US Army Corps of Engineers ®
Seattle District

United States Environmental Protection Agency

DRAFT Federal Involvement in Shoreline Habitat in Tidally-Influenced Waters of Washington State

Review and Analysis

November 2016

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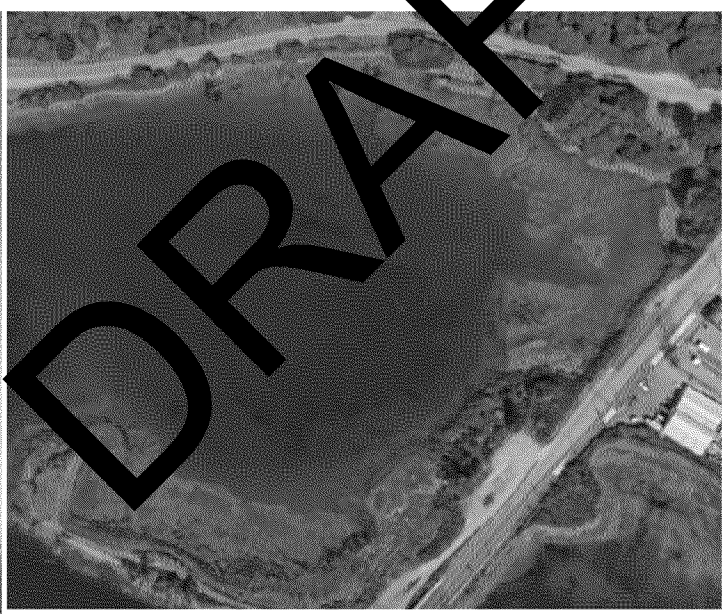

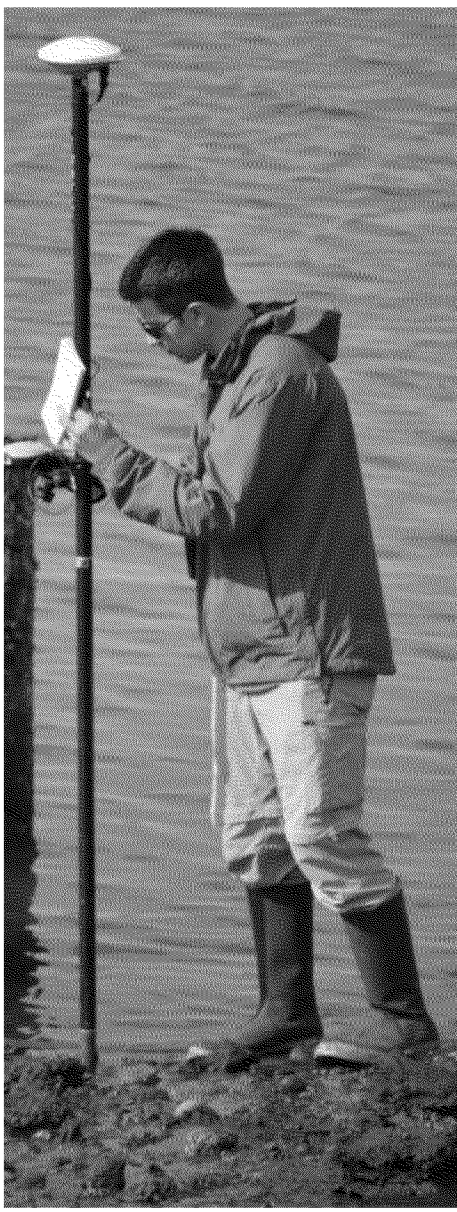

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Executive Summary

This report provides a review and analysis of actions that the U.S. Army Corps of Engineers – Seattle District (Seattle District); the Environmental Protection Agency – Region 10 (EPA); and the National Oceanic & Atmospheric Administration – West Coast Region (NOAA) can take to enhance marine shoreline habitat along Puget Sound and the coast of Washington. The genesis of the interagency analytical effort is a commitment made by the three federal agencies to local tribes under the Treaty Rights at Risk Initiative as a response to their concern that the federal agencies are not doing enough to protect tidally-influenced shoreline habitat. A workgroup was formed by the three agencies to evaluate two main components: 1) conduct technical research and analysis of various tidal datums and elevations that could be relevant to determining the jurisdictional threshold of the high tide line in Washington State as defined in regulations implementing Section 404 of the Clean Water Act (CWA); and 2) identify potential actions that can be improved and/or implemented that promote further enhancement of tidally-influenced shoreline habitats.

Based on the CWA, regulations implementing the CWA, and other relevant sources of law, guidance, and policy, the workgroup identified technical criteria that guided its evaluation of the high tide line, and specifically which tidal datum or elevation to use. It was critical that the high tide line be reasonably representative of the intersection of the land and the water's surface at the maximum height reached by the rising tide, based on gravitational forces, be predictable, reliable, repeatable, reasonably periodic, measurable, simple to determine, scientifically defensible, and based on data that is reasonably available and accessible to the public. The workgroup relied upon scientific data and input from tide and fish experts from the National Ocean Service and the Washington Department of Fish & Wildlife respectively, as well as field verification of different high tide line elevations and their biological significance

The workgroup also reviewed each agencies' own authorities and developed a list of potential actions that could be implemented to better protect shoreline habitat.

The workgroup identified five alternatives with the primary focus being given to a proposed tidal datum or elevation that would be used to determine the high tide line, as well as identifying actions that agencies could implement within existing authorities to better protect tidally-influenced shoreline habitat. The five alternatives are:

- Alternative 1: Mean Higher High Water (MHHW)
- Alternative 2: Mean Monthly Highest Tide (MMHT)
- Alternative 3: Mean Annual Highest Tide (MAHT)
- Alternative 4: Highest Astronomical Tide (HAT)
- Alternative 5: Washington State Ordinary High Water Mark (WOHWM)

As outlined further in this report, the workgroup concludes that as a technical finding, Alternative 3, MAHT, constitutes an appropriate application of the regulatory definition of the statutory term high tide line and recommends its consideration by the U.S. Army Corps of Engineers, Northwestern Division (NWD) for adoption. Alternative 3, MAHT, is an elevation that is reasonably representative of the intersection of the land and the water's surface at the maximum height reached by the rising tide, is based on gravitational forces, is predictable, reliable, repeatable, reasonably periodic, measurable, simple to determine, scientifically defensible, and based on data that is reasonably available and accessible to the public. It is an alternative that would extend the scope of shoreline protection that would require environmental review through Section 404 permitting and the associated

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coordination measures. Although it is expected that the Seattle District's workload would increase roughly 10% during the initial phase if Alternative 3 is used to determine the high tide line, the workgroup believes that Alternative 3 is achievable with deliberate outreach, education, planning, and commitment of resources (e.g., increased staffing) from the three federal agencies.

While the workgroup supports Alternative 3 as the preferred alternative, Alternative 4, HAT, has substantial support from an ecological perspective and is used by NOAA for designating Critical Habitat for salmon and steelhead under the Endangered Species Act (ESA). Additionally, HAT meets the local tribes' expressed desire for it to be Seattle District's interpretation of the high tide line.

Through technical evaluation of multiple tide lines, it was evident that tidal maximums recur during each tidal epoch between MAHT and HAT, and are superior from a purely ecological perspective because it includes all potential spawning habitat for forage fish that are important to the local food chain. That said, within the confines of the workgroup's established evaluation criteria, the low frequency of recurrence of HAT (once every 19 years) kept it from being the preferred alternative. NOAA intends to continue to use HAT for the purposes of salmon and steelhead Critical Habitat designations under the ESA.

In conclusion, it is the technical finding and recommendation of the workgroup that the NWD consider adopting MAHT as a viable high tide line as it relates to the CWA Section 404 and that the three federal agencies begin immediately implementing additional habitat protection measures regardless of jurisdictional limit.

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Introduction

Shoreline habitat protection is critically important to Puget Sound and the coast of Washington. The U.S. Army Corps of Engineers – Seattle District (Seattle District), the Environmental Protection Agency – Region 10 (EPA), and the National Oceanic & Atmospheric Administration – West Coast Region (NOAA) all have an interest and a responsibility to do their utmost in protecting shoreline habitat for the health of the environment and for the good of the public. In the past few years, there has been a growing concern over the perceived degradation of marine riparian habitat in Washington. It is universally recognized to be a problem stemming from an intricate interplay of a wide variety of causal factors and arising from the activities of numerous public entities, commercial actors, and private individuals. It is recognized that this collective problem can only be addressed through collective solutions involving all the most directly involved parties. Certainly, one legitimate focus is the adequacy of the federal agencies' efforts in protecting shoreline habitats. Specifically, local tribes and environmental advocacy groups have made it clear that they believe that the Seattle District and EPA are insufficiently applying the regulatory responsibilities under Section 404 of the Clean Water Act (CWA) to protect tidally-influenced shoreline habitat. They assert that the current interpretation of the high tide line as the Mean Higher High Water mark (MHHW) is too low of an elevation and does not reflect the maximum height reached by the rising tide. Tribes have specifically requested that the Seattle District and EPA interpret the high tide line to be the Highest Astronomical Tide (HAT). Additionally, in March 2015, Mr. Will Stelle, Regional Administrator for the National Marine Fisheries Service, West Coast Region, sent a letter to then U.S. Army Corps of Engineers' Northwestern Division Commander, Brigadier General (BG) John Kem, suggesting that HAT may be a more appropriate jurisdictional boundary; a position that mirrors the current boundary of NOAA's designation of Critical Habitat for threatened and endangered species in Puget Sound. In response, BG Kem invited Mr. Stelle to join in a regional dialogue regarding the Seattle District's landward extent of the CWA jurisdiction in marine and estuarine areas in Puget Sound. Furthermore, BG Kem stated that the dialogue should explore a variety of options, to include the application of the independent authorities of NOAA, EPA, and the State of Washington, in order to achieve NOAA's goal of increased habitat protection in the marine supra-tidal area.

In January 2016, the Seattle District Commander, Colonel John Buck, convened a staff-level workgroup of Seattle District, EPA, and NOAA personnel (Appendix D) to evaluate and recommend shoreline habitat protection measures and review the current use of MHHW as the tidal datum used to determine the high tide line and alternatives thereto, up to and including HAT, with the intent of providing maximum shoreline habitat protection in Puget Sound and elsewhere along the coast of Washington. The workgroup consisted of technical, legal, and managerial staff from each of the three agencies.

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Purpose and Need

The purpose of this evaluation is to investigate two overarching issues:

1. Conduct technical research and analysis of various tidal datums and elevations that could be relevant to determining the jurisdictional threshold of the high tide line in Washington State as defined in regulations implementing Section 404 of the Clean Water Act (CWA).

2. Identify potential actions that can be improved and/or implemented that promote further enhancement of tidally-influence shoreline habitats.

The genesis of the interagency analytical effort is a federal commitment to the regional tribes under the Treaty Rights at Risk Initiative to research the Seattle District and EPA's application of high tide line and to look for opportunities across the three federal agencies that further enhance marine shoreline habitat.

Development of Alternatives

The workgroup initially identified a suite of criteria to guide its investigation of high tide line. The group researched the applicability and feasibility of various tidal datums and tidal elevations that support an interpretation of the high tide line while, concurrently, looking for opportunities/actions that the federal agencies could implement to provide better protection of shoreline habitat regardless of the CWA Section 404 jurisdictional limit. The following sections address each of those elements.

Criteria

The workgroup's criteria for guiding the investigation of high tide line are:

1. The federal definition of the term high tide line at 33 C.F.R. 328.3(c)(7), which is:

   "the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm."

2. A technical application of the definition of high tide line demonstrated that the tidal datums and tidal elevations reviewed by the workgroup must be reasonably

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representative of the intersection of the land and the water's surface at the maximum height reached by the rising tide, based on gravitational forces, are predictable, reliable, repeatable, reasonably periodic, measurable, simple to determine, are scientifically defensible, and based on data that is reasonably available and accessible to the public.

3. Where necessary and applicable, an agency (e.g., National Ocean Service) would be able to commit the resources needed to establish tidal elevations other than MHHW, and that NOAA, the Seattle District, and/or EPA would be able to commit the resources needed to maintain the appropriate tidal datums or tidal elevations on a publicly accessible website.

4. Agency staffing levels and workload were considerations in the analysis; however, they were not considered impediments to making the final recommendation provided agencies committed resources to support the finding.

5. Any recommendation to update the interpretation of the high tide line on the Columbia River would need to occur separately due to the shared regulatory responsibility between the Seattle and Portland Districts. The geographic scope of this analysis was limited to the tidal shorelines of Washington State excluding the Columbia River.

Researching the Applicability and Feasibility of Various Tidal Datums and Tidal Elevations that Inform the Interpretation of 'High Tide Line'

The workgroup investigated MHHW, as well as those tidal elevations above MHHW that could be considered viable elevations that are reasonably representative of the intersection of the land and the water's surface at the maximum height reached by the rising tide, based on gravitational forces, are predictable, reliable, repeatable, reasonably periodic, measurable, simple to determine, are scientifically defensible, and based on data that is reasonably available and accessible to the public. Most of the elevation elevations are from data obtained over an approximate 19-year period known as the National Tidal Datum Epoch (NTDE), which reflects the 18.6-year cycle in the positions of the sun and moon in relation to the earth. The NTDE currently in use for tidal calculations is derived from the data compiled in the period 1983 to 2001. The workgroup looked at several tidal elevations above MHHW that appeared to meet the workgroup's established criteria. They included mean perigean spring tides (also known as "king tides"), mean spring tides, greater tropic range, mean monthly highest tides (MMHT), mean annual highest tides (MAHT), and HAT[1]. Through consultation with a National Ocean Service (NOS) tide expert, application of our established criteria resulted in the workgroup evaluating three of those tidal elevations; they were MMHT, MAHT and HAT. In addition to those three, the workgroup also considered the State of Washington's Ordinary High Water Mark (WOHWM), which is derived from physical and biological indicators known to be influenced by repeated tidal actions. The remainder of the workgroup's analysis of the interpretation of high tide line focused on these five alternatives; MHHW (existing practice, Alternative 1), MMHT (Alternative 2), MAHT (Alternative 3), HAT (Alternative 4), and WOHWM (Alternative 5).

It was clear from the outset that the workgroup could not feasibly map the high tide line

[1]Mean monthly highest tide (MMHT) and mean annual highest tide (MAHT) are tidal elevation names coined by the workgroup and do not represent National Ocean Service official nomenclature.

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elevation options for the entire margin of Puget Sound and the coast of Washington. Among other issues, covering the entire coast with a scale small enough to depict the difference in elevation options meaningfully would have required production of an inordinate number of maps. Across coastal Washington, there are 171 tide stations monitored and maintained by NOAA (Fig. 1). Of the 171 stations, 47 are harmonic stations, which generally have the longest period of tide records and thus the greatest capabilities within the NOAA Tide Predictions service for providing predictions with different data intervals and relative to different tidal datums; the 47 harmonic stations have MHHW and HAT already established and have the data necessary for calculating MMHT and MAHT (Table 1 and Fig. 2). For detailed analysis, the workgroup selected six locations throughout Puget Sound, the Strait of Juan de Fuca, and the Washington State coast with the intent of both covering the geographic range and including at least one site on or adjacent to tribal land (Fig. 3). Additionally, to facilitate production of detailed maps, the sites needed to be close to a harmonic tide station (to minimize the need for data interpolation), as well as the North American Vertical Datum of 1988 (a geodetic datum used in overlaying elevation contours on the aerial photo maps bases). The purpose of the maps was to serve as visual aids in understanding what the various tidal datums or elevations that could be used to determine the high tide line would look like on the ground.

The six site maps are GIS-based depictions of how each tidal datum or elevation generally relates to the shoreline (Appendix A). It is important to note that the precise location of contours on the shoreline is not possible in such an exercise. However, the relationship between the elevations is accurate and depicts the relative width of beach between them. We attempted to improve the accuracy of the on-the-ground locations by recreating the topography at the Tulalip and Seattle sites though GPS/GIS field data collection.

In addition to preparing the maps, the workgroup conducted field visits to theTulalip and Seattle sites, both to examine in greater detail the relationship of the various high tide line elevation options to the physical characteristics of the beach, including fish habitat, and to investigate various methods for locating the specific elevations.A Washington Department of Fish & Wildlife (WDFW) fisheries biologist, M . Phill Dionne, also participated in those site visits. Mr. Dionne is a forage fish specialist and is experienced both in making WOHWM determinations and in using electronic survey equipment to locate specific elevations.The workgroup located the MHHW, MAHT, and HAT elevations at the two sites, using WDFW's electronic survey equipment as well as two less technologically advanced methods; the standard method used by Seattle District Regulatory personnel, and the other practice by the State of Maine and demonstrated by EPA (Fig. 4). The workgroup also determined the WOHWM under WDFW's guidance. At the two field sites, the WOHWM was near the elevation of MAHT and HAT. MMHT was not located in the field at the time of the visit, but was estimated later based on its relationship to the field-located elevations. In general, the three field methods produced relatively similar results, but they were dissimilar enough to reveal that, without precise survey equipment and experience in its use, there was a horizontal margin of error of 12-16 inches at the gradient exhibited by the field visit sites. It is likely that the margin of error resulted largely from human variability when selecting a starting point at the water's edge for the methods demonstrated by Seattle District and EPA staff, but such imperfection is certain to be present as well for most practitioners of the less advanced—and much less expensive to apply—survey methods. The variability in results contributed to the workgroup considering HAT as a possible representation of the high tide line because of its closeness to MAHT horizontally on the ground. Although tides reach or exceed HAT very infrequently during any given 19-year period, tides come close to it (i.e., within six inches) much more frequently (i.e., several times annually). Accordingly, considering HAT would ensure that, even with

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a margin of error in surveying, the jurisdictional limit would reach to the maximum extent of virtually all high tides.

