



Reference: 016240.020

February 3, 2017

Jack Crider, Executive Director  
Humboldt Bay Harbor, Recreation and Conservation District  
1000 King Salmon Drive  
Eureka, CA 95503

**Subject: Summary of Dredge Material Disposal on the Samoa Beach Surf Zone and Alternative Disposal Analysis**

Dear Mr. Crider:

SHN Engineers & Geologists (SHN) has prepared a review summary of dredge material disposal on the Samoa beach surf zone and an alternative disposal analysis from historical documents generated as part of project permitting for maintenance dredging in Humboldt Bay. Numerous plans and reports have been produced for disposal of dredge material at the Samoa beach surf zone over the past 20 years and this summary report is intended to consolidate the actions and findings into 1 document. Specifically to incorporate the dredging operations completed during winter months of 2006/2007 with previous events and the 2016 disposal site feasibility study.

**Introduction**

In August 2005, a Section 401 Water Quality Certification permit was issued to the HBHRCD and City of Eureka by the North Coast Regional Water Quality Control Board (RWQCB). This permit approved beach disposal of an estimated 217,000 cubic yards (cy) of dredge material generated from cooperative maintenance dredging projects in Humboldt Bay. In the 401 permit, the California Department of Fish and Game (CDFG) and the United States Environmental Protection Agency (EPA) commented that the project may proceed. However, the sediment may not be suitable for beach disposal in the future due to the small grain size and the lack of studies to evaluate the effects of disposal on the near shore sea floor habitat.

The RWQCB noted that the planned dredging to start in November 2006 might be the last opportunity for the applicants to thoroughly study the effects of this type of disposal, and if future shoreline disposal is proposed then a plan will need to be developed to monitor and study the discharge and near shore subtidal habitat during implementation of the project. Subsequent discussion on shoreline disposal led to development of the beach zone disposal monitoring plan in August 2006 (Pacific Affiliates, 2006). The purpose of the 2006 Samoa beach surf zone monitoring and reporting program was to provide data to the regulatory and resource agencies that would allow them to re-evaluate the near shore ocean disposal methodology for future events. The actions and findings of the 2006 beach surf zone monitoring program as well as results from previous monitoring programs implemented for beach surf zone disposal of dredge material are provided in this summary report.

## **Previous Dredging and Beach Surf Zone Disposal Events**

The HBHRCD and City of Eureka waterfront mooring facilities require maintenance dredging to restore adequate depth on average every 10 years. Cooperative maintenance dredging projects using a cutter head suction dredge and transport pipeline to the Samoa beach surf zone for disposal of dredge slurry were conducted in 1988, 1998, and 2007. The period of occurrence and volume of material dredged and disposed for each event on the Samoa beach surf zone is summarized as follows:

- January to March 1988—approximately 131,000 cy
- January to May 1998—approximately 226,238 cy
- November 2006 to March 2007—approximately 230,065 cy

Due to concern for dredge material composition and potential adverse effects on benthic habitats, permitting agencies have requested nearshore subtidal and intertidal habitat monitoring for changes in conditions during beach surf zone disposal. Each dredging episode conducted has been accompanied by a beach surf zone disposal monitoring program for specific criteria, which has incorporated an increased level of monitoring with each successive Samoa beach surf zone disposal event.

## **Samoa Beach Surf Zone Disposal Monitoring**

The 1988 monitoring program established three transects along the beach zone that included the disposal site, a transect 100 meters north of the discharge location, and a control site approximately 1,000 meters south of the discharge location. Samples were collected from intertidal locations at each transect for determination of material composition and faunal abundance before and after dredging operations. Results of the study indicated that portions of dredge material had been deposited at the discharge site and were buried under a layer of sand. The remainder of the material was carried away by the tides and wave action (Newton, 1988).

Based on the 1988 monitoring study, negative effects of temporary discharge of dredge spoils on the intertidal fauna of Samoa Beach were localized and transitory, primarily affecting the abundance of characteristic beach species in the immediate vicinity of the disposal outfall. Within one month following the end of disposal operations, most species characteristic of this beach were present at the disposal site, although at reduced densities. Approximately four months following termination of beach disposal, intertidal fauna populations at the disposal site had recovered to levels comparable to those at the control site (Newton, 1988).

The 1998 monitoring program used the same three monitoring transects on the beach zone as in 1988 to determine species compositions and abundance at locations within the study area (discharge point, 100 meters north of discharge point, and control site 1,000 meters south). Monitoring events were increased during the 1998 program to include pre-, during, and four months of post-discharge operations. In addition, annual monitoring events with reports were required for five years following termination of dredging operations.

The objectives of the beach zone disposal monitoring were to provide information that included:

- establishing pre-project baseline conditions,
- material grain size composition, and
- species composition and abundance of intertidal invertebrates.

Monitoring was conducted at all three transects prior to operations to evaluate baseline conditions and during operations to assess effects from beach surf zone disposal. Overall project monitoring showed the effects of discharged material were highly localized, with a typical assemblage of sand beach composition and animals being observed in samples collected 100 meters to the north of the discharge location. Four monthly monitoring events (May through August) were conducted after the dredging had stopped, and showed a gradual increase in species abundance and occurrence at the disposal transect location. By August 1998, the sampling event showed patterns of species occurrence and abundance were quite similar to the control site, and were approaching a level of faunal similarity approximating that found in the January pre-discharge sampling event (SHN, 1998).

