

EXPLANATION

Symbols for historical map	Features	Symbols for present-day map
	Kellogg Island	
	Shoreline	
	Mean lower low-water line	Not shown
	Urban or waterfront development	Shown as streets, buildings, and structures
	Subaerial wetland (salt-water or fresh-water marsh)	
	Intertidal wetland	Not applicable
	Forested upland	Not shown
	Grassland	Not shown

DUWAMISH RIVER AND ELLIOTT BAY

Setting
The Green River, which in its lower course becomes known as the Duwamish River, drains from the west slope of the Cascade Range in the southeastern part of the Puget Sound region. The river discharges into Elliott Bay through two outlets in Seattle, the East and West Waterways. Land along the lower 8 km (5.0 mi) of the Duwamish River is heavily developed for commercial, industrial, and port facilities.

Shoreline and Wetland Changes
The shoreline and wetland environment of the Duwamish River delta has changed dramatically in the past 125 years. The most notable changes since the earliest surveys are the massive landfill of the intertidal reach of Elliott Bay and the channelization of the Duwamish River.

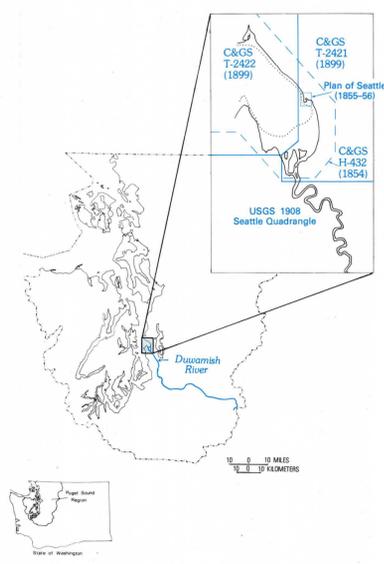
In 1854, the Duwamish River meandered across its valley and entered Elliott Bay through three main distributary channels. A broad intertidal area extended bayward beyond marshlands near the river mouth to near the northern edge of the present-day Harbor Island. Smaller areas of wetland were located in an embayment southwest of the West Waterway, east of the small peninsula of land that was early Seattle (see map explanation), and in Smith Cove (near top left corner of map). The early mapping of wetland ended about 3 km (1.9 mi) upstream from the former river mouth, but marsh land probably continued upstream some additional distance.

In 1895, the filling of the marsh and intertidal area began with the dredging of the East Waterway (Hynding, 1973, p. 149). Material dredged from the East Waterway was deposited as fill over a wide area of what today is Harbor Island. From 1901 to 1904, several thousand cubic meters of material were removed from Beacon Hill to the intertidal area by hydraulic sluices. By 1917, the East and West Waterways had been formed and more than 5.7 sq km (2.2 sq mi) of intertidal area had been filled (Hynding, 1973, p. 157-162), largely by deposition of dredge spoil from the two water ways which flanked it. All the former marsh except a small area on the northern tip of Kellogg Island (A on map explanation) has been filled or converted to urban land use. Dredging to form the Duwamish Waterway has created a channel deeper than the former natural channel and has lengthened the landward incursion of salt water in the channel.

Compilation of Map
The compilation of the Duwamish River and Elliott Bay historical features is a composite from five map references. The 1854 hydrographic survey (H-432) was a basic reference for the early setting, shoreline, low-water line, and upland vegetation of Elliott Bay and vicinity prior to urbanization and shoreline development. The 1899 topographic surveys (T-2421 and T-2422) provided the historical shoreline of the Duwamish River distributaries, much of Elliott Bay shoreline, Smith Cove, and other small embayments. Street intersections and other lines provided the basic control for data transfer, topographic agreements provided supplemental control. Delineation of historical shoreline for the early settlement of Seattle was compiled from the sketch map, "Plan of Seattle 1855-56" by Thomas Phelps (undated). Mapping of the lower Duwamish River was compiled from the 1908 Seattle quadrangle map (scale 1:62,500).

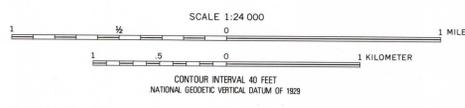
Summary of Environmental Changes and Some Planning Considerations

Progradation (seaward advance of shoreline)	None apparent by natural processes. Bayward growth has been substantial, but is largely, if not entirely, due to manmade landfills.
Recession (landward retreat of shoreline)	None.
Channel migration	None apparent by natural processes.
Channel straightening	Substantial. About 15 km of the former river channel has been filled and replaced by a channel 7 km in length to create the Waterway.
Diking or substantial filling of subaerial delta land near salt-water shoreline	The shoreline of the present-day subaerial part of the delta is landfill protected by bulkheads and riprap.
Diking or substantial filling near stream banks	Continuous dikes and bulkheads, extending upstream beyond the map area, confine the Duwamish River channel on both sides.
Other artificial landfill on subaerial delta land	Landfill has been extensive for commercial, industrial, and port facilities. Landfill covers all former islands between distributary stream channels and former marsh embayments around Elliott Bay.
Landfill on intertidal delta land	Landfill has been placed on the intertidal area for commercial, industrial, and port facilities. Approximately 10 sq km of additional land—includes fill seaward of mean lower low-water line—has been created mainly by deposition of dredge spoil and by hydraulic sluicing from Beacon Hill and other nearby areas.
Loss of subaerial wetland	About 0.03 sq km of subaerial marsh remain from 2.6 sq km mapped in 1899 (table 2). This does not include an additional but unknown amount of marshland that existed in the Duwamish Valley upstream beyond the extent of 1899 mapping.
Loss of intertidal wetland	About 8.5 sq km of intertidal wetland has been eliminated mostly by hydraulic filling since the early mapping.
Some planning considerations	The former subaerial and intertidal wetland has been lost from the Duwamish delta. Changing land uses have been associated with a decrease in water quality of Duwamish River. At present, pollution-control measures are in effect; the greatest potential for water-quality degradation in the delta area probably is related to industrial activities, including shipping (Williams and others, 1975). Channel snagging, bulkheads, and dikes undoubtedly have reduced the frequency of flooding from upstream; however, the lower reaches of the waterway are susceptible to occasional coastal flooding, such as occurred in December 1977. Ground instability on unconsolidated landfill deposits can be a potential problem, particularly during an earthquake. For example, ground principally on hydraulic fill subsided in the industrial area along the Duwamish River during the 1949 and 1965 earthquakes, apparently as a result of liquefaction during ground shaking (U.S. Geological Survey, 1975, p. 95, 99).



SOURCE MAPS FOR COMPILED HISTORICAL SHORELINE AND LOCATION OF RIVER-MOUTH DELTA

Base from U.S. Geological Survey, Shilshole Bay, Seattle North, Seattle South and Duwamish Head, 1948. Shilshole Bay and Seattle South photorevisions 1966 and 1973. Seattle North and Duwamish Head photorevisions 1966.



HISTORICAL CHANGES OF SHORELINE AND WETLAND AT DUWAMISH RIVER AND ELLIOTT BAY, WASHINGTON

By
G. C. Bortleson, M. J. Chrzastowski, and A. K. Helgerson
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