In addition to establishing the tidal elevations on the beach during the field visits, the workgroup also looked at ecological factors within each of the elevational bands. WDFW's Mr. Dionne explained the locations and substrate needs for forage fish spawning (a key food source for salmon), the significance of drift logs, wrack material, and overhanging vegetation in the back-beach area for salmon and forage fish survival. He also gave a brief tutorial on what to look for when determining the WOHWM, such as the line of vegetation, salt-tolerant vegetation, etc.

One of the most discussed aspects of the evaluation was periodicity or frequency of occurrence for the various tidal elevations. Going into the project, various opinions existed as to whether HAT occurs with sufficient frequency, given that, as the highest tide predicted to occur during the NTDE, HAT may be reached only once every 19 years. While the workgroup's analysis confirmed the approximate periodicity for HAT, the data also showed that predicted tides (i.e., tides resulting from gravitational, rather than meteorological, forces, such as storm surge) come within six inches of HAT multiple times over the course of a year and in some cases, exceed it (Fig. 5). This was a significant finding, particularly when coupled with another finding from the field investigation, namely, that there is a margin of error inherent in various techniques for placing specific tidal elevations on the shoreline. These "near-HAT" tidal events gave the workgroup some clarity on the viability of HAT as a tidal datum relevant to the determination or delineation of the high tide line.

The final component to looking at the various tidal datums and tidal elevations that could be used to make CWA high tide line determinations was developing a matrix to compare and/or highlight the differences among those datums and elevations, and the opportunities/challenges that each one poses. Appendix B provides that comparison.

Identifying Opportunities / Actions that Federal Agencies can Implement to Provide Better Protection of Tidally-Inflenced Shoreline Habitat

Understanding that each of the three federal agencies has a mandate, as well as a desire and responsibility to protect shoreline habitat, the workgroup tasked each member agency with identifying actions that they could implement more extensively, or could implement for the first time that would better protect shoreline habitat. Appendix C elaborates on those actions.

Alternatives Analysis

In addition to the existing practice used in making high tide line determinations (i.e., MHHW), the workgroup identified four viable alternatives that can be used to determine the high tide line, as well as additional actions agencies could implement to protect shoreline habitat. The five potential tidal datums or elevations that can be used to determine the high tide line are: MHHW (Alternative 1 – current practice), MMHT (Alternative 2), MAHT (Alternative 3), HAT (Alternative 4), and WOHWM (Alternative 5). Additionally, as part of the analysis, an implementation matrix was created that outlined the relative differences between each alternative in terms of agency staffing and workload, environmental consequences, and potential impacts to the regulated public, resource agencies, and the tribes. Also, an action agency list was created that outlined what more agencies could do to protect shoreline habitats. Both are discussed in more detail in Appendix B and C, and are summarized in each alternative.

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Figure 1. NOAA Tide Stations in Washington State

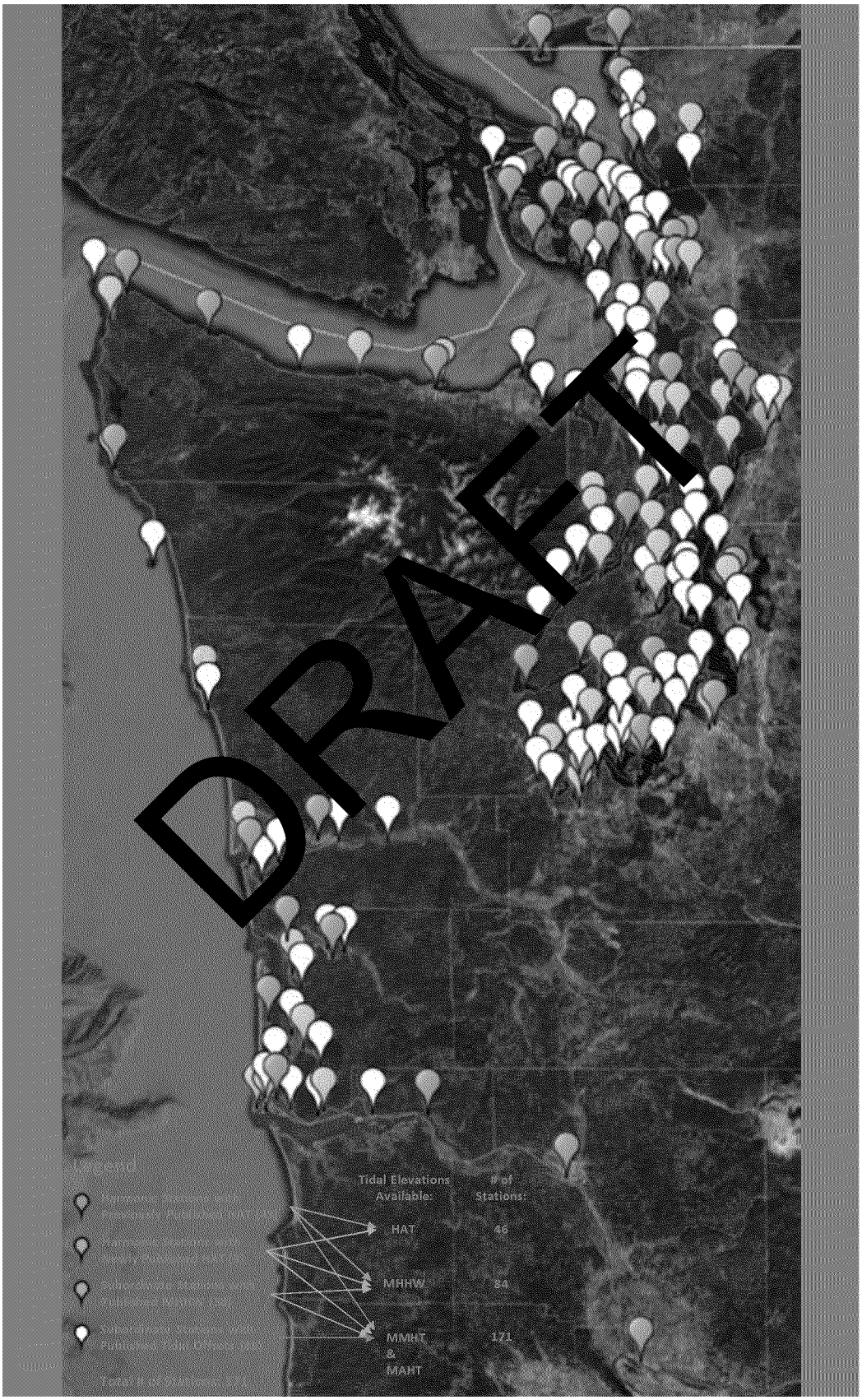

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Table 1: Harmonic Tide Stations in Washington State

Region	Station Name	Station #	Tidal Elevation; referenced to MLLW				Differences in Elevation				
			** (in Feet)				** (in Inches) **				
			HAT[1]	MAHT[2]	MMHT[3]	MHHW1	HAT-MHHW	HAT-MAHT	MAHT - MHHW	MAHT-MMHT	MMHT-MHHW
Strait of Georgia	Point Roberts	9449639	11.89	11.59		9.79	25	3.6	22		
	Blaine	9449679	11.19	10.96		9.53	20	2.8	17		
	Cherry Point	9449424	10.99	10.74		9.15	22	3.0	19		
	Village Point	9449161	10.95	10.63		8.66	27	3.8	24		
San Juan Islands	Waldron Island	9449746	8.31	8.10		7.02	15	2.5	13		
	Hanbury Point	9449828	9.08	8.87		7.62	18	2.5	15		
	Friday Harbor	9449880	9.72	9.47		7.76	24	3.0	21		
	Rosario	9449771	9.79	9.47		7.89	23	3.8	19		
	Upright Head	9449911	9.75	9.43		7.84	23	3.8	19		
	Armitage Island	9449932	9.42	9.16		7.84	19	3.1	16		
	Kanaka Bay	9449856	8.96	8.68		7.33	20	3.4	16		
	Richardson	9449982	8.68	8.38		7.17	18	3.6	15		
	Telegraph Bay	9449988	7.64	7.43		6.21	[illegible]	2.5	15		
Fidalgo & Whidbey Islands	Bowman Bay	9448614	9.17	9.04		7.72	[illegible]	1.6	16		
	Turner Bay	9448657	12.29	12.11		10.3[illegible]	23	2.2	21		
	Sneeoosh Point	9448576	12.97	12.81		[illegible]	[illegible]	1.9	21		
	Swinomish	9448682	10.67	10.38		8.75	23	3.5	20		
	Green Bank	9447883	13.80	13.57		11.35	29	2.8	27		
Strait of Juan de Fuca	Neah Bay	9443090	10.59	10.34	9.4[illegible]	7.96	32	[illegible]0	29	11.0	17.5
	Sekiu	9443361	10.05	9.72	[illegible]	7.[illegible]	31	4.0	27		
	Port Angeles	9444090	9.06	8.71	7.8[illegible]	[illegible]06	24	4.2	20	10.0	9.8
North Puget Sound	Port Townsend	9444900	9.99	9.85		8.52	18	1.7	16		
	Tulare Beach	9448043	13.29	[illegible]		[illegible].08	27	2.8	24		
	Spee-Bi-Dah	9448009	13.43	1[illegible]9		1[illegible]	27	2.9	24		
	Tulalip	9447773	13.39	13[illegible]	1[illegible]	11.06	28	2.6	25	10.1	15.2
	Priest Point	9447717	13.02	12.8[illegible]		10.96	25	2.5	22		
	Everett	9447659	[illegible]	13.00		11.09	26	2.6	23		
Hood Canal	Foulweather Bluff	9445[illegible]	11.83	11.64		10.00	22	2.3	20		
	Bangor	9445[illegible]3	12.86	12.71		11.07	21	1.8	20		
	Union	9445[illegible]	14[illegible]			11.85	29	2.9	26		
South Puget Sound	Seattle	9447130	[illegible].26	13.08	12.36	11.36	23	2.2	21	8.6	12.0
	Wauna	[illegible]291	[illegible]07	15.85		13.51	31	2.6	28		
	Tacoma	9446[illegible]	13.[illegible]	13.57	12.84	11.80	24	2.6	21	8.8	12.5
	Budd Inlet	9446680	16.53	16.32		14.50	24	2.5	22		
	Yoman Point	9446705	15.31	15.16		13.48	22	1.8	20		
	Sandy Point, Anderson I[illegible]d	9446804	13.85	13.66		11.56	27	2.3	25		
Outer Coast	La Push	9442[illegible]	10.46	10.33		8.45	24	1.6	23		
	Westport	[illegible]02	11.35	11.22		9.15	26	1.6	25		
	Aberdeen	9441187	12.39	12.26		10.11	27	1.6	26		
	Toke Point	9440910	11.44	11.27		8.92	30	2.0	28		
	South Bend	9440875	12.23	12.06		9.82	29	2.0	27		
	Nahcotta	9440747	12.76	12.59		10.49	27	2.0	25		
	Cape Disappointment	9440581	10.09	9.91	9.07	7.75	28	2.2	26	10.1	15.8
Columbia River	Skamokawa	9440569	9.73	8.82		7.56	26	10.9	15		
	Longview	9440422	7.57	5.19		4.61	36	28.6	7		
	Vancouver	9440083	5.98	3.81		3.34	32	26.0	6		
						Averages	25 in	3.9 in	21 in	9.8 in	13.8 in
			w/o Columbia River Stations[4]				24 in	2.6 in	22 in	Same	Same
						Lowest	15 in	1.6 in	6 in	8.6 in	9.8 in
			w/o Columbia River Stations[4]				Same	Same	13 in	Same	Same
						Highest	36 in	29 in	29 in	11. in	17.5 in
			w/o Columbia River Stations[4]				32 in	4.2 in	Same	Same	Same

[1] HAT (Highest Astronomical Tide) & MHHW (Mean Higher High Water) calculated by NOAA for the most recent National Tidal Datum Epoch (1983-2001) & obtained for each station through NOAA's "Datums Page" at:https://tidesandcurrents.noaa.gov/stations.html?type=Datums#Washington.

[2] MAHT (Mean Annual Highest Tide) calculated by the workgroup using NOAA tide tables for the most recent 19-year period (i.e., 1998-2016), to facilitate annual updates. Tide tables available at: http://opendap.co-ops.nos.noaa.gov/axis/webservices/highlowtidepred/index.jsp.

[3] MMHT (Mean Monthly Highest Tide) calculated only for the six study sites, due to time constraints. Calculations done as described for MAHT.

[4] The relationship between HAT, MAHT, & MHHW at the Columbia River stations is anomalous compared to elsewhere.

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Figure 2a. Harmonic Tide Stations in Washington & Relationship between Elevations of Highest Astronomical Tide (HAT), Mean Annual Highest Tide (MAHT), Mean Monthly Highest Tide (MMHT), & Mean Higher High Water (MHHW)

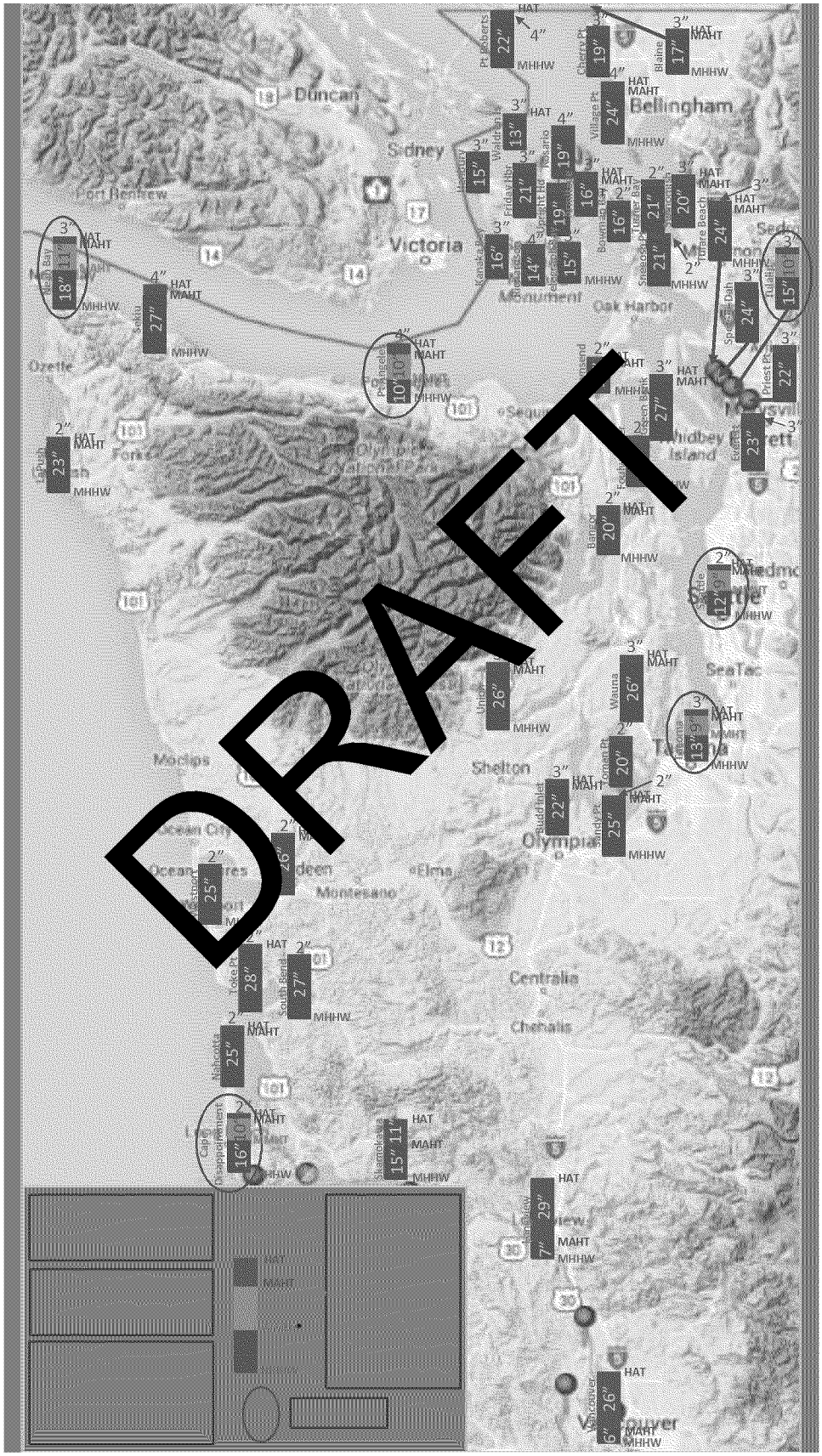


Figure 2b. Harmonic Tide Stations in Puget Sound & Relationship between Elevations of Highest Astronomical Tide (HAT), Mean Annual Highest Tide (MAHT), Mean Monthly Highest Tide (MMHT) & Mean Higher High Water (MHHW)