The presence of the mole crab (*Emerita analoga*) was monitored closely in 1998 as an indicator species of return to pre-discharge conditions. This species is known to require highly oxygenated water and is highly sensitive to contaminants in beach sands (Morris et al, 1980). The reappearance of this species in August 1998 indicated that little residual biological effect could be detected at the discharge point.

The Coastal Development Permits (CDPs) issued for the cooperative maintenance dredging project in 2006 (1-05-039 and 1-05-040) additionally required a beach surf zone disposal monitoring program as a special condition. The monitoring program was designed to assess conditions at the discharge point, areas in close proximity, and a control point away from the project site. A fourth transect was added to the previously used set of monitoring transects located 100 meters to the south of the discharge point. Each location was monitored prior to operations, during the beach disposal application process, and after application of material had stopped. In addition, annual monitoring with reports was required for five years following termination of dredging operations. The primary objectives of the 2006/2007 beach surf zone disposal monitoring were to provide information that included:

- establishing pre-project baseline conditions,
- pattern of dispersal of material deposited at the site,
- species composition and abundance of intertidal invertebrates,
- turbidity monitoring offshore, and
- hydrographic and land surveys.

Aspects implemented as part of the monitoring program consisted of aerial photographs of the shoreline, hydrostratigraphic surveys, land surveys, turbidity measurements, sediment core samples for grain size analysis, and near shore sediment testing for infauna and epibenthic marine habitat. The dredging event occurred during the period of November 10, 2006 to March 31, 2007, and deposited an estimated 230,065 cy of material on the beach surf zone. Monitoring for the beach zone was conducted prior to application in October 2006, monthly during operations (five events), post-operations monthly (four events), and then annually for an additional four years.

Changes in topography were observed at the discharge point location with the application and accumulation of material, and a channel would form from the slurry discharge. Each time dredging was stopped for more than one tide cycle, the channel created would fill with sand as result of the high rates of sediment transport that occur on the beach in the winter (Pacific Affiliates, 2007). Disposal operations appear to have only contributed a minor fraction of sediment that accumulated along each transect. Overall, observations show that material was predominantly transported away from the beach zone in winter months (December through March).

Aerial photographs were taken as part of the monitoring program on three occasions (before, during, and after operations) to provide a view of the ocean conditions along the shoreline. The photographs were taken along the coastal stretch from the mouth of the Eel River to the mouth of the Mad River, a distance extending 27.25 miles. Disposal operations at Samoa beach were not evident on the aerial photographs taken during the dredging program. Although, the discharge channel created by the dredge slurry during operations was evident, the sediment deposited from beach surf zone disposal cannot be distinguished from the sediment present in the water and no sediment plume from discharge operations was evident. Aerial photographs of both the Mad River and Eel River show a distinct plume of sediment from winter storm activities.

Monitoring data showed a short term impact to biological communities located only at the discharge pipeline location. Biological communities monitored at the north and south transects were not affected by the dredge disposal operations. Pre- and post-project monitoring at the pipeline disposal transect indicate that the abundance and richness of macroinvertebrates returned to pre-project conditions three months following termination of the beach surf zone disposal operations (Pacific Affiliates, 2009).

The 2009 annual Samoa beach surf zone monitoring report provided data to the regulatory agencies that should allow them to re-evaluate near shore ocean disposal methodology. Data in that report indicated:

- The affects of dredge disposal operations on sediment composition are temporary and localized to the pipeline transect.
- Sediment composition returned to pre-project conditions three months following termination of disposal operations.
- Hydrographic survey data provided show variation in the quantities of sediment in the intertidal and subtidal zones along the monitored transects. Sediments were predominantly affected by winter conditions, including large swells, high tides, and fast moving currents.
- Sediment was transported away from the beach during the winter time, and was either transported to the beach or there was no change observed during the summer.
- The same seasonal pattern of onshore and offshore material transport was observed in past dredging episodes.
- Aerial photographs of the disposal site showed that no plume was developing from the sediment deposited at the beach, but plumes were observed at the Eel and Mad River mouths.

- Suspended sediment concentrations increased during the winter months and decreased in the offseason.
- There was no change in turbidity levels between May and July 2007 following the dredging operations.
- Infaunal community survey reports indicate that the biological communities along the disposal monitoring transect returned to pre-project conditions three months following termination of the project.
- The biological communities were only affected temporarily at the disposal site location during disposal operations.
- The data suggested the biological communities north and south of the discharge location were not affected by the dredge disposal operations.

## **Beach Surf Zone Disposal Operations**

The Samoa beach disposal site is located between two major rivers, the Eel and Mad Rivers. Planning dredging events during the winter months (November to March) will allow the material to disperse more rapidly due to large swells, high tides, and strong currents. Both rivers would be discharging turbid water into the ocean at a natural seasonal maximum, which would minimize the sedimentation impact from dredging and beach surf zone disposal on the ocean. Most of the material discharged to the surf zone disposal site will be dispersed offshore as part of the cyclical process of erosion on the beach in the winter.

The Eureka Littoral Cell is a complex coastal system with a high-energy wave environments, moderate tides and winds, significant sediment yield from rivers, and offshore features that influence the morphology of the coastline (Moffatt & Nichol, 2013). The Eel River represents one of the largest suspended sediment sources in the world, with an annual volume estimated to be 24,698,370 cy of material discharged. A majority of this material is transported offshore and settles on the continental margin. Material that is deposited on the beaches is subject additional transport and redistribution from erosion of the beaches and dunes by winter waves.

