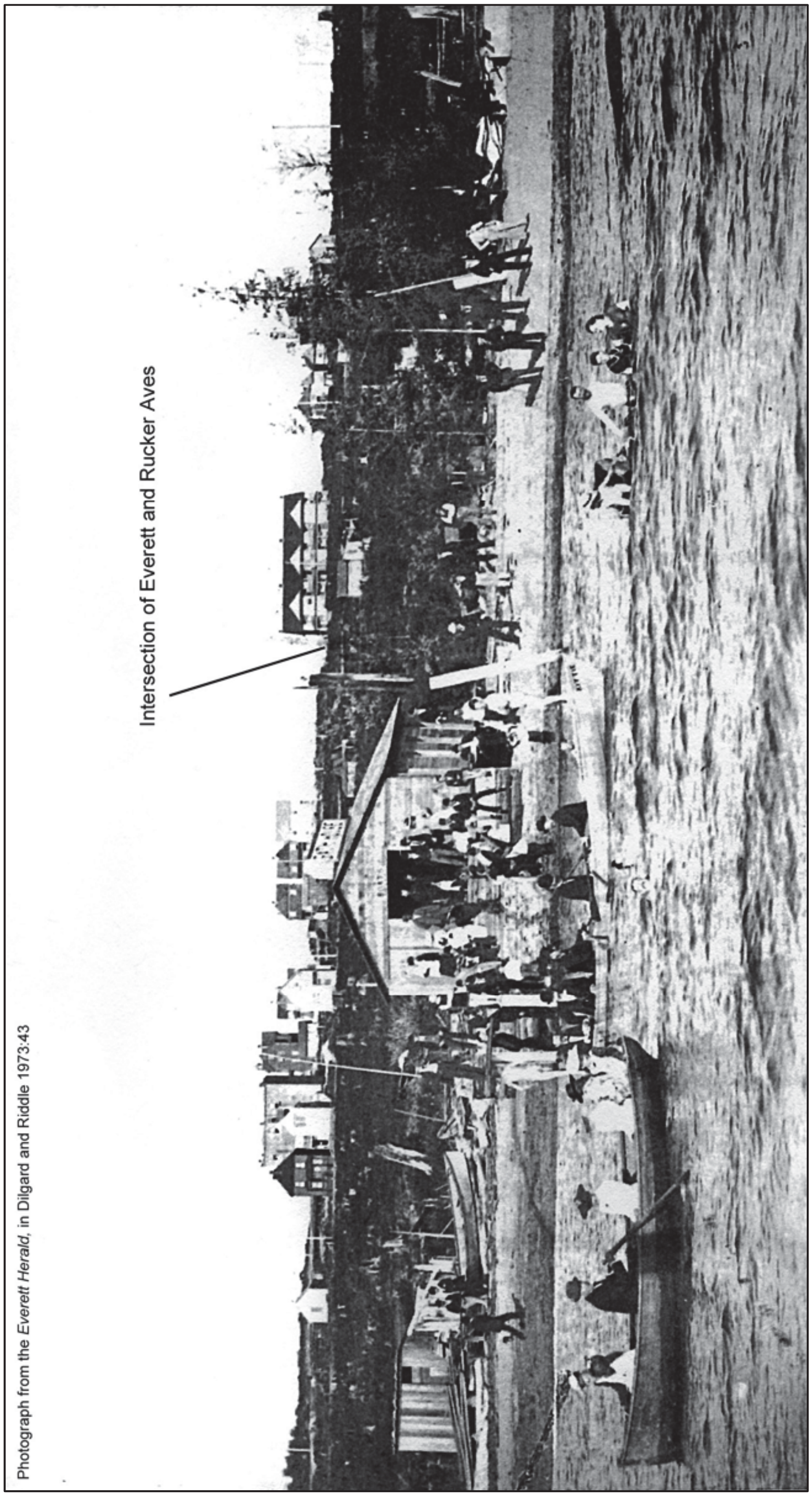


Figure 13. The bathing beach at the south end of the project area, near the base of Everett Ave., 1905. The bath house depicted is likely the one shown in block 618 on the 1902 Sanborn Fire Insurance Map (see Appendix C, Map 1).

Ossian Anderson, had previously served as the head of the San Juan Pulp Manufacturing Company of Bellingham and Fidalgo Pulp Manufacturing Company in Anacortes, and both of these companies were merged into the new corporation. Directors came from Northwest business, banking and industry, including U.M. Dickey, president of Consolidated Dairy Products, and H.M. Robbins, who was head of the Clark-Nickerson Lumber Company (*Pacific Pulp and Paper Industry* 3 (5), April 1920:35-36; (3(7), June 1929:32).

The property chosen for the Puget Sound Pulp and Timber Company mill was a 32-acre parcel on the Everett waterfront adjacent to the Clark-Nickerson Lumber Company operations, sometimes referred to as “the old shipyard site.”’

Puget Sound Pulp and Timber chose Hardy S. Ferguson, a renowned consulting engineer on pulp and paper mill projects, to design and oversee construction of the mill. Ferguson wanted to incorporate all of the latest engineering practices into the facility and based some of his design and machinery choices on successful Swedish mills. Ferguson came to Everett in August of 1929 to initiate the construction phase of the project. There he finalized plans with his personal representative J. H. McCarthy, who would serve as resident engineer (*Pacific Pulp and Paper Industry* 3(5), Apr. 1929:36; 3(12) Nov. 1929:36; 3(10) Sept. 1929).

Bids were quickly solicited and awards made on major construction contracts. Albertson, Cornell Brothers of Tacoma were named the general contractors for the project with Isaacson Ironworks of Seattle supplying the structural steel. One of the first major tasks was to dredge a 30-foot channel in front of the mill site on Port Gardner Bay and develop moorage for ocean-going vessels. Puget Sound Bridge and Dredging Company and its subcontractors began this work as soon as contracts were let in late August of 1929. Original specifications called for a 610’ by 88’ dock as well as a bulkhead and stone riprap along the shoreline. American Pile Driving Company of Everett drove several thousand piles for the wharf after the dredging company had moved its spoils to fill low-lying areas of the site (*Pacific Pulp and Paper Industry* 3(10) Sept. 1929, 3(11), Oct. 1929:42; *Pacific Builder and Engineer*, Aug. 31, 1929: 5; Sept. 14, 1929:6; *Everett Herald*, Sept. 4, 1929).

Very quickly after dredging and pile driving for the new wharf began, plant construction got underway at the pulp mill site. The first building to break ground was the company office, which would become the center for all business operations. Puget Sound Pulp and Timber Company executives and mill supervisors were housed temporarily in offices in downtown Everett until the building was completed. The company hoped to move into its new quarters on the south end of the mill site by December, so construction moved quickly with footings in place and foundation poured by early October of 1929 (*Everett Daily News*, Oct. 27, 1929:6; *Pacific Pulp and Paper Industry* 3(10) Oct. 1929:42; 4(1) Jan. 1930:62).

Several unusual features of the overall mill plan set the Puget Sound Pulp and Timber Company’s new facility apart and also addressed the goals of promoting efficiency and full utilization of timber while limiting waste. One of these innovations was to incorporate a large sawmill within the pulp processing layout. This mill would be used to break down logs into cants of uniform sizes, which would then be fed by uniquely designed conveyors into a corresponding series of chippers to make wood chips for the pulp. Some of these chippers were among the largest ever installed on the West Coast and could accommodate squares that were up to 20 inches in diameter. Mill supervisors could control the quality of the material used in the process and an elaborate washing system would further ensure that the logs would be as clean and defect-free as possible. Puget Sound Pulp and Timber also had its own timber holdings and planned to provide a steady supply of logs in 40 foot lengths of diameters ranging from 12 to 40 inches (*Pacific Pulp and Paper Industry* 3(13) Dec. 1929: 35).

Other notable innovations included straight and noticeably wider digester pipes that made it easier to dump the digester into the blowpits and handle the stock more gently. In addition, larger wooden blend tanks could hold several batches of pulp as they moved between the digester and drying room, eliminating any slight differences among batches. Scandinavian fourdrinier drying machines purchased for the mill dried the pulp in much thinner sheets than American-made machines and were the most modern available in Europe and completely new on the West Coast (*Pacific Pulp and Paper Industry* 5(4) Mar. 1931:47-48).

The mill was essentially designed in a "U" shape so that material could be moved efficiently through the manufacturing process. From the sawmill and cut-up plant where the logs were first processed, the cants moved up two steel-belt conveyors to the chipping plant and chip screen room, which were housed in an adjoining steel and brick building. Once processed, refined chips were then sent on long rubber conveyor belts to storage hoppers over the digesters, while sawdust was diverted to the hogged fuel conveyor from the sawmill. An acid plant with a standard two-tower system received the necessary chemicals, including sulphur, limestone and lime, which were first sent to storage facilities by an overhead tram from the dock.

The digester building contained five digesters, each with 18-ton yield capacity. These units had the ability to cook the chips in three different ways and were outfitted with specially placed pipes to permit easier drainage of the cooking liquor. The cooked stock was then washed and separated before being combined in a large blending tank to ensure pulp uniformity. An extensive screening process followed before the brown stock was sent through a two-stage bleaching process. A separate building housed the bleach liquor plant, which chlorinated lime paste and stored the bleaching liquid until it was sent through rubber pipes to the bleach room. The material was then moved into a large machine room which housed two dryers. These machines were able to dry 100 tons of pulp per day, forming pulp sheets and using pressure rollers to keep the sheets in contact with the drying cylinders. Storage warehouses and a separate laboratory for quality control and monitoring of all the chemical processes completed the main components of the mill (*Pacific Pulp and Paper Industry* 4(8), July 1930: 25-26; 4(10), Sept. 1930: 47, 49-54).

Among the other early work begun at the site was excavation for the blowpits and sulphur storage and driving of the piles for the digester building. Footings for the stores and repair building were also begun in early October and foundation work for acid storage tanks as well as the plant and tower. In order to get supplies to the mill site as quickly as possible during construction, the company negotiated with the Great Northern Railroad to build a 1500-foot line into the property. Once the spur was in place, needed materials were sidetracked and readily available for contractors' use. Later the railroad constructed additional spurs within the complex, including one directly from the Great Northern main line to the dock for easy movement of the pulp to market by both transcontinental and overseas shipping (*Pacific Pulp and Paper Industry* 3(10) Oct. 1929:42; 4(7) June 1930: 33; *Everett Herald*, Sept. 27, 1929:1; *Everett Daily News*, Oct. 27, 1929:6).

Local newspapers and industry journals regularly described the progress of the huge project, which employed at least 200 men as the construction process gained momentum. Good fall weather helped to keep the work on schedule, if not ahead of the original predictions for a late summer start-up date. Once steel was unloaded at the site, contractors began raising the steel superstructures for some of the plant's main buildings in November of 1929. By January 1930 some of the plant machinery had also

begun to arrive. The first ocean-going vessel to use the company's new wharf, the 4211-ton *S.S. Lena Luckenbach*, docked in early March, unloading more than 300 tons of cast-iron pipe for construction use. The machine room was among the final segments of the mill to be finished, with the fourdrinier drying machines from Sweden arriving at the dock near the end of May. By the beginning of June, mill construction was nearing completion (*Everett Daily News*, Oct, 25, 1929:8; *Pacific Pulp and Paper Industry* 4(1) Jan. 1930:62; 4(3) Mar. 1930:48; 4(7) June 1930:33).

Testing began on various sections of the new mill to make sure the equipment was in running order. The sawmill was the first to operate with its initial batch of logs broken down into cants on June 12, 1930 (Figure 14). The acid system and the digesters were started up a few days later, and the pulp mill followed, with finished pulp running through the drying machines. The first operation as a complete unit took place on July 1st, coinciding with the delivery of the first water from the City of Everett's new Sultan River pipeline (*Pacific Pulp and Paper Industry* 4(8) July 1930:25).

As the economic depression worsened in 1931, industry publications reported that Ossian Anderson had made several trips to the East Coast and California, contacting buyers and later "negotiating matters of far-reaching consequences" (*Pacific Pulp and Paper Industry* 5(12) Nov. 1931:14). The Anacortes mill halted production again for a number of months in early 1932 and it was followed by the closure of the Everett facility on June 1st. When production in Everett resumed on July 20, 1932, management announced that it would "conduct its operations on a curtailed basis commensurate with the requirements of the market and the mill's trade" (*Pacific Pulp and Paper Industry* 6(9) Aug. 1932:13). Behind the scenes, however, negotiations were underway to solve the severe financial problems facing the company. According to summaries of court documents and other sources, Puget Sound Pulp and Timber had originally mortgaged its holdings for $4.5 million, and the financial firm of Pierce, Fair and Company had raised the funds by selling shares in a syndicate at $1000 each. The company had been able to meet its obligations until August of 1931, when it paid only half of the bond interest with the rest in the form of a note. By June 1932 the syndicate had received no further interest payments and so a partitioning agreement was negotiated in which the Bellingham, Anacortes and Clear Lake properties were released from the mortgage, but the syndicate retained the Everett mill and the Hartford and Eastern Railroad as well as some timber lands in Snohomish County (*Pacific Pulp and Paper Industry* 8(2) Feb. 1934:6-7; Adams 1951:161).

Throughout this period the whole harbor area was undergoing changes. To improve opportunities for new businesses to locate in Everett during these difficult financial times, the Port of Everett began a project to fill part of the tidelands near the foot of 21st Street as part of an agreement with the pulp company. It was important to maintain deep-water access, so the Port developed what was called Tract O, which added protective fill west of Puget Sound Pulp and Timber land to within 300 feet of the south end of the jetty. This jetty, which had been built and then extended by the Corps of Engineers since the 1890s, stretched more than 2300 feet south of the Snohomish River mouth. Its purpose was to act in conjunction with dikes to prevent silting of the harbor while maintaining portions of the Snohomish River as a fresh-water port. These projects had never been entirely successful and repeated dredging was necessary. The fill added by the Port in the early 1930s created the East Waterway which was intended to remain free of silt deposition (Dilgard and Riddle 1973:49-51, 54).

Formation of the Soundview Pulp Company

The Soundview Pulp Company, formed on July 15, 1932, took title to the Puget Sound Pulp and Timber property and became the manager of the assets, although Ossian Anderson continued to operate the mill under a friendly lease arrangement of $1 per month. A proposal by Soundview directors to merge

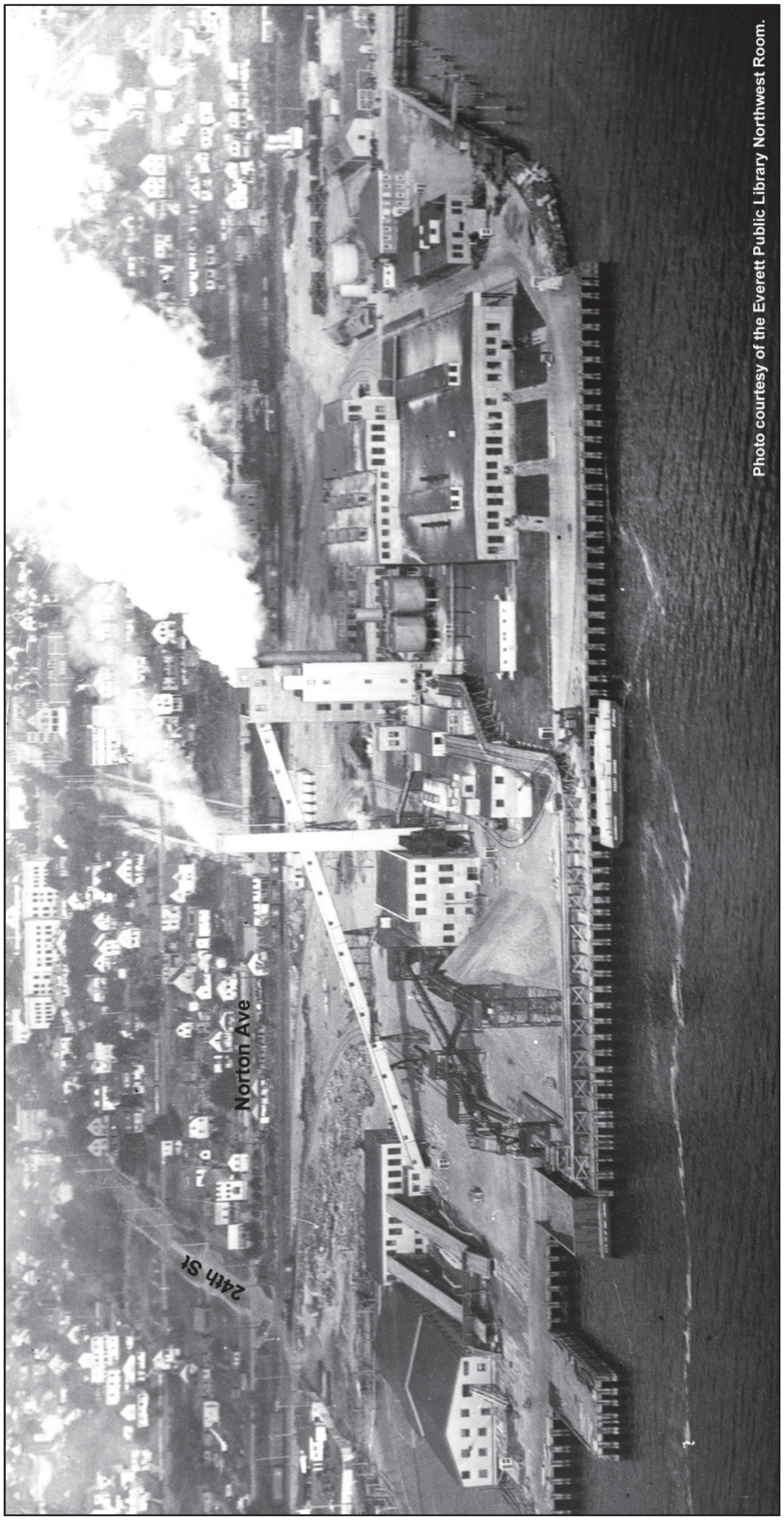


Figure 14. Puget Sound Pulp and Timber Company mill nearing completion in 1930.

with two other pulp and paper companies led to a legal battle with some of the minority shareholders, and the courts eventually voided the merger. Soundview then ended its lease with Puget Sound Pulp and Timber Company and on March 1, 1934, took over management of the Everett mill. G. J. Armbruster remained as the superintendent of the plant and Leo Burdon, who had lengthy experience in the industry, was named operating manager. U.M. Dickey, a Seattle businessman and vice president of the Board of Directors, became the general manager of the mill. Most of the rest of the officers and directors of Soundview were prominent San Francisco businessmen (*Pacific Pulp and Paper Industry* 8(3) Mar. 1934:24; Soundview Minute Book, Vol. 1, Washington State University (WSU) Manuscripts, Archives and Special Collections (MASC), Cage 251).

On the recommendations of Dickey, the company made a number of upgrades and additions to various parts of the mill. Among the changes were improvements to the acid tower, installation of a new sprinkler system in the dryer and warehouse buildings and the purchase of two automatic wood barkers for the sawmill to increase log utilization. Probably the most significant additions were two new bleaching units that would allow production of the highest quality bleached pulp and increase the overall capacity of the plant. As Dickey argued to the Board:

> The reputation of the mill has suffered under Puget Sound Pulp and Timber Co. administration by a combination of the absence of adequate bleaching facilities and an effort on the part of management to crowd the productive capacity of the mill. This adverse reputation is a serious obstacle to the sale of the mill's product and it is of great importance that a reputation for high quality product should be gained as well as that the mill should be mechanically equipped to produce pulp even up to the grade required for cellophane and rayon use (Soundview Minute Book, Vol. 1, May 14, 1934, WSU,MASC).

Throughout his tenure at Soundview, Dickey continued to urge the Board to make improvements to the mill and increase its productive capacity. The installation of acid heating and digester circulating systems as well as several additional digesters were among the initial projects that brought new technological innovations to the facility. In what later became one of his most important contributions, Dickey also encouraged the company to develop a timber acquisition plan that would ensure a steady log supply. (Soundview Minute Book, Vol. 1, Nov. 9, 1934; Dec. 26, 1934; Vol. IV, May 10, 1937, WSU,MASC; *Everett Daily Herald*, Feb. 8, 1954: 21, 27).

U.M. Dickey replaced Harry Fair as president of the Soundview Pulp Company after an election of the Board of Directors on August 6, 1936, and Fair became chairman of the Board. During that year the company also made a major new investment in the expansion of the mill's capacity. A complete new processing unit, which included an acid plant, boilers, digesters, and a bleach plant as well as dryers and other equipment, was added to the complex (Figure 15). The mill's output was boosted to nearly 600 tons of bleached sulphite wood pulp per day, and the new equipment also gave the mill the capability of producing some of the highest grades of specialty paper. The company financed the $2.1 million addition by the sale of nearly 21,000 new shares of capital stock as well as two $500,000 issues of debentures (Soundview Minute Book, Vol. III, Aug. 6, 1936; Adams 1951:162; *The Argus* 43, June 20, 1936:4).