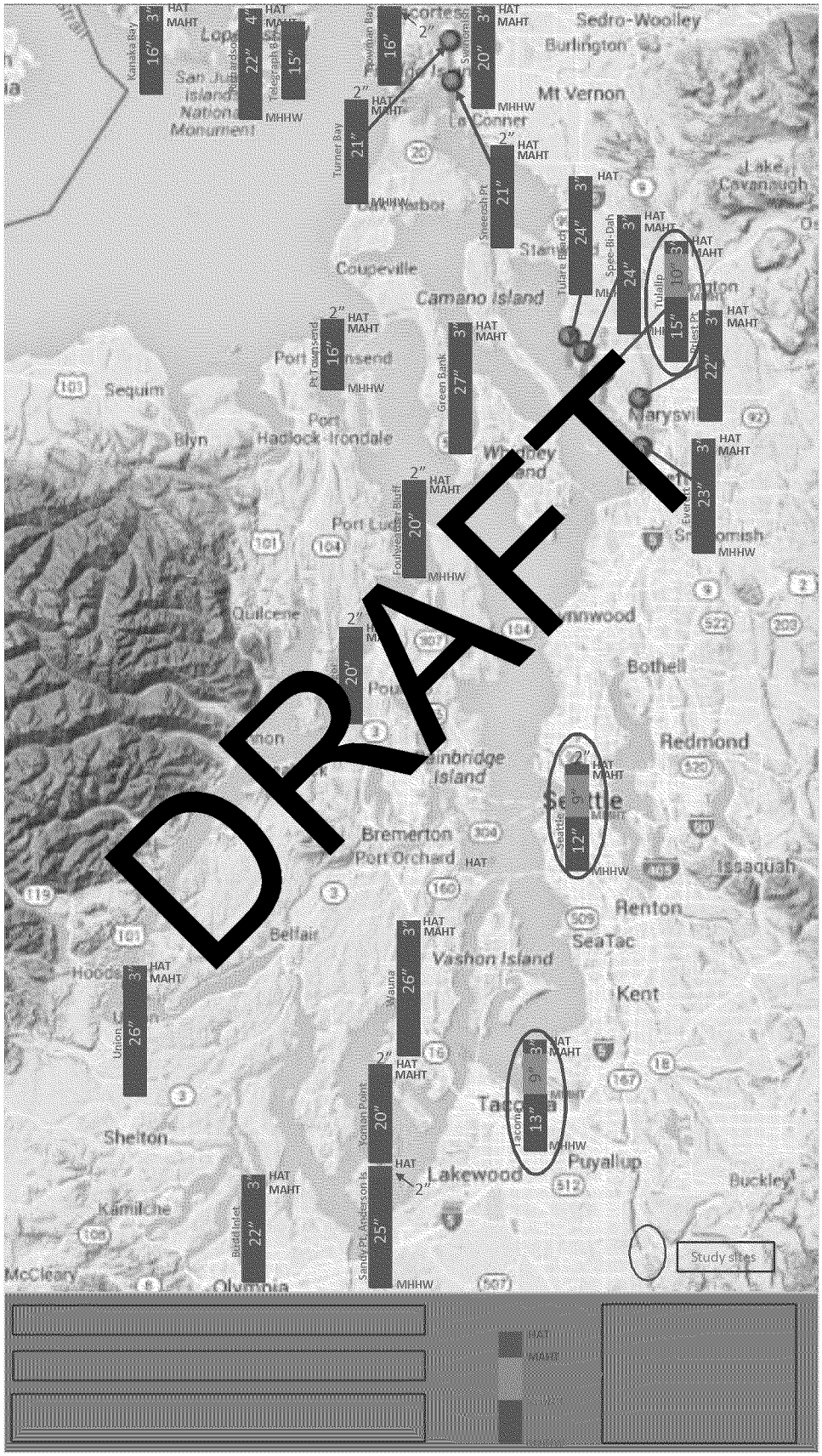


Figure 3. High Tide Line Study Sites

Figure 4a. Site Visit Photos: High Energy Beach (Tulalip)

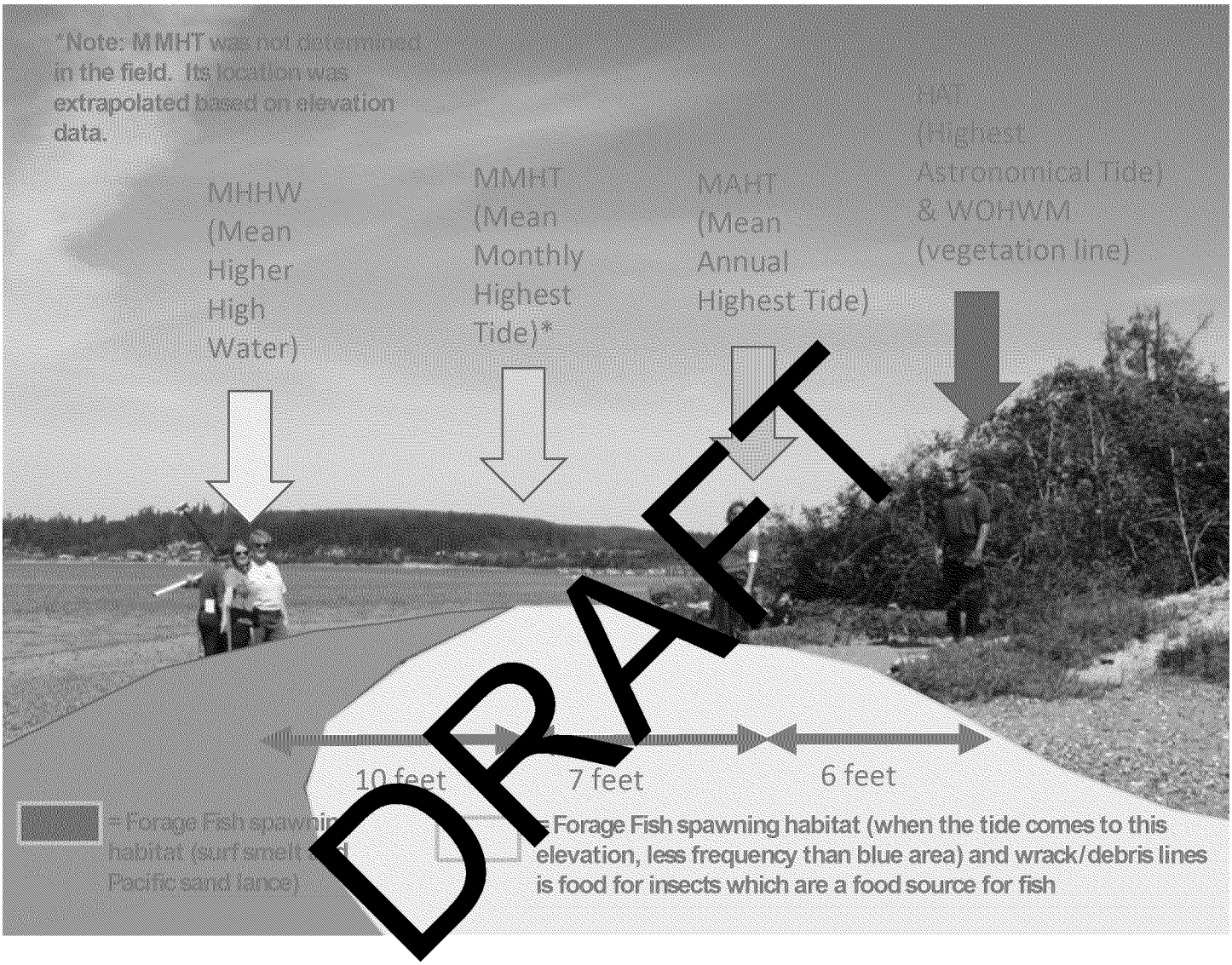
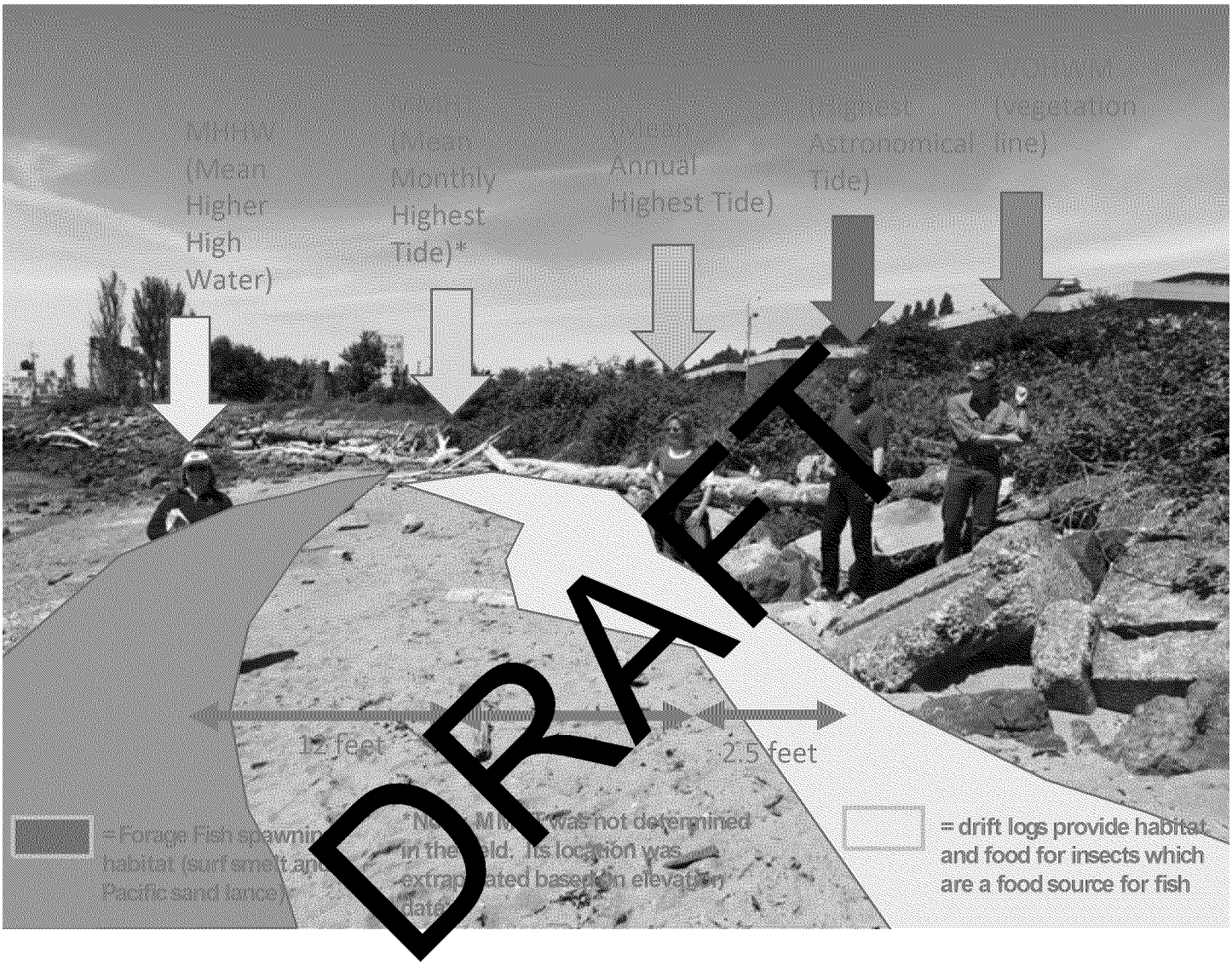
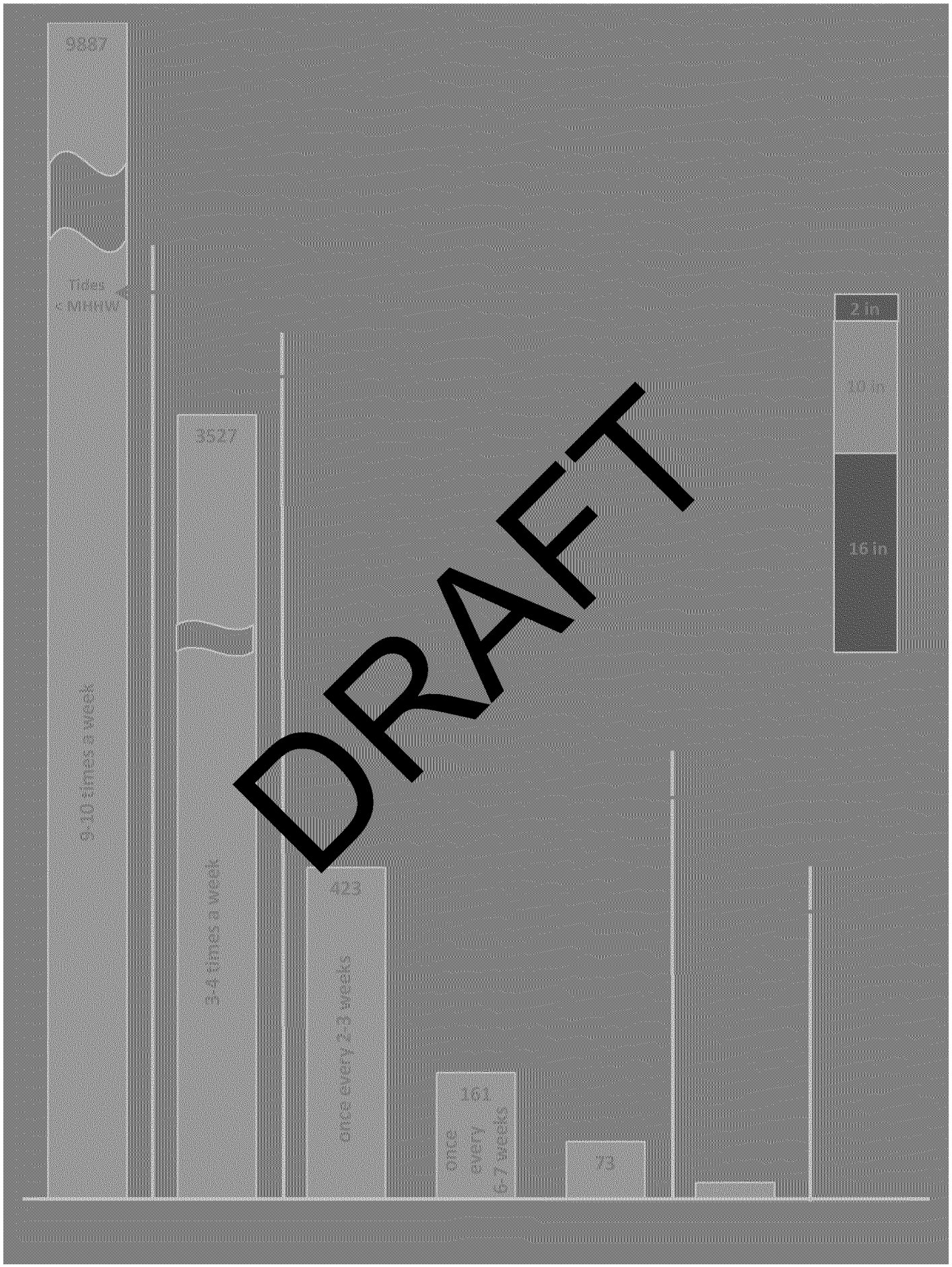


Figure 4b. Site Visit Photos: High Energy Beach (Seattle)




9887
Tides
< MHHW
9-10 times a week
3527
3-4 times a week
423
once every 2-3 weeks
161
once
every
6-7 weeks
73
2 in
10 in
16 in