The dredging window selected and approved for the 2006 dredging project (November to March) is the only time during the year that nearshore ocean disposal can be implemented in a manner that will cause the least disturbance to the Samoa beach (Pacific Affiliates, 2009). Because massive quantities of coarse grained sand are shifted both parallel and normal to the shore by natural forces, dispersal of the additional sediment load has not posed a problem at the proposed average use for previous cooperative maintenance dredging projects.

Water quality impacts from dredging and disposal operations may affect water quality parameters, such as, dissolved oxygen (DO), pH, suspended solids (SS), and turbidity. Turbidity near the dredging and disposal sites would increase because of additional SS in the water column. DO levels in the water column could decrease during disposal operations due to dispersed sediment absorbing DO. Since ambient water quality conditions recur shortly after each dredging event, any associated adverse effects of dredging and disposal operations on these water quality variables would be short-term and minor in magnitude.

The disposal application area would be posted at several locations along the beach as to the activities and duration of the project. Barricades and lighting were previously provided and maintained throughout the project. The discharge area is to be monitored daily to ensure proper public notification of the project activities and safe access to the North Spit recreational areas. The daily monitoring of the beach surf zone during disposal operations will also allow for collection of debris that is transported through the pipeline and eventually ends up on the beach.

No mitigation measures were required for implementation of the 1998 cooperative maintenance dredging program. The CDP evaluated feasible mitigation measures to minimize adverse environmental effects and determined the project will have no significant adverse environmental effects as proposed. The use of cutter head suction dredging and transfer of dredged material through pipeline minimized turbidity impacts at the dredging site to a level of insignificance. The use of the surf zone disposal site during winter months resulted in only temporary impacts to the invertebrate fauna existing at the site, which was not significant. The California Coastal Commission (CCC) stated that additional mitigation measures were neither available nor required in order to minimize environmental effects of the project. By avoiding significant impacts to coastal resources, the 1998 maintenance dredging project as stated in the CDP maintained the biological productivity and functional capacity of the habitat.

However, mitigation measures were identified in the 2006 biological opinion as well as the CCC's recommendations to minimize and fully mitigate the impacts of the authorized take on SONCC<sup>1</sup> coho salmon in Humboldt Bay during operation from the cutter head suction dredge. In addition, the 2006 CDP included performance standards as part of the dredge operation in the bay that included:

- Intake of the cutter head shall be no more than 3 feet from the substrate during pipeline pumping.
- No pumping of water by the suction dredge during descent prior to beginning dredging shall be permitted.
- Suspended sediment within bay waters shall not exceed 200 milligrams per liter (mg/L) beyond 1,000 feet beyond the dredge platform.
- The monitoring report shall be submitted 60 days following completion of the project.
- A spill prevention plan shall be prepared, and regulatory agencies shall be notification immediately upon a spill or leak occurring.

The applicant implemented these conditions in 2006, as well as partial funding of a salmonid access and habitat restoration project as part of the Coho Salmon Incidental Take Mitigation in 2006. The incidental take permit for impacted species was issued by U.S. Fish and Wildlife (FWS) and a consistency determination from the CDFG in 2006.

One other aspect that will minimize impact from dredging and disposal operations in the future is to reduce the amount of material dredged and shortening the window of operations. Reducing the annual dredge material volume to approximately 100,000 cy or less per year would further lessen

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1 SONCC: Southern Oregon/Northern California coast

any potential impacts to the beach surf zone disposal site. Conducting operations during the winter months additionally avoids the peak periods of public beach use. It is anticipated that future maintenance dredging in Humboldt Bay after an initial two-year period would be further reduced to maintenance dredge material volumes in the 30,000 to 40,000 cy range annually. Handling this volume of dredged material on an annual basis will be easier to manage for the HBHRCD and City of Eureka, and will allow for discontinuation of beach surf zone disposal due to establishment of and alternate upland disposal site.

## Dredge Material Characteristics

Sediment samples were recently collected from City of Eureka waterfront facilities for the Small Boat Basin and Commercial Street dock (August 2016). Samples were collected and tested in accordance with the approved sampling and analysis plan (SAP) prepared for the HBHRCD in December 2015 (NHE, 2015). Testing results of these samples were compared to results of historical samples collected in these areas in August 1996 and February 2005. Specifically, for constituents of concern that included dioxin/furans, pentachlorophenol, polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbon (PAHs). A summary of results for the primary constituents of concern over the three testing programs is provided in Table 1.

Table 1 Historical Sample Testing Results						
City of Eureka	Aug-96		Feb-05		Aug-16	
Small Boat Basin	Sample #1 (A,B,C,D)	Sample #1 (E,F,G,H)	Sample #A	Sample #B	SBB-H	SBB-J
<b>Semivolatile Organics</b>						
Benzo(a)pyrene, (ug/kg) <sup>1</sup>	27/17	45/21	17.8	22.8	<9.2 <sup>2</sup>	<9.0
<b>PCBs<sup>3</sup></b>						
Arcolor 1016, 1221, 1232, 1242, 1248, 1254, 1260 (mg/kg) <sup>4</sup>	ND <sup>5</sup> /ND	ND/ND	ND	ND	ND	ND
<b>Herbicides</b>						
Pentachlorophenol (ug/kg)	NA <sup>6</sup>	NA	ND	ND	<4.3	<4.2
<b>Dioxin/Furans</b>						
Total TEQ <sup>7</sup> (pg/g) <sup>8</sup>	NA	NA	3.74	2.57	0.427	0.330
Commercial Street Dock	Sample #3- (A,B,C,D)		Sample #A (1,2)		COM-G	
<b>Semivolatile Organics</b>						
Benzo(a)pyrene, (ug/kg)	97/65		73.1		<9.9	
<b>PCBs</b>						
Arcolor 1016, 1221, 1232, 1242, 1248, 1254, 1260 (mg/kg)	ND/ND		ND		ND	
<b>Herbicides</b>						
Pentachlorophenol (ug/kg)	NA		ND		<1.5	
<b>Dioxin/Furans</b>						
Total TEQ (pg/g)	NA		3.13		1.66	