Pulp industry prospects continued to improve as the United States moved closer to World War II. A local newspaper published Soundview's forecast that it would be able to pay off its $1 million debt for the new addition to the plant within two years. As soon as the United States entered the war, however, the plant was subject to the needs of the defense effort. The company agreed to invest $170,000 in the equipment to produce nitrate pulp for military use under the direction of the War Production Board. At the Board meeting in late October of 1942 Soundview directors were also notified that all of the

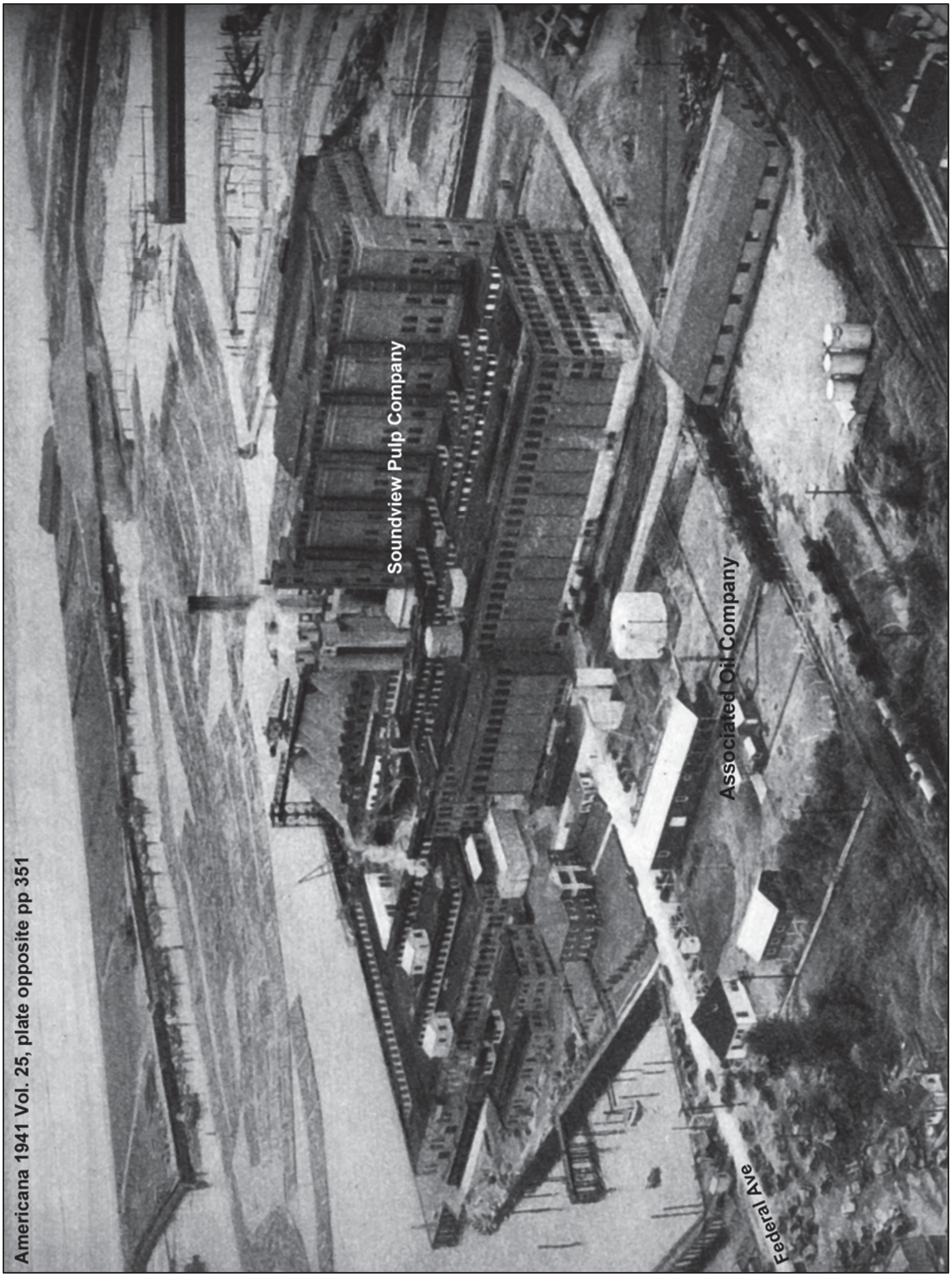


Figure 15. The Soundview Pulp Company, c. 1940

production of the mill after November 1 of that year would be allocated for war purposes (*Seattle Times*, Jan. 22, 1937; Soundview Minute Book, Vol, IV, July 29, 1942; Oct. 26, 1942).

As the war years came to an end, Soundview was in a sound financial position to continue its expansion of the mill. As timber conservation increasingly became a focus of the industry, the company once again added new equipment that applied the latest technology to these goals. In 1945 the company installed a new system for debarking pulp wood logs that made use of hydraulic pressure to save an additional 20 percent of the wood fiber when the bark was removed. The company was also one of the first in the industry to use the chemi-pulp or hot acid process as well as the SO2 recovery process in pulp production (*Everett Daily Herald*, Feb. 8, 1954:20).

Soundview Pulp Company was already the largest single sulphite pulp producing plant in the world when Scott Paper Company representatives came West to discuss a possible merger in the summer of 1951. Scott had been searching for a new location for a Pacific Coast mill, and Soundview's waterfront site and large timber holdings were attractive as was its strong cash position. The plan to exchange shares of common stock to carry out the merger received the approval of directors from both companies by November of 1951 (*Pulp and Paper* 25(13), Dec. 1951:40).

Scott's goal was to build a new paper plant at the Everett site and use the Soundview pulp facility and timber resources to establish an integrated paper manufacturing and distribution operation. Once the merger was complete, construction of the paper mill began adjacent to the pulp mill. By December of 1953, the first of the company's new high-speed paper machines had begun production and a second went on line a few months later. At the grand opening of the new facility in February of 1954, plans were already underway to construct another new section for two more of these high-speed units and related equipment for installation in 1955 (*Scott Broadcast*, 10(8) Nov. 1954:1).

Environmental concerns and changing industry practices characterized the more recent history of the Everett mill as pulp and paper production continued. New state and federal regulations on pollution control influenced continuing plant upgrades over the decades. In 1964 Scott completed a wastewater treatment facility at the Everett site. A decade later, the company converted the mill to an ammonia-based sulphite process and installed a recovery furnace (Figure 16). A secondary treatment facility for effluent was constructed in 1979. Other innovative programs included a joint project with the Snohomish County PUD to build a cogeneration plant to provide electrical power as well as steam for the company's tissue plant (Zwaller and Cross 2003:1).

After Scott merged with the Kimberly Clark Corporation in 1995, additional investments were made at the plant to put in place new technologies for better environmental protection as well as more efficient plant production (Figure 17). The company constructed a larger wastewater treatment system and added a new effluent outfall in cooperation with the cities of Everett and Marysville. In 2000 Kimberly Clark converted the pulp-making operation to a chlorine dioxide system, which produces less dioxin than the older chlorine process. To meet new company goals, Kimberly-Clark attempted to sell the mill. When negotiations failed, all mill operations ended in April 2012 and the last of the Everett waterfront mills shut down permanently (Benbow and Batdorf 2012:1).

Figure 16. The Scott Paper Company in 1977.

Figure 17. The Kimberly-Clark Mill in 2006.

PREVIOUS INVESTIGATIONS

Fifteen cultural resources investigations have been completed within 1 mile of the project, including general overviews, field surveys and project-related assessments (Table 1). Early cultural resources investigations were usually regional, large-scale surveys, summaries, and inventories of known resources for agencies like the National Park Service, the United States Army Corps of Engineers (USACE), and the Office of Archaeology and Historic Preservation (now Department of Archaeology and Historic Preservation [DAHP]) (Blukis Onat 1987; Dunnell and Fuller 1975; Miss and Campbell 1991). Archaeological investigations became more targeted and project related later in time.

Table 1. Previous Cultural Resource Investigations Within Approximately One Mile of the Project Area.

AUTHOR	DATE	PROJECT	[redacted]	RESULTS*
Dunnell and Fuller	1975	An Archaeological Survey of Everett Harbor and the Lower Snohomish Estuary-Delta	[redacted]	None
Blukis Onat	1987	Resource Protection Planning Process Identification of Prehistoric Archaeological Resources in the Northern Puget Sound Study-Unit	[redacted]	Overview
Evans-Hamilton	1988	The Location, Identification and Evaluation of Potential Submerged Cultural Resources In Three Puget Sound Dredged Material Disposal Sites	[redacted]	None
Robinson	1990	A Cultural Resources Survey of SR 5: Everett Park and Ride Preliminary Site #8, Snohomish County, Washington	[redacted]	None
Miss and Campbell	1991	Prehistoric Cultural Resources of Snohomish County, Washington	[redacted]	None
Demuth	1998	Technical Report: Historic, Cultural, and Archaeological Resources Assessment for Everett-to-Seattle Commuter Rail Project Environmental Impact Statement	[redacted]	Historic buildings
Johnson	2000	Letter Report: Proposed California Street Overpass, Everett, Washington	[redacted]	None
Barnard and Gordon	2005	Sunken Vessels and Aircraft Containing Hazardous Materials in Puget Sound	[redacted]	One sunken vessel
Johnson Partnership	2005	Appendix I: Cultural and Historic Resource Analysis 12th Street Marina & North Marina Redevelopment 3333Project Port of Everett	[redacted]	Historic buildings
Juell	2006	Archaeological Site Assessment of Sound Transit's Sounder: Everett-to-Seattle Commuter Rail System, King and Snohomish Counties, Washington	[redacted]	None
Hartmann	2008	Technical Report: Cultural Resources Assessment for the Swift Bus Rapid Transit Project, Snohomish County, Washington	[redacted]	None
Baker and Allen	2010	Cultural Resource Inventory for the Community Health Centers of Snohomish County – Replacement of the Broadway Clinic Building Project, Everett, Snohomish County, Washington	[redacted]	None
Lenz et al.	2011	Cultural Resource Assessment for the Broadway Bridge Replacement Project, Everett, Washington	[redacted]	Historic bridge and two buildings
McDaniel	2011	Cultural Resources Inventory Report, Everett Shipyard Cleanup Project, 1016 14th Street, Everett, Washington	[redacted]	None
Boswell and Sharley	2012	Level II Documentation of the Kimberly-Clark Mill Site Main Office Building	[redacted]	Historic building

*Newly recorded cultural material identified within one mile of project area.

By the 1990s, archaeological investigations were more commonly associated with transportation-related projects. For example, cultural resources investigations were completed for the Washington State Department of Transportation's (WSDOT) Everett Park and Ride and California Street Overpass projects, as well as for the Swift Bus Rapid Transit project that WSDOT accomplished in partnership with Snohomish County (Hartman 2008, Johnson 2000, Robinson 1990). Cultural resources investigations

related to transportation projects were also undertaken for Sound Transit's Everett to Seattle Commuter Rail line and the City of Everett's Broadway Bridge replacement over the Burlington Northern Santa Fe (BNSF) Railroad (Demuth 1998; Juell 2006; Lenz et al. 2011).

Two previous cultural resources investigations were completed for the Port of Everett, including one for the 12th Street Marina and North Marina redevelopment project and one for the cleanup of the Everett Shipyard [redacted] (Johnson Partnership 2005; McDaniel 2011). One historic bridge and historic buildings were identified in the project vicinity by Demuth (1998), the Johnson Partnership (2005), and Lenz et al. (2011). Two other previous investigations highlight cultural resources submerged in the port, including one for dredging by the USACE and one related to cleanup of spills associated with sunken vessels by the Environmental Protection Agency (EPA) (Barnard and Gordon 2005; Evans Hamilton 1988). Barnard and Gordon (2005) identified a sunken vessel called the *Al-ind-esk-a-sea* in Port Gardner at 222 feet below sea level [redacted]. Cleanup in the project vicinity also sponsored Level III documentation of the K-C WW upland area mill main office building before it was demolished as part of this project (Boswell and Sharley 2012). Just one assessment not associated with transportation was recently completed for the Community Health Centers of Snohomish County for replacement of a clinic in Everett (Baker and Allen 2010).

Two cultural resources have been recorded within 1 mile of the project (Table 2). One of these resources is a pre-contact lithic isolate and the other is an historic church. Site 45SN88 is a bipointed CCS knife (10 by 4.5 centimeters wide and 12 millimeters thick) identified during private home construction [redacted] (Mattson 1980). The isolate's setting was further described in 1991 when a new site form was filled out, but the artifact was not illustrated and no new data was presented (Stenholm 1991). The forms state that any other cultural materials that may have once associated with the knife have since been destroyed. Site 45SN555 is the Trinity Episcopal Church cemetery (columbariam), located adjacent to the Trinity Church Sanctuary originally constructed ca. 1920 (DAHP 2013). The church still stands [redacted]. There are no previously recorded sites within the project boundary.

Table 2. Previously Recorded Sites Within Approximately One Mile of the Project Area.

SITE NO.	COMPILER/DATE	AGE	DESCRIPTION	[redacted]
45SN88	Mattson 1980; Stenholm 1991	Pre-contact	Connerman Site (Lithic isolate)	[redacted]
45SN555	DAHP 2013	Historic	Trinity Episcopal Church Columbariam	[redacted]

This assessment is focused on archaeological resources and does not address historic buildings in the K-C WW upland vicinity. Nine surveys of historic buildings have already been completed within 1 mile of the APE and historic buildings have been documented as a result. These surveys are not included in Table 1. One contingency of the SEPA determination of no significant adverse project impacts was that demolition of the Puget Sound Pulp and Timber Main Office Building could not occur until adequate evaluation, documentation and recordation of the building was complete, which was fulfilled in 2012 (Boswell and Sharley 2012; Kimberly-Clark Worldwide, Inc. 2012). The results of previously completed cultural resources investigations provide expectations for cultural resources in the project vicinity.

EXPECTATIONS

Although the K-C WW upland area has been altered by filling, diking, pile driving, wharf building, and more recent shoreline development, it is still sensitive for significant buried cultural resources. Background research summarized above indicates that the vicinity was used intensively by Native Americans prior to Euroamerican settlement. [redacted] otential also exists for encountering other types of fishing and resource procurement camps or features along the historical shoreline. Archaeological remains along the Port Gardner shoreline may include evidence of village and camp sites; fishing, hunting, and shellfish collection and processing sites; and locations of other traditional activities (Table 3).

Table 3. Native American Site Types and Activities that May Be Represented in the Project Area.

SITE TYPE/ ACTIVITY	ARCHAEOLOGICAL EVIDENCE	ASSOCIATED LANDFORM
Village	Archaeological remains would consist of midden containing discarded shell and bone, scatters and concentrations of fire-modified rock, as well as a variety of stone, bone, or wooden tools and debris from stone tool making. The remains of buildings, poles, and other structures may be present and organic materials, such as mats and basketry, could be preserved in buried wet sites.	Beach, Backshore, or Upland
Seasonal Campsite	Archaeological remains of campsites may consist of middens containing discarded shell and bone, scatters or concentrations of fire-modified rock, and stone, bone, or wooden tools. Debris from stone tool making may be present and it is possible the remains of shelter poles, mats, and planks may be preserved. Less diversity of faunal, lithic, and feature remains	Beach, Backshore, or Upland
Sweat lodge	Archaeological evidence of such a structure would consist of a concentration or scatter of fire-modified rock and, perhaps, structural remains.	Beach, Backshore, or Upland
Cemeteries	Archaeological evidence of a burial would be human bones that may be associated with grave goods or other artifacts.	Beach, Backshore, or Upland
Cooking	Archaeological evidence of cooking activities would be dominated by fire-modified rock (FMR), with larger concentrations of FMR representing oven features. Pit features may contain identifiable charred food remains.	Beach, Foreshore, Backshore, or Upland
Weir Fishing	Archaeological remains of weir fishing in the project area would be difficult to identify. If present, fish weirs would consist of a series of aligned posts or stakes that have been pointed on one end with woody fibers, twigs, or other material woven horizontally between. The weirs are most likely to be along the shoreline where tidal channels or streams emptied into Port Gardner.	Foreshore or Marsh
Line or net fishing	Archaeological evidence for the continued use of a fishing area could result in accumulation of anchor stones or weights. Isolated artifacts, such as hooks, could also be present, but would be difficult to identify.	Foreshore or Marsh
Shellfish collection and processing	Shell middens are a widespread type of archaeological site. In addition to marking past locations of village and camp sites, middens form in shellfish processing areas. Middens at residential sites usually contain a mix of bone, lithic debitage, FMR, and tools. Midden made from refuse at a shellfish processing site is dominated by shell.	Foreshore or Beach
Sea-mammal Hunting	Little archaeological evidence of these resource procurement activities would be left at the hunting site; however, butchered bone may be in nearby camps or villages. Pointed stakes may remain below low water levels today.	Foreshore, Marsh, or Delta
Duck hunting	Archaeological evidence of duck nets would consist of the remains of paired posts. Duck or geese bones may be present in village or camp middens and projectile points or other hunting equipment could be identified. Little archaeological evidence of duck hunting activities would be left at the hunting site.	Beach, Foreshore, Backshore, or Upland
Land Mammal hunting	Isolated projectile points could be found alone or with butchered bone near a kill site. Projectile points may also be in a village or camp and would provide evidence of game hunting activities.	Upland, Beach, or Backshore

Table 3. Native American Site Types and Activities that May Be Represented in the Project Area.

SITE TYPE/ ACTIVITY	ARCHAEOLOGICAL EVIDENCE	ASSOCIATED LANDFORM
Wood & Fiber Collection	Archeological evidence of plant collection activities includes, bark peeled cedar trees, cedar trees with plank removals or bark stripping, structural remains, expedient lithic flake and cobble implements, fire-modified rock from cooking, processing , or fabrication fires and preserved mats, basketry, or other fiber or wood products.	Upland, Beach, Foreshore, Backshore, or Marsh
Toolstone collection and tool manufacture	Processes of stone tool fabrication using chipping and grinding would leave discarded stone debitage behind as part of the archaeological record. Broken Discarded or misplaced tools could be identified in camps, villages, or as isolated finds.	Upland, Beach, or Backshore
Petroglyphs	Archaeological evidence of a petroglyph would be a marking or pecking pattern carved onto or into a strategic rock face, boulder, or large cobble.	Beach, Foreshore, or Backshore

Recent studies have documented subsidence of the Snohomish delta and, depending on degree and location, sudden subsidence could have preserved pre-contact or ethnographic period archaeological sites by quickly burying them through bank sloughing or sedimentation. The portions of the project area that were once part of the backshore and beach landforms were particularly susceptible to burial by landslides and mass wasting from the uplands east of the project area. In fact, it appears a large landslide occurred at the north end of the project area in the past based on the slumped bluff profile and inclined vegetation. The intertidal zone is predominantly vulnerable to liquefaction and subsidence related to tectonic activity, which would result in disturbance and burial by sedimentation. Sub-tidal portions of the project area would also be prone to subsidence and sedimentation, but probably do not harbor archaeological resources. Delta and shoreline environments provide excellent potential for preservation of archaeological sites where wave action is subdued (Lewarch et al. 1996; Stanley and Warne 1997; Waters 1992).

Deltas are composed of bottomset, foreset, and topset beds and only the sub-aerial topset beds of a delta would be stable enough to occupy or preserve evidence of pre-contact human occupation. Most of the project area was at least partially inundated as a marsh on the delta front prior to historic development. Pre-contact archaeological deposits in the project area would most likely be related to hunting, fishing, or other marsh-type resource procurement and sites, if present, would be buried under fine-grained intertidal alluvium that historically accumulated on top. Pre-contact archaeological materials or ethnographic deposits in this setting would probably exhibit signs of tidal reworking or rapid burial as a result of alluvial processes on the delta front or subsidence. More substantial pre-contact and ethnographic period archaeological sites associated with cooking, camping, and habitation would probably be on elevated landforms, if present, near the former shoreline along the east margin of the property where a beach was once present.

The project area is also very sensitive for historical archaeological resources. Although a number of Euroamerican explorers and traders visited Port Gardner between the 1820s and 1850s, the permanent Euroamerican presence along Port Gardner's southeast shoreline dates to the early 1860s. Archaeological evidence of Euroamerican visitors may be found in archaeological sites in the vicinity and would consist of artifacts like glass beads, metal tools and pots, guns, buttons and other new materials and technologies. Historical cultural materials dating after 1862 are more clearly attributed to Euroamericans and could include architectural, industrial, domestic and other assemblages (Table 4). Cultural materials associated with nineteenth-century homesteading, mills and railroads, early industry, and residential occupation may be in the project area. Euroamerican entrepreneurs significantly altered

Table 4. Historical Site Types and Activities that May Be Represented in the Project Area.