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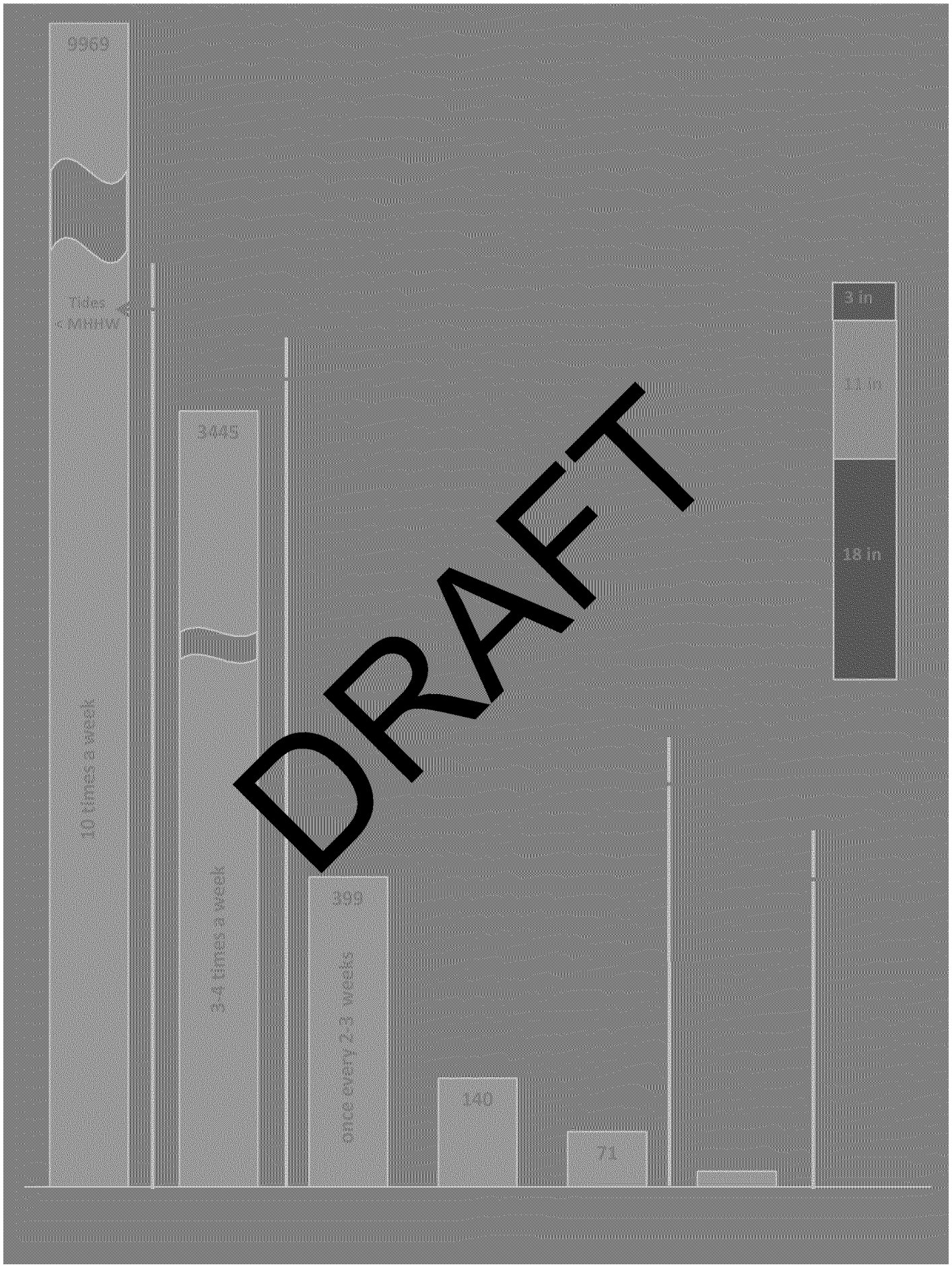
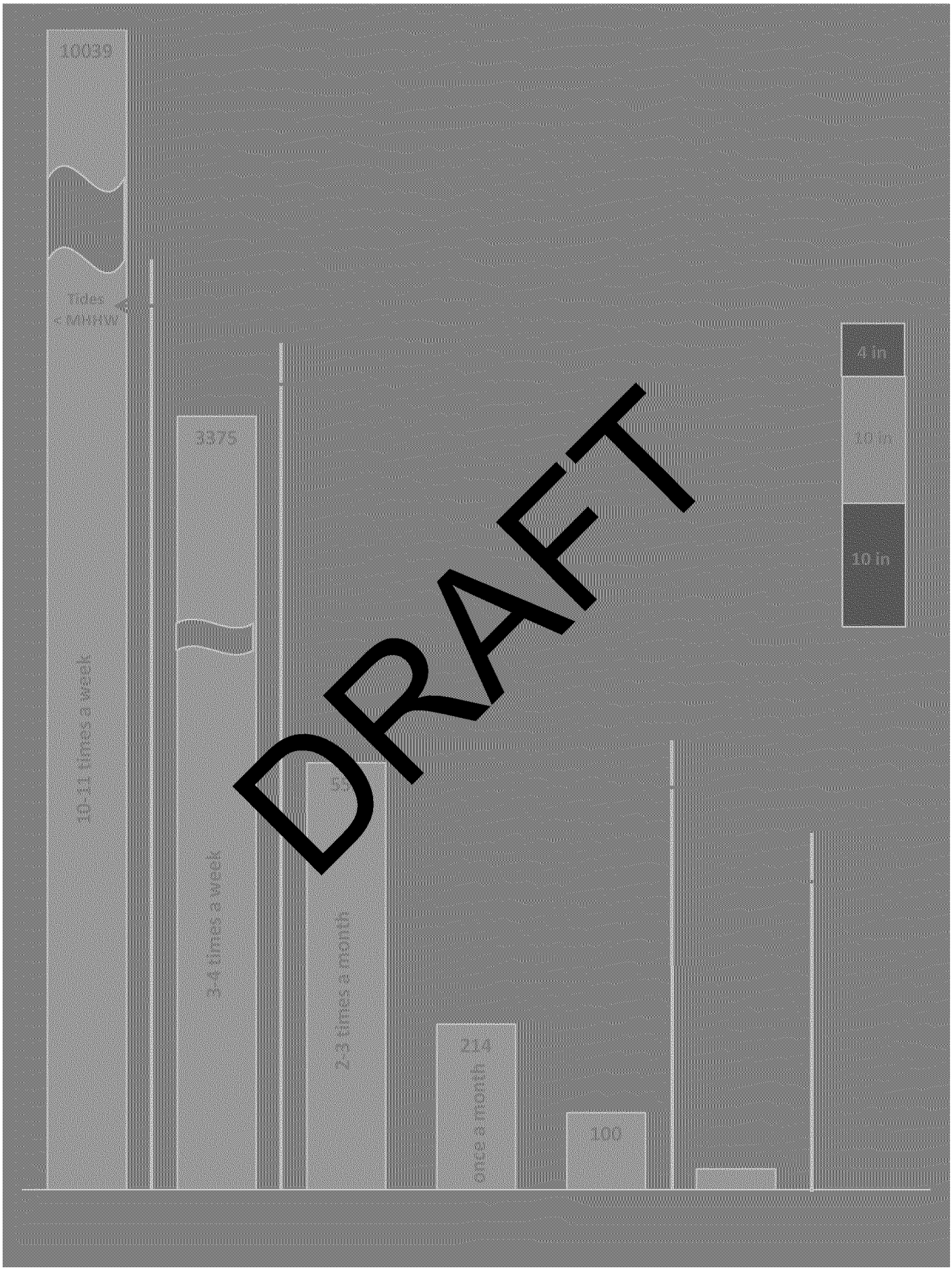
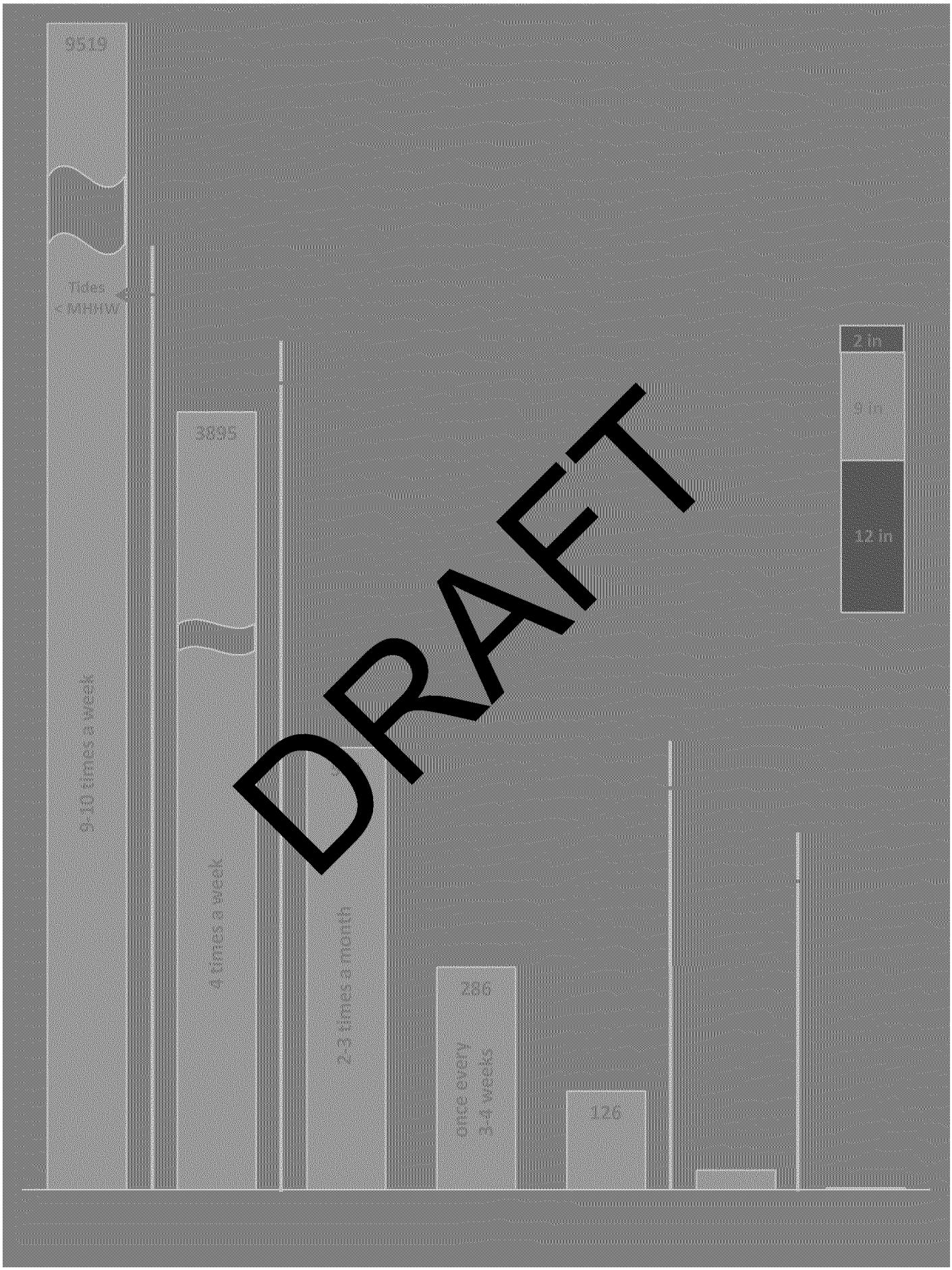

9969
Tides
≤ MHHW
10 times a week
3445
3-4 times a week
399
once every 2-3 weeks
140
71
3 in
11 in
18 in
DRAFT


10039
Tides
< MHHW
10-11 times a week
3376
3-4 times a week
2-3 times a month
214
once a month
100
4 in
10 in
10 in

DRAFT


9519
Tides
< MHHW
9-10 times a week
3895
4 times a week
2-3 times a month
286
once every
3-4 weeks
126
2 in
9 in
12 in

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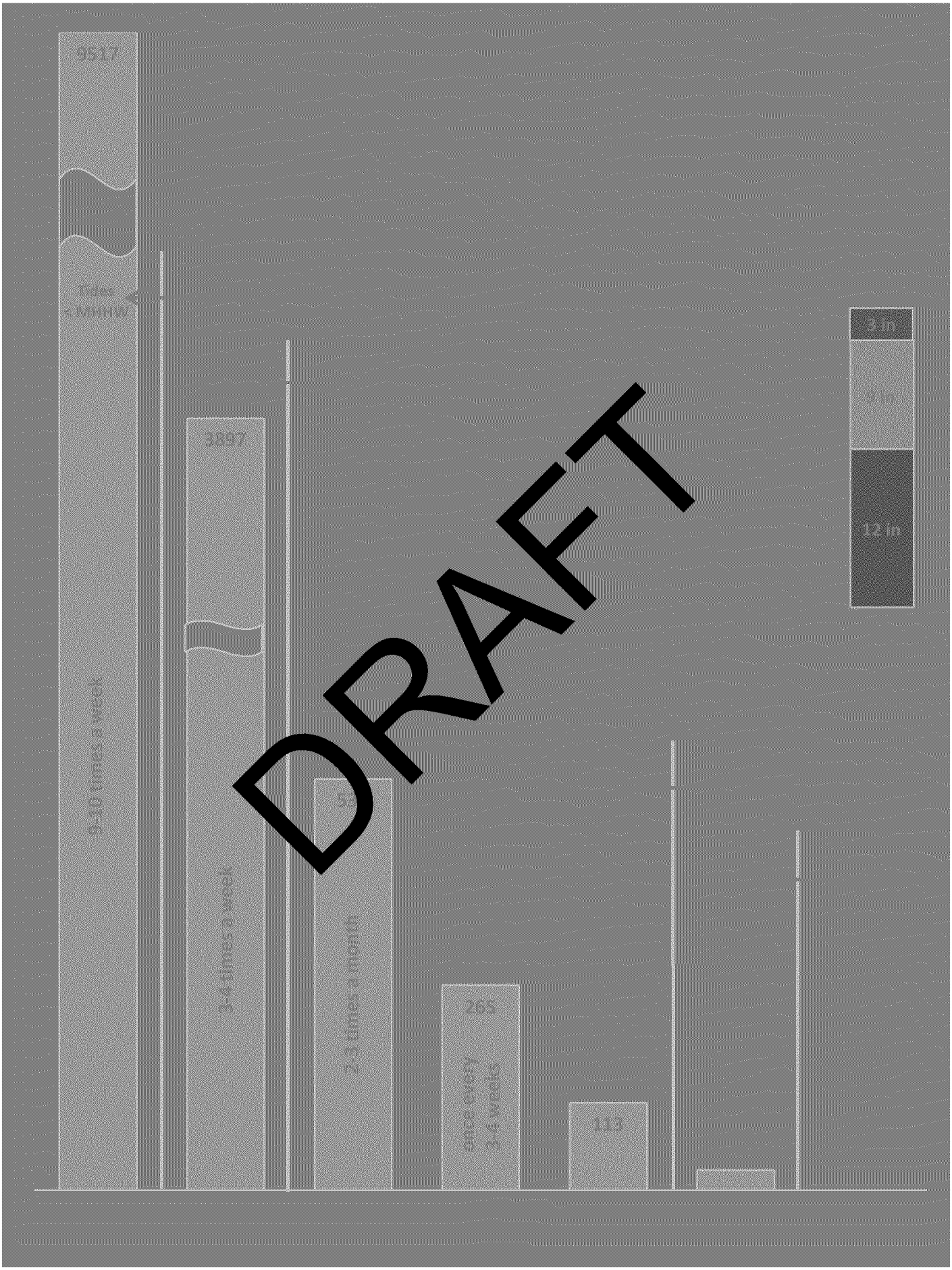
9517
Tides
< MHHW
9-10 times a week
3897
3-4 times a week
55
2-3 times a month
265
once every
2-4 weeks
113
3 in
9 in
12 in

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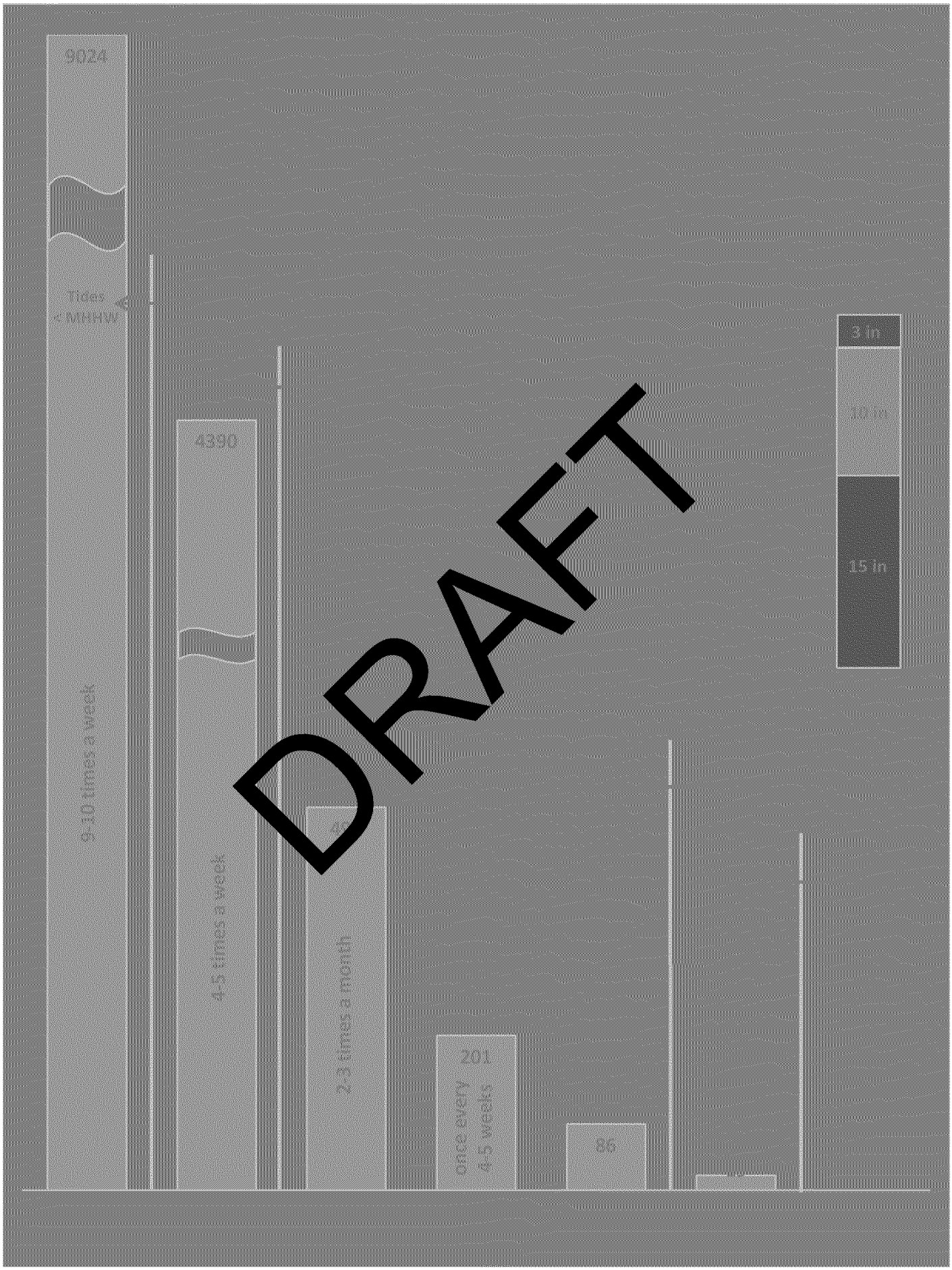
9024
Tides
< MHHW
9-10 times a week
4390
4-5 times a week
2-3 times a month
201
once every
4-5 weeks
86
3 in
10 in
15 in

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Alternative 1: MHHW

Alternative 1 represents the Seattle District's Regulatory status quo in terms of interpreting the location of the high tide line as MHHW, which is the average of the higher high water heights of each tidal day observed over the NTDE. However, this alternative does identify new actions that agencies can implement to provide better protection of tidally-influenced shoreline habitat; as such, it is not entirely a no-action alternative.