<b>Table 1</b>	
<b>Historical Sample Testing Results</b>	
1. ug/kg: micrograms per kilogram	5. ND: not detected
2. <: "less than" the laboratory reporting limit	6. NA: not analyzed
3. PCBs: polychlorinated biphenyls	7. TEQ: toxic equivalents
4. mg/kg: milligrams per Kilogram	8. pg/g: pictograms per gram

Constituent levels over the three testing programs for these areas have shown that concentrations have either decreased or stayed the same since 1996 project sampling. Pentachlorophenol and PCBs were below laboratory method detection limits during all three events. The PAH constituent Benzo(a)pyrene is showing a significant decrease over this period with results showing no detectable concentrations during the August 2016 sampling event. Although dioxins and furans were not tested in the 1996 Small Boat Basin sampling program, the sediment samples collected in August 2016 showed decreased concentrations from previous results obtained in February 2005. Dioxin/furan TEQ levels for the Small Boat Basin were an order of magnitude lower than the previous samples collected 10 years prior. The results of metals testing showed all levels to be consistent over time and within the range of naturally occurring concentrations.

Disposal of this predominantly silty material in the high-energy surf zone at the high-tide contour would result in short-term, minor adverse effects to a zone of low biological activity. The finer material placed on the beach would disperse from the coastal zone, and would eventually settle in deeper water. Impacts to water quality at the dredging and disposal sites due to chemical contaminants associated with the dredge material are generally short-term and localized.

In January 2006, the EPA provided comment on the proposed cooperative dredging and stated that it does not believe that a significant health or ecological risk is associated with discharge of material at the Samoa spit from dioxins and furans at the concentrations found in the Eureka area project dredge material. Current levels of dioxins and furans identified in the material planned for dredging are lower than those observed and approved by oversight agencies in 2006.

## **Alternatives Analysis**

The previous CDPs issued for maintenance dredging have included requirements for the applicants to evaluate alternatives for use of different dredging methodology and disposal options. A detailed analysis for dredging methods and disposal options was completed by the HBHRCD in December 2005 and is included in the 2006 CDP staff report. The dredging alternative review additionally contained an economic analysis of each dredging and disposal method considered for evaluation. The 2005 alternative analysis is summarized in the following sections.

The cutter head suction dredge and pipeline transport of material was determined to be the environmentally less damaging alternative than use of a clam shell dredging method and hopper barge. The alternative method would increase turbidity levels in the dredge area, require disassembling of docks, and the material would have to be transported in barges to an offshore disposal site by scows or tugs. The cutter head suction dredge will enable removal of sediment

from beneath floating docks, pile supports and from within the relatively narrow berths and fairways. Turbidity is minimized by the draw-off at the cutter head and spoils are transported in a closed pipeline extending to the disposal site.

The analysis additionally evaluated use of a cutter head suction dredge and hopper barge for containment and transport of material for offshore disposal. This process would generate a significant volume of suspended sediment as the hopper barge fills the accompanying water with finer material would overflow into the water body from which it is dredged. Additionally, the amount of non-productive time spent mooring the barges, disconnecting the spoils pipeline, and transporting to Humboldt Offshore Disposal Site (HOODS) would add considerable time and costs to the project. Transport capabilities can also be constrained by weather and/or tide conditions during the winter months.

Disposal locations evaluated as part of previous permitting efforts included use of HOODS, Former Louisiana Pacific (LP) disposal site, a new upland disposal site (Superbowl), and the existing upland disposal site (Samoa lagoons). The issues associated with material placement at each of these sites remain during the feasibility analysis completed for material disposal in 2016. Primary reasons identified include:

- HOODS transport of material will not allow for cutter head dredging method due to discharge slurry being predominantly liquids (80%). The distance to transport barge material (18 mile round trip) and winter conditions will also be problematic for the project.
- The Superbowl site is a bermed area by the airstrip that could be modified to receive dredge material. The site would not be able to discharge decant water from the disposal process and would have to be large enough to facilitate infiltration as part of the dewatering process. Nearby areas of the Superbowl site have transformed into freshwater marsh habitat with sensitive plant species that have colonized.
- The former LP disposal site, used previously no longer has waste discharge requirements (WDRs)—they were rescinded in 2001 due to inactivity. A technical report was submitted to the RWQCB in July 2005 to obtain permits to reactivate the former LP disposal site. However, the HBHRCD was notified that no discharge from the facility would be permitted to Humboldt Bay. The site has limited capacity which would impact the ability to use infiltration as a means to dewater the material in a timely manner. The inability to discharge dredge slurry decant water to a nearby water body will prevent use of this site.
- The Samoa dredge pond lagoons currently have limited capacity for additional material and will need to address additional permit requirements to reactivate; however, this location does appear to be the most probable site to receive dredge material in the future.