SITE TYPES / ACTIVITIES	ARCHAEOLOGICAL EVIDENCE	ASSOCIATED LANDFORM
Early Homestead	Archaeological evidence of early historic homesteading could be in the form of agricultural ditches, levees, old roads and foundations, structures in ruin, debris concentrations, or artifact scatters. Highest potential for encountering these would be at the south end of the property near the foot of Everett Avenue, closest to Brigham's cabin.	Upland, Beach, Backshore, or Marsh
Great Northern Railroad	Archaeological evidence of the Railroad in the project vicinity might consist of wooden trestle, ties, metal spikes, pilings, a particular kind of fill under the trestles, metal hardware, ruins of support structures, and mass deposits of industrial debris along the tracks, such as piles of slag, coal, cinders, and other debris. These materials are expected to be more common along the east edge of the project area.	Upland, Beach, Marsh, Backshore, or Foreshore
Everett Flour Mill	Pilings of wood and concrete, horizontal decking, discarded machinery, demolition debris, industrial artifacts, abandoned utilities, and railroad remains are all forms of archaeological evidence related to the Everett Flour Mill that may be in the project area. These materials may be buried below fill and debris associated with the Puget Sound Pulp and Timber Company.	Upland, Beach, Marsh, Backshore, or Foreshore
Clark-Nickerson Lumber Co. Mill	Pilings, bulkheads, horizontal decking, discarded machinery, demolition debris, industrial artifacts, abandoned utilities, and railroad remains may be buried below mill deposits associated with the Puget Sound Pulp and Timber Company.	Upland, Beach, Marsh, Foreshore, or Sub-tidal delta
Puget Sound Pulp and Timber Company	Pilings, bulkheads, horizontal decking, discarded machinery, demolition debris, industrial artifacts, abandoned utilities, and railroad remains, building foundations and evidence for past structures where piers were historically present below fill laid down by the Soundview Pulp Company or disturbed by excavations for new utilities and construction by later mill owners.	Upland, Beach, Marsh, Backshore, Foreshore, or Sub-tidal delta
Soundview Pulp Company	Pilings, horizontal decking, structural foundations, discarded machinery, demolition debris, industrial artifacts, abandoned utilities, and railroad remains.	Upland, Beach, Marsh, Backshore, Foreshore, or Sub-tidal delta
Scott Paper Company	Pilings, horizontal decking, structural foundations, discarded machinery, demolition debris, industrial artifacts, abandoned utilities, and railroad remains related to the Scott Paper Company . It may be difficult to discriminate between cultural materials related to Soundview Pulp Company and Scott Paper Company.	Upland, Beach, Marsh, Backshore, Foreshore, or Sub-tidal delta
Log dumps and rafting areas	Modern maps of the project vicinity show pilings in the rafting areas marked on historic maps. Other archaeological features, such as rope, waterlogged rafts, pilings, horizontal decking, industrial artifacts, or logging tools like peaveys, cable, and chain could be present.	Marsh, Foreshore, or Sub-tidal delta
Debris concentrations	If the debris is industrial in origin it may contain tools, hardware, or byproducts. If the debris originates from a residential source it may contain broken home items, ceramics, empty bottles, or other evidence for residential and social activities. The concentrations or scatters of artifacts may be interbedded with layers of wood waste or fill.	Upland, Beach, Marsh, Backshore, or Foreshore
Temporary Dwellings	Remains of squatter shacks, structures or artifact scatters at the lower fill boundary in the vicinity of their shacks south of the mill. Deposits could contain information regarding lifestyles of employees belonging to identifiable ethnic or socioeconomic groups. Evidence for the ethnicity of squatter occupants may be in the form of structural architecture or imported items, such as ceramics, clothing, medicines, or food jars.	Upland, Beach, or Backshore

and filled the shoreline and old beach surfaces are certainly present below the fill. The fill itself might contain historical archaeological deposits or objects in the form of artifact dumps or scatters and possibly stable surfaces that could have been occupied between fill events. Maps of the project area show docks and wharves expanding at a great pace, especially between 1900 and 1910 and between 1929 and 1936.

Three deposits, or strata, were expected in the project area based on background research and review of the previously completed borings that will be discussed below. Fill would be below the dock structures and along the shoreline parallel with the upland. Delta sands and dredged sediment would be expected in the intertidal portions of the project area that are not covered with fill, where sediments are largely the product of modern delta progradation and active estuarine processes. The top 10 feet of fill is expected to be highly disturbed by repeated mill construction cycles and utility installation and upgrades. Deeper fill may be less disturbed and its stratification may reflect the historic context. Natural deposits are expected to be rare above 20 fbs, as the entire Snohomish River mouth is controlled and artificial. Holocene-age deposits below the fill are expected to grade from coarse to fine from northeast to southwest across the project area, as one moves from more proximal to distal along the delta shoreline.

METHODS

Research began with examination of records at the Department of Archaeology and Historic Preservation (DAHP) for previously recorded sites and reports of previous investigations in the project vicinity. Other background information was collected from ethnographic and historic accounts, regional cultural resource investigations, the collections of local historical societies, and from environmental reports and other sources. The holdings of the Everett Public Library, the Seattle Public Library, and the University of Washington Library and Special Collections were searched for information related to the Everett waterfront. General Land Office (GLO) and Bureau of Land Management (BLM) cadastral survey and land entry records were reviewed, and researchers completed a search of historical maps in Washington State University's on-line map collection and the online resources of the Great Northern/Northern Pacific Railway Historical Society, as well as at the University of Washington and Everett Public Libraries. Copies of numerous industry trade publications were also found at the University Washington Library as were microfilm of historic newspapers. Photographs in the University of Washington's and Everett Public Library's digital collections were also reviewed.

Geoarchaeological analysis was undertaken once historical and environmental research was complete. Previously completed geotechnical investigations provide a means of researching buried landforms and their histories within the project area. Geotechnical data was reviewed to determine depth of fill across the K-C WW upland area and to find out if sufficient evidence is available below the fill to characterize contrasting environmental settings that could have hosted early inhabitants. The logs of 154 previously completed borings were then reviewed and 69 of the most descriptive logs recounting the deepest deposits in the K-C WW upland are were selected to be entered into a Rockworks™ software database. A summary of the core data entered into the database is in Appendix B. The borelogs reviewed were provided by K-C WW, Inc. and compiled by Aspect Consulting for this project. The purpose of the geotechnical investigations was installation of groundwater sampling monitoring wells and understanding the extent of soil contamination. The boreholes were drilled using direct push or hollow stem auger methods by Cascade Drilling and using hand augering methods by Aspect. The results of geotechnical analysis will eventually be presented in a report, but a document summarizing the cores was not available for this assessment (Germiat 2013). Bores ranged from 1 to 31.5 fbs with an average depth of 14 feet below the surface (fbs). The average depth to the base of the limited selection of cores used for this geoarchaeological assessment is 17.7 fbs. The results of geoarchaeological analysis are in the following section. The borelog data was used to construct a 3-dimensional model of the fill topography and detailed cross-sections were also compiled to aid in the development of the sensitivity maps found at the end of this assessment.

All the background research allowed for formulation of the expectations for cultural resources in the project area, as described above. These combined data were then used to model the sensitivity for buried cultural resources in the project area, especially within the 11 areas slated for opportunistic cleanup. The sensitivity model uses a limited number of geomorphic variables to predict the risk of clean up or other actions intersecting Native American or historical archaeological sites. The geomorphic variables, such as beach or marsh that were defined from the results of geotechnical borings, are combined with ethnographic and historical information to be as complete a representation as possible. SWCA used ArcGIS Spatial Analyst, an extension of the ESRI ArcGIS software program designed to analyze spatial data and relationships, to build the archaeological sensitivity model. Spatial Analyst is particularly useful for suitability modeling, that is, combining a variety of data sets to identify the most suitable or likely places for a particular activity or occurrence. GIS layers are created from the data sets and the layers are stacked or overlaid. Although questions remain about precise locations of archaeological material in the project area, this assessment has characterized areas of risk within the K-C WW upland area in a way that allows planners to take areas assigned a moderate to high risk for buried cultural resources into account when designing cleanup procedures.

Models oversimplify complex systems and the results of modeling should be used with caution. Additional data that would greatly increase the accuracy and utility of this model includes bathymetry information dating to between 1902 and 1936 and data from archaeologically monitored borehole and other excavations. The following model only reflects sensitivity for cultural resources based on information collected from archaeological and geotechnical sources. Contemporary Native American use of the shoreline may include additional sensitive areas and other areas of traditional value that could be affected by cleanup activities may also exist in the project boundary.

GEOARCHAEOLOGICAL ANALYSIS

Existing borehole data from the K-C WW upland area was categorized by the project geoarchaeologists using a facies approach that organized the downhole lithology into vertical and lateral sequences. Three strata, Fill, Holocene, and Pleistocene were identified in the borings. Each sediment layer logged by Aspect is a unit with distinct observable physical properties, such as color, lithology, texture, and sedimentary structure, called a lithofacies and each stratum hosts a number of lithofacies (Miall 2000). Each lithofacies is the product of a depositional process and has a set of distinctive lithologic characteristics. Lithofacies analyses develop interpretations of past environments by characterizing the geometry of deposits and modes of sedimentation within a localized area, and are an important tool for reconstruction of the local landscape history (Eyles et al. 1985; Gilbertson 1995; Miall 2000; Reading 1978). Lithofacies analyses also offer a way to generate reasonable expectations regarding areas of potential archaeological sensitivity within a study area because grouping depositional sequences on the basis of facies types facilitates interpretation of landscape characteristics, assists in identification of site formation processes, determines the suitability of the physical substrate for habitation or as potential resource areas, and establishes a relative chronological sequence. A 3-dimensional model of the fill topography and detailed cross-sections were compiled to facilitate the following geoarchaeological discussion (Figures 18 through 23). Eleven lithofacies were identified in the Fill stratum and 17 lithofacies were identified in the Holocene stratum (Table 5). Individual facies were not named for Pleistocene deposits, which pre-date the arrival of humans to the region.

Fill

The 11 lithofacies identified in the fill are named for their dominant constituent and include layers of Asphalt, Brick, Concrete, Rubble, Peat, Gravel, Sand, Silt, Clay, Wood, and Voids (Table 5). Many of the fill layers are contaminated and give off a petroleum odor. The materials used to fill in the tideflats west

Figure 18. Map of previously completed borings used to model the sub-surface stratigraphy in the project area and cross-section transects in relation to opportunistic cleanup areas.

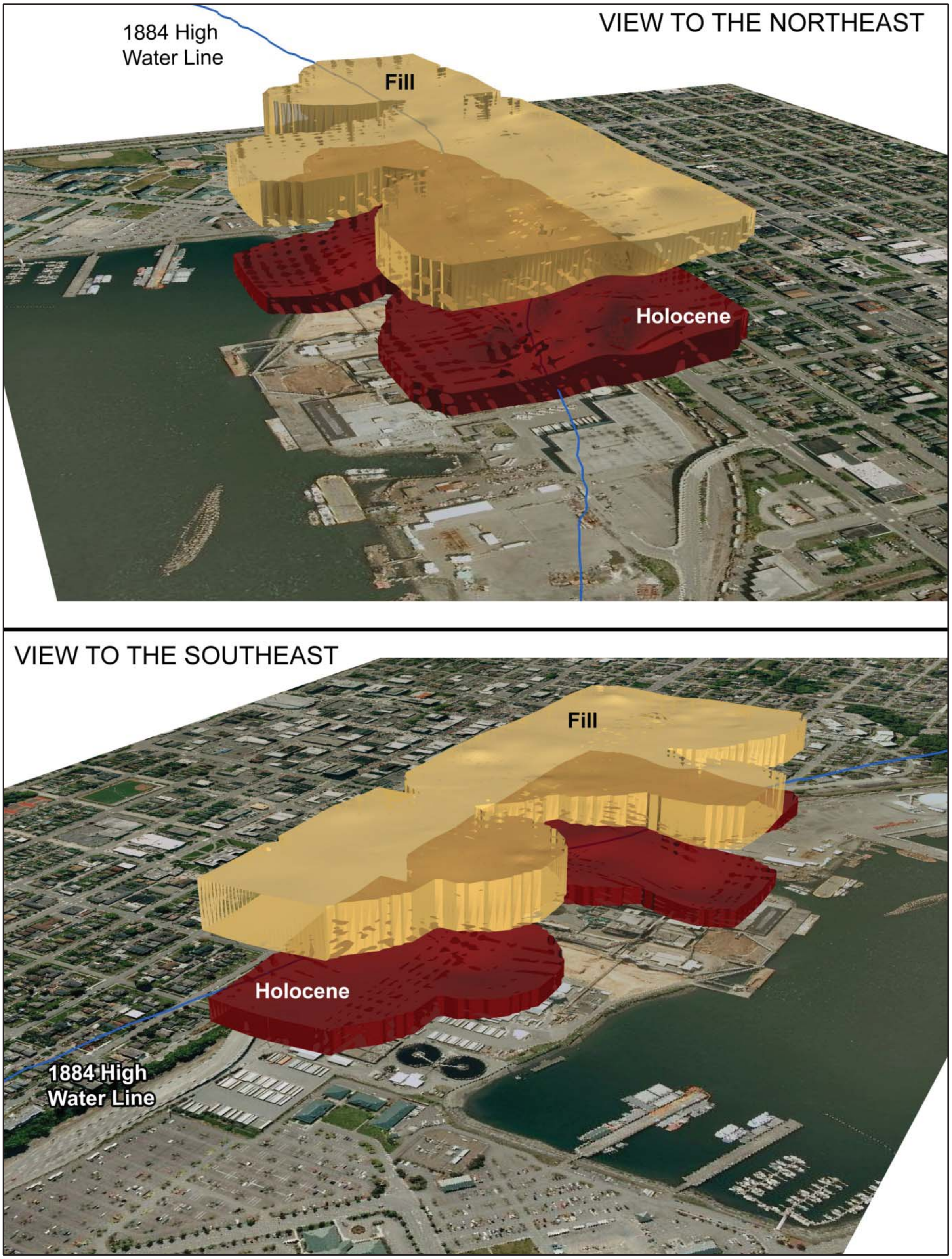


Figure 19. 3-D model of project area stratigraphy showing fill and Holocene deposits overlain by the streetscape.

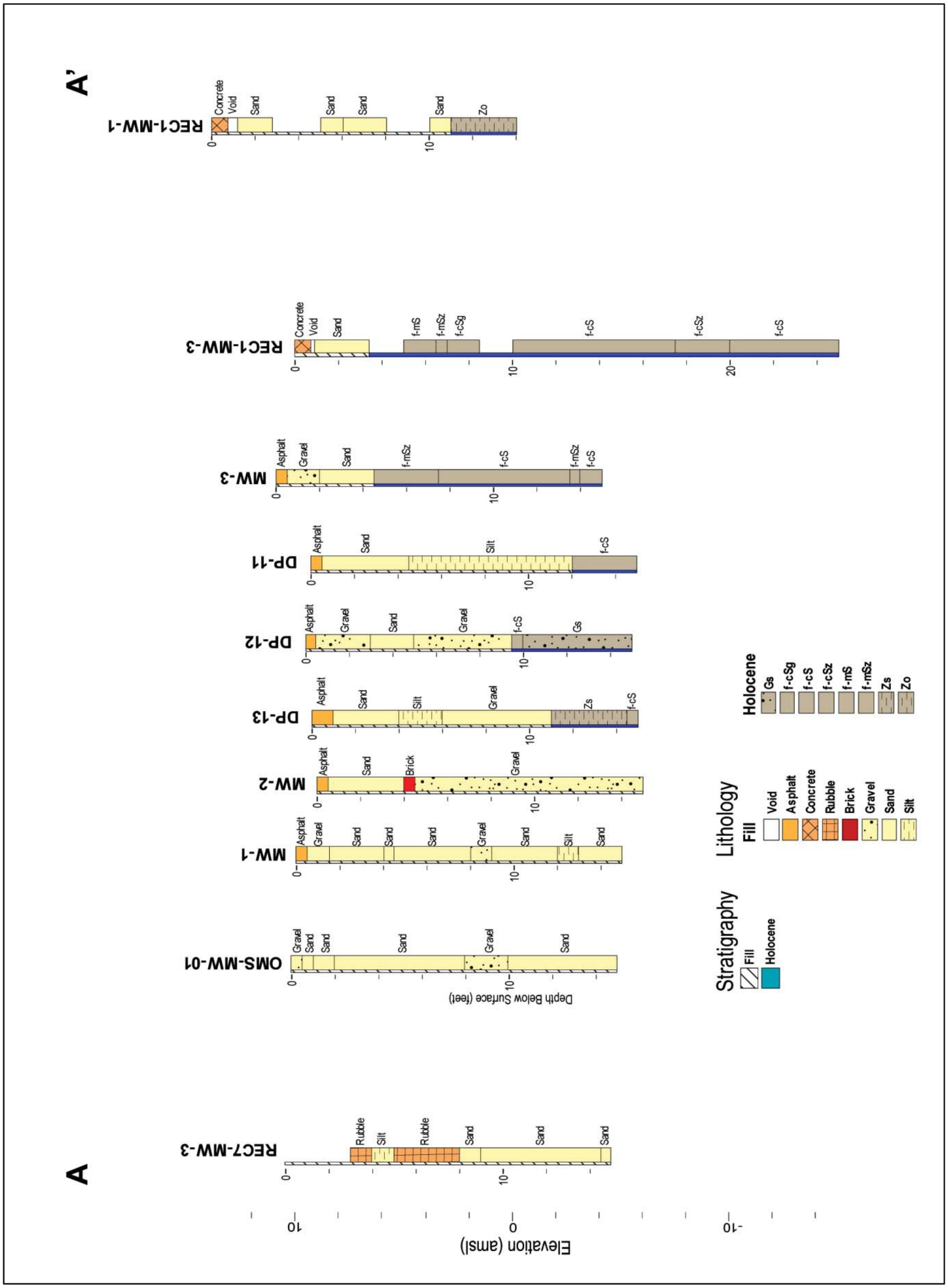


Figure 20. A-A' cross-section.

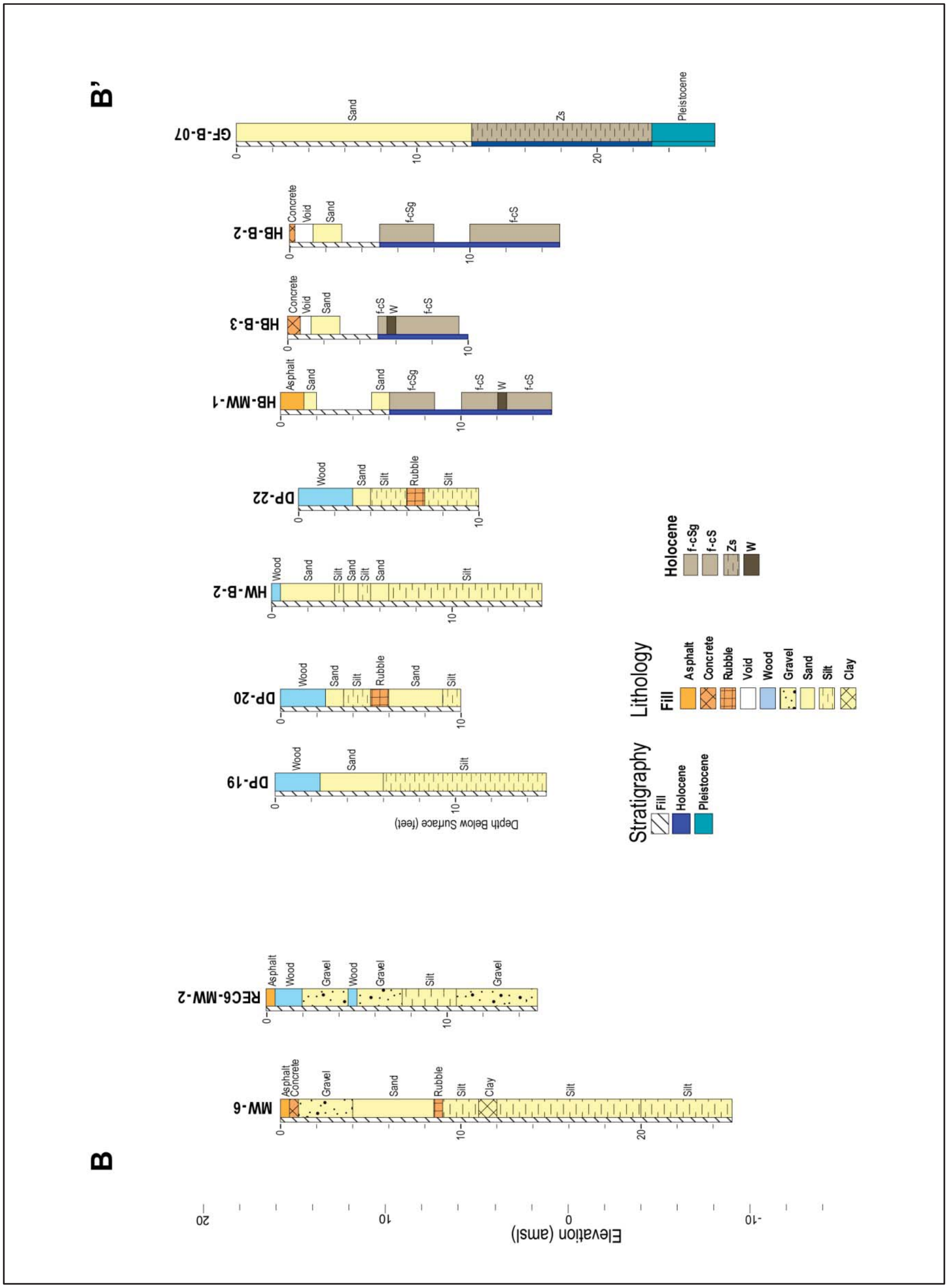


Figure 21. B-B' cross-section.