Alternative 1 would have no change to the regulated public and would only require minimum public outreach and education. In general, there would be little impact to agency staffing and workload, butAlternative 1 would require additional agency efforts to implement and maintain actions that better protect shoreline habitat. From an ecological standpoint, activities that could impact significant aquatic resource areas above MHHW, including forage fish spawning habitat and threatened and endangered species' Critical Habitat, would not require CWA Section 404 permits or the associated federal review.

The workgroup's analysis of Alternative 1 was relatively straightforward in terms of the high tide line. The Seattle District and several other Districts have been using this elevation as the high tide line since the early 1970s in response to the passage of the CWA. At the time, the available data for establishing a high tide line allowed for nothing higher than MHHW. MHHW has been in use for over 40 years, so regulators and stakeholders are readily familiar with it. It is important to note, however, that the workgroup's analysis revealed that many high tides exceed this elevation at tide stations in the Seattle District (Fig. 5).

MHHW does protect some valuable shoreline habitat including the lower limit of forage fish spawning habitat, and on rocky shorelines, barnacles, limpets, snails, rockweed and other intertidal species although indirect impacts to this area could be expected. However, structural development above this elevation results in more adverse ecological effects than the other alternatives discussed in this document. Recent forage fish studies have noted that approximately 30 – 40% of forage fish eggs occur above MHHW (Appendix A). There is wide concern that with sea level rise, and continued development of the shoreline, forage fish will experience the "squeeze" between shoreline armoring and water that is too deep for spawning. In addition, development at MHHW prevents lateral beach sediment distribution through historic drift cell movement. Beach sediments are extremely important for forage fish spawning, eelgrass substrate, and buffering uplands from coastal erosion. Wrack accumulation and drift logs, as well as back-shore trees and shrubs provide habitat for numerous species of insects that are food for small fish such as juvenile salmon and forage fish.Structural development at or above MHHW removes this habitat by many feet, locally, and approximately 6,000 acres in Puget Sound alone (acreage between MHHW and HAT; calculated using a hypothetical average of 10% slope over 2,500 miles of shoreline).

In terms of additional actions the three federal agencies could do to protect shoreline habitat above MHHW, the federal agencies could implement the following mechanisms:

- Continue to utilize available funding by each agency for shoreline property acquisition, restoration, stewardship opportunities, social marketing, or special studies to help inform gaps in shoreline protection research.
- Continue to implement the Puget Sound Action Agenda.
- Provide federal funding to Washington Department of Ecology to enforce the provisions in the Shoreline Management Act.
- The federal family could work together to streamline the permitting process for dredge material disposal so that some clean dredge

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materials could be used for beach restoration projects.

- Provide outreach, education and permit streamlining for bulkhead removal projects.

See Appendix C for more detail.

Alternative 2: MMHT

Alternative 2 would adjust the Seattle District's interpretation of high tide line to the MMHT, which is the average of the highest monthly tide predicted by NOS over a period of 19 years. The workgroup calculated MMHT over a period of 19 years to match the length of the NTDE, but used the most recent 19 years—including 2016—to reflect the most current data. Because of the time-consuming nature of calculating MMHT, the workgroup did so only for the six sites chosen for detailed analysis. At those sites, the MMHT for the period from 1998 through 2016 was 10 – 18 inches above MHHW, depending on the location in Puget Sound and the coast of Washington (Columbia River is excluded in this calculation). Alternative 2 also identifies new actions that the agencies can implement to provide better protection for shoreline habitat.

Alternative 2 would constitute a fairly substantial change for the regulated public in terms of the elevation at which the Seattle District would require CWA permits for the placement of fill in tidally-influenced waters, and would require extensive public outreach and education. There would likely be an increase in regulatory workload, with a consequent need for additional staffing. From an ecological standpoint, it would extend the geographic reach of the CWA Section 404 permitting requirements and associated federal review, such as Endangered Species Act consultation, to ecologically significant areas above MHHW, including forage fish spawning habitat and threatened and endangered species' designated Critical Habitat, but not to ecologically significant areas between MMHT and MAHT, nor the uppermost boundary of that habitat.

The analysis of Alternative 2 focuses on two main issues: implementation and ecological significance. MMHW, although not already published, is one of two tidal elevations, the other being MAHT, that derives from readily available data (i.e., tide predictions published by NOS). In contrast to MHHW and HAT, MMHT, and consequently MAHT, is available for far more tide stations (171 compared to 84 or 46, respectively), thereby reducing the need for interpolation of the high tide elevation at locations between tide stations. That said, the workgroup has, so far, calculated MMHT only for the six sites chosen for detailed analysis. Calculating MMHT for the remaining 97 subordinate stations with published historical tide tables would be a matter of averaging the highest tides predicted for each month over the 19-year period. For the remaining 68 tide stations, the calculation would involve simply applying published tidal height offsets to the MMHT for the appropriate reference station. Tidal height offsets are differences that NOS calculates for subordinate stations in comparison to reference stations, which have much longer periods of record with which to analyze tides. While tide predictions derived using offsets are not as accurate as those calculated for reference stations, NOS describes using offsets as providing reasonably accurate approximations of tide elevations. Updating MMHT annually would involve a simple process of locating the highest predicted tide for each month of the upcoming year from each station's tide tables and using those elevations to replace the oldest twelve in the calculation of the 19-year mean. Seattle District currently provides links to current and historic tidal datums through the "Permit Guidebook" on the Regulatory Program's home page. The initial calculation of MMHT for the full suite of Washington tide stations, while simple, would be somewhat time consuming, requiring approximately 400 hours of work. Updating it annually and making it available on a public website would have minimal resource costs, provided an agency commits to the upkeep (e.g., NOS). Specifically, the workgroup estimates that annual updates would take approximately 30 hours. Preparing the list or table for a website

would take some start up time, as well as time for annual updates, but that effort should be relatively minimal.

From an implementation standpoint, any change from MHHW to another datum at a higher elevation (e.g., MMHT, MAHT, HAT, and WOHWM) would have similar impacts on the regulated public and the Regulatory Program in the Seattle District. There would be a need to re-educate the public on the update to the tidal elevation data that the Seattle District uses for high tide line determinations, as the public has been associating MHHW with the Seattle District for over 40 years. See Appendix B for additional implementation details.

Continuing with implementation, more shoreline areas would be regulated by the Seattle District (approximately 5,000 acres). This would mean more permits would be required, which would result in an increased workload for the federal regulatory agencies (Seattle District, EPA, and NOAA). These impacts could be mitigated over time with additional funding to hire more staff. Additionally, it is anticipated that the increased workload may diminish over time as the public were to learn about the new interpretation. As a result, similar to how many in the regulated community approach shoreline monitoring decisions today, many choose to avoid permitting requirements by building above that elevation. However, permits would still be required by state and local agencies, as this alternative is not in alignment with those agencies' jurisdiction. One challenge would be development of policies on the legality, maintenance, and enforcement actions related to structures previously built landward of MHHW, but within CWA jurisdiction based upon an updated tidal elevation used to determine the high tide line (details in Appendix B). However, this scenario is not without precedent and there are various approaches that could be implemented to mitigate confusion related to regulation of existing structures (e.g., grandfathering, CWA 404(f)(1) permitting exemptions for maintenance of existing structures, etc.). In any event, this would require coordination with the U.S. Army Corps of Engineers, Northwestern Division (NWD) and Headquarters (HQ) (both Regulatory staff and Office of Counsel), as well as EPA.

From an ecological standpoint, more shoreline habitat would be regulated between MHHW and MMHT by the Seattle District; whereas before, only the state and local governments regulated the work in that area of the shoreline. This would mean a slightly greater level of protection through increased review by the Corps and NOAA. At MMHT, Section 404 permitting requirements would apply to more of the forage fish spawning habitat, although surf smelt will spawn well above this elevation. Additionally, slightly more of the rocky shoreline intertidal habitat would also be protected by Alternative 2. Some of the beach area that accumulates drift material and logs (and therefore insects that provide food for small fish) would also be protected. Structural development above this elevation would not protect the lateral movement of beach sediments or the back-shore habitat where trees and shrubs harbor insect populations and provide needed shade to the beach sediments where forage fish eggs may occur.

Additional actions the three federal agencies could undertake to protect shoreline habitat above MMHT, including those specified in Alternative 1, are:

- Initiation of an education and outreach program: The federal family could also initiate an outreach program to educate the public and consultants about the new high tide line interpretation, how to locate the elevation on the beach, and why it is important.

- Exploration of additional funding strategies: EPA, NOAA, and the Seattle District could continue the funding mechanisms that are in place and seek other opportunities as options arise.

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Alternative 3: MAHT

Alternative 3 would adjust the Seattle District's interpretation of high tide line to the MAHT, which is the average of the highest annual tide predicted by NOS over a period of 19 years. The workgroup calculated MAHT over a period of 19 years to match the length of the NTDE, but used the most recent 19 years—including 2016—to reflect the most current data.As calculated by the workgroup, the MAHT for the period from 1998 through 2016 is 13 – 29 inches above MHHW depending on the location in Puget Sound and the coast of Washington (Columbia River is excluded in this calculation). Alternative 3 also identifies new actions that the agencies can implement to provide better protection for shoreline habitat.

Alternative 3 would constitute a fairly substantial change for the regulated public, in terms of the elevation at which the Seattle District would require CWA permits for the placement of fill in tidally-influenced waters and would require extensive public outreach and education. There would likely be an increase in regulatory workload, with a consequent need for additional staffing. From an ecological standpoint, it would extend the geographic reach of the CWA Section 404 permitting requirements and associated federal review, such as Endangered Species Act consultation, to ecologically significant areas above MHHW, including forage fish spawning habitat and threatened and endangered species' designated Critical Habitat, but not to the uppermost boundary of that habitat.

The analysis of Alternative 3 focuses on two main issues: implementation and ecological significance. MAHT, although not already published, is one of two tidal elevation, the other being MMHT, that derives from readily available data (i.e., tide predictions published by NOS). In contrast to MHHW and HAT, MAHT is available for far more tide stations (171 compared to 84 or 46, respectively), thereby reducing the need for interpolation of the high tide elevation at locations between tide stations. That said, the workgroup has calculated MAHT for Washington's 46 harmonic tide stations. This availability compares to the 84 tide stations with published MHHW and 46 stations—the harmonic stations—with published HAT. Calculating MAHT for the remaining 124 subordinate stations would be a matter of applying published tidal height offsets to each one. Tidal height offsets are differences that NOS calculates for subordinate stations in comparison to reference stations, which have much longer periods of record with which to analyze tides. While tide predictions derived using offsets are not as accurate as those calculated for reference stations, NOS describes using offsets as providing reasonably accurate approximations of tide elevations. Updating MAHT annually would involve a simple process of locating the highest predicted tide for the new year from each station's tide tables and using that elevation to replace the oldest one in the calculation of the 19-year mean. Seattle District currently provides links to current and historic tidal datums through the "Permit Guidebook" on the Regulatory Program's home page. Thus, determining MAHT, updating it annually, and making it available on a public website would have minimal resource costs provided an agency commits to the upkeep (e.g., NOS). Specifically, the workgroup estimates that calculating MAHT for the additional 124 subordinate tide stations where the workgroup has not already calculated it would take approximately 10 hours of work, while annual updates would take less than 4 hours. Preparing the list or table for a website would take some start up time, as well as time for annual updates, but, similar to the initial calculations, that effort should be relatively minimal.

From an implementation standpoint, any change from MHHW to another datum at a higher elevation (e.g., MMHT, MAHT, HAT, and WOHWM) would have similar impacts on the regulated public and the Regulatory Program in the Seattle District. There would be a need to re-educate the public on the update to the tidal elevation data that the Seattle District uses for high tide line determinations, as the public has been associating MHHW with the Seattle

District for over 40 years. See Appendix B for additional implementation details.

Continuing with implementation, more shoreline areas would be regulated by the Seattle District (approximately 8,600 acres). This would mean more permits would be required, which would result in an increased workload for the federal regulatory agencies (Seattle District, EPA, and NOAA). These impacts could be mitigated over time with additional funding to hire more staff. Additionally, it is anticipated that the increased workload would diminish over time as the public were to learn about the new interpretation. As a result, similar to how many in the regulated community approach shoreline armoring decisions today, many chose to avoid permitting requirements by building above that elevation, which, for this alternative, is more closely aligned with state and local agencies' jurisdiction. One challenge would be development of policies on the legality, maintenance, and enforcement actions related to structures previously built landward of MHHW but within CWA jurisdiction based upon an updated tidal elevation used to determine the high tide line (details in Appendix B). However, this scenario is not without precedent and there are various approaches that could be implemented to mitigate confusion related to regulation of existing structures (e.g., grandfathering, CWA 404(f)(1) permitting exemptions for maintenance of existing structures, etc.). In any event, this would require coordination with the U.S. Army Corps of Engineers, Northwestern Division (NWD) and Headquarters (HQ) (both Regulatory staff and Office of Counsel), as well as EPA.

From an ecological standpoint, significantly more shoreline habitat would be regulated between MHHW and MAHT by the Seattle District; whereas before, only the state and local governments regulated the work in that area of the shoreline. This would mean a greater level of protection through increased review by the Corps and NOAA, and support of local government in permit decisions. At MAHT, Section 404 permitting requirements would apply to most of the forage fish spawning habitat, although surf smelt will spawn wherever the water takes them as long as there is adequate substrate. The majority of rocky shoreline intertidal habitat would also be protected by Alternative 3. Most of the beach area that accumulates drift material and logs (and therefore insects to provide food for small fish) would also be protected. The lateral movement of beach sediments could continue, which is important for the formation of protective berms on the beach, in turn helping to buffer wave run-up from strong winter storms. Structural development above this elevation would not necessarily protect the back-shore habitat where trees and shrubs harbor insect populations and provide needed shade to the beach sediments where forage fish eggs may occur.

Additional actions the three federal agencies could undertake to protect shoreline habitat above MAHT, including those specified in Alternative 1, are:

- Establishment of an interagency permitting coordination group: MAHT, as well as HAT, is generally close to the WOHWM jurisdictional line as defined in the State of Washington's Shoreline Management Act and Hydraulics Code. There would be a benefit to both the regulatory agencies at the federal, state and local levels, and the regulated public if a multi-agency permitting coordination group were to be established. This group could alleviate much of the increase in Seattle District and other agency workload, as they could reduce duplication of reviews for shoreline and restoration development projects.

- Initiation of an education and outreach program: The federal family could also initiate an outreach program to educate the public and consultants about the new high tide line interpretation, how to locate the elevation on the beach, and why it is important.

- Exploration of additional funding strategies: EPA, NOAA, and the Seattle District could

continue the funding mechanisms that are in place and seek other opportunities as options arise.

Alternative 4: HAT

Alternative 4 would adjust the Seattle District's interpretation of high tide line to HAT, which is the elevation of the highest astronomical tide expected to occur at a tide station during the NTDE. The workgroup's research shows that HAT is 15 – 32 inches above the current application (MHHW), depending on the location (Columbia River is excluded in this calculation).

Alternative 4 also identifies new actions that the agencies can implement to better protect shoreline habitat. Alternative 4 would constitute a fairly substantial change for the regulated public and would require extensive public outreach and education, equal to that of Alternative 2 and 3. There would likely be an increase in regulatory workload, with a consequent need for additional staffing. From an ecological standpoint, Alternative 4 would extend CWA review process to the upper reaches of the intertidal zone, including all forage fish spawning habitat. In addition, this alternative would encompass the designated Critical Habitat for threatened and endangered species listed in Puget Sound.

The analysis of Alternative 4 focuses on three main issues: periodicity/frequency, implementation, and ecological significance. In contrast to MHHW, MMHT, and MAHT, tides reach or exceed the elevation of HAT far less frequently (i.e., approximately once per tidal epoch). In addition, HAT information is currently less widely available than MHHW, MMHT, or MAHT, being published at present for only 46 of the existing171 tide stations in Washington (compared to 84 for MHHW and 46 for MMHT and MAHT, which can be expanded to 171 with a simple additional calculation). Furthermore, unlike MMHT and MAHT, establishing HAT at present for additional tide stations would involve a sizeable commitment of time and resources for NOS. It would require determining, for each station, the harmonic constituents that, together, form the mathematical expression of the tide-producing forces at that station. Each harmonic constituent represents an effect on tides from the relative position of the earth, sun, and moon or from the variations in those positions; there are 37 harmonic constituents. In addition, since HAT is tied to the NTDE, presently dating from 1983-2001, it is less up to date with long-term trends such as sea level rise than is MMHT and MAHT, which would reflect the tides from the most recent 19-year period.