The CDP requirement to evaluate alternatives determined in 1996 and 2006 that none of the alternatives provides a feasible less environmentally damaging alternative. Other options have more impact to sensitive species than surf zone disposal. The CCC additionally stated in 1998 that the overall impacts using beach disposal would be less than using the offshore HOODS site. The 2005 alternatives review evaluated six combinations of dredging and disposal options for economical analysis. The findings showed that use of cutter head suction dredging and beach disposal was the most economically viable alternative, with costs to use HOODS being almost twice as much.

Actions were initiated by the HBHRCD in 2007 to reauthorize WDR permits for the Samoa dredge pond lagoons with the RWQCB. In May 2010, the RWQCB responded to the mitigated negative declaration (MND) prepared for the upland disposal site, citing an Environmental Impact Report (EIR) would be a more appropriate form of environmental review for the proposed project. The RWQCB also summarized project permits required would include; Construction General Storm Water, Water Quality Certification (401), and WDRs or a conditional waiver. Based on these considerations and uncertainty for site reactivation, the HBHRCD began to seek alternative disposal locations.

In 2016, a feasibility study was completed for the HBHRCD to reassess disposal site locations as well as new options that have developed in recent years (SHN, 2016). The feasibility study evaluated nine potential material disposal options and outlined the necessary permitting, engineering and associated costs. The feasibility study evaluated disposal options not previously considered by the HBHRCD that included:

- Use of Redwood Marine Terminal (RMT) clarifiers and ocean outfall.
- Pumping maintenance dredge material into the federal channel flow lane for the ACOE to remove
- Beneficial reuse projects around Humboldt Bay that require material and are suitable to receive dredge material.
- Construction of a new upland disposal site.

The feasibility study spreadsheet with cost analysis completed for HBHRD in 2016 along with a figure showing disposal option locations is provided in Attachment 1.

Although the ability to permit beach surf zone disposal appears to be one of the more difficult options, the annual dredging and permitting costs would be the more manageable by the HBHRCD and City of Eureka. Additional efforts completed in 2016 have included a habitat assessment for sensitive botanical and biological species conducted at the Samoa Lagoons upland disposal site. This location would be the most viable option to receive dredge material in the future upon acquiring applicable permits, and removal of existing material to increase storage capacity.

The USEPA and CDFG stated in the 2006 permitting process that the applicant must investigate other disposal options for any future maintenance dredging to be conducted under subsequent USACE authorization. The primary concern for beach disposal of dredge material was mainly due to small grain size and the lack of studies to evaluate the effects of disposal on the near shore sea floor habitat. The monitoring programs implemented during previous beach surf zone disposal have shown that the small grain size of the material is not a significant issue as the material is dispersed offshore. The HBHRCD continues to seek alternative options and anticipates that, in two years, the activation of the Samoa Lagoons upland disposal site will be available to receive dredge material.

## California Coastal Commission Observations

Previous CCC findings in the 1996 and 2006 CDP staff reports stated that the proposed dredging, its associated pipeline installation, and beach surf zone disposal are consistent with the use limitations of Section 30233, because the dredging is for maintenance of existing vessel berthing and mooring areas, no new development is planned, and will not result in a significant loss of biological productivity.

Public comments were solicited following each permit application submitted to the regulatory agencies. Comments were received following the submittal of the negative declaration, after the public notice to proceed, and following the RWQCB 401 permit application. To obtain all permits in 1996 and 2006, the applicants had to demonstrate that all environmental impacts were fully mitigated.

Review of the sediment chemical analysis was conducted by the CCC Water Quality Unit, US EPA, RWQCB and the CDFG. Based on the review, CCC staff concluded that the project would not significantly impact coastal resources and approved nearshore disposal of the material provided adequate monitoring is performed. The CDP approved for the HBHRCD and City of Eureka in 2006 identified seven (7) potential effects on coastal resources from the proposed dredging and beach disposal that included:

1. Increased turbidity during pipeline installation and removal
2. Covering of estuarine intertidal habitat along the pipeline route
3. Accidental releases of dredge slurry or hazardous materials
4. Disturbing marine intertidal habitat at the material disposal site
5. Degrading water quality at the nearshore dredge material disposal site
6. Impacts to terrestrial environmentally sensitive habitat areas
7. Release of hydrogen sulfide

Each potentially adverse impact identified was addressed in the 2006 CDP staff report and none of these impacts were determined to be significant. Specific items of note cited in the 2006 CDP for potential adverse impacts consisted of:

1. **Turbidity** – minimize impacts to a level of insignificance by avoiding mudflats to extent practicable and conducting work during high tide when sensitive areas are inundated.
2. **Habitat Covering** – pipeline placement would be temporary and would not result in a significant loss of biological productivity. Flora and fauna temporarily displaced by pipeline routes are expected to be re-colonized by the abundance of organisms in adjacent areas.
3. **Accidental Release** – development of a Dredge Spoils Slurry/Hazardous Materials Spill Contingency Plan that included monitoring, prevention measures and a response plan.
4. **Nearshore Habitat Disturbance** – post project monitoring from previous events have shown little residual biological effect of dredge spoils could be detected at the discharge

point with four months. Samoa Beach is exposed to extreme wave conditions and the temporary burial by dredge spoils would only remain until wave and tidal action disperse the material to the offshore shelf.