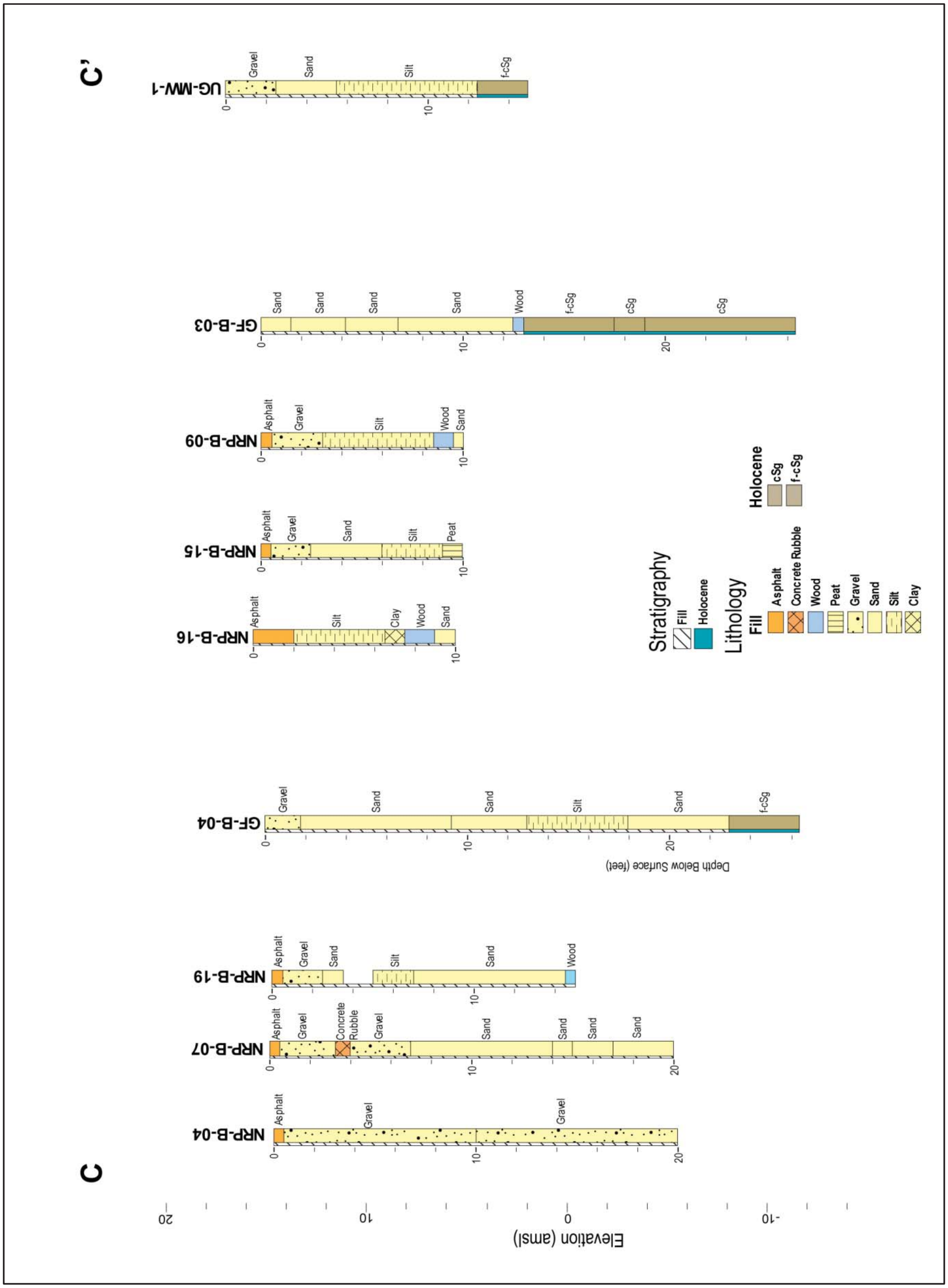


Figure 22. C-C' cross-section.

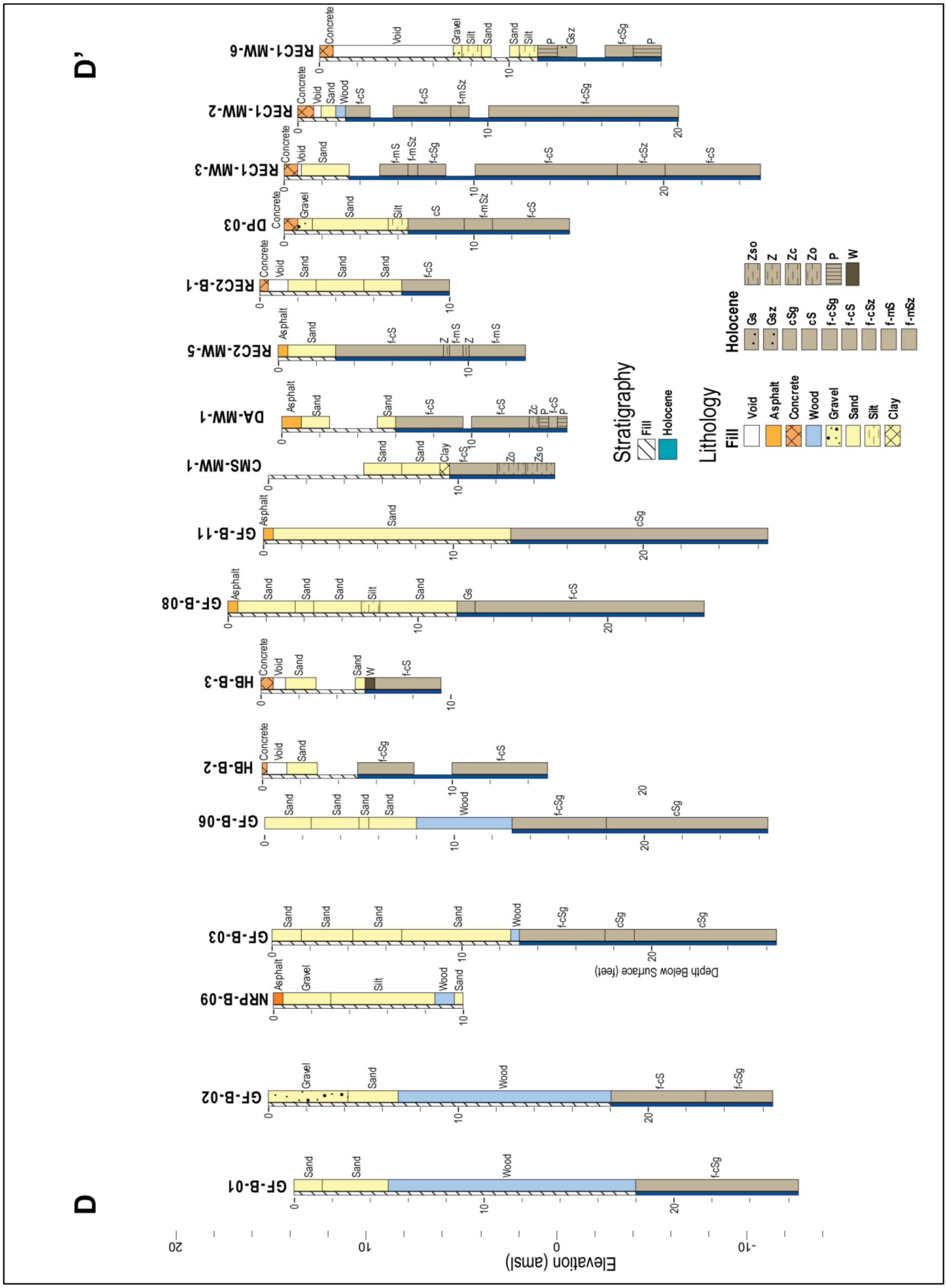


Figure 23. D-D’ cross-section.

Table 5. Typical Descriptions of the Historical Fill and Holocene-aged Lithofacies Recorded in Borings in the K-C WW Upland Area With Inferred Depositional Environments and Shorthand Nomenclature.

FILL LITHOFACIES	TYPICAL DESCRIPTION	
Asphalt	Asphalt; mainly at the ground surface.	
Brick	Bricks in a matrix of sand and gravels with other wood debris and plastic.	
Concrete	Concrete; mainly at the ground surface.	
Rubble	Concrete rubble in a matrix of silty, gravelly, sand.	
Peat	Dark brown peat with a large component of sawdust.	
Gravel	Grayish brown, sandy or silty, angular to sub-rounded, small to very large pebbles, sometimes with scattered shell fragments and dispersed cultural debris; commonly described as crushed rock.	
Sand	Brown to dark gray, usually gravelly, sometimes silty, fine to very coarse sand with iron oxide mottles, organic and woody debris, and scattered shell fragments; gravels range from very few to common, very small to large pebbles when present; silt is commonly concentrated in thin beds within the sand units when present; scattered historical cultural debris; highly variable deposit.	
Silt	Varies from black to brown to bluish gray, sometimes gravelly and usually sandy, silt with scattered organic and woody debris; gravels are few to common, sub-rounded to angular, small to large pebbles when present; sometimes with a significant amount of wood waste; rarely clayey.	
Clay	Dark gray to grayish green, usually silty, clay.	
Wood	Wood chips, sawdust, and wood waste.	
Void	Structural void space.	
HOLOCENE LITHOFACIES	**TYPICAL DESCRIPTION**	**INFERRED DEPOSITIONAL ENVIRONMENT**
Gs	Dark brownish gray, sandy, sub-rounded, small to large pebbles.	Beach or Upland
Gsz	Gray, sandy, silty, small to very large pebbles with many organic debris.	
cSg	Gray, gravelly, coarse to very coarse sand with few to common, rounded, very small to large pebbles; sometimes with few woody debris.	
cS	Gray, coarse to very coarse sand with a few pebbles.	
f-cSg	Gray, occasionally silty, gravelly, fine to very coarse sand; gravels are few to common, small to large pebbles; sometimes with few wood chips or shell fragments.	
f-cSzg	Dark brown, gravelly, very silty, fine to medium sand.	
f-cS	Black to dark gray to brown, sometimes silty, gravelly, fine to very coarse sand with a few small to large pebbles; sometimes with organic or woody debris and scattered shell fragments.	Backshore, Foreshore, or Beach
f-cSz	Gray, silty, fine to coarse sand with very few, very small pebbles; silt component commonly in the form of thin interbeds with small organic debris.	
f-mS	Brown to dark gray, fine to medium sand sometimes with very few, small to very large pebbles and scattered shells; sometimes slightly silty.	
f-mSz	Dark gray to gray, silty, fine to medium sand; usually with organic debris and shells.	
Zs	Black to dark gray, sandy silt; sometimes laminated and organic-rich; sometimes with very few, small pebbles; sand is usually fine- to medium-sized.	
Zso	Dark brown, fine to coarse sandy, organic-rich silt.	
Z	Brown or gray silt	Marsh, Backshore, or Sub-tidal delta
Zo	Dark brown peaty silt to organic-rich silt with woody debris.	
W	Wood.	
P	Brown fibrous peat.	
Zc	Gray clayey silt.	
LITHOFACIES BASED ON MODAL GRAIN SIZE	**SECONDARY PROPERTIES OF NATURAL DEPOSITS**	**MODIFIERS FOR SAND**
G – Gravel	g – gravelly	c – coarse
S – Sand	s – sandy	m – medium
Z – Silt	z – silty	f - fine
W – Wood	c – clayey	
P – Peat	o – organic-rich	

of the historical shoreline are mainly composed of thick sand layers with pockets of gravel and silt. Gravels are more common above about 6 fbs and silt is more common below about 6 fbs, suggesting the early sources of fill were from offshore dredging activities and the fill source later changed. Wood debris related to mill waste is also a common component in the fill west of the historical shoreline, especially in the top 15 feet of fill north of borehole HB-B-2, in the form of wood chips and sawdust (see Figure 18).

Layers of wood and sawdust were also called out as individual deposits in the borelogs. Other cultural materials identified as discrete deposits in the fill include bricks and concrete rubble. Brick in borehole MW-2 at 4 fbs, drilled along the historical average low water level, may relate to mill structures built by the Soundview Pulp Company. Nearby borelogs noted nails, tile, ceramics, charred wood, and slag in the sand between 4.5 and 6 fbs as well. Rubble is commonly found between 5 and 9 fbs in cores drilled west of the historical shoreline on what would have been the tideflats, or foreshore landform, prior to the 1930s. This rubble is probably related to dumping off of the piers rather than *in situ* structural debris. Rubble in borehole REC7-MW-3 at the west edge of property may relate to mill construction after about 1930 and rubble in borehole NRP-B-07 between 3 and 4 fbs could be part of the expanded Clark Nickerson Mill, as well.

The fill thickens from east to west, from about 10 to 23 feet (see Figure 19). Many cores did not sample deeply enough to characterize the base of the fill, especially west of the historic shoreline. The fill east of the historic shoreline is almost completely composed of sand, and is an average of 6 feet thick (varies from 2.5 to 12 feet). Void spaces are at the top of the fill east of the historical shoreline and they represent the empty space between current pile-supported floor slabs of structures that were drilled through and the underlying sedimentary fill. Units recorded as voids are not equivalent to samples with no recovery. Evidence of the squatters, buried mill materials or structures, and any other historic surfaces were generally absent from cores drilled on the beach and backshore portion of the shoreline that would have been the highest elevation land in the historical project area. One layer of wood at about 2 fbs in borehole REC-1-MW-2 could be related to the squatters or bath houses that were in the southern project area between 1902 and 1914 (see Appendix C, Maps 1, 2).

Holocene-age Deposits

The naturally deposited, or Holocene, facies types are also classified according to the modal grain-size of the depositional layer, indicated with a capital letter. Table 5 includes the shorthand nomenclature scheme used to categorize the naturally deposited sediments in the project area, as well as a list of secondary properties used to further describe those lithofacies. Glacial deposits below the Holocene sediment were not usually encountered in the shallow borings, but the brown, gravelly, silty, fine to coarse sand below 23 fbs at the base of borehole GF-B-07 and compact, gray, silty, fine to very coarse sand also below 23 fbs at the base of borehole GF-B-13 are probably glacial in origin.

A layer dominated by sand-sized sediments would be designated with the letter “S.” Secondary properties were designated by a lower-case letter appearing to the right of the capital letter. The lower case letters may represent secondary constituents of the depositional unit, or may be used as an additional descriptor term for the modal grain-size. For example, in the facies type f-mSz, “S” indicates that sand is the primary constituent; the “f-m” shows the sand ranges from fine to medium in texture, and the “z” signals silt as a secondary component. The 17 lithofacies in Table 5 relate to different sub-environments of Port Gardner, such as the sub-tidal delta, marsh, upland, beach, foreshore, and backshore. The borelogs include gravelly (Gs and Gsz), sandy (cSg, cS, f-cSg, f-cS, f-cSzg, f-cSz, f-mS, and f-mSz), silty (Zs, Zso, Z, Zo, and Zc), and organic (W and P) facies (Table 5).

Natural deposits below the fill across the project area are mostly composed of sand, mainly thick deposits of f-cS, cS, and f-mS that are sometimes silty (f-mSz and f-cSz) or gravelly (Gs, f-cSg, and cSg). The coarser deposits of sand and gravelly sand represent a beach environment, while the finer-grained sands suggest a foreshore or intertidal depositional environment. Beach sands and gravels are sometimes interbedded with deposits of natural wood (W). One layer of black, f-cS with scattered shell fragments below the fill from 12-15 fbs in DP-11 could represent a cultural deposit. The coarser deposits are concentrated north of borehole GFB-11, but are found across the project area too. Finer-grained sands and silts are concentrated south of borehole GFB-11, but are also distributed across the project area. Natural deposits are more variable along the intertidal zone where the sand deposits are interbedded with naturally deposited units of silt (Zs, Zso, Zo, Z, and Zc) and gravel (Gs and Gsz). Backshore sediments deposited along the far eastern edge of the property include silt (Zo) and peat (P) units. The natural deposits were not described in great detail on the geotechnical borelogs, so it is not possible to define any evidence for landslides or subsidence based on the existing data.

Other borehole data is available from the south end of the current project collected for ExxonMobil Environmental Services (AMEC 2010). The stratigraphy there is described as consisting of fill overlying recent marsh deposits and glacial sediment by the geotechnicians. Mixed beds of fill including layers of Sand, Silt, "Peat," and Wood extend to depths of between 20 and 27 fbs. The fill contains pockets of wood and brick debris up to 10 fbs. The fill deposits below an average of 20 fbs overlie a more homogeneous unit of Holocene-aged, organic-rich and clayey silt or a unit of medium sand. The more homogenous deposits beneath the fill were originally interpreted as part of the fill, however, AMEC (2010) state the silt and fine-grained sands are probably intertidal deposits. Materials that occur at depths greater than 27 fbs were interpreted to be Pleistocene-aged glacial deposits. Glaciers pre-date the arrival of humans to the region and therefore, only the very surface of a glacial deposit harbors potential for buried cultural materials. Similar stratigraphy is expected across the project area.

SENSITIVITY MODELING

The major goal of this assessment was to model the sensitivity for buried cultural resources within the K-C WW upland project area based on background research and existing geotechnical data. Geomorphic landforms defined in GIS provided the base-line data set for model building and evidence for historic development of the shoreline was overlain on top of the modeled pre-development coastline. Existing borehole data provides a third dimension of information allowing us to determine how deeply sensitivity for cultural resources extends and what types of archaeological resources might be present within depth ranges. Although the following results apply to the entire K-C WW upland area, specific formation and cultural histories are provided for the 11 areas slated for opportunistic cleanup, as excavation is imminent in those spots. Targeted site formation and cultural histories can be compiled relatively quickly for other specific locations within the K-C WW upland area in the future, if needed, now that the model has been constructed.

Landforms

Landforms act as the ideal base for the sensitivity map because, as related to the shoreline, the landforms in the project area represent availability for use and occupation. Landforms that are always underwater are assigned low sensitivity for buried cultural resources. Moderate sensitivity is given to landforms that are intertidal and were therefore used for resource procurement or other ephemeral activities. Landforms that are rarely inundated along the shoreline are assigned high sensitivity for buried cultural resources, as these would be the types of landforms past people would have lived or camped on and used for other activities, such as resource processing and cooking. Modern filling of the project area results in geologic maps that classify the lad as urban. So, bathymetric data from early historic maps was used to determine which portions of the project area were sub-tidal, intertidal, and sub-aerial. Sub-aerial landforms identified in the project area include the upland, beach, and backshore. Intertidal landforms in the project area are the foreshore, which includes the tideflats, and marsh. Finally, the delta front is the only sub-tidal landform identified in the K-C WW upland area.

Vicinities of alluvial fans and wetlands would have provided rich resources and potential camping areas during the early Holocene, while glacial terraces were the preferred landforms for occupation. During the middle Holocene, wetlands, the shoreline, and forested uplands would have been landforms on which resource procurement and temporary camping took place, and glacial uplands and creek mouths were the preferred locations for occupation. With the exception of glacial uplands, many of these landforms have been inundated by sea-level rise during the Holocene. The shoreline, especially sand spits and creek mouths, became the preferred landforms for occupation during the late Holocene. The following paragraphs introduce these landforms and discuss them in terms of potential to contain archaeological materials.

Snohomish River Delta

Deltas are complex estuarine and nearshore land systems that were highly productive for pre-contact people. The distal end of the Snohomish River delta is just north of the project area and most of the delta landform in the project vicinity is sub-tidal. The sub-tidal portion of the delta was used much less often by Native Americans than the sub-aerial portion [redacted]. Delta-front silts and sands supported marsh environments, as well as river channel distributaries, at the delta front. Topographically low areas between distributary tidal channels often consist of muddy floodplain sediment or marsh grasses and silt if they are not completely inundated. Littoral drift cells in Port Gardner push sediment-laden plumes of fresh water south from the mouth of the Snohomish River to distribute fine-grained alluvium along the shoreline (Mutti et al. 2000).

Marsh

Tidal marshes are wetlands dominated by herbaceous plant species, such as grasses, rushes, or reeds, at the ecotone between aquatic and terrestrial land systems. Marshes provide habitat for plant and animal species that have adapted to flooded conditions with low oxygen levels. Marshes were highly productive for pre-contact peoples providing saltwater and freshwater fish, shellfish, waterfowl, terrestrial mammals, and a range of plant species useful for technical, food, and medicinal purposes. Salt water marshes, like those at the mouth of the Snohomish River, are found along protected coastlines and they are tidally influenced each day. Salt marshes flourish where sediment collects faster than the rate of delta subsidence, as it did on the Snohomish delta until historic development. The slow currents in the Snohomish River estuary allowed the fine particles in suspension in the river to be trapped by the marsh vegetation and to drop. This way, the salt marshes on top of the delta allowed the delta to grow west into Port Gardner throughout the Holocene.

Foreshore

The foreshore, or intertidal zone, is the portion of a shoreline that is inundated at high tide and exposed at low tide. Tideflats occupy the foreshore where tidal action is moderate and plenty of sediment is available, like at the mouth of the Snohomish River. The surface of the tide flat gently slopes from the beach to the subtidal zone in deeper water. The tideflat surface is marked by meandering channels, typically created during ebbing flow. Tideflats support abundant and diverse resources important to Native Americans, such as shellfish, migratory birds, and plants like tule and cattail for making mats, stinging nettle for fiber for cordage and nets, as well as estuarine roots, rhizomes, and bulbs. Site types associated with the foreshore include weirs and traps made with posts and flexible withes. Temporary camps could be established seasonally on adjacent high ground. Beach foreshores that do not host extensive tideflats can also be important sources of resources, offering suitable substrates for formation of eelgrass beds and spawning grounds for various species of fish (Jackson et al. 2002).

Beach

Beaches are coastal accumulations of sediment, usually of clasts that are sand-sized or larger. The sediment from the beach buried in the K-C WW upland area derived from the Snohomish River delta and the bluffs to the east. The sediment was moved by tides and waves to form the beach after about 5,000 years ago (Johannessen and MacLennan 2007). Beaches have characteristic profile forms, which are determined by the steepness of the waves and the size of sediment (Downing 1983; Masselink and Hughes 2003; Thomas and Goudie 2000). Beaches are usually dry landforms, except during severe winter storms, so they were preferred for human use and occupation. Beaches provided easy access to the surrounding bay, marshes and tideflat resources and the upland where hunting and gathering also occurred. They also represent a high point in the shoreline topography that may have been utilized by Native Americans and early Euroamericans alike.

Backshore

The backshore is the supratidal portion of a beach that is usually only inundated during storms. A low ridge or berm usually separates the backshore from the beach berm (Elliott 1978). Backshore zones of beaches along the Puget Sound shores are usually narrow because the beaches are backed by bluffs and uplands rather than the dune fields that are typical of a wider coastal plain. Backshore zones can sometimes be inundated by fresh water if creeks draining the uplands flow along the bluff base. Wetlands will develop in wetter portions of the backshore, which would be attractive resource procurement locations for Native Americans. People could occupy the drier portions of the backshore environment and they would be protected from onshore winds and most waves. The east edge of the backshore in the project area appears to have been wet, according to historic maps (see Figure 4).