Under Alternative 4, the implementation of HAT would be the same as that found in Alternative 2 and 3 (see Alternative 2 and 3 for more details).

From an ecological standpoint, the HAT alternative means more shoreline habitat would be regulated between MAHT and HAT by the Seattle District and NOAA than was identified inAlternatives 1, 2, and 3. In addition to those ecological functions identified inAlternatives 1, 2, and 3, protection would include more back-shore habitat such as shrubs and trees to help shade forage fish eggs, preventing desiccation, as well as providing habitat for insects, which drop onto the beach where they become prey for small fish. Furthermore, drift logs and beach detritus could accumulate in the frontal back-shore area with this alternative, harboring additional insect species. Development at HAT would not protect all of the back-shore habitat or the sediment supply from erosional or feeder bluffs. Cutting off this sediment supply reduces the amount of beach substrate available for beach development, thus affecting people, forage fish and eelgrass beds.

As for additional actions the three federal agencies could do to protect shoreline habitat if the HAT alternative were chosen, they would be the same as identified in Alternatives 1, 2, and 3.

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Alternative 5: WOHWM

Alternative 5 would adjust the Seattle District's regulatory interpretation of high tide line to an elevation that is higher than the current interpretation (MHHW) and generally near MAHT and HAT. WOHWM is determined in the field on a case by case basis using field indicators such as the line formed by salt-tolerant vegetation, toe of eroding bluffs, or drift log presence.

Alternative 5 would be a substantial change for the regulated public regarding federal permitting and would require extensive public outreach and education, similar to Alternatives 2, 3, and 4. It would require additional staffing and the workload could increase substantially due to the required field work necessary to ensure agreement on the location of WOHWM. However, since the WOHWM is the jurisdictional elevation used by state and local agencies pursuant to the State of Washington's Shoreline Management Act, the Hydraulics Code of Washington, and Section 401 of the CWA, the Seattle District could collaborate with these agencies to jointly determine the location of the WOHWM. This could mitigate the increase in workload for this alternative.

The analysis of Alternative 5 focuses on two main issues: implementation and ecological significance.As mentioned earlier in Alternatives 1, 2, 3, and 4, they are the only four repeatable tidal elevations that occur within the NTDE that NOS currently can reliably and readily produce using predictable tide data. Identifying the location of WOHWM is a field-based investigation that relies on observations of biological and physical indicators that must be determined at each site by the applicant or their consultant, and staff from a regulatory agency. The regulatory definition of high tide line also identifies certain physical characteristics that the agency can use to determine the high tide line in the absence of actual data; i.e., "a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines." While not entirely synonymous with the WOHWM, the physical characteristics identified in the federal definition, in the absence of actual tidal data, bear a strong resemblance to the indicators used by the state of Washington.

Under Alternative 5, the implementation of the WOHWM would have similarities with those found in Alternatives 2, 3 and 4, but would likely see a larger staffing effort/workload due to the nature of determining the high tide line through physical observation and analysis.

Ecologically, the WOHWM alternative would trigger CWA permitting requirements and associated federal review for those projects that fall between MHHW and WOHWM with similar ecological significance found in Alternative 3.

In terms of additional actions the three federal agencies could do to protect shoreline habitat above WOHWM, they are very similar to those for MAHT and HAT. In addition to those, however, EPA and the Seattle District could solicit the help of the Washington Department of Ecology to train Seattle District staff and continue to train consultants and local governments in the methods for determining the WOHWM.

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Recommended Alternative & Rationale

The recommended alternative is Alternative 3, MAHT. The workgroup concludes that as a technical findingAlternative 3, MAHT, constitutes an appropriate application of the regulatory definition of the statutory term high tide line in Washington State and recommends its consideration by the U.S. Army Corps of Engineers, Northwestern Division for adoption. Alternative 3, MAHT, is an elevation that is reasonably representative of the intersection of the land and the water's surface at the maximum height reached by the rising tide, is based on gravitational forces, is predictable, reliable, repeatable, reasonably periodic, measurable, simple to determine, is scientifically defensible, and based on data that is reasonably available and accessible to the public. Alternative 3 would extend the scope of shoreline protection that would require environmental review through CWA permitting and the associated coordination measures. Additionally, the workgroup believes that it would be achievable with deliberate outreach, education, planning, and commitment of resources from the three federal agencies. Although it is expected that the Seattle District and NOAA workload would increase, the Seattle District estimate it would need to accommodate roughly 17 additional permit applications a year (approximately a 10% increase in overall workload), especially during the early years of implementation. If MAHT were adopted as the tidal elevation data used to determine the high tide line, adding additional Seattle District staff (approximately 3.25 FTEs) could reduce the impacts on the regulated public; NOAA did not estimate its additional staffing needs (Appendix B).The workgroup further believes that as the regulated public becomes aware of the update to the tidal elevation data used to determine the high tide line, if adopted, there is an assumption that a similar percentage of overall potential applicants (10%) would now elect to avoid jurisdictional waters.

Conclusion

The recommended alternative does not constitute a position adopted by any agency. Rather, it seeks to inform agency leadership of considerations that may not have been known prior to this effort. Furthermore, the workgroup recognizes that there are logistical, economic, and staffing challenges associated with Alternative 3, MAHT, but concludes that they would not be insurmountable, particularly with continued interagency cooperation and support. While NOAA will continue to use MHHW (Alternative 4) for the purposes of Critical Habitat designations under the ESA, the benefits of Alternative 3 are an appropriate application for the apparent intent of the definition of high tide line, as described in the preamble to the Corps of Engineers' regulations where the definition of high tide line was originally promulgated (42 Fed. Reg. 37129 (July 19, 1977)). Alternative 3 would be scientifically defensible, logistically feasible to implement, and would provide substantial protection of shoreline habitats along Puget Sound and the coast of Washington. Finally, Alternative 3 would be responsive to the commitment made by the three federal agencies to local tribes under the Treaty Rights at Risk Initiative and the tribes' concern that the federal agencies are not doing enough to protect tidally-influenced shoreline habitat.

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Appendices

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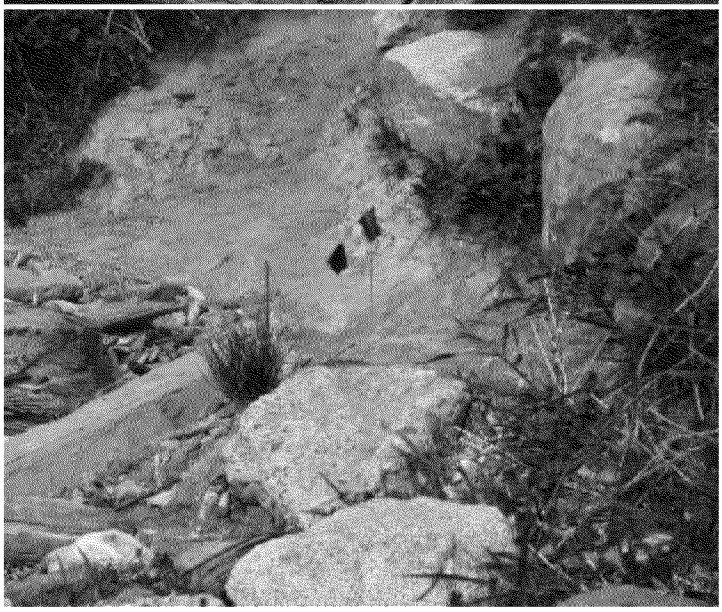

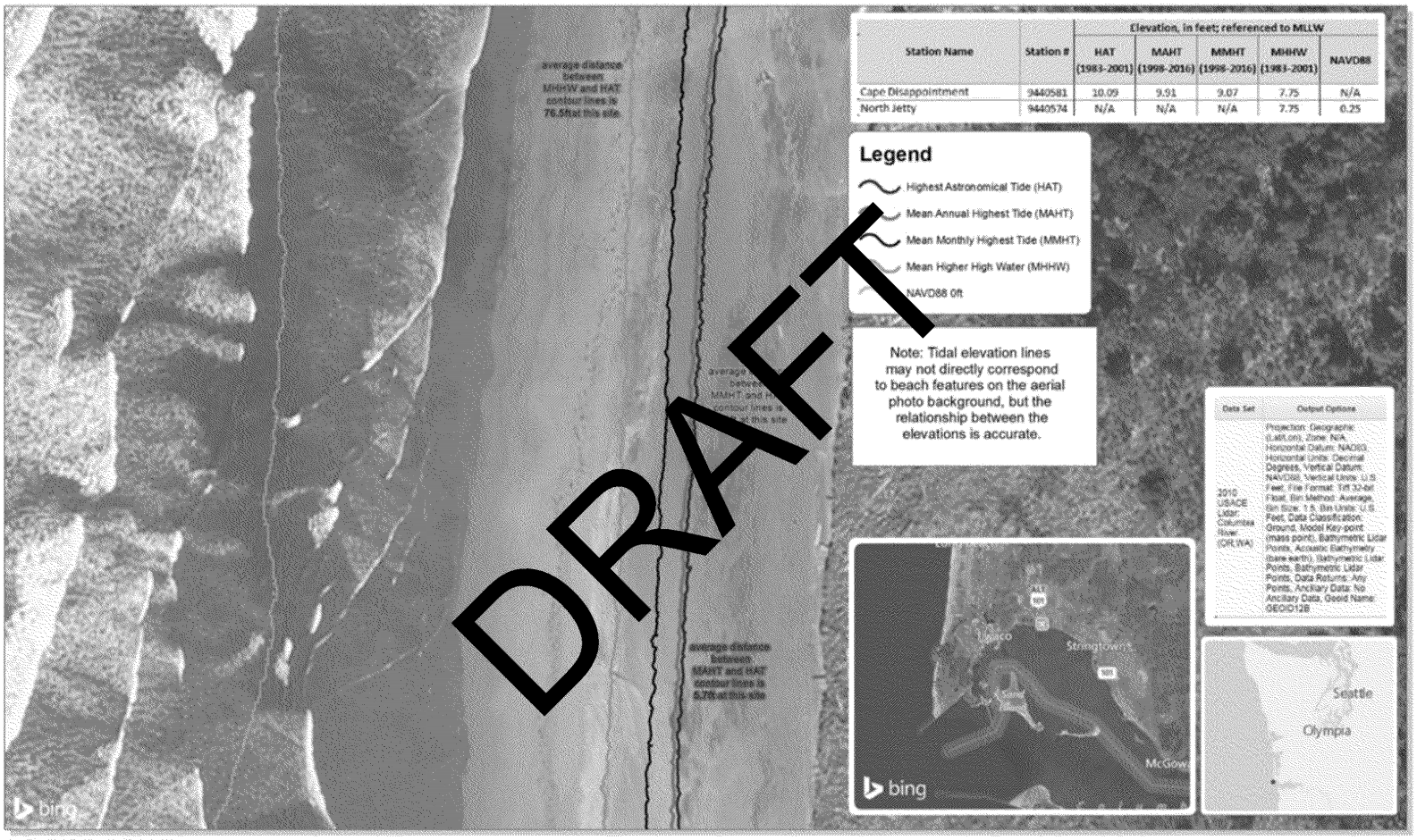

Station Name	Station #	Elevation, in feet; referenced to MLLW				
		HAT (1983-2001)	MAHT (1998-2016)	MMHT (1998-2016)	MHHW (1983-2001)	NAVD88
Cape Disappointment	9440581	10.09	9.91	9.07	7.75	N/A
North Jetty	9440574	N/A	N/A	N/A	7.75	0.25

Data Set	Output Options
2010 USACE Lidar: Columbia River (OR,WA)	Projection: Geographic (Lat/Lon), Zone: N/A, Horizontal Datum: NAD83, Horizontal Units: Decimal Degrees, Vertical Datum: NAVD88, Vertical Units: U.S. Feet, File Format: Tiff 32-bit Float, Bin Method: Average, Bin Size: 1.5, Bin Units: U.S. Feet, Data Classification: Ground, Model Key-point (mass point), Bathymetric Lidar Points, Acoustic Bathymetry (bare-earth), Bathymetric Lidar Points, Bathymetric Lidar Points, Data Returns: Any Points, Ancillary Data: No Ancillary Data, Geoid Name: GEOID12B

Tidal Datum Comparison - Cape Disappointment State Park (Long Beach), WA

(Highest Astronomical Tide vs Mean Annual Highest Tide vs Mean Monthly Highest Tide vs Mean Higher High Water)

*Contours are derived from a lidar dataset using the NAVD88 datum

0 50 100 200 Feet

EPA Region 10 GIS Team

Station Name	Station #	Elevation, in feet; referenced to MLLW				
		HAT (1983-2001)	MAHT (1998-2016)	MMHT (1998-2016)	MHHW (1983-2001)	NAVD88
Neah Bay	9443090	10.59	10.34	9.42	7.96	0.84

Note: Tidal elevation lines may not directly correspond to beach features on the aerial photo background, but the relationship between the elevations is accurate.

Tidal Datum Comparison - Neah Bay (near Coast Guard Station), WA

(Highest Astronomical Tide vs Mean Annual Highest Tide vs Mean Monthly Highest Tide vs Mean Higher High Water)

*Contours are derived from a raster dataset using the NAVD88 datum

0 50 100 200 Feet

EPA Region 10 GIS Team

Station Name	Station #	Elevation, in feet; referenced to MLLW				
		HAT (1983-2001)	MAHT (1998-2016)	MMHT (1998-2016)	MHHW (1983-2001)	NAVD88
Port Angeles	9444090	9.06	8.71	7.88	7.06	0.42

Tidal Datum Comparison - Port Angeles (Valley Creek Park), WA

(Highest Astronomical Tide vs Mean Annual Highest Tide vs Mean Monthly Highest Tide vs Mean Higher High Water)

0 50 100 200 Feet

EPA Region 10 GIS Team

Station Name	Station #	Elevation, in feet; referenced to MLLW				
		HAT (1983-2001)	MAHT (1998-2016)	MMHT (1998-2016)	MHHW (1983-2001)	NAVD88
Tulalip	9447773	13.39	13.17	12.33	11.06	2.04

Tidal Datum Comparison - Tulalip (near Tribal Center), WA

(Highest Astronomical Tide vs Mean Annual Highest Tide vs Mean Monthly Highest Tide vs Mean Higher High Water)

0 25 50 100 Feet

EPA Region 10 GIS Team

Station Name	Station #	Elevation, in feet; referenced to MLLW				
		HAT (1983-2001)	MAHT (1998-2016)	MMHT (1998-2016)	MHHW (1983-2001)	NAVD88
Seattle	9447130	13.26	13.08	12.36	11.36	2.34

Tidal Datum Comparison - Seattle (Myrtle Edwards Park), WA

(Highest Astronomical Tide vs Mean Annual Highest Tide vs Mean Monthly Highest Tide vs Mean Higher High Water)

0 25 50 100 Feet

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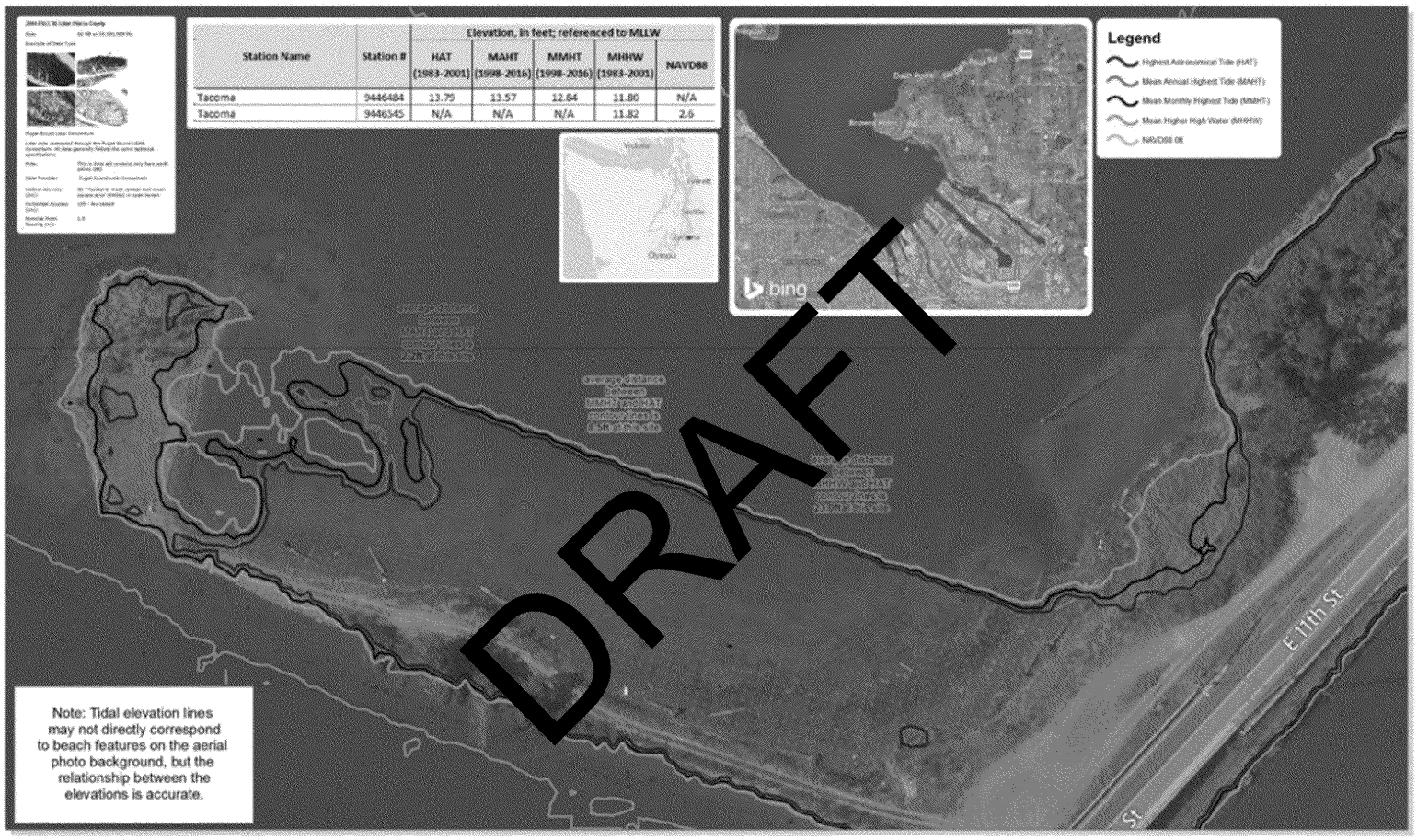