5. **Water Quality Impacts** -

- a. **Physical** - the dredge material consists of 80 to 90% fine grain material that is being placed in an environment comprised of 95% sand. The USACE and USEPA do not have a prohibition on nearshore disposal of material that is predominately fine grain provided it meets guidelines that the dredge material is demonstrated to be compatible with the receiving beach. This includes: being the least environmentally damaging alternative, will not result in significant degradation of ecosystems based on factual determination, and all practicable means employed to minimize adverse environmental impacts. All these guideline mandates were addressed and documented during the 2006/2007 dredging and disposal program.
  - b. **Chemical** - results of sediment testing have shown that the material does not have contaminants in concentrations that would result in significant human health risks or ecological degradation. Testing for constituents of concern that include pesticides, PCBs and dioxins have decreased over time and are below any regulatory screening levels. Any contaminants that may be present would be further diluted in the dredging process and rapidly dispersed in the high-energy environment of the surf zone.
6. **Terrestrial Habitat Impacts** - the pipeline route across the Samoa Peninsula will minimize impacts to potentially sensitive habitat species by using an established trail route. In addition, field surveys and monitoring during the project by a qualified biologist would reduce the impacts to a level of insignificance.
7. **Hydrogen Sulfide** - generated as a byproduct of anaerobic breakdown of organic material within bay sediment, hydrogen sulfide can be a toxic and irritating gas. The hydrogen sulfide levels expected during surf zone disposal of dredge material in the open air do not pose a threat to human health. Suction dredging would dilute the hydrogen sulfide with seawater and the material would be further diluted during the initial mixing with ocean waters upon discharge.

The CCC additionally stated in the 2006 CDP staff report that the project as conditioned will be in conformity with policies of Chapter 3 of the Coastal Act. Approval of the permit complies with California Environmental Quality Act (CEQA) because either: 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment; or 2) there are not further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.

## Summary of Findings

Near shore beach surf zone disposal has proven to be a successful dredging disposal methodology in previous dredging episodes. Although there will be temporary impacts at the Samoa Beach zone disposal site, the effects on ocean water quality are considered less significant than other disposal alternatives. Negative effects of temporary discharge of dredge spoils on the intertidal fauna of Samoa Beach were localized and temporary. Further, approximately four months following project termination, populations had recovered to pre-project conditions at the disposal site.

The biggest obstacle for approval of future dredging projects using beach disposal will be from public perception. The aesthetics and odor generated from discharge of the material in the surf zone will cause concern from the general public; therefore education outreach of the perceived impacts will need to be addressed. Information efforts on the process, material composition, previous findings, monitoring program, and duration with temporary localized impacts will need to be initiated prior to and during operations.

The HBHRCD and City of Eureka continue to seek out alternative disposal options for cooperative maintenance dredging. Currently the HBHRCD is evaluating conditions and requirements to remove material and reactivate with new permits, the Samoa lagoons upland disposal site. Additional efforts being made by the HBHRCD to reduce maintenance dredging costs include: purchase of a cutter head suction dredge and pipeline, purchase of vibracore sampling equipment, and completing an SAP for all HBHRCD and City of Eureka waterfront facilities. The HBHRCD additionally completed a feasibility analysis in 2015 for beneficial aspects of dredge material reuse.

The purpose of the dredging is to provide mooring areas for fishing boats, recreational, and other boats. It is the goal of the HBHRCD, the City of Eureka, and the CCC to provide as many recreational opportunities as possible for the public in Humboldt Bay. Conducting maintenance dredging is not a new project and is vital to achieving this goal. The disposal of dredge material on Samoa Beach surf zone is similar to the previous maintenance dredging projects approved by the CCC in 1988, 1998, and 2006. A "No Action" project would result in loss of existing mooring facilities that would eventually silt in. This is contrary to policies of the Coastal Act.

If you have any comments or concerns, please call me at 707-441-8855.

Sincerely,

**SHN Engineers & Geologists**



Mike K. Foget, PE  
Project Manager



Erik J. Nielsen, PG, CHG  
Project Hydrogeologist

MKF:EJN:dla

Attachment : 1. Alternatives Analysis of Dredge Material Analysis  
c. w/attach.: Miles Slattery, City of Eureka