Upland

The bluffs ringing much of Puget Sound began forming shortly after the retreat of the continental glaciers, and in fact, most probably developed only after sea level began stabilizing about 5,000 years ago (Downing 1983; Shipman 2004). The bluff edges, and uplands behind, would have been available to inhabitants of the region beginning in the early Holocene. These areas may have supported camps of early hunter-gatherers who moved from location to location with little specialization in settlement type. These early camps would be characterized by Olcott or earlier style stone tools and fire modified rock (FMR) from campfires. Later users, more focused on the marine shoreline where fish, shellfish, and sea mammals could be found, were more likely to use the uplands and bluffs for special purposes, some related to resources like the cedar, game animals, berries, and other plants found there, as well as other purposes unrelated to subsistence, like burials. The project area marks a portion of the coastline where the bluffs are not extremely steep and the shoreline could have been accessed relatively easily from the upland.

The horizontal extent of the six historical landforms results in a model of the sensitivity for late pre-contact cultural resources in the project area. The applicability of the model is limited to the mid-Holocene and later because sea level variability before about 5,000 years ago did not allow development of productive littoral habitats. The resulting GIS map (Figure 24) depicts areas of high, medium, and low risk for finding pre-contact or very early historical period Native American archaeological sites. Highest risk areas, according to the model, are along the historic beach and sub-aerial landforms and the lowest potential for identification of sites is in areas that were historically inundated, like the sub-tidal delta. Moderate levels of risk for identification of pre-contact or very early historical period Native American archaeological sites is assigned to the intertidal zone, including the foreshore and marsh landforms, where human use was limited and sites are generally ephemeral in type. About half of the 11 opportunistic cleanup areas are on landforms with high sensitivity for buried resources. These are the Xylene UST 29/Latex Spill (2), GF 11 (8), Diesel AST Area (9), Bunker C ASTa (10), and Bunker C ASTb (11) proposed cleanup areas (Table 6). The Naval Reserve Parcel UST Area (1), Bunker C USTs71/72/73 (5), and Boiler/Baghouse Area (6) are on landforms with moderate sensitivity for buried cultural resources and the Rail Car Dumper Hydraulic System Building (3), Diesel UST 70 (4), and Heavy Duty Shop sump (7) are on the sub-tidal delta that has been assigned low sensitivity. There are no cleanup areas proposed on the upland.

Cultural materials associated with the earliest historical occupation of the project vicinity would also be along the shoreline on the beach or backshore landforms that were dry and available for use in the early 1860s. As marshland was reclaimed for agricultural use and drained the marshes became available for occupation as well. So, sensitivity for early historic cultural resources looks very similar to the sensitivity map for pre-contact cultural resources. Most of the earliest development in the vicinity was at the northeast edge of the project at the Robinson Mill, nearest areas 1 and 2. James Brigham settled at the far south end of the project and his cabin may have been as close as the foot of California Street, nearest areas 10 and 11 (see Figure 5).

Borehole data provides vertical limits to the sensitivity for buried historical cultural materials, as well as ground-truths information about the contents of the historic fill. For example, Cultural debris, such as brick and concrete fragments, woody debris, charred wood, slag, cinders, tile, ceramic fragments, and glass were described in the fill in MW-1, MW-2, DP-12, DP-13, DP-20, DP-22, GF9-MW-1, REC1-MW-9, REC7-MW-3, NRP-B-07, and UST70-B-2. Only one of these borings, NRP-B-7 is within one of the 11 proposed cleanup areas, in the Naval Reserve Parcel UST Area (1). The borehole data, in general, show deeper fill to the west where the project area was once part of Port Gardner and shallower fill to the east along the historical beach. Both the fill and underlying natural deposits are highly variable, so it is not possible to make broad generalizations about their nature for the entire project area. Instead, the stratigraphy will be characterized by proposed opportunistic cleanup area. Table 6 also describes the depth of the fill and the general stratigraphy of each opportunistic cleanup area, based on the borehole data. Sensitivity for buried cultural resources increases where fill is slightly shallower.

By overlaying the outline of the shoreline in 1886, and the shoreline with wharves in 1902, 1914, 1957, and 2013, we can observe a progression of waterfront development that generally trends from east to west and from north to south across the project vicinity. Areas where piers overlap, or where piers have been present since the shoreline was first developed, indicate areas that have not been dredged and where cultural materials would be preserved (Figure 25). Areas with the highest preservation potential are areas 1, and 8 through 11, which all have moderate to high potential for buried early historical and pre-contact cultural resources.

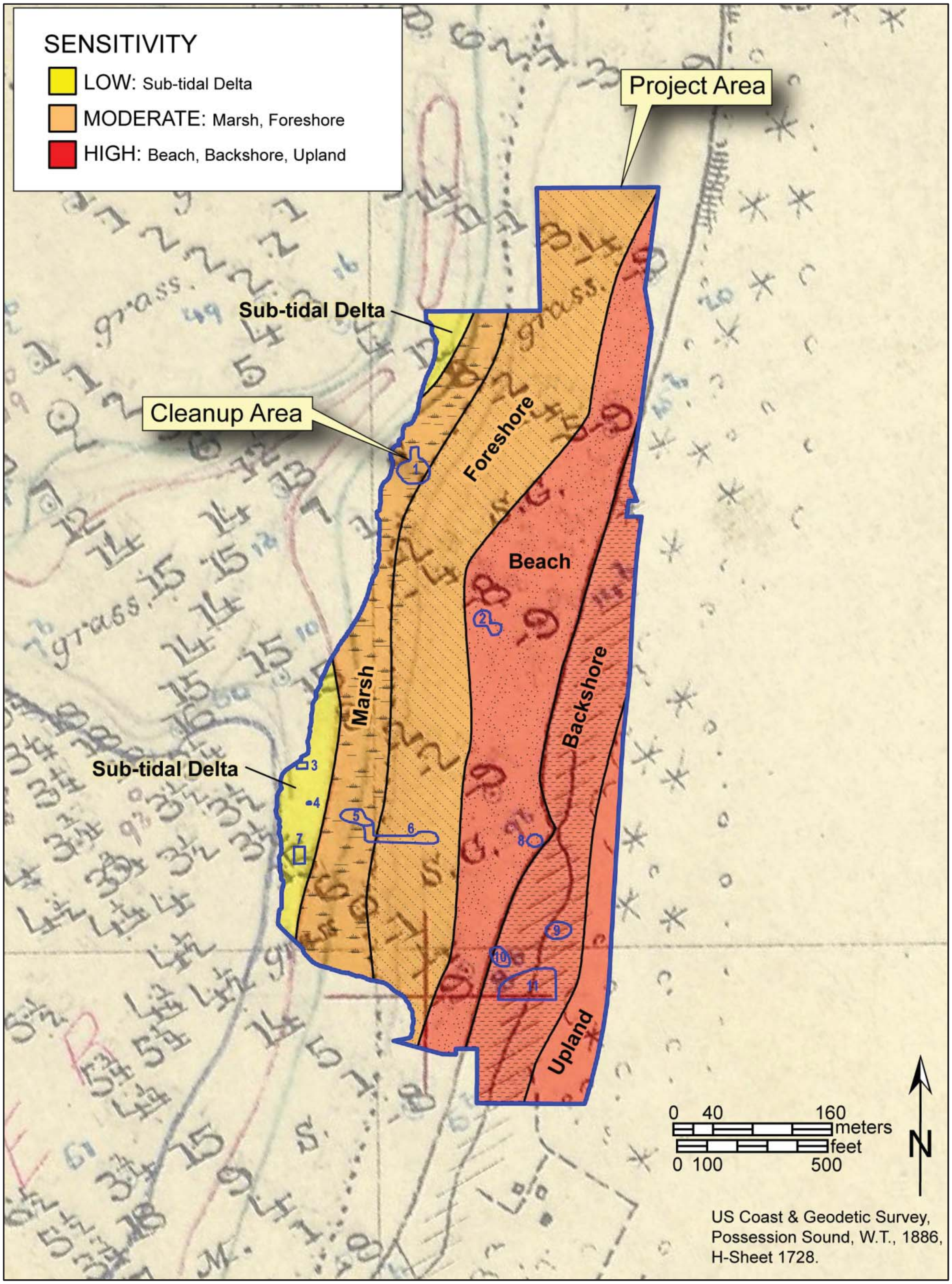


Figure 24. Areas of risk for finding pre-contact, early historical period Native American and early historical period archaeological sites, based on landforms and the historical shoreline.

Table 6. Sensitivity for Buried Cultural Resources by Cleanup Area With Summary of Fill and Holocene Stratigraphy Characteristics Based on Analyzed Borehole Data.

AREA NO.	NAME	LANDFORM	CHARACTER-IZATION OF NATURAL DEPOSITS	SENSITIVITY FOR PRE-CONTACT AND <1900 HISTORIC	EXPECTED DEPTH OF FILL	CHARACTER-IZATION OF FILL	SENSITIVITY FOR HISTORIC >1900
1	Naval Reserve Parcel UST Area	Marsh	Natural deposits not sampled	Moderate	Over 20 feet	Mixed fill to 7 fbs; Sand 7-15 fbs; Woody debris 15-17 fbs; Sand to 20 fbs	Moderate
2	Xylene UST 29/Latex Spill	Beach	Natural deposits not sampled	High	Over 12.5 feet	Gravels to 6 fbs; Silt 6-12.5 fbs	Low
3	Rail Car Dumper Hydraulic System Building	Sub-tidal Delta	Natural deposits not sampled	Low	Over 20 feet	No borings in area 3; Gravels expected near surface overlying Sand based on nearby borings	Low
4	Diesel UST 70	Sub-tidal Delta	Natural deposits not sampled	Low	Over 15 feet	Gravelly to 2.5 fbs; Sandy to 15 feet	Low
5	Bunker C USTs71/72/73	Marsh	Natural deposits not sampled	Moderate	Up to 30 feet	Wood chips and rubble 0-5 fbs; Gravel 5-12 fbs; Beds of Sand and wood chips 12-20 fbs; Sand to at least 30 fbs	Low
6	Boiler/ Baghouse Area	Marsh	Natural deposits not sampled	Moderate	Over 12 feet	Gravelly sand or silt 0-3 fbs; Wood and concrete 4-5 fbs	Low
7	Heavy Duty Shop sump	Sub-tidal Delta	Natural deposits not sampled	Low	Over 15 feet	No borings in area 7; Sand expected 0-15 fbs based on nearby borings	Low
8	GF 11	Beach	Pebbly sand with wood fragments 13-26.5 fbs	High	About 13 fbs	Sand 0-13 fbs	High
9	Diesel AST Area	Backshore	Bedded fine to coarse sand and silt 3-13 fbs; shells below 12.5 fbs	High	About3 fbs	Sand 0-3 fbs	High
10	Bunker C ASTa	Backshore	Gravelly coarse sand 10 - 26 fbs; overlying organic-rich silt to 31.5 fbs	High	About 10 fbs	Gravel 0-2; Sand 0-10	High
11	Bunker C ASTb	Backshore	Sometimes silty or peaty sand 8-12 fbs overlying gravelly sand to at least 20 fbs	High	Varies greatly from about 6 to 15 feet	A foot of gravel overlying Sand or Silt 5.5-8 fbs; Some rubble above 3 fbs; Wood at base of fill where it is deeper	High

Sanborn maps provide detail about the historical activities that occurred in the project area over time and they allow targeted expectations to be formulated on where certain types of sites might be within the project area (Table 7). Sanborn maps show areas where people may have dumped cultural debris off the piers or where concentrations of structural remains, artifacts of a certain type, or specific industrial materials might be identified. For example, the squatters housing along the shoreline south of the mill shown on the 1902 Sanborn maps present an opportunity to identify cultural materials related to residential and social themes dating to between 1902 and 1914 at the base of the historic fill. Foundations and related deposits of structures that are shown on both the 1914 and 1957 Sanborn maps might still be present just below the modern asphalt and concrete surfaces of the decommissioned mill today.

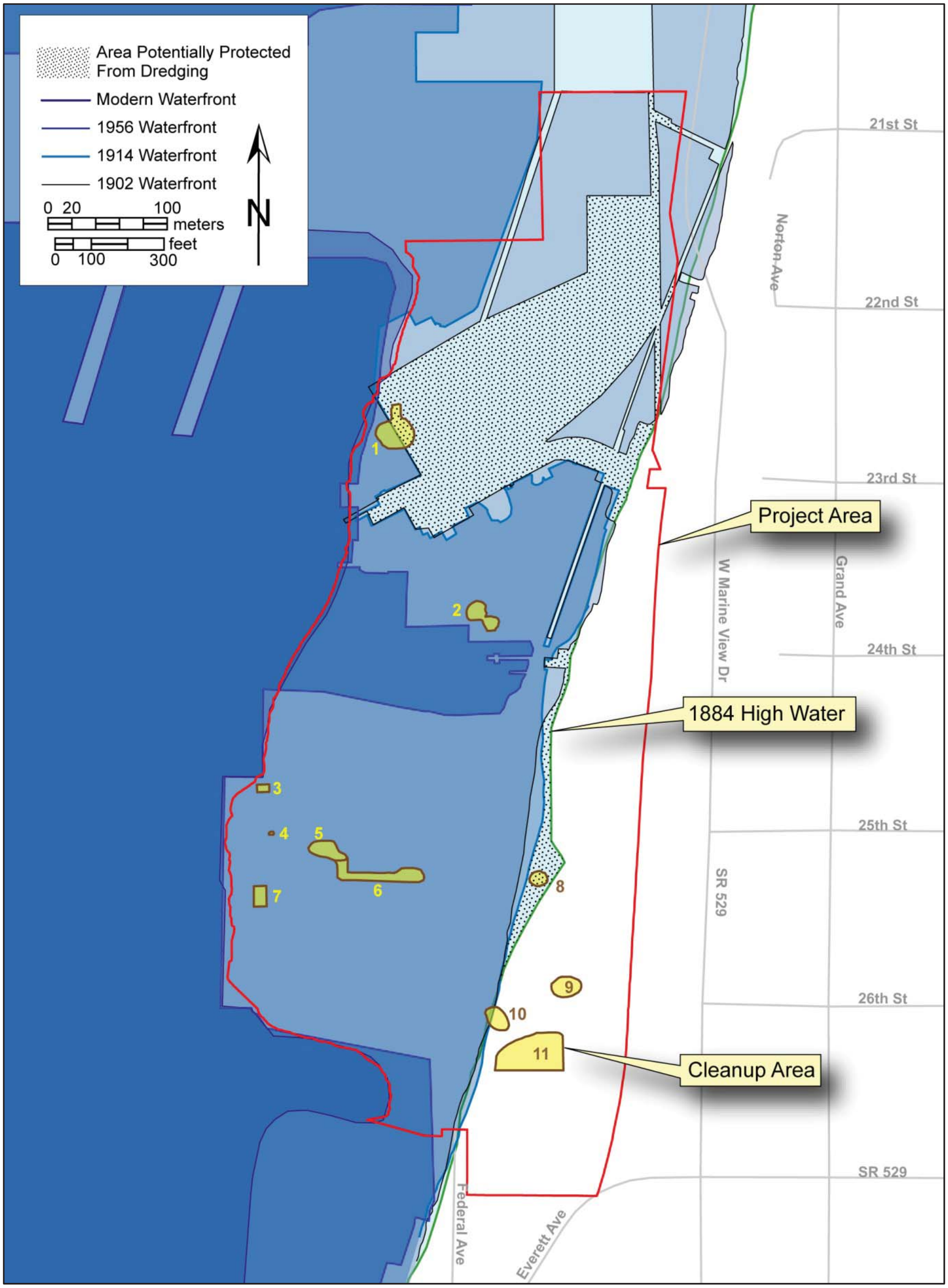


Figure 25. Map showing pre-fill shoreline and outlines of piers from historic maps from 1902, 1914, 1957 and 2013; shaded areas mark parts of the project area that have been protected from dredging.

Table 7. Historical Activities By Cleanup Area Over Time Based on Sanborn Maps and Sensitivity for Historical Cultural Resources Dating After 1900.

AREA NO.	1902	1914	1957
1	Clark-Nickerson Deep Water Dock	Clark-Nickerson Shipping Wharf	US Naval Reserve Training Center
2	Port Gardner/Beach	Port Gardner/Beach	Scott Paper Stock Tanks and pump near stock preparation area
3	Port Gardner	Port Gardner	Open wharf area near hog fuel pile; between slicer dock and Tractor shed at the Scott Paper Mill
4	Port Gardner	Port Gardner	Open wharf area near hog fuel pile; between slicer dock and Tractor shed at the Scott Paper Mill
5	Port Gardner/Salt marsh	Port Gardner/Salt marsh	Transit corridor for machines and mill waste between the Boiler and Paper Warehouse at the Scott Paper Mill
6	Port Gardner/Salt Marsh	Port Gardner/Salt Marsh	Sulphur storage, Burner, Cooler, and Digester Buildings of the Scott Paper Mill
7	Port Gardner	Port Gardner	Pulp warehouse of the Scott Paper Mill
8	Beach with Squatters Shacks	Beach just west of Nassau Road	Open wharf area between Scott paper office, the filter plant, the digester building, and the blow pits
9	Along backshore of beach with Squatters Shacks at the west edge of Nassau Road	Intersection of Nassau Rd and 26th Street	Open area at the northwest corner of the Scott paper General Warehouse headquarters
10	Beach and Backshore with Squatters Shacks	Open space just southeast of intersection between Federal Road and 26th Street; likely beach-like and sometimes wet.	Associated Oil Company Oil/Fuel Tank yard; below tanks
11	Along backshore of beach with Squatters Shacks	Open beach between Nassau and Federal roads	Associated Oil Company Oil/Fuel Tank yard; below tanks and near pumps

Sanborn maps can also be used to show where cultural materials would not be expected based on an absence of historic occupation or where more recent disturbance might have obscured archaeological evidence of earlier historic occupation. Table 7 shows a time-series catalog of culture history based on Sanborn information for each of the 11 opportunistic cleanup areas. These data correspond with the maps provided in Appendix C. Area 1 has moderate potential for buried historical resources and areas 8 through 11 have high potential for historical cultural resources. These results are similar to the sensitivity for buried pre-contact and early historical cultural materials and good preservation potential.

CONCLUSION AND RECOMMENDATIONS

The model of sensitivity for buried cultural resources in the K-C WW upland project area shows that potential is highest for both pre-contact Native American cultural resources and historical cultural materials along the pre-fill natural Port Gardner shoreline. The results are based on background research, historic maps, and existing geotechnical data. Although questions remain about precise locations of archaeological material within the K-C WW upland area, this overview has characterized areas of risk in a way that allows planning for future clean up. Above all, this assessment has shown the abundance of known resources and potential for cultural resources around the Port Gardner shoreline. In moving forward planners should take into account the locations and settings of known and suspected archaeological sites in the vicinity, as well as high and moderate risk areas within the project area, when designing cleanup procedures. Mitigation undertaken as a consequence of inadvertent discovery during implementation of cleanup can be costly and time consuming.

Excavation work associated with the interim cleanup actions will primarily occur in fill. It has already been determined that the cleanup actions will be observed by a geologist who will ensure the excavation does not extend below the fill and that a professional archaeologist will only be contacted to assess the find if a potential archaeological object is observed by the geologist. SWCA recommends this process be applied to areas assigned low to moderate risk for buried cultural resources and an Inadvertent Discovery Plan (IDP) should be devised for this work. Proposed cleanup areas with low to moderate sensitivity for cultural resources are the Naval Reserve Parcel UST Area (1), Rail Car Dumper Hydraulic System Building (3), Diesel UST 70 (4), Bunker C USTs71/72/73 (5), Boiler/Baghouse Area (6), and Heavy Duty Shop sump (7). SWCA also recommends an archaeological monitor be present to view any excavation below the fill in areas assigned low to moderate potential for buried cultural resources and that details of this process be defined in a Monitoring and Discovery Plan (M&DP).

SWCA recommends that an archaeologist be present to monitor interim actions in areas assigned high risk for buried cultural resources. Proposed cleanup areas with high sensitivity for cultural resources are the Xylene UST 29/Latex Spill (2), GF 11 (8), Diesel AST Area (9), Bunker C ASTa (10), and Bunker C ASTb (11) cleanup areas. Additional archaeological investigations are recommended in areas assigned high risk for buried cultural resources where cleanup investigations would breach the fill and penetrate the underlying natural sediment. In addition, appropriate Native American tribes should be contacted to inquire about traditional cultural resources and other areas of traditional value that could be affected by the proposed project and may not have been previously recorded by archaeologists.

In the event that construction activities reveal such resources and an archaeological monitor is not present during the construction work, the contractor should cease construction and follow the steps defined in the IDP. If any construction activities encounter human remains, whether burials, isolated teeth, bones, or mortuary items, work in that area should stop immediately and the area surrounding the discovery should be secured.