Station Name	Station #	Elevation, in feet; referenced to MLLW				
		HAT (1983-2001)	MAHT (1998-2016)	MMHT (1998-2016)	MHHW (1983-2001)	NAVD88
Tacoma	9446484	13.79	13.57	12.84	11.80	N/A
Tacoma	9446545	N/A	N/A	N/A	11.82	2.6

Tidal Datum Comparison - Tacoma (Squally Beach), WA

(Highest Astronomical Tide vs Mean Annual Highest Tide vs Mean Monthly Highest Tide vs Mean Higher High Water)

EPA Region 10 GIS Team

POTENTIAL HIGH TIDE LINE DATUMS & ELEVATIONS

Acronym	Term	Definition	Comments
MHHW	Mean Higher High Water	average of the higher daily high tide observed over the NTDE	NTDE = National Tidal Datum Epoch, which is the 19-year period used to calculate mean tidal datums; reflects the 18.6-year cycle of the position of the moon & sun in relation to the Earth, rounded to the nearest full year
MMHT	Mean Monthly Highest Tide	average of the highest tide predicted each month over the previous 19 years	slightly higher than halfway between MHHW and MAHT
WOHWM	Washington Ordinary High Water Mark	State definition; line where the presence & action of waters are so common & usual, & so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation	slightly lower than MAHT where the line cannot be found (very rare), Ecology's rule states that the line will be "mean higher high tide" RCW 90.58.030(c)
MAHT	Mean Annual Highest Tide	average of the highest tide predicted annually over the previous 19 years	slightly lower than HAT (1-4") averaging over 19 years would even out annual & NTDE-like variability
HAT	Highest Astronomical Tide	highest predicted astronomical tide expected to occur over the NTDE	highest elevation established by tides alone

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ECOLOGICAL IMPLICATIONS FOR EACH DATUM / ELEVATION*

"Datum"	Vertical Distance from MHHW	Ecosystem / Habitat Coverage and Other Considerations
MHHW	N/A	This elevation in the intertidal zone provides habitat for spawning forage fish, juvenile or larval shell- fish, and ESA listed salmonid species including migration, feeding, and refuge. Drift logs, wrack, and litterfall, which support a wide array of insect species, are often found scattered in this zone. Insects are a key component of the nearshore food web. Woody drift material also helps trap sediments, which provide substrate for eelgrass and forage fish spawn, as well as a healthy beach for people to use. Projects that are permitted at this elevation in the nearshore result in direct loss of forage fish spawning habitat, juvenile salmon migration habitat, and riparian vegetation's detrital matter and shading effects for forage fish survival. Additionally, the loss of sediment supply and falling logs from upland slopes directly affects all nearshore habitats. Dethier et al. (2016) found that armored beaches in general had lower accumulation of logs and wrack, thus affecting the nearshore food- web, but also found that the lower elevations of shoreline armoring had more detrimental effects on most beach parameters. There seemed to be a threshold between MHHW and 2 vertical feet below MHHW that showed dramatic adverse impacts to the beach. On rocky shorelines, development at this elevation could directly or indirectly affect a wide array of the nearshore food web in the mid to upper littoral zone including barnacles, periwinkles, muscles and limpets, which are prey to many species of seabirds.
MMHT	Averages 1.1 feet above MHHW with a range of 1.0 to 1.4 feet for 6 representative stations from 1998 through 2016	At the MMHT elevation, similar habitat would be expected as that at the MHHW elevation, although slope of the beach will determine the distance between alternative elevations. However, in this zone, there would be spawning sands and gravels for forage fish, as well as migration corridors for juvenile salmon and refuge for juvenile and larval shellfish. This is also in an area of drift log, wrack, and litterfall accumulation, and well within the zone of sediment transport, both lateral and horizontal. A permitted armoring at this elevation would have similar habitat impacts to that at MHHW, but at a slightly smaller scale. One would still expect the direct loss of habitat for forage fish spawning, ESA-listed salmonid species migration, feeding, and refuge, and insects (which are also food for small fish) that rely on drift logs and beach detritus for food and shelter, Hard armoring at this elevation would preclude the landward movement of drift logs and the replenishing of sediments to the beach, which affects all nearshore species including people who use the beach to forage and recreate. The backshore riparian vegetation which shades fish eggs and insects would likely be eliminated as well.
WOHWM	averages approximately 1.5' higher than MHHW in WA	The WOHWM zone is generally at the edge of a consistent line of vegetation in natural settings. This is in the upper zone for forage fish, particularly of smelt. Drift logs, wrack, and detritus from the riparian area often accumulate at the WOHWM. Projects permitted at this elevation could have indirect effects to forage fish spawn-ing habitat, drift log or wrack accumulation, invertebrate populations, and juvenile salmon habitat. There would be direct impacts to riparian vegetation and subsequent reduction in upland litterfall, upland insect populations available for small fish, and lack of shading for smelt eggs. Lack of shading can greatly reduce survival of surfsmelt eggs; in one study on Orcas Island, the number of live embryos in the eggs on an armored beach was half that of a natural beach, largely due to higher temperatures. There would be a direct loss of sediment supply in areas with feeder bluffs or other nearshore sediment sources. The loss of sediment supply can adversely affect the geomorphic processes that ecological function, such as the formation and maintenance of substrate textures that are suitable for bivalves and eelgrass habitat or forage fish spawning areas.
MAHT	from 1998 through 2016, averaged 1.75' higher than MHHW, with a range of 0.5 to 2.4' higher	This elevation is a few inches higher than WOHWM, and thus may include more of the riparian vegetation that helps shade forage fish eggs, provide detritus and invertebrates, and filter stormwater that flows down to the beach. It is likely that species diversity would be greatly increased if the area below this elevation was left unarmored. Sediment transport within drift cells would occur without impediment and there would be greater opportunity for the recruitment of drift logs and wrack. Projects permitted at this elevation would directly impact some riparian vegetation and sediment supply in areas below erosional features. In addition, large wood recruitment from erosional bluffs would not be able to reach the nearshore. However, since this elevation could be easily calculated each year, it could account for rising sea level resulting from climate change, thus further protecting the nearshore environment.
HAT	averages 2.1' higher than MHHW in WA, with a range of 1.25 to 3' higher	This elevation supports a wide array of riparian vegetation, in natural settings, which protects forage fish eggs from desiccation and provides food web support for juvenile salmon and forage fish. Nearshore species would not be directly affected by a development permit at this elevation. Backshore woody riparian vegetation may be eliminated or reduced, and large wood recruitment from feeder bluffs could not occur, but nearshore herbaceous vegetation and large drift logs would be maintained along with the processes they sustain. Coastal bluff sediment supply could be cut off in areas below erosional features, but sediment transport along drift cells would be maintained. In the near term, this elevation represents the most protective of ecological processes in the nearshore environment.

**Ecological implications are based on the following:*

Hughes, Zack and M. Longenbaugh. 2014, revised 2016. The importance of Marine Backshore for Ecosystem Function and ESA Listed Chinook and Chum Salmon. White paper literature review, NOAA, National Ocean Service.

Dethier, Megan N., W.W. Raymond, A. N. McBride, J.D. Toft, J.R. Cordell, A.S. Ogston, S.M. Heerhartz, and H.D. Berry. 2016. Multiscale Impacts of Armoring on Salish Sea Shorelines: Evidence for Cumulative and Threshold Effects. Estuarine, Coastal and Shelf Science 175 (2016) 106-117.

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Implementation Considerations

High Tide Line (HTL) Datum [line of jurisdiction under the Clean Water Act (CWA)]	Availability and Accessibility of Benchmarks for Datum	Vertical Distance from MHHW	Horizontal Distance from MHHW	Possible Impacts on the Regulated Public	Possible Impacts on Corps	Coordination with State and Local Governments	Possible Environmental Consequences	Possible Impacts on Resource Agencies and the Tribes
Mean Higher High Water (MHHW)	MHHW readily available on the internet (approximately 84 stations in WA)	n/a	n/a	Status quo: Typically, applicants hire a consultant who prepares permit application drawings which show the line of MHHW and MHW (Section 10 limit of jurisdiction). The consultant may or may not have hired a surveyor to determine the location. They may have used an informal (yet acceptable) method of using tide tables to determine the location of the elevation of MHHW.	Status quo: As part of the permit review process, the Corps PM will look at the MHHW elevation identified on the drawings and check to make sure that is the elevation of the nearest benchmark or on the benchmark which would most accurately reflect the correct elevation. If the site was between benchmarks, we would see what the elevation difference is between the benchmarks and check to see if using one or the other would affect whether or not the proposal is within Corps jurisdiction. If it would, on a case-by-case basis, we would make a determination on which benchmark elevation was most appropriate to use taking into account geographic considerations (i.e., location in a cove, around a point from a benchmark, etc.). If it is an application for an overwater structure, we would typically not perform a site inspection to verify if the location of MHHW is correct on the drawings because it is usually very evident that all of the work is within Corps jurisdiction. If the application is for a bank stabilization activity, we would likely perform a site inspection to verify if the location of MHHW is correct on their drawings.	None required	Status quo; Important environmental resources landward of MHHW (i.e., forage fish spawning, nearshore habitat) will continue to be protected and regulated at the same level by other agencies such as local governments (via shoreline permits), Washington Department of Ecology (Ecology)(shoreline permits), Washington Department of Fish and Wildlife (WDFW) (Hydraulic Project Approvals), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS, also known as NOAA Fisheries) (through the Section 10 Endangered Species Act (ESA) process). See discussion in next column regarding environmental issues as described by the Tribes and other agencies.	Tribes want to have their resource and fishery concerns addressed on all shoreline projects landward of MHHW to the Highest Astronomical Tide (HAT). For projects which occur landward of MHHW, there is no federal nexus (Corps permitting); therefore, opportunities for tribal consultation and coodination are reduced. They believe impacts in areas landward of MHHW adversely impacts their Tribal treaty rights. This concern of the Tribes would remain. Status Quo: NMFS wants to consult on all shoreline projects landward and waterward of MHHW to address critical habitat concerns. For projects which occur landward of MHHW, there is no federal nexus (Corps permitting); therefore, they are solely responsible for assessing ESA impacts under Section 10, not Section 7 of the ESA. They state impacts in this area of the shoreline adversely impact the critical habitat of many listed species.

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Implementation Considerations

High Tide Line (HTL) Datum [line of jurisdiction under the Clean Water Act (CWA)]	Availability and Accessibility of Benchmarks for Datum	Vertical Distance from MHHW	Horizontal Distance from MHHW	Possible Impacts on the Regulated Public	Possible Impacts on Corps	Coordination with State and Local Governments	Possible Environmental Consequences	Possible Impacts on Resource Agencies and the Tribes
WOHWM, MMHT, MAHT, OR HAT				Will increase the areas of waters of the US regulated by the Corps; subsequently resulting in more activities requiring a need for a permit from the Corps; increase cost (and time) to the regulated public to obtain a permit from the Corps where in the past none was needed; on average, to obtain a permit for a typical project in Puget Sound, based on the current level of scrutiny from resource agencies and the Tribes, it takes 6-12 months to reach a permit decision. So, where previously a Corps permit was not needed, it may now take a year to obtain a Corps permit. During this permit review process, environmental reports will need to be prepared by applicants whereas previously no reports were required. The typical costs of these reports range from $5000 - $10,000 and up. Mitigation will likely also be required. Costs of mitigation can vary quite a bit from $5000 to $100,000's. Ecology currently requires a geotechnical analysis for bank stabilization projects and WDFW often requires mitigation for bank stabilization projects. **Mitigation measure:** The actual costs of required studies and mitigation may not be as high as estimated above since there may be overlap with State and local requirements. Maintenance of existing structures constructed landward of MHHW: The original construction of these structures would have been landward of the Corps' jurisdiction of MHHW and therefore, would not have required a permit from the Corps. However, now the structures would be in Corps jurisdiction. There would likely be confusion from the public on this issue. Many property owners in this situation may not apply for a Corps permit to maintain their existing structure which may result in violations. This would surprise and dismay many property owners but would not negate the fact that they may have a violation that needs to be resolved. It would be difficult to do outreach in this situation since these entities never came into the Corps in the first place to obtain a permit. **Mitigation measure:** If the maintenance works occurs within the same footprint of the original structure, the work may be exempt from requiring a permit under the 404 exemption for maintenance (33CFR330.4 (a)(3)). Work with EPA, the State, and local governments to develop and implement an outreach program to educate shoreline property owners on the Corps use of different datum and permit requirements. If other agencies were not able to provide this outreach, costs for the Corps could involve hiring a special outreach person, as we would not want to sacrifice valuable Regulatory Project Manager time doing outreach when their time could be better spent on increased permit review and enforcement workload due to change in jurisdictional limits. Regulatory NWD: Inconsistency with Portland District which uses MHHW as the datum for HTL; applicants applying for permits in both Portland and Seattle District will have to be made aware of this difference. There are already concerns from the public regarding differences in regulating between NWS and NWP Regulatory offices. This will further add to concerns about inconsistencies and increased frustration from the public. **Mitigation measure:** Need a consistent policy between NWS and NWP. This will require NWD to establish a jurisdictional policy utilized by both Districts. We would need NWD's commitment to expend the time and effort to establish this policy. Time and costs associated with this effort are unknown.	Will increase the areas of waters of the US regulated by the Corps; subsequently resulting in more permit applications to the Corps which results in increased workload for Corps Project Managers which would delay permit review process * **Mitigating measure:** Request more funds from NWD and HQ so Regulatory can hire more project managers to reduce individual workload of each project manager so timely decisions can be provided to the public. Over a six year period 980 Hydraulic Project Approvals were issued for bank stabilization work conducted waterward of the WOHWM. Over the same period, only a very small fraction of these activities were in Corps jurisdiction. Using these rough numbers, it is possible the Corps could receive 150 more applications a year for bank stabilization activities. And adding in an increase in number of unauthorized activities (as described below) and compliance issues, this could mean 175 more actions a year. Currently, Corps PMs have an average of 50 applications pending. Therefore, at our current staffing levels, the Corps would need of an additional 3.25 FTE. * The Tribes and other resources agencies believe that a project requires Standard Individual Permit review from the Corps (which many more bank stabilization projects would), the 404(b)(1) Guideline reviewwould result in permit denials and many of these proposed structures would not be constructed. And once the public realizes this, they will re-design the projects to be landward of the Corps jurisdiction so a permit is not required. Therefore, it is possible the increase in actions may not be as high as 150 per year. For existing structures constructed landward of MHHW: Regulatory needs to establish a policy on the "legality" of these structures (i.e., are they grandfathered); development of this policy will require coordination with Office of Counsel, NWD, and potentially HQ; with this level of coordination the time to develop this policy would take many months and many work hours for many Corps employees; once finalized, there will be a need to widely distribute this policy statement to the public (cost and time for public notice and public meetings if necessary). Maintenance of existing structures constructed landward of MHHW: * If the maintenance works occurs within the same footprint of the original structure, the work may be exempt from requiring a permit under the 404 exemption for maintenance (33CFR330.4 (a)(3)). * If the maintenance is not exempt, many property owners in this situation may not apply for a Corps permit to maintain their existing structure which would result in many violations. This could be a substantial increase in enforcement for the Regulatory Branch. * Also in terms of equity, Regulatory would need to develop a policy on how to address these types of violations (i.e., Would action be taken because this would not be a knowing and willful violation? Could we issue penalties without permits?) * Our current policy on maintenance of previously authorized currently serviceable structures is that they can repair it in kind and typically mitigation is not required. However, for a proposal to maintain a portion of bulkhead previously constructed landward of Corps jurisdiction (not previously authorized and not exempt), if the work occur "in kind" or would be require the maintenance work be "fish friendly" because it was authorized. Would we require the applicant to "retrofit" the entire bulkhead to be more fish friendly since it was not previously authorized? * Development of these policies will require coordination with Office of Counsel, NWD, and potentially HQ; with this level of coordination the time to develop this policy would take many months and many work hours for many Corps employees; once finalized, there will be a need to widely distribute this policy statement to the public (cost and time for public notice and public meetings if necessary). * **Mitigation measure:** Before a new line of jurisdiction is implemented, obtain guidance from District Office of Counsel, NWS, and HQ on our policy on these issues so that once implemented, Regulatory has a clear path forward with no delays in implementation. The time to obtain this is unknown. Time and costs associated with this effort are unknown. * **Mitigation measure:** EPA and the Seattle District can address any increased need for enforcement and the associated consideration of workload and priorities through the existing Field Level Agreement. Regulatory NWD: Inconsistency with Portland District which uses MHHW as the datum for HTL; applicants applying for permits in both Portland and Seattle District will have to be made aware of this difference; There are already concerns from the public regarding differences in regulating between NWS and NWP Regulatory offices. This will further add to concerns about inconsistency. * **Mitigation measure:** Need a consistent policy between NWS and NWP. This will require NWD to establish a jurisdictional policy utilized by both Districts. Time and costs associated with this effort are unknown. Regulatory HQ: Continued inconsistency with other Districts in the nation – status quo Corps Civil Works: Would not likely increase the number of activities in CWA jurisdiction but may increase the impact area of projects; this increase in impact area would correspondingly require more mitigation accompanied by associated costs of construction and monitoring of mitigation and time to develop mitigation; cost and time increase for additional mitigation would be moderate.	Need for Corps to coordinate more closely with State and local governments which would already regulate to this higher line of jurisdiction. They may be able to assist with outreach to the public (since the public is already coming to them for a permit in these areas) and may be able to assist with field work to verify lines of jurisdiction since they may already be regulating to this higher line of jurisdiction.	More of the shoreline area will be regulated by the Corps; whereas before, only the State and local governments regulated the work; this does not necessarily equate to "more protection" of these resources but it does mean there will now be an additional layer of review over impacts to these resources. The Tribes and other resources agencies believe that if a project requires Standard Individual Permit review from the Corps (which many more bank stabilization projects would), the 404(b)(1) Guideline review may result in permit denials and many of these proposed structures would not be constructed, hence additional environmental protection.	Tribal involvement: This will bring more projects under Corps review which translates to more projects coordinated with Tribes to fulfill Treaty Tribe coordination procedures; the Tribes will welcome the opportunity to provide input on shoreline projects that they previously couldn't comment on so that they can give input to ensure impacts to their treaty fishing resources are not adversely impacted. NMFS/USFWS Section 7 ESA Consultation: An increase in permit applications would correspond to an increase in the number of Section 7 ESA consultations the Corps would require NMFS and USFWS to complete. This could be 150 more consultation requests per year. With the current workload, NMFS is often taking over a year to complete ESA consultations in Puget Sound. 150 more consultations a year will only result in even lengthier review times for the public. **Mitigating measure:** The Corps or the Services could develop a programmatic consultation (PC) to address bank stabilization activities. However, PC development can take years to develop. Therefore, initially, this measure would not reduce the impact on the Corps or Services.