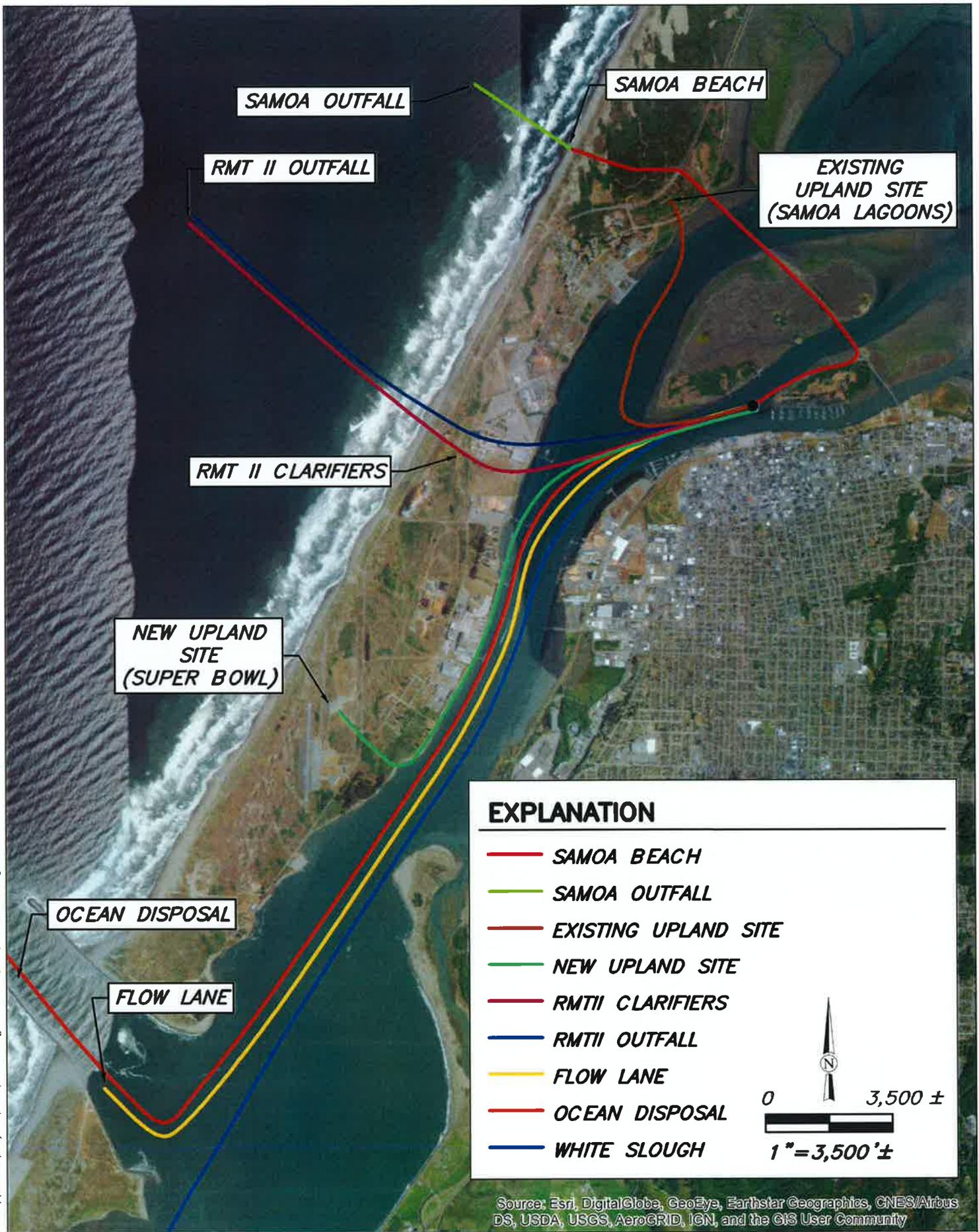
## References

- Newton, G and Associates. (July 1988). *Monitoring Report: Samoa Dredge Spoil Biological Monitoring Program at Samoa Beach. Humboldt County, California.* NR:Newton and Associates.
- Moffat & Nichol. (December, 2013). *Coastal Regional Sediment Management Plan – Eureka Littoral cell, California. Prepared for the California Coastal Sediment Management Workgroup.*
- Morris, R.H., D.P. Abbott, and E.C. Haderlie. (1980). *Intertidal Invertebrates of California.* NR:NR.
- Northern Hydrology & Engineering. (December 2015). *Sampling and Analysis Plan, Humboldt Bay Harbor, Recreation, and Conservation District and City of Eureka Sediment Characterization for 2016-2021 Maintenance Dredging, Humboldt Bay, California.* McKinleyville, CA:Northern Hydrology.
- Pacific Affiliates, Inc. (August 2006). *Samoa Beach Disposal Monitoring Plan, City of Eureka and Humboldt Bay Harbor, Recreation, and Conservation District Cooperative Maintenance Dredging Project, Eureka Channel, Humboldt Bay, California.* Eureka, CA:Pacific Affiliates.
- . (June 2006). *Samoa Beach Surf Zone Disposal During Project Monitoring Report, City of Eureka and Humboldt Bay Harbor, Recreation, and Conservation District Cooperative Waterfront Facilities Maintenance Dredging Project, Eureka Channel, Humboldt Bay, California.* Eureka, CA:Pacific Affiliates.
- . (August 23, 2007). *Samoa Beach Surf Zone Disposal Post Project Monitoring Report, City of Eureka and Humboldt Bay Harbor, Recreation, and Conservation District Cooperative Waterfront Facilities Maintenance Dredging Project, Eureka Channel, Humboldt Bay, California.* Eureka, CA:Pacific Affiliates.
- . (July 29, 2009). *Samoa Beach Surf Zone Disposal Post Project Annual Monitoring Report, City of Eureka and Humboldt Bay Harbor, Recreation, and Conservation District Cooperative Waterfront Facilities Maintenance Dredging Project, Eureka Channel, Humboldt Bay, California.* Eureka, CA:Pacific Affiliates.
- North Coast Regional Water Quality Control Board, (August 26, 2005). *Issuance of Clean Water Act Section 401 Certification (Waster Quality Certification) for the Humboldt Bay Harbor, Recreation and Conservation District and City of Eureka Cooperative Maintenance Dredging Project.* Santa Rosa, CA:RWQCB.
- SHN Consulting Engineers & Geologists, Inc. (December 10, 1998). *Annual Biological Monitoring Report, Harbor District and City of Eureka Maintenance Dredging Project, Samoa Beach, Humboldt County California.* Eureka, CA:SHN.