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APPENDIX A: CORRESPONDENCE

APPENDIX A HAS BEEN REDACTED

APPENDIX B: CORE LOG SUMMARY

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
AP-MW-1	558440.324	5314929.122	Fill	0	0.5	Asphalt	Asphalt.
				0.5	6.5	Sand	Brown to dark gray, fine to medium sand with very few pebbles; moist; iron-oxide-gray mottles and scattered shells and organic debris.
			Holocene	6.5	8.5	f-mSz	Dark gray, silty, fine to medium sand; wet; scattered organic debris and shells; many organics and shells between 8 and 8.5 fbs.
				8.5	15	f-cS	Dark gray, fine to very coarse sand with very few pebbles.
Boiler-MW-1	558322.106	5314877.542	Fill	0	0.7	Concrete	Concrete.
				0.7	2	Silt	Dark gray, sandy, gravelly, silt; numerous organic debris; moist; petroleum-like odor.
				2	3.8	Sand	Dark gray, gravelly, fine to medium sand; moist; slight petroleum-like odor.
				5	9	Sand	Dark gray, coarse sand with faint petroleum-like odor; moist.
				10	14	Sand	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small pebbles; wet; visible separate phase product and strong petroleum-like odor at 12 fbs.
				15	20	Sand	Gray, coarse to very coarse sand with very few, very small pebbles; wet; numerous shell fragments.
CMS-MW-1	558511.368	5314815.391	Fill	5	7	Sand	Dark gray, slightly silty, fine to medium sand; wet.
				7	9	Sand	Dark gray, fine to coarse sand with very few, small to large pebbles; wet.
				9	9.5	Clay	Dark gray, silty clay; wet.
			Holocene	9.5	12	f-cS	Dark gray, fine to coarse sand with few, small to large pebbles; wet.
				12	13.5	Zo	Dark brown, organic-rich silt; peat-like; wet.
				13.5	15	Zso	Dark brown, fine to coarse sandy, organic-rich silt; wet.
DA-MW-1	558511.66	5314781.801	Fill	0	1	Asphalt	Asphalt.
				1	2.5	Sand	Dark gray, gravelly, very silty, fine to medium sand; moist.
				5	6	Sand	Dark gray, gravelly, very silty, fine to medium sand; wet; plastic sheeting at 6 fbs.
			Holocene	6	9.5	f-cS	Dark gray, fine to coarse sand with very few, scattered pebbles; wet.
				10	13	f-cS	Dark gray, fine to coarse sand with very few, scattered pebbles; wet.
				13	13.5	Zc	Gray, clayey silt; wet.
				13.5	14	P	Brown, fibrous peat; wet.
				14	14.5	f-cS	Brownish gray, fine to medium sand with common to many organic debris; wet.
				14.5	15	P	Brown, fibrous peat; wet.
DP-03	558485.448	5314704.175	Fill	0	0.75	Concrete	Concrete, 9 inches thick.
				0.75	1.5	Gravel	Brown, sandy, angular, small to large pebbles; wet.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				1.5	5.5	Sand	Brown to gray, silty, gravelly, fine to coarse sand; wet; wood at 4 fbs; strong petroleum-like odor.
				5.5	6.5	Silt	Black silt.
			Holocene	6.5	9.5	cS	Gray, coarse to very coarse sand with very few, scattered pebbles; wet.
				9.5	11	f-mSz	Dark gray, silty, fine to medium sand; wet.
				11	15	f-cS	Gray, fine to coarse sand with very few, scattered pebbles; wet.
DP-11	558411.289	5314693.101	Fill	0	0.5	Asphalt	Asphalt.
				0.5	4.5	Sand	Brown to dark brown, gravelly, fine to coarse sand; very moist.
				4.5	12	Silt	Dark gray, silt with scattered woody debris; wet; slight hydrogen sulfide odor.
			Holocene	12	15	f-cS	Black, fine to coarse sand with scattered shell fragments; wet; hydrogen sulfide odor.
DP-12	558397.478	5314694.045	Fill	0	0.5	Asphalt	Asphalt.
				0.5	3	Gravel	Brown, very silty, pebbles with a trace of sand; moist.
				3	5	Sand	Brown, gravelly, fine to coarse sand; moist; contains burnt and melted plastic and charred brick.
				5	9.5	Gravel	Brown, very silty, sub-angular, small to large pebbles; contains charred brick and burnt and melted plastic between 5 and 8 fbs.
			Holocene	9.5	10	f-cS	Black, fine to coarse sand; wet.
				10	15	Gs	Dark brown to dark gray, very sandy, sub-rounded, small to large pebbles; wet; hydrogen sulfide odor at 14 fbs.
DP-13	558385.311	5314698.949	Fill	0	1	Asphalt	Asphalt.
				1	4	Sand	Brown, very gravelly, fine to coarse sand; very moist.
				4	6	Silt	Dark brown, silt with few pebbles; very moist.
				6	11	Gravel	Brown, very silty, sub-angular, small to large pebbles; wet; contains firebrick, ceramic and wood fragments.
			Holocene	11	14.5	Zs	Dark gray to black, sandy silt; wet.
				14.5	15	f-cS	Black, fine to coarse sand; wet; trace of silt.
DP-18	558349.088	5315040.737	Fill	0	2.5	Wood	Wood chips.
				2.5	10	Silt	Gray, sandy, gravelly, silt; gravels are common, sub-rounded, small to large pebbles.
DP-19	558404.633	5315054.31	Fill	0	2.5	Wood	Wood chips.
				2.5	6	Sand	Gray, very silty, fine to medium sand with few, small to large pebbles; moist.
				6	15	Silt	Gray to bluish gray, silt with few pebbles.
DP-20	558421.516	5315028.792	Fill	0	2.5	Wood	Wood chips.
				2.5	3.5	Sand	Gray, gravelly, silty, fine to medium sand; moist.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				3.5	5	Silt	Dark gray, gravelly, sandy silt; moist.
				5	6	Rubble	Concrete rubble.
				6	9	Sand	Black, gravelly, silty, fine to medium sand; wood chips at 7 fbs; wet.
				9	10	Silt	Brown, sandy silt; wet.
DP-22	558469.126	5315013.547	Fill	0	3	Wood	Wood chips.
				3	4	Sand	Gray, very silty, fine to medium sand; moist.
				4	6	Silt	Dark gray, sandy, gravelly silt; moist.
				6	7	Rubble	Concrete rubble.
				7	10	Silt	Mottled gray and brown, sandy silt; moist.
GF9-MW-1	558429.183	5314984.615	Fill	0	0.5	Asphalt	Asphalt.
				0.5	1.5	Sand	Brown, gravelly, very silty, fine to medium sand; moist.
				1.5	3.5	Sand	Brown, gravelly, fine to coarse sand with brick debris; moist.
				5	6.5	Sand	Dark gray and brown, gravelly, fine to coarse sand; wet.
				6.5	9	Sand	Dark gray, very silty, fine to coarse sand; wet.
				10	12	Sand	Dark gray, silty, fine to coarse sand; wet.
				12	15	f-cS	Dark gray, slightly silty, fine to coarse sand; wet.
GF-B-01	558549.941	5315414.397	Fill	0	1.5	Sand	Gray, slightly silty, gravelly, fine to very coarse sand; gravels are common, very small to large pebbles; loose; slightly moist.
				1.5	5	Sand	Gray, silty, fine to medium sand; loose; moist to wet.
				5	18	Wood	Wood chips; becomes loose below 8 fbs and very loose below 11 fbs.
			Holocene	18	26.5	f-cSg	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small pebbles; very loose; wet; trace of silt.
GF-B-02	558508.19	5315350.092	Fill	0	4.2	Gravel	Silty gravel.
				4.2	6.8	Sand	Black, silty, fine to medium sand; wet; moderately compact.
				6.8	18	Wood	Wood chips.
			Holocene	18	23	f-cS	Gray, fine to coarse sand with trace of silt; very loose; wet.
				23	26.5	f-cSg	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small pebbles.
GF-B-03	558523.561	5315231.763	Fill	0	1.5	Sand	Gray, gravelly, fine to very coarse sand; gravels are common to many, rounded, small to very large pebbles; loose; slightly moist.
				1.5	4.2	Sand	Gray, fine to medium sand; "clean"; moist; loose.
				4.2	6.8	Sand	Gray, silty, fine to very coarse sand with very few pebbles and woody debris.
				6.8	12.5	Sand	Gray, slightly silty, fine to medium sand; loose; wet; gradual lower boundary.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				12.5	13	Wood	Wood chips.
			Holocene	13	17.5	f-cSg	Gray, gravelly, fine to very coarse sand with very few, scattered wood chips; very loose; wet.
				17.5	19	cSg	Gray, gravelly, coarse to very coarse sand; gravels are few to common, very small pebbles; very loose; wet.
				19	26.5	cSg	Gray, gravelly, coarse to very coarse sand; gravels are few to common, very small pebbles; very loose, becoming compact below 25 fbs; wet.
GF-B-04	558432.762	5315244.419	Fill	0	1.8	Gravel	Grayish brown, slightly silty, slightly sandy, gravel; slightly moist.
				1.8	9.25	Sand	Gray, silty, fine to medium sand; loose; moist.
				9.25	13	Sand	Gray, fine to coarse sand with trace of silt; very loose; wet.
				13	18	Silt	Interbedded gray, sandy silt and silty, fine to coarse sand; soft; wet.
				18	23	Sand	Gray, silty, fine to coarse sand with wood chips; very loose; wet.
			Holocene	23	26.5	f-cSg	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small pebbles; trace of silt; loose; wet.
GF-B-05	558389.354	5315141.537	Fill	0	1.8	Sand	Gray, gravelly, fine to coarse sand; loose; slightly moist.
				1.8	5.5	Sand	Fine to coarse sand with few pebbles and coarse sand; loose; very moist.
				5.5	11.5	Sand	Coarse to very coarse sand with few pebbles; very loose; wet; shells present below 8 fbs; organic or slight hydrocarbon odor at 8 fbs; trace of silt at 10 fbs.
				11.5	14.5	Sand	Gravelly, coarse to very coarse sand; gravels are common, very small pebbles; contains shells.
				14.5	15.5	Sand	Silty, fine to medium sand with woody debris; very loose.
				15.5	23	Sand	Gray, coarse to very coarse sand with trace organics; moderately compact; wet; organic or slight hydrocarbon odor.
				23	26.5	Gravel	Gravelly, coarse sand to coarse sandy, very small pebbles with very few shells; slight organic or hydrocarbon odor.
GF-B-06	558519.817	5315063.666	Fill	0	2.5	Sand	Gray, very gravelly, fine to coarse sand; gravels are very many; loose; slightly moist; slightly musty odor.
				2.5	5	Sand	Gray, fine to coarse sand with trace of silt; moderately compact; slightly moist.
				5	5.5	Sand	Gravelly, coarse to very coarse sand; gravels are few to common, very small pebbles; loose; wet.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				5.5	8	Sand	Gray, gravelly, coarse to very coarse sand; gravels are few to common, very small pebbles; loose; slightly moist; trace of silt; becomes moderately compact near 7.5 fbs.
				8	13	Wood	Wood chips.
			Holocene	13	18	f-cSg	Gravelly, fine to coarse sand; loose; wet; trace of silt/clay.
				18	26.5	cSg	Gray, gravelly, coarse sand to coarse sandy, rounded, small to very large pebbles; wet; moderately compact; trace woody debris.
GF-B-07	558570.694	5314998.645	Fill	0	13	Sand	Brown, slightly silty, gravelly, fine to very coarse sand; gravels are few to common, very small to large pebbles; very loose; moist to wet; becomes gray with trace silt below 6 fbs; common to many woody debris below 10 fbs.
			Holocene	13	23	Zs	Gray, sandy silt with laminae of reddish brown, organic-rich silt; soft; wet; becomes very stiff below 21 fbs.
			Pleistocene	23	26.5	Pleistocene	Brown, silty, fine to coarse sand with very few pebbles; diamict fabric present; compact; wet.
GF-B-08	558508.404	5314935.195	Fill	0	0.5	Asphalt	Asphalt.
				0.5	3.5	Sand	Gray, gravelly, silty, fine to coarse sand; moist.
				3.5	4.5	Sand	Brown, gravelly, coarse to very coarse sand; gravels are few to common, very small pebbles.
				4.5	7	Sand	Brown, fine to medium sand with iron staining.
				7	8	Silt	Dark gray, very sandy, silt and very silty, sand; very moist.
				8	12	Sand	Brown to gray, gravelly, fine to coarse sand, fining upwards; gravels are few to common, very small pebbles; wet.
			Holocene	12	13	Gs	Gray, sandy, small to large pebbles; wet.
				13	25	f-cS	Gray, fine to coarse sand with few pebbles; wet; many woody debris at 14 fbs; becomes mostly coarse sand below 20 fbs; slight hydrogen sulfide odor at 23 fbs.
GF-B-10	558301.411	5314948.696	Fill	0	2	Concrete	Concrete.
				2	4.5	Sand	Brownish gray, silty, fine to medium sand; loose; moist.
				4.5	5	Silt	Brown, sandy silt; moist; moderately compact.
				5	6.8	Sand	Gray, silty sand; loose; moist.
				6.8	8	Silt	Brown, sandy silt; wet; compact.
				8	20	Sand	Gray, gravelly, coarse to very coarse sand; gravels are few to common, very small pebbles; loose; wet; trace of silt.
			Holocene	20	23	f-cS	Fine to coarse sand; very loose.
				23	26.5	f-cSz	Gray, silty, fine to coarse sand with very few, very small pebbles; moderately compact; wet.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
GF-B-11	558495.264	5314852.948	Fill	0	0.5	Asphalt	Asphalt.
				0.5	13	Sand	Black to dark gray, silty, fine to medium sand; charcoal odor; loose; becomes fine to coarse and wet below 10 fbs.
			Holocene	13	26.5	cSg	Gray, gravelly, coarse sand; gravels are few to common, very small pebbles; moderately compact; wet; gravels increase, with layer of wood chips 1 inch thick at 20 fbs; trace of silt and fine sand, common wood fragments at 25 fbs.
GF-B-12	558361.815	5314831.065	Fill	0	0.5	Asphalt	Asphalt.
				0.5	7	Sand	Mottled brownish orange, slightly silty, gravelly, fine to coarse sand.
				7	10	Silt	Dark gray, very (fine to medium) sandy, silt; wet; wood at 8.5 fbs.
GF-B-13	558550.526	5314797.836	Fill	0	6.8	Sand	Grayish brown, slightly silty, gravelly, fine to very coarse sand; gravels are common to many, angular, very small to very large pebbles; loose; moist.
			Holocene	6.8	9.2	f-cS	Fine to coarse sand with few, very small pebbles and shell fragments; loose; wet.
				9.2	11	f-cSg	Gravelly, fine to very coarse sand with shell fragments; gravels are few to common, very small pebbles; poorly-sorted; loose to very loose; wet; wood chips or debris between 12 and 13 fbs.
				11	14	f-cS	Fine to very coarse sand with very few, very small pebbles; poorly sorted.
				14	23	f-cS	Slightly silty, fine to very coarse sand with shell fragments and very few, scattered, very small pebbles; very loose; slight sulfide odor.
			Pleistocene	23	25.5	Pleistocene	Gray, very silty, fine to very coarse sand; very compact; wet; diamict fabric.
GF-B-14	558457.719	5314741.026	Fill	0	2	Sand	Brown, sometimes silty, gravelly, fine to coarse sand; gravels are few to common, very small to large pebbles; petroleum-like odor; very loose; slightly moist.
				2	6.8	Sand	Gray, fine to medium sand with trace shells; faint petroleum-like odor.
			Holocene	6.8	23	f-cSg	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small to large pebbles; very loose; wet; becomes moderately compact below 10.5 fbs; compact below 20 fbs.
				23	26	cSg	Gray, gravelly, coarse to very coarses sand; gravels are few to common, very small pebbles; wet; compact.
				26	26.1	Zo	Organic-rich silt with woody debris; 0.5 inch thick.
				26.1	31.5	Z	Brown silt; very soft; wet; slight hydrogen sulfide odor.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
GF-B-15A	558403.407	5314674.63	Fill	0	13	Sand	Brown, gravelly, fine to coarse sand with few building debris; gravels are few to common, very small to very large pebbles; wet; moderately compact; very loose below 5 fbs; gray to black below 10 fbs.
				13	18	Gravel	Black, slightly silty, gravel; wet; moderately compact.
			Holocene	18	28	f-cS	Dark gray to black, slightly silty, fine to coarse sand with trace shell fragments; few, very small to small pebbles below 25 fbs; very loose; wet.
				28	31.5	f-cSg	Gray, gravelly, fine to coarse sand with very few shell fragments; gravels are few to common, very small to large pebbles; trace of silt; very compact; wet.
HB-B-2	558549.459	5315028.561	Fill	0	0.3	Concrete	Concrete.
				0.3	1.3	Void	Empty void.
				1.3	2.9	Sand	Brown, slightly silty, gravelly, fine to coarse sand; moist.
			Holocene	5	8	f-cSg	Brown, gravelly, fine to coarse sand; trace of silt; moist to wet; color becomes brown to black below 6.5 fbs.
				10	15	f-cS	Dark brown to black, fine to coarse sand with few pebbles and trace of silt; wet.
HB-B-3	558528.739	5315014.26	Fill	0	0.7	Concrete	Concrete.
				0.7	1.3	Void	Empty void.
				1.3	2.9	Sand	Brown, fine to medium sand with very few pebbles; becomes fine to coarse sand at 2.5 fbs; moist.
			Holocene	5	5.5	f-cS	Brown, fine to coarse sand with very few pebbles; wet.
				5.5	6	W	Wood.
				6	9.5	f-cS	Brown, fine to coarse sand with very few pebbles; wet.
HB-MW-1	558507.404	5315027.084	Fill	0	1.3	Asphalt	Asphalt.
				1.3	2	Sand	Brown, slightly silty, fine to coarse sand with few pebbles; moist.
				5	6	Sand	Brown, fine to coarse sand with few pebbles and brick fragments; moist.
			Holocene	6	8.5	f-cSg	Black, slightly silty, gravelly, fine to coarse sand; gravels are common, small to large pebbles; wet.
				10	12	f-cS	Dark gray, fine to coarse sand with few, small to large pebbles; wet.
				12	12.5	W	Wood.
				12.5	15	f-cS	Gray, fine to coarse sand with few, small to large pebbles; wet.
HW-B-2	558458.965	5315044.854	Fill	0	0.5	Wood	Wood chips.
				0.5	3.5	Sand	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small to large pebbles; very moist.
				3.5	4	Silt	Dark brown, gravelly, sandy silt; moist.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				4	4.8	Sand	Gray, gravelly, fine to very coarse sand; gravels are common, very small to large pebbles; wet.
				4.8	5.5	Silt	Dark brown, sandy silt; wet.
				5.5	6.5	Sand	Gray, gravelly, fine to very coarse sand; gravels are common, very small to large pebbles; wet.
				6.5	15	Silt	Gray, gravelly, sandy silt with scattered wood and organic debris; wet; becomes slightly clayey below 9 fbs.
MW-1	558353.754	5314709.511	Fill	0	0.5	Asphalt	Asphalt with gravel.
				0.5	1.5	Gravel	Brown to gray, silty, sandy, subrounded, small to very large pebbles; very moist; 2-inch thick bed of organic debris at 1 fbs.
				1.5	4	Sand	Brown, gravelly, fine to coarse sand; gravels are common, small to very large pebbles; very moist.
				4	4.5	Sand	Brown, very silty, fine to medium sand; very moist.
				4.5	8	Sand	Brown, fine to coarse sand with fill debris (charred wood, nails, ceramic fragments, black, and orange debris) between 4.75 and 6 fbs; very moist.
				8	9	Gravel	Gray, very sandy, rounded, small to large pebbles; wet.
				9	12	Sand	Gray, fine to coarse sand; wet.
				12	13	Silt	Gray, sandy silt; wet.
				13	15	Sand	Gray, fine to coarse sand with common silt laminae; wet.
MW-2	558371.086	5314700.402	Fill	0	0.5	Asphalt	Asphalt.
				0.5	4	Sand	Gray to brown, gravelly, fine to coarse sand; very moist.
				4	4.5	Brick	Debris including brick, wood and plastic.
				4.5	15	Gravel	Brown to gray, slightly sandy, very silty, sub-rounded, small to very large pebbles with historic debris including brick, plastic, tile/ceramics, wood; wet; becomes black below12 fbs.
MW-3	558440.108	5314702.097	Fill	0	0.5	Asphalt	Asphalt.
				0.5	2	Gravel	Gray, sandy, silty, sub-rounded, small to very large pebbles; very moist.
				2	4.5	Sand	Gray, fine to coarse sand with few, small to very large pebbles; wet.
			Holocene	4.5	7.5	f-mSz	Dark gray, silty, fine to medium sand with many shell fragments; wet.
				7.5	13.5	f-cS	Gray, fine to coarse sand; wet.
				13.5	14	f-mSz	Gray, silty, fine to medium sand; wet.
				14	15	f-cS	Gray, fine to coarse sand with few, small to large pebbles; wet.
MW-5	558366.856	5315260.038	Fill	0	1	Sand	Grass over topsoil.
				1	3	Silt	Brown to gray, fine to medium sandy, silt; very moist.
				3	11	Silt	Dark gray, sandy, gravelly silt; very moist.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				11	13	Silt	Organic-rich silt with many woody and organic debris: wet.
				13	15	Sand	Dark gray, fine to coarse sand with many shells and woody debris; wet.
MW-6	558315.292	5315053.852	Fill	0	0.5	Asphalt	Asphalt.
				0.5	1	Concrete	Concrete.
				1	4	Gravel	Dark gray, sandy, sub-rounded to angular, small to very large pebbles; moist.
				4	8.5	Sand	Dark gray, fine to medium sand with few shell fragments; moist.
				8.5	9	Rubble	Concrete rubble.
				9	11	Silt	Gray, slightly sandy, silt with few, small to large pebbles; moist.
				11	12	Clay	Grayish green, clay; moist.
				12	20	Silt	Gray, fine to medium sandy, silt with few, small to very large pebbles; moist; becomes wet below 16 fbs; wood debris at 17.5 fbs.
				20	25	Silt	Gray to dark gray, gravelly silt; wet.
NRP-B-04	558370.987	5315238.504	Fill	0	0.5	Asphalt	Asphalt.
				0.5	10	Gravel	Gray, sandy, angular, small to very large pebbles; trace to slightly silty; moist.
				10	20	Gravel	Gray, silty, angular, small to very large pebbles; wet; faint petroleum-like odor; rainbow sheen between 15 and 20 fbs.
NRP-B-07	558376.979	5315237.88	Fill	0	0.5	Asphalt	Asphalt, post-holed to 1 fbs due to utilities.
				0.5	3.25	Gravel	Brown, silty, sandy, angular, small to large pebbles; moist.
				3.25	4	Rubble	Concrete rubble.
				4	7	Gravel	Very silty, very sandy, angular, small to very large pebbles; few small cobbles; moist.
				7	14	Sand	Gray, fine to coarse sand; very moist; strong petroleum-like odor; heavy rainbow and bleb sheen; many organic debris at 9 fbs.
				14	15	Sand	Dark gray, very silty, fine to medium sand; wet.
				15	17	Sand	Gray, fine to medium sand; trace organics; wet.
				17	20	Sand	Dark gray, very silty, fine to medium sand; wet; wood at 19.75 fbs.
NRP-B-09	558508.069	5315247.218	Fill	0	0.5	Asphalt	Asphalt.
				0.5	3	Gravel	Brownish gray, sandy, angular gravel; crushed rock; moist.
				3	8.5	Silt	Dark gray, fine to medium sandy, silt; moist.
				8.5	9.5	Wood	Wood.
				9.5	10	Sand	Dark gray, fine to coarse sand; wet.
NRP-B-15	558495.378	5315234.536	Fill	0	0.5	Asphalt	Asphalt.
				0.5	2.5	Gravel	Light gray, angular pebbles; crushed rock; moist.
				2.5	6	Sand	Dark gray, very silty, fine to medium sand; moist.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				6	9	Silt	Gray, sandy silt; wet.
				9	10	Peat	Dark brown, peat; wet; (may be sawdust from mill).
NRP-B-16	558486.855	5315239.941	Fill	0	2	Asphalt	Asphalt, crushed rock and gravel.
				2	6.5	Silt	Dark gray, slightly sandy, silt; moist.
				6.5	7.5	Clay	Dark gray, silty clay; wet.
				7.5	9	Wood	Wood.
				9	10	Sand	Gray, fine to coarse sand; wet.
NRP-B-19	558385.296	5315232.214	Fill	0	0.5	Asphalt	Asphalt.
				0.5	2.5	Gravel	Gray, silty, angular gravel; crushed rock; moist.
				2.5	3.5	Sand	Light brown to dark gray, fine to medium sand with silt beds; moist.
				5	7	Silt	Dark gray, sandy silt; very moist to wet.
				7	14.5	Sand	Dark gray, coarse sand with very few shells; wet; very thin interbeds of wood and organic silt at 9.5 fbs; trace silt between 11 and 13 fbs.
				14.5	15	Wood	Wood.
NRP-B-20	558370.404	5315222.238	Fill	0	0.5	Asphalt	Asphalt
				0.5	2	Sand	Gray, very gravelly, very silty, fine to medium sand; moist.
				2	3.5	Sand	Gray, slightly silty, fine to medium sand; moist; thin bed of silt near 3.5 fbs.
				5	12.5	Sand	Gray, fine to very coarse sand with very few shells; wet.
				12.5	13.5	Sand	Dark gray, very silty, fine to medium sand; many organic and woody debris; wet.
				13.5	15	Sand	Gray, fine to coarse sand with trace organics; wet.
NRP-B-22	558375.905	5315247.315	Fill	0	0.5	Asphalt	Asphalt.
				0.5	3	Gravel	Gray, silty, angular gravels; crushed rock; moist.
				5	8	Gravel	Gray, silty, angular gravels; crushed rock; moist.
				10	10.5	Sand	Gray, gravelly, silty, fine to medium sand; wet.
				10.5	12.5	Sand	Dark gray, fine to medium sand with trace of silt; wet; sheen and strong petroleum-like odor at 11-12 fbs.
				15	16.5	Sand	Dark gray, fine to medium sand with many organic debris; wet.
				16.5	17	Wood	Wood.
				17	17.5	Sand	Dark gray, fine to medium sand with many organic debris; wet.
NRP-MW-5	558483.792	5315247.692	Fill	0	3	Gravel	Gray, slightly silty, fine to coarse sandy, angular, very small to very large pebbles; crushed rock.
				3	4	Silt	Gray to dark gray, clayey silt; moist.
				4	5.5	Sand	Dark gray, fine to medium sand; moist to wet.
				5.5	6	Gravel	Gray, sandy, silty, gravel; moist.
				6	7	Clay	Dark gray, silty, clay; wet.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				7	8	Gravel	Dark gray, very (fine to coarse) sandy, small to large pebbles with charred wood debris.
				8	15	Sand	Gray, fine to coarse sand; wet; slightly silty layer at 12 fbs; scattered shells at 13 fbs.
OMS-MW-01	558327.129	5314721.098	Fill	0	0.5	Gravel	Gravel surface.
				0.5	1	Sand	Brown, fine to coarse sand; moist.
				1	2	Sand	Brown, gravelly, fine to very coarse sand; gravels are few to common, very small to very large pebbles; moist.
				2	8	Sand	Brown, fine to very coarse sand with very few to few, small to large pebbles; moist.
				8	10	Gravel	Brown, very sandy, sub-rounded, small to large pebbles; moist.
				10	15	Sand	Brown, fine to coarse sand; wet; becomes dark gray below 13.5 fbs; hydrogen sulfide smell near 15 fbs.
REC1-MW-1	558543.368	5314681.471	Fill	0	0.7	Concrete	Concrete.
				0.7	1.2	Void	Empty void.
				1.2	2.8	Sand	Gray, fine to coarse sand; moist.
				5	6	Sand	Gray, slightly silty, fine to coarse sand with very few, small to very large pebbles; wet.
				6	8	Sand	Gray, very gravelly, fine to coarse sand; wet.
				10	11	Sand	Gray, gravelly, fine to coarse sand; wet.
			Holocene	11	14	Zo	Organic-rich silt; woody; very moist to wet.
REC1-MW-2	558489.627	5314661.796	Fill	0	0.8	Concrete	Concrete.
				0.8	1.2	Void	Empty void.
				1.2	2	Sand	Brown, gravelly, fine to very coarse sand; gravels are common, very small to very large pebbles; moist.
				2	2.5	Wood	Wood.
			Holocene	2.5	3.8	f-cS	Brown, fine to medium sand with few, small to very large pebbles; moist.
				5	8	f-cS	Brown, fine to coarse sand with few, small to very large pebbles; moist.
				8	9	f-mSz	Gray, silty, fine to medium sand; we.
				10	20	f-cSg	Gray, fine to very coarse sand with few, small to large pebbles.
REC1-MW-3	558481.904	5314684.582	Fill	0	0.7	Concrete	Concrete.
				0.7	0.9	Void	Empty void.
				0.9	3.4	Sand	Brown, gravelly, fine to very coarse sand; moist.
			Holocene	5	6.5	f-mS	Brown, fine to medium sand with few, small to very large pebbles and scattered shells; moist.
				6.5	7	f-mSz	Gray, silty, fine to medium sand; wet.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				7	8.5	f-cSg	Gray, gravelly, fine to very coarse sand with many shells; gravels are few to common, very small pebbles; wet.
				10	17.5	f-cS	Gray, fine to coarse sand; wet.
				17.5	20	f-cSz	Gray, fine to coarse sand interbedded with silt in thin interbeds; many organic debris in silt beds.
				20	25	f-cS	Brown to gray, fine to coarse sand with very few, small to large pebbles; wet.
REC1-MW-5	558427.6	5314645.633	Fill	0	0.3	Asphalt	Asphalt.
				0.3	1	Concrete	Concrete.
				1	4	Sand	Brown, fine to very coarse sand; moist; pocket of fine to medium sand at 2 fbs.
				5	9	Sand	Brown, fine to very coarse sand; moist.
			Holocene	10	12	f-mS	Dark gray, fine to medium sand; sheen and petroleum-like odor; wet.
				12	15	cSg	Gravelly, coarse sand.
				15	23.5	f-cS	Fine to very coarse sand with very few, small to very large pebbles; trace silt; wood at 16.5 fbs; pocket of silt at 19 fbs.
				23.5	24	Z	Brown silt; wet.
				24	25	f-cS	Gray, fine to very coarse sand; wet.
REC1-MW-6	558488.544	5314615.306	Fill	0	0.7	Concrete	Concrete.
				0.7	7	Void	Void.
				7	7.5	Gravel	Dark brown, silty, sandy gravel; moist.
				7.5	8.5	Silt	Brown, fine to medium sandy, silt; becomes gravelly below 8 fbs.
				8.5	9	Sand	Gray, fine to very coarse sand with few, small to very large pebbles; wet.
				10	10.5	Sand	Gray, fine to very coarse sand with few, small to very large pebbles; wet.
				10.5	11.5	Silt	Mottled brown and gray, gravelly, fine to very coarse sandy, silt; gravels are common, angular, small to large pebbles; wet.
			Holocene	11.5	12.5	P	Brown, fibrous peat; wet.
				12.5	13.5	Gsz	Gray, sandy, silty, small to very large pebbles with many organic debris; wet.
				15	16.5	f-cSg	Gray, very gravelly, fine to very coarse sand; wet.
				16.5	18	P	Brown, fibrous peat; wet.
REC1-MW-7	558449.147	5314616.841	Fill	0	0.9	Concrete	Concrete.
				0.9	5.1	Void	Empty void.
				5.1	7.5	Sand	Brown, slightly silty, fine to medium sand with very few pebbles; moist.
				7.5	8.5	Sand	Gray, silty, sand with few, small to very large pebbles; wet.
			Holocene	10	12	Zs	Brown to gray, sandy silt with very few pebbles; wet; wood at 11.5 fbs.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				12	12.5	f-cS	Gray, fine to very coarse sand with very few pebbles; wet.
				12.5	13.5	Zc	Gray, clayey silt; wet.
				13.5	14	f-cS	Gray, fine to very coarse sand; wet.
				15	15.5	f-cS	Gray, fine to very coarse sand; wet.
				15.5	16.5	Zc	Brownish gray, clayey silt; numerous organics; wet.
				16.5	17.5	f-cS	Gray, fine to very coarse sand; wet.
REC1-MW-8	558405.958	5314644.789	Fill	0	0.5	Asphalt	Asphalt.
				0.5	2.5	Sand	Brown, gravelly, silty, fine to very coarse sand; moist.
				2.5	3.5	Sand	Brown, fine to very coarse sand with very few pebbles; brick debris; moist.
				3.5	4	Gravel	Black, silty, fine to medium sandy, small pebbles to cobbles; moist.
				5	6	Sand	Brown, gravelly, fine to very coarse sand; moist.
				6	7	Gravel	Black, silty, fine to medium sandy, small pebbles to cobbles; moist.
				7	8	Gravel	Brown, sandy gravel; wet.
				10	10.5	Sand	Brownish gray, gravelly, fine to very coarse sand; gravels are few to common, very small pebbles; wet.
				10.5	13.5	Gravel	Brown to black, sandy, small pebbles to cobbles; wet; becomes red at 13 fbs.
			Holocene	15	20	f-cS	Gray, fine to very coarse sand with very few, small to very large pebbles; wet.
REC1-MW-9	558384.153	5314653.126	Fill	0	0.5	Asphalt	Asphalt.
				0.5	1	Sand	Brown, slightly silty, fine to medium sand; moist.
				1	2	Gravel	Dark brown to dark gray, silty, sandy, sub-rounded, small to large pebbles; fill debris.
				2	3	Sand	Brown, very silty, fine to medium sand with fill debris and very few pebbles; very moist.
				5	8	Sand	Dark brown to black, silty, very gravelly, fine to medium sand with brick and other fill debris; very moist; gravels decrease below 6.5 fbs.
				8	9	Sand	Dark gray, gravelly sand; wet.
				10	11	Sand	Brown, gravelly sand; wet.
				11	12	Sand	Gray, silty, gravelly, fine to very coarse sand; wet.
				12	14.5	Sand	Black, gravelly, fine to very coarse sand; wet; becomes brown below 13.5 fbs.
			Holocene	14.5	15	f-cSzg	Dark brown, gravelly, very silty, fine to medium sand; wet.
REC2-B-1	558527.528	5314724.121	Fill	0	0.5	Concrete	Concrete.
				0.5	1.5	Void	Void.
				1.5	3	Sand	Brown, gravelly, fine to very coarse sand; gravels are common, very small to large pebbles.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				3	5.5	Sand	Brown, gravelly, fine to medium sand; gravels are common, small to large pebbles; moist.
				5.5	7.5	Sand	Brown, gravelly, fine to very coarse sand; gravels are common, very small to large pebbles; moist.
			Holocene	7.5	10	f-cS	Dark gray, fine to medium sand with scattered shells; wet.
REC2-MW-5	558519.469	5314763.228	Fill	0	0.5	Asphalt	Asphalt.
				0.5	3	Sand	Dark gray to black, very silty, fine to medium sand with few, small to very large pebbles; moist; petroleum-like odor; slight bleb sheen from 0-2 fbs.
			Holocene	3	8.7	f-cS	Gray, slightly silty, fine to very coarse sand with few, small to very large pebbles; wet.
				8.7	9	Z	Gray silt; wet.
				9	9.7	f-mS	Dark gray, fine to medium sand; wet.
				9.7	10	Z	Gray silt; wet.
				10	13	f-mS	Dark gray, slightly silty, fine to medium sand; wet; many shell fragments below 12.5 fbs.
REC3-MW-1	558263.503	5314851.458	Fill	0	0.7	Concrete	Concrete; 8 inches thick.
				0.7	15	Sand	Brown, fine to very coarse sand with very few pebbles; trace to slightly silty; moist; wet below 11 fbs; 1-inch thick lens of silt at 14 fbs.
REC5-MW-1	558322.16	5314909.506	Fill	0	1	Concrete	Concrete.
				1	6.5	Sand	Dark gray , fine to very coarse sand with very few pebbles; moist; fine to medium sand at 3 fbs; wood at 4 fbs.
				6.5	8.5	Sand	Gray, silty, fine to medium sand; wet.
				8.5	12	Sand	Gray, fine to very coarse sand with very few, very small pebbles; wet.
				12	14	Sand	Dark gray, very silty, fine to medium sand; wood at 12.5 fbs; wet.
				14	14.5	Silt	Gray silt with common, organic debris and shell fragments; wet.
				14.5	15	Sand	Gray, very silty, fine to medium sand; wet.
REC6-MW-1	558447.012	5315075.183	Fill	0	0.5	Concrete	Concrete.
				0.5	2.5	Gravel	Pea gravel; white liquid at bottom of pea gravel.
				2.5	3.5	Sand	Brown, fine to very coarse sand; wet.
				3.5	5	Gravel	Pea gravel.
				5	12.5	Silt	Dark gray, sandy silt with very few pebbles; strong sweet odor.
REC6-MW-2	558342.278	5315088.956	Fill	0	0.5	Asphalt	Asphalt.
				0.5	2	Wood	Wood chips; post-holed for utilities.
				2	4.5	Gravel	Dark gray, sandy, very silty, small to very large pebbles; moist.
				4.5	5	Wood	Wood chips.
				5	7.5	Gravel	Dark gray, very silty, sub-rounded, small to very large pebbles; wet.