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Implementation Considerations

High Tide Line (HTL) Datum [line of jurisdiction under the Clean Water Act (CWA)]	Availability and Accessibility of Benchmarks for Datum	Vertical Distance from MHHW	Horizontal Distance from MHHW	Possible Impacts on the Regulated Public	Possible Impacts on Corps	Coordination with State and Local Governments	Possible Environmental Consequences	Possible Impacts on Resource Agencies and the Tribes
WA State Ordinary High Watermark (WOHWM)	No established elevations; it is based on physical characteristics of the shoreline; therefore, it must be determined in the field	averages approximately 1.5' higher than MHHW in WA	Similar to area for MAHT	Ecology has already trained hundreds of consultants and state/ local government staff on the methods for determining the WOHWM. A guidance document has been drafted and internally reviewed, and it should be out for public review sometime this summer. The benefit of using this elevation is that local and state governments use it, and so all permitting jurisdictions would be consistent. Also, the Corps could potentially rely on Ecology and the local governments for site visits (to confirm line of jurisdiction) and compliance monitoring since our lines of jurisdiction would be the same. Using WOHWM could reduce public confusion regarding permitting jurisdiction between State and the Corps.	**Mitigating Measures:** The Corps could potentially rely on Ecology and the local governments for site visits (to confirm line of jurisdiction) and compliance monitoring since our lines of jurisdiction would be the same. Corps staff would need training from Ecology. **Mitigating Measures:** Ecology could provide training to the Corps and if they did not charge for the training, then costs to the Corps could be minimized. The time needed for training would take away from time PMs could spend in reviewing permit applications and making permit decisions.	Initially, lots of coordination until the Corps becomes familiar with State process on determining OHWM in tidal systems		
Mean Monthly Highest Tide (MMHT)	Not readily available but can be calculated for any tide station with published tide tables, of which there are over 170	over the 19-year period from 1998 through 2016, averaged 1.2' higher than MHHW, based on data from six harmonic tide stations	Range of horizontal distance: 8 – 46' for a total of ~5000 ac	Once the data is calculated for ~170 stations and the data is made readily available, there will be predictability for the Regulated public regarding the line of the Corps' jurisdiction. However, the Corps does not have the staffing to complete these calculations and maintain an updated website. The Corps would need assistance from EPA or NOAA for this effort. It would be most reasonable for NOAA to complete this effort since they already maintain their website for other datums.	Once the data is calculated for ~170 stations and the data is made readily available, there will be predictability for the Regulated public and Corps project managers regarding the line of the Corps' jurisdiction. However, the Corps does not have the staffing to complete these calculations and maintain an updated website. The Corps would need assistance from EPA or NOAA for this effort. It would be most reasonable for NOAA to complete this effort since they already maintain their website for other datums. To best account for climate change and sea level rise, it would need to be recalculated annually. The agency to do this would need to be identified. It could be done by NOS or EPA. However, it would be best done and maintained by NOS. Because the elevation of the HTL could change annually, this could create confusion for PMs reviewing applications. Would they use the elevation designated when the application was submitted? What if the review process went on for several years? Should Regulatory use the new elevation? **Mitigation measure**: We would need a commitment from NOS to do the calculation annually and maintain public access via the web. If the elevation changes annually, it would probably only be a difference of a 1/100th to a 1/10th of an inch. A policy will need to be established explaining how a potential annual change in elevation, however small, in light of annual recalculations will affect the processing of application spanning one or more years, future requests for time extensions, future maintenance or modification requests, etc.			
Mean Annual Highest Tide (MAHT)	Not readily available but can be calculated for any tide station with published tide tables, of which there are over 170	over the 19-year period from 1998 through 2016, averaged 1.7' higher than MHHW, based on data from 44 harmonic tide stations range of 0.5' to 2.4'	Range of horizontal distance: 6 – 70' for a total of ~9000 ac	Once the data is calculated for ~170 stations and the data is made readily available, there will be predictability for the Regulated public regarding the line of the Corps' jurisdiction. However, the Corps does not have the staffing to complete these calculations and maintain an updated website. The Corps would need assistance from EPA or NOAA for this effort. It would be most reasonable for NOAA to complete this effort since they already maintain their website for other datums.	Once the data is calculated for ~170 stations and the data is made readily available, there will be predictability for the Regulated public and Corps project managers regarding the line of the Corps' jurisdiction. However, the Corps does not have the staffing to complete these calculations and maintain an updated web site. The Corps would need assistance from EPA or NOAA for this effort. It would be most reasonable for NOAA to complete this effort since they already maintain their website for other datums. To best account for climate change and sea level rise, it would need to be recalculated annually. The agency to do this would need to be identified. It could be done by NOS or EPA. However, it would be best done and maintained by NOS. Because the elevation of the HTL could change annually, this could create confusion for PMs reviewing applications. Would they use the elevation designated when the application was submitted? What if the review process went on for several years? Should Regulatory use the new elevation? **Mitigation measure:** We would need a commitment from NOS to do the calculation annually and maintain public access via the web. If the elevation changes annually, it would probably only be a difference of a 1/100th to a 1/10th of an inch. A policy will need to be established explaining how a potential annual change in elevation, however small, in light of annual recalculations will affect the processing of application spanning one or more years, future requests for time extensions, future maintenance or modification requests, etc.	None required		
Highest Astronomical Tide (HAT)	available at 46 harmonic tide stations on the internet	averages 2.1' higher than MHHW range of 1.25' to 3'	Range of horizontal distance: 6.5 – 76' for a total of ~12,000 ac	More subjectivity in determining jurisdiction line because of the need to adjust the line based on larger distance between tide stations since there are fewer stations; could lead to inconsistencies between projects resulting in the public feeling determinations are arbitrary which could result in many appeals to jurisdictional determinations which requires review by NWS and would delay the permit review process **Mitigation measure:** If NOAA, specifically NOS, has the funding and technology, they could possibly officially calculate, post and maintain the datum for all of the 84 stations. This would reduce the level of inconsistency and provide the public the same access to the same amount of benchmarks similar to the status quo of using MHHW. NOS would need money and manpower to complete this and they have indicated it would be a low priority for them to do this action.	More subjectivity in determining jurisdiction line because of the need to adjust the line based on larger distance between tide stations since there are fewer stations; could lead to inconsistencies between projects resulting in the Corps having uncertainty in determining the line of jurisdiction which could result in many appeals to jurisdictional determinations which requires review by NWS and would delay the permit review process and require more work for Corps project managers **Mitigation measure:** If NOAA, specifically NOS, has the funding and technology, they could possibly officially calculate, post and maintain the datum for all of the 84 stations. This would reduce the level of inconsistency and provide the public the same access to the same amount of benchmarks similar to the status quo of using MHHW. NOS would need money and manpower to complete this and they have indicated it would be a low priority for them to do this action.			
Any Datum	Note: The Corps is in the process of developing new regional conditions to the 2017 Nationwide Permits. One of the conditions may be revocation of NWP 13 for bank stabilization activities in the Salish Sea. This would mean any bank stabilization activities in the Salish Sea would require a standard individual permit (SIP) (regardless of the datum used for the HTL). Should this condition be added to the NWPs, more shoreline projects will need to be reviewed under the SIP process.				SIP review requires more time and costs for the applicant and Corps.		The Tribes and other resources agencies believe that if a project requires Standard Individual Permit review from the Corps, the 404(b)(1) Guideline review would result in permit denials (or applicants will design projects to avoid the need for a DA permit) and many of these proposed structures would not be constructed and the upper shoreline would be protected.	

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Recommended Actions to Further Enhance Shorelines

The U.S. Army Corps of Engineers – Seattle District (Seattle District); the Environmental Protection Agency – Region 10 (EPA); and the National Oceanic & Atmospheric Administration – West Coast Region (NOAA), all play key roles in the protection of marine shorelines. Each agency has authority under the Clean Water Act and/or the Endangered Species Act related to evaluating and minimizing the effects of development proposals and/or federal actions on shoreline habitat. The agencies also currently provide millions of dollars to state and local governments, as well as non-profit organizations, to conduct studies and projects for restoration of shoreline tidal habitat under several different grant or cost-share programs unique to each agency. There are many other mechanisms that are currently employed to enhance the shoreline environment, both in a regulatory and non-regulatory framework including technical assistance to other agencies, overseeing state agencies' water quality authority, and coordination on Clean Water Act and Endangered Species Act enforcement activities.

The following are collective actions the Seattle District, EPA, and NOAA could explore to improve shoreline protection under their respective existing authorities. Some of these actions can be implemented immediately while others will require more time and effort.

1. Multi-agency permitting team

If the Seattle District finds the interpretation of the high tide line to be either Highest Astronomical Tide or Mean Annual Highest Tide, the federal family could establish a team of permitting experts from federal, state and local governments to work on development and restoration projects in the marine shoreline both for permitting and for compliance with permit conditions. This type of team has been working on Washington Dept. of Transportation projects for several years, and has a proven successful track record.

2. Coastal Improvement Team

Many coastal communities are in need of technical, stewardship, and social behavior support to better achieve successful habitat protection and restoration outcomes. Local involvement is crucial to engaging the larger community and maximizing agency funding and technical support. Local sponsors may not be engaged due to lack of knowledge about funding sources, understanding of coastal issues in their jurisdiction, and other concerns that impede their partnerships with the agencies. A designated individual or team from the Seattle District, EPA, and NOAA with a mission of identifying coastal issues and engaging local sponsors could facilitate a more successful program at a local watershed or basin scale. This team would be familiar with grants and funding authorities in each of the agencies and educate local sponsors about the benefits of bulkhead removals, building on stilts, etc. The team's objectives could also include additional funding for outreach and education around the importance of the shoreline habitats and the financial costs from degradation.

3. Development Thresholds

The EPA and NOAA could work with the Seattle District, and state and local agencies, to monitor developments on the shoreline to get a better handle on trends in length of hard armoring, length of bulkhead removal, soft shore protections, etc. This information could better inform future development permit proposals and facilitate evaluation of cumulative effects of each project both on an individual and a collective basis.

4. Instill Importance of Shoreline Habitat in Federal Actions and Planning

A. District managers provide team focus on shoreline habitat protection as an essential component for current and future projects consistent with its applicable authorities.

B. Stress the importance of shoreline habitat in emergency responses consistent with its applicable authorities.

C. Increased enforcement focus by the Seattle District, NOAA, and EPA on permit violations.

   i. EPA to continue to coordinate the multi-agency compliance/enforcement group (under a field level agreement to facilitate better enforcement of the CWA among the federal family and Washington State

   ii. Provide funding to Department of Ecology to better enforce the provisions of the Shoreline Management Act.

5. Dredged Material Management

A. Utilizing clean dredged material for restoration efforts is challenging in Washington State. The use of dredged material for increased shoreline protection, habitat creation, and beach nourishment is slowed by a complex regulatory and permitting structure that results, in most cases, with open-water disposal. This has resulted in missed opportunities for shoreline/beach nourishment. That said, this issue cannot be solved solely by federal agencies because the permitting process can include state, local, and private authorities, depending on the material and the location. However, by looking for opportunities to create efficiencies and promote the use of clean dredged material in the federal context, they can have a positive effect on shoreline protection and enhancement.

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Agency Action Items

The following are individual actions for each agency derived from the writings above.

Seattle District:

- Help form and be a member of the multi-agency permitting team.
- Aid in the development of the Coastal Improvement Team providing a member or members that provides knowledge of the Seattle District funding, construction, and coastal issues that can actively engage communities.
- Monitor cumulative developments in the shoreline areas.
- Work with internal project managers and staff to increase the awareness of the importance of shoreline habitat in planning, emergency, and construction projects.
- Work with EPA to develop opportunities for dredged material beneficial reuse in lieu of open-water disposal.

NOAA:

- Help form and be a member of the multi-agency permitting team.
- Aid in the development of the Coastal Improvement Team providing a member or members that provides knowledge of NOAA funding authorities, coastal issues, and can actively engage the community.

EPA:

- Help form and be a member of the multi-agency permitting team.
- Aid in the development of the Coastal Improvement Team providing a member or members that provides knowledge of funding authorities, coastal issues, and can actively engage the community.
- Review permits and processes for areas where beneficial use of material can be promoted.
- Provide federal funding to Department of Ecology to better enforce the provisions of the Shoreline Management Act.
- Coordinate the multi-agency compliance/enforcement group to facilitate better enforcement of the CWA among the federal family and Washington State

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Principal Workgroup Members

Name	Agency	Responsibility
Jim Jacobson	USACE	Agency Lead
Tina Tong	USACE	Technical
Peter Gibson	USACE	Technical
Lori Morris	USACE	Tribal Liaison
Craig Juckniess	USACE	Legal
Peter Murchie	EPA	Agency Co-Lead
Michael Szerlog	EPA	Agency Co-Lead
Heather Dean	EPA	Technical
Susan Meyer	EPA	Technical
Endre Szalay	EPA	Legal
Elizabeth Babcock	NOAA	Agency Lead
Matt Longenbaugh	NOAA	Technical
Ryan Couch	NOAA	Legal

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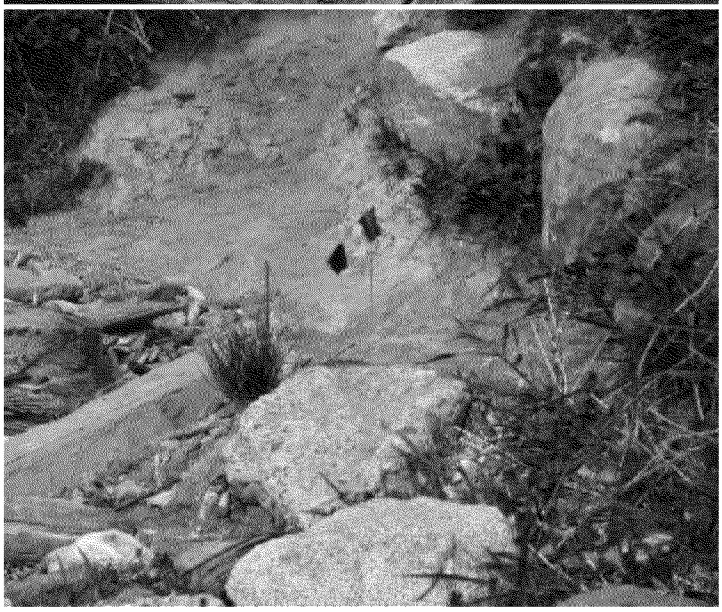
US Army Corps of Engineers ®
Seattle District

United States Environmental Protection Agency



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