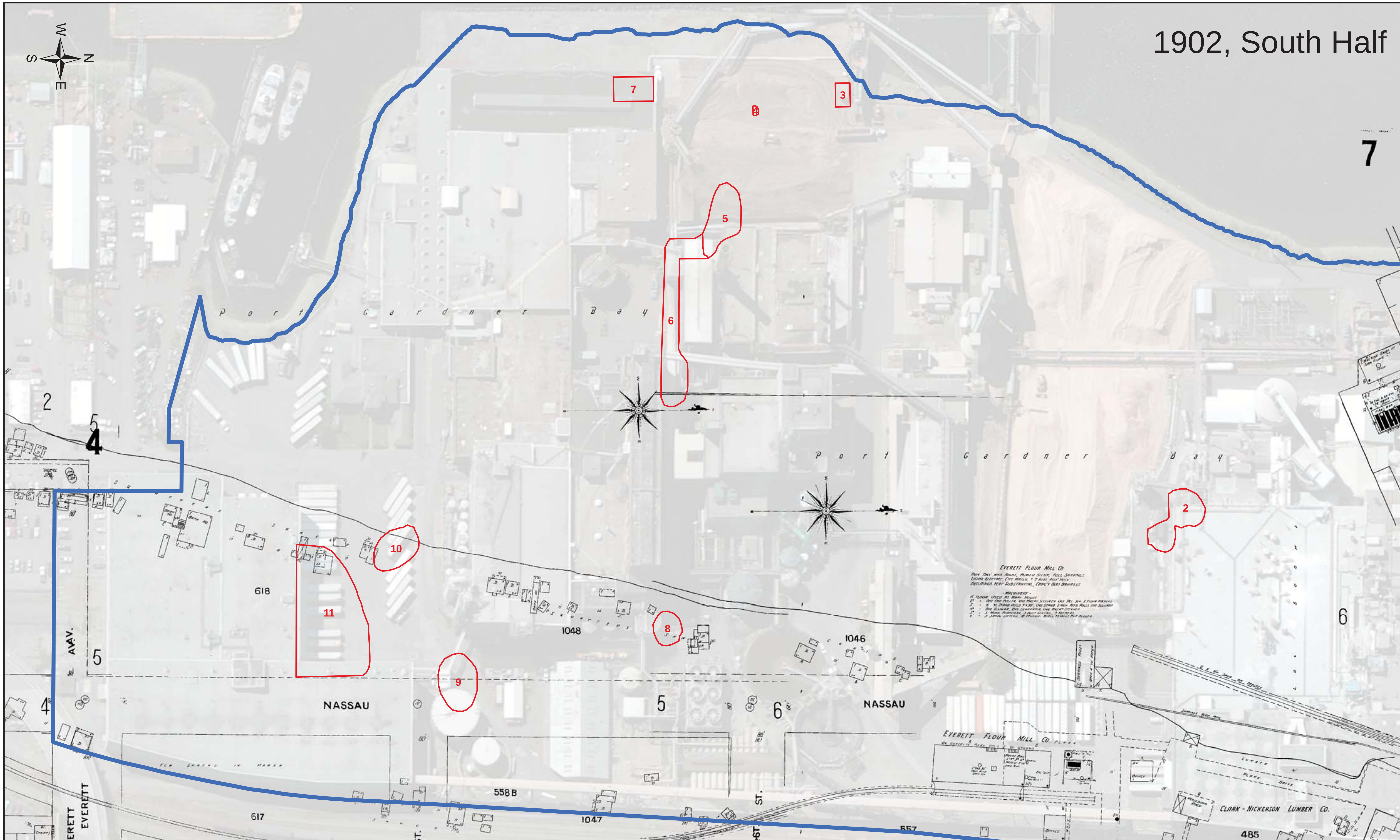
Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
				7.5	10.5	Silt	Mottled gray and brown, slightly sandy, gravelly silt; wet.
				10.5	15	Gravel	Black to dark gray, very sandy, very silty, sub-rounded to sub-angular, small to very large pebbles; slight hydrogen sulfide odor.
REC7-MW-1	558393.286	5315329.502	Fill	0	2	Gravel	Gravel fill.
				2	3.5	Sand	Brown, silty, gravelly, fine to medium sand with iron staining.
				3.5	4.5	Silt	Gray silt; moist.
				4.5	6	Sand	Gray, fine to medium sand; moist.
				6	15	Sand	Brown to gray, coarse to very coarse sand; woody debris at 7 fbs; becomes wet with few shell fragments at 7.5 fbs; many organic debris between 11 and 15 fbs.
REC7-MW-2	558348.344	5315171.238	Fill	0	0.5	Asphalt	Asphalt.
				0.5	4.5	Silt	Brown, sandy, very gravelly, silt; gravels are many, sub-rounded, small to large pebbles.
				4.5	5	Cinders	Black, charred debris.
				5	7.5	Sand	Brown, silty, fine to medium sand; wet; becomes gray at 7 fbs.
				7.5	15	Sand	Dark gray, coarse to very coarse sand.
REC7-MW-3	558272.176	5314737.262	Fill	3	4	Rubble	Concrete rubble.
				4	5	Silt	Brown silt; moist; many woody organic debris at 4.5 fbs.
				5	8	Rubble	Concrete rubble.
				8	9	Sand	Brown, silty, fine to medium sand; wet.
				9	14.5	Sand	Brown, fine to medium sand, grading to coarse to very coarse sand below 10 fbs; wet.
				14.5	15	Sand	Brown, gravelly, coarse to very coarse sand.
UG-MW-1	558587.288	5315237.815	Fill	0	2.5	Gravel	Asphalt debris, crushed rock and gravel fill.
				2.5	5.5	Sand	Dark gray, fine to medium sand; wood debris at 4 fbs.
				5.5	12.5	Silt	Dark gray, slightly clayey, slightly sandy, silt with many wood and organic debris below 8 fbs, may be mill wood waste.
			Holocene	12.5	15	f-cSg	Gray, gravelly, fine to very coarse sand; gravels are few to common, very small to large pebbles; wet.
UG-MW-2	558557.778	5314939.763	Fill	0	1	Concrete	Concrete.
				1	2.5	Sand	Dark gray, sand with brick debris.
				2.5	7.5	Silt	Dark gray, silt with very few pebbles; moist to wet.
			Holocene	7.5	13.5	f-cSg	Dark gray, gravelly, fine to very coarse sand; gravels are few to common, very small to very large pebbles; wet; orangish gray color from 9-12.5 fbs.
				13.5	15	Zs	Dark gray, fine to medium sandy silt.

Table B-1. Core Log Summary.

BORING	UTMs (Zone 10, NAD83) NORTHING	EASTING	STRATIGR-APHY	DEPTH (fbs) TOP	BOTTOM	LITHOLOGY	DESCRIPTION
UST68-MW-1	558414.396	5314758.451	Fill	0	0.5	Asphalt	
				0.5	6	Sand	Brown, fine to medium sand; moist.
				6	6.5	Silt	Gray silt; very moist.
				6.5	14	Sand	Brown, fine to medium sand; wet; becomes gray below 8 fbs; 2-inch thick layer of silt at 9 fbs.
			Holocene	14	15	f-mSz	Gray, silty, fine to medium sand; wet.
UST69-MW-1	558410.753	5315082.183	Fill	0	0.5	Asphalt	Asphalt.
				2	11.75	Sand	Brown, fine to very coarse sand with few pebbles; moist.
				11.75	12	Silt	Silt lens, 4 inches thick.
				12	14.5	Sand	Dark gray, fine to medium sand.
				14.5	15	Wood	Wood debris.
UST70-B-2	558272.735	5314884.485	Fill	0	1	Wood	Wood chips - hogged fuel.
				1	4	Sand	Brown sand with few pebbles; moist.
				4	8	Sand	Dark brown, slightly silty, sand; moist.
				8	9	Rubble	Concrete rubble.
				9	15	Sand	Gray, slightly silty, gravelly, fine to very coarse sand; gravels are common, small to very large pebbles; wet.
UST71-B-4	558311.734	5314874.365	Fill	0	2.5	Wood	Wood chips - hogged fuel.
				2.5	5	Gravel	Gray, sandy, very silty, sub-rounded, small to large pebbles; moist;
				5	10.5	Gravel	Gray, small to very large pebbles.
				10.5	14	Sand	Dark brown, very silty, fine to medium sand; wet.
				14	30	Sand	Gray, fine to medium sand with a bed of coarse sand between 18 and 19 fbs.

APPENDIX C: SANBORN MAPS



Sanborn Map Company Insurance Map of Everett, Washington, 1902, Sheets 4, 5, & 6.

0 50 100 150 200 Feet

0 10 20 30 40 50 Meters

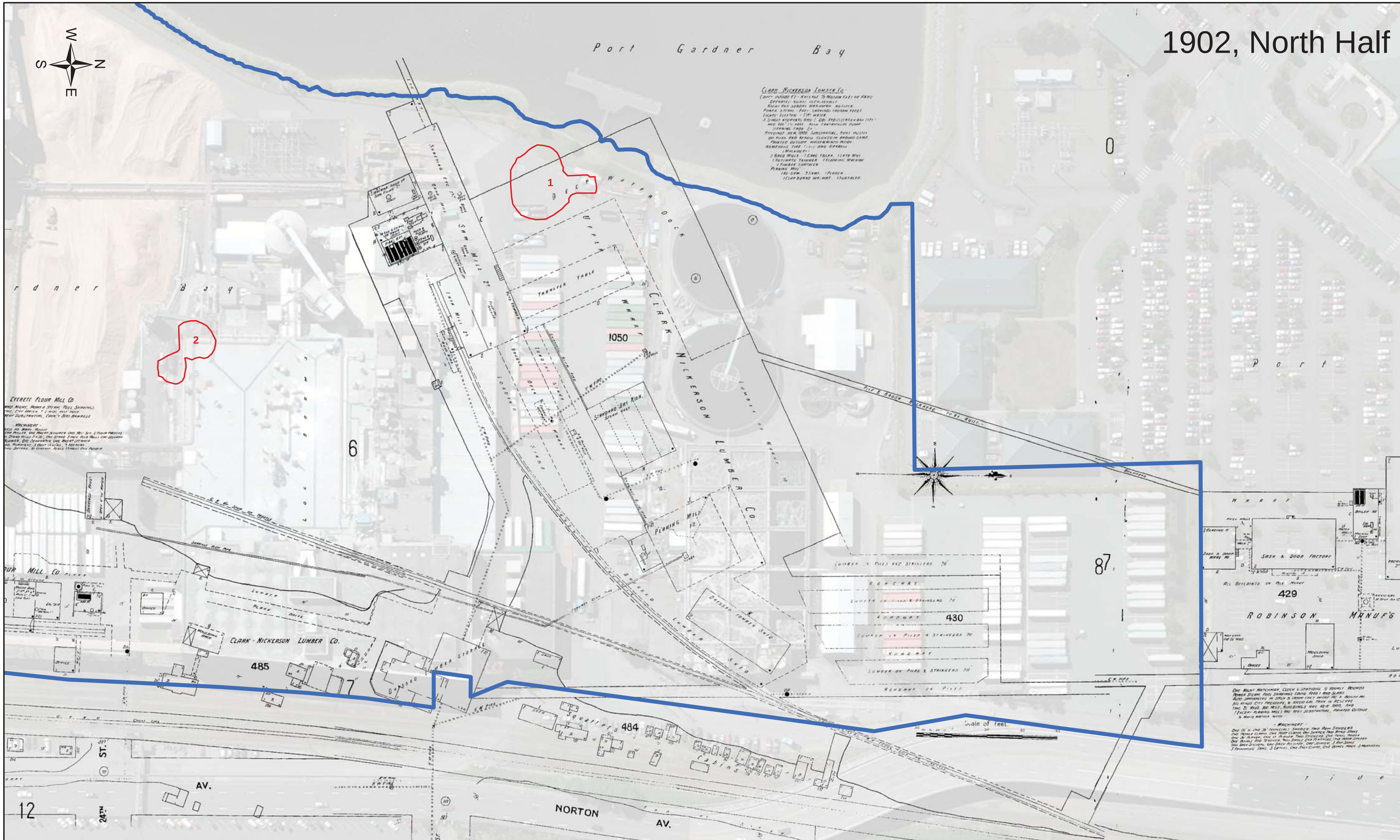
Legend

Proposed Cleanup Area

Project Boundary

Map 1 of 6

SWCA Environmental Consultants



Sanborn Map Company Insurance Map of Everett, Washington, 1902, Sheets 6, 7, & 8.

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0 10 20 30 40 50 Meters

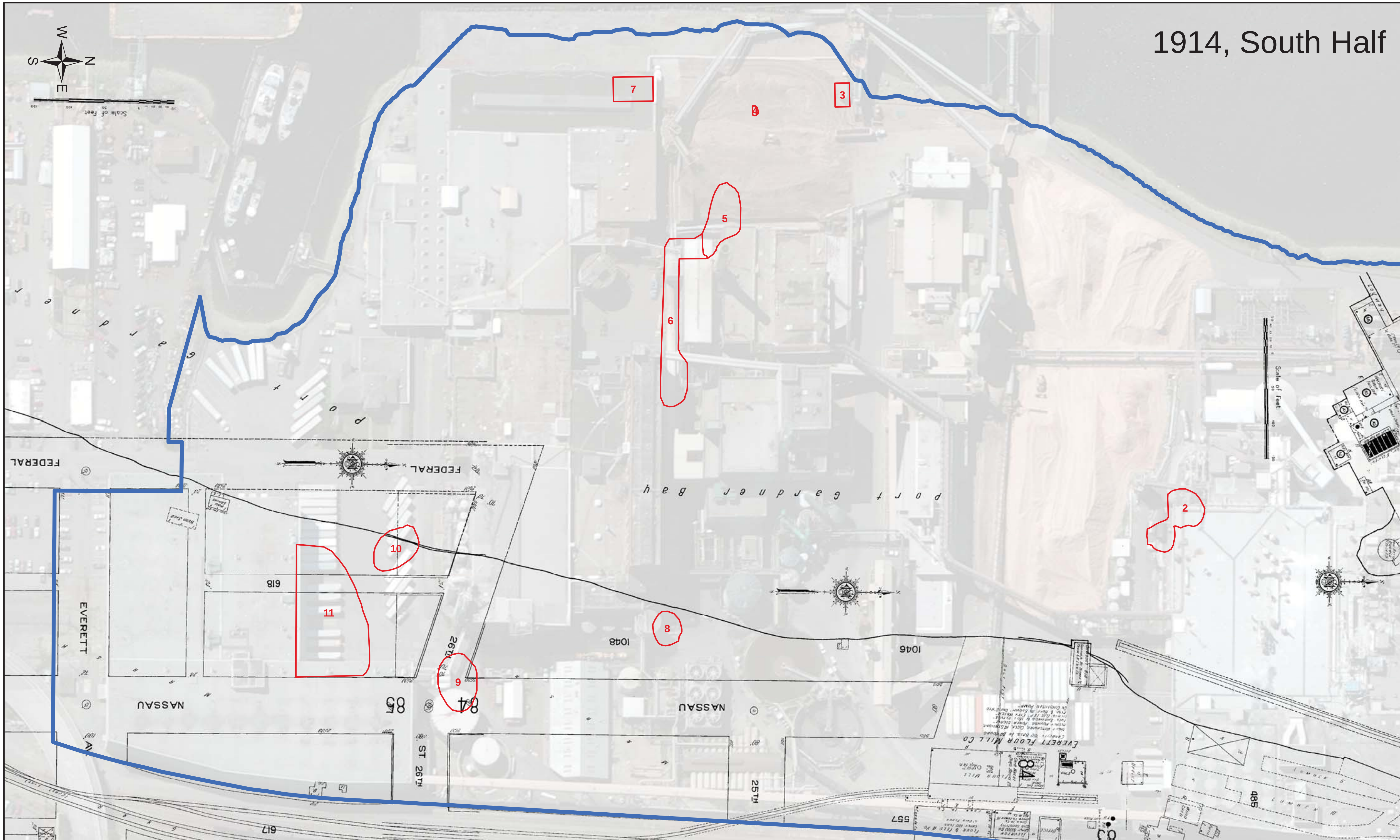
Legend

Proposed Cleanup Area

Project Boundary

Map 2 of 6

SWCA Environmental Consultants



Sanborn Map Company Insurance Maps of Everett, including Lowell, Washington, 1914, Sheets 83, 84, & 85.

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0 10 20 30 40 50 Meters

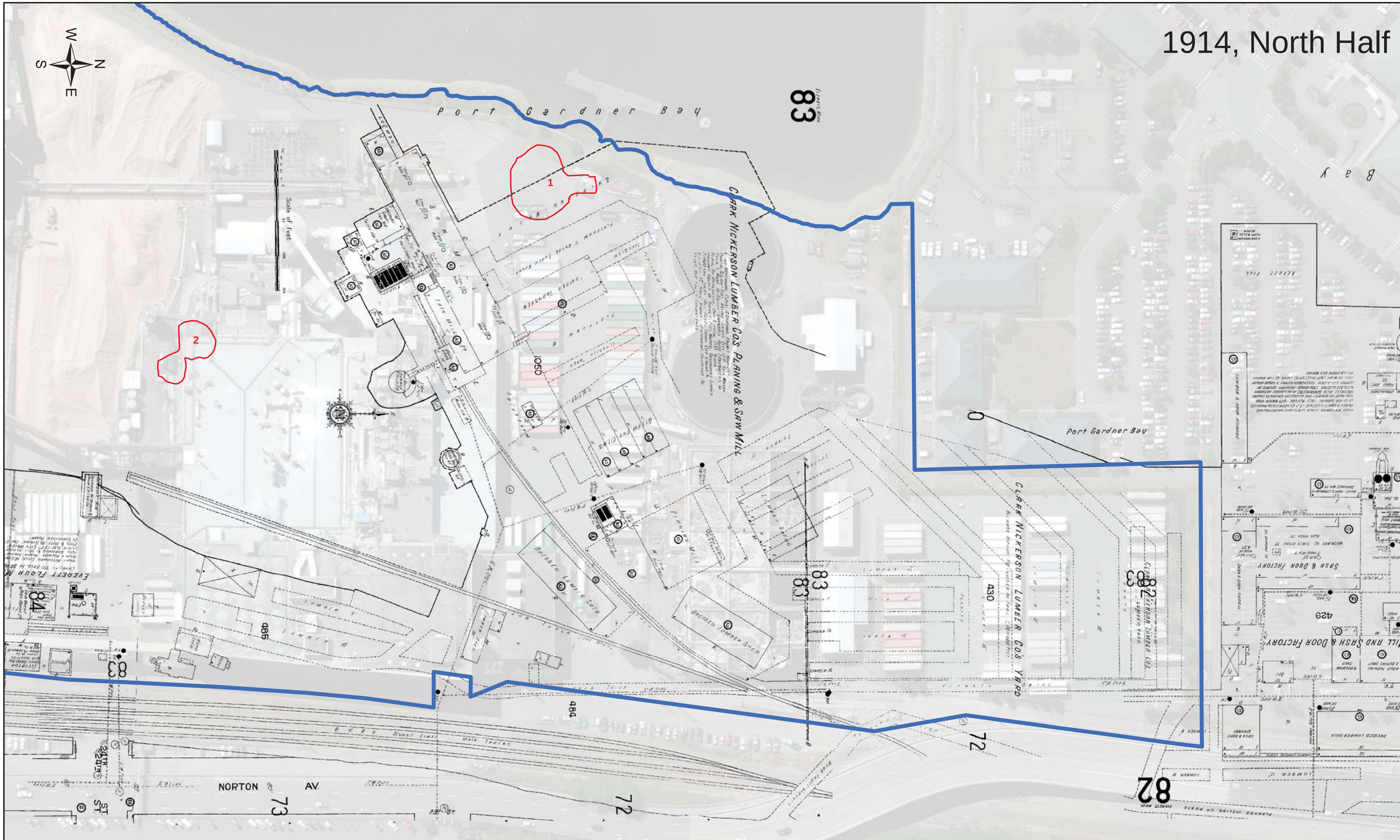
Legend

Proposed Cleanup Area

Project Boundary

Map 3 of 6

SWCA Environmental Consultants



Sanborn Map Company Insurance Maps of Everett, including Lowell, Washington, 1914, Sheets 82 & 83.

0 50 100 150 200 Feet

0 10 20 30 40 50 Meters

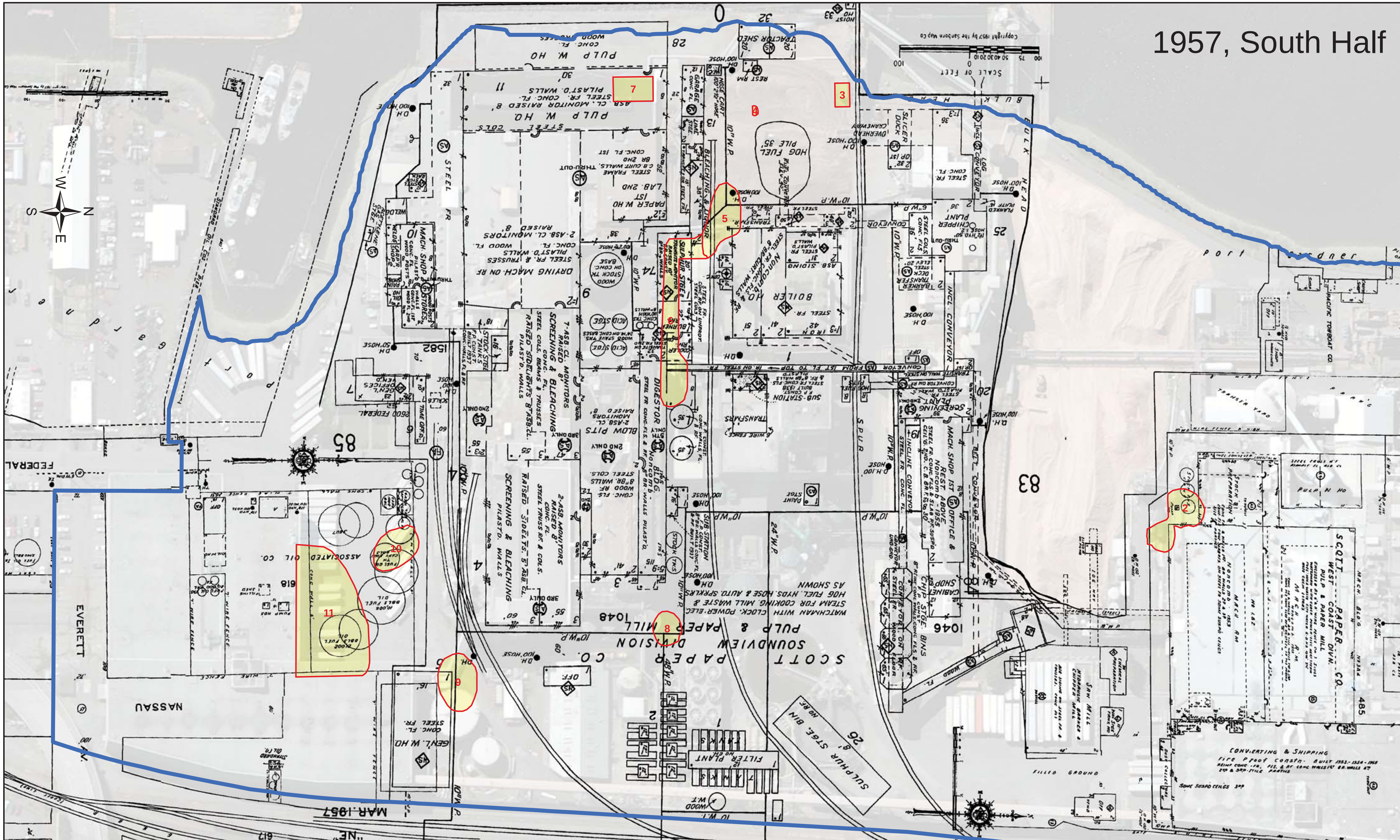
Legend

Proposed Cleanup Area

Project Boundary

Map 4 of 6

SWCA Environmental Consultants



Sanborn Map Company Insurance Maps of Everett, Washington, 1957, Volume 1, Sheets 83, 84, & 85.

0 50 100 150 200 Feet

0 10 20 30 40 50 Meters

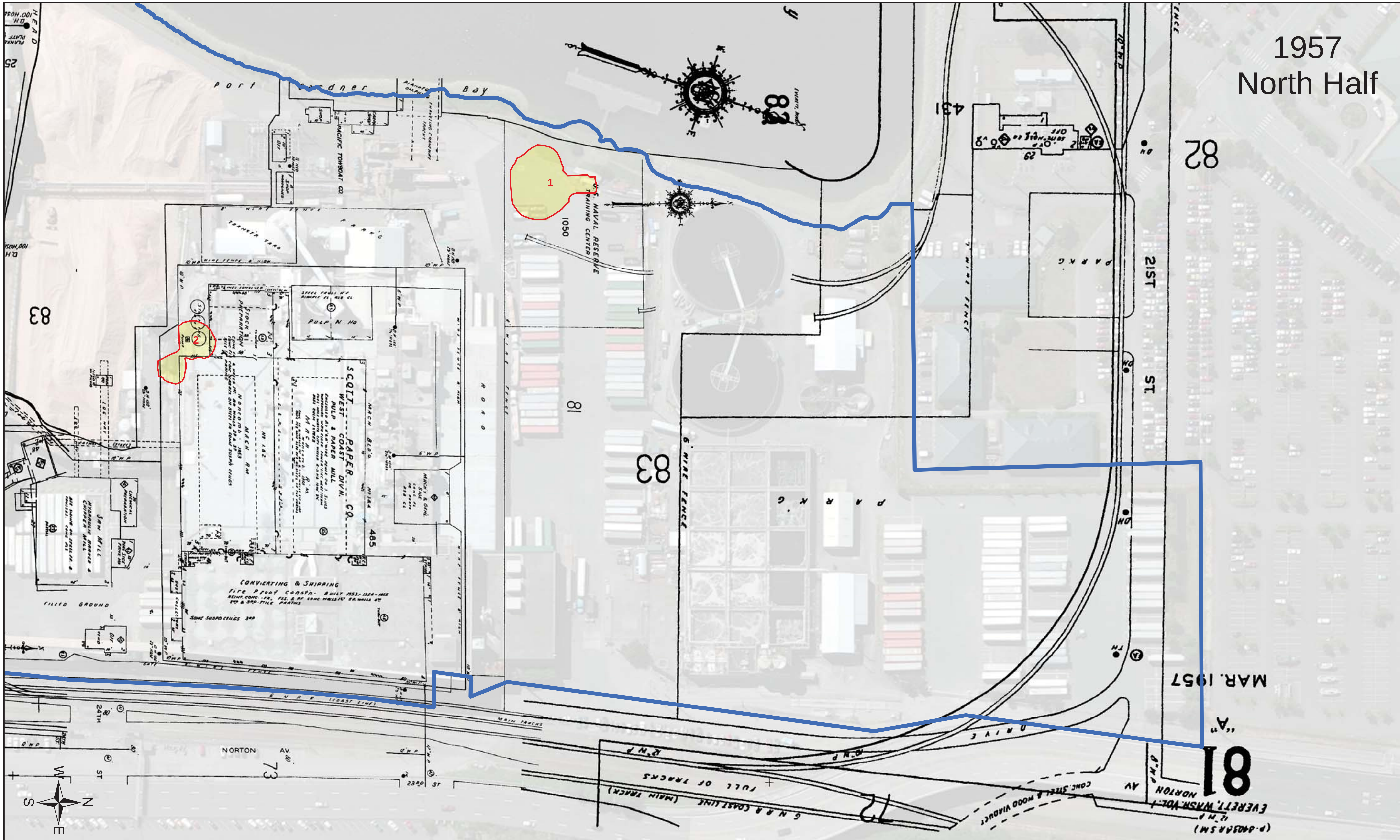
Legend

Proposed Cleanup Area

Project Boundary

Map 5 of 6

SWCA Environmental Consultants



Sanborn Map Company Insurance Maps of Everett, Washington, 1957, Volume 1, Sheets 81 & 83.

0 50 100 150 200 Feet
0 10 20 30 40 50 Meters

Legend

Proposed Cleanup Area

Project Boundary

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