# 1

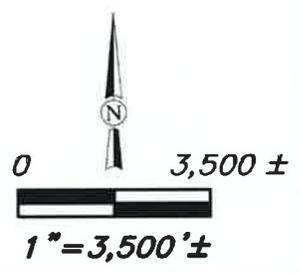
## Alternatives Analysis for Dredge Material Disposal

Path: \\Eureka\Projects\2016\016240-Engr-HBHCDC\GIS\PROJ\_MXD\Figure2\_REV1\_20170203.mxd



**EXPLANATION**

- SAMOA BEACH
- SAMOA OUTFALL
- EXISTING UPLAND SITE
- NEW UPLAND SITE
- RMTII CLARIFIERS
- RMTII OUTFALL
- FLOW LANE
- OCEAN DISPOSAL
- WHITE SLOUGH



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



City of Eureka  
Dredging  
Eureka, California

Dredging  
Storage Site Alternatives  
SHN 016240

February 2017

Figure2\_REV1\_20170203.mxd

Figure 1

Table 1: Comparison of Dredge Material Placement Sites

Dredge Disposal Location	Description	Challenges	Permit Requirements	Degree of Difficulty	Annual Dredging Cost	Costs to Permit	Total Cost <sup>1</sup> (Over 10 Year Period)	Equivalent Slip Fee Unit <sup>2,3</sup> (\$ per lineal foot per month)
Samoa Beach	Beach application of dredge material	<ul style="list-style-type: none"> <li>Discouraged by the California Coastal Commission</li> <li>Aesthetic, public perception concerns</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>NMFS Biological</li> <li>RWQCB 401</li> <li>CCC CDP</li> </ul>	☐	\$240,000	\$460,000-\$2,250,000	\$2,860,000-\$4,650,000	\$2.35-\$3.82
Samoa Beach Temporary Ocean Outfall	Ocean application of dredge material through 1/2 mile temporary outfall	<ul style="list-style-type: none"> <li>Difficult to meet discharge limitations</li> <li>Outfall pipe installation and removal</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>NMFS Biological</li> <li>RWQCB 401</li> <li>CCC CDP</li> </ul>	☐	\$270,000	\$400,000-\$1,800,000	\$3,100,000-\$4,500,000	\$2.55-\$3.70
Existing Upland Storage Site	Settling basins and outflow structure at west end of Samoa bridge	<ul style="list-style-type: none"> <li>Permit to current agency standards</li> <li>Requires removal of existing material</li> <li>Final disposition of dredge material</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>RWQCB 401</li> <li>CCC CDP</li> </ul>	☐	\$480,000	\$185,000-\$450,000	\$4,985,000-\$5,250,000	\$4.10-\$4.31
New Upland Storage Site	Settling basin and outflow structure	<ul style="list-style-type: none"> <li>Permitting and construction of new settling basin with outflow structure</li> <li>Final disposition of dredge material</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>RWQCB 401</li> <li>RWQCB WDRs</li> <li>SWRCB CUP</li> <li>CCC CDP</li> </ul>	☐	\$250,000	\$220,000-\$540,000	\$2,720,000-\$3,040,000	\$2.24-\$2.50
RMT II Clarifiers/Outfall	Process dredge slurry through settling clarifiers then discharge decant water to the ocean outfall	<ul style="list-style-type: none"> <li>Infrastructure improvements</li> <li>Removal of sediment from clarifier</li> <li>Final disposition of dredge material</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>NMFS Biological</li> <li>RWQCB 401</li> <li>RWQCB NPDES</li> <li>CDFW 1600</li> <li>CCC CDP</li> </ul>	☐	\$450,000	\$230,000-\$450,000	\$4,730,000-\$4,950,000	\$3.89-\$4.07
RMT II Ocean Outfall	Direct discharge of dredge material through ocean outfall	<ul style="list-style-type: none"> <li>Difficult to meet discharge limitations for suspended sediment</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>NMFS Biological</li> <li>RWQCB 401</li> <li>RWQCB NPDES</li> <li>CDFW 1600</li> <li>CCC CDP</li> </ul>	●	\$280,000	\$345,000-\$1,350,000	\$3,145,000-\$4,150,000	\$2.58-\$3.41
Flow Lane	Transfer to main federal channel where Army Corps of Engineers (ACOE) dredges	<ul style="list-style-type: none"> <li>Not previously completed in Humboldt Bay</li> <li>ACOE approval and work commitment</li> <li>Suspension of fine sediments</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>NMFS Biological</li> <li>RWQCB 401</li> <li>RWQCB NPDES</li> <li>CCC CDP</li> </ul>	☐	\$510,000	\$345,000-\$1,800,000	\$5,445,000-\$6,900,000	\$4.47-\$5.67
Ocean Disposal via ACOE Dredge	Transfer to ACOE dredge vessel. ACOE subsequently ships offshores to ocean disposal site	<ul style="list-style-type: none"> <li>Not previously completed in Humboldt Bay</li> <li>Dredge slurry is 90% liquids</li> <li>ACOE approval denied (Oct 2016)</li> </ul>	N/A	N/A	N/A	N/A	N/A	N/A
White Slough	Slurry placement within bermed area. Material settling and infiltration of water	<ul style="list-style-type: none"> <li>Not previously completed in Humboldt Bay</li> <li>Distance from dredge location to placement site</li> </ul>	<ul style="list-style-type: none"> <li>ACOE 404</li> <li>RWQCB 401</li> <li>RWQCB WDRs</li> <li>CCC CDP</li> </ul>	☐	\$1,000,000	\$230,000-\$538,000	\$10,230,000-\$10,538,000	\$8.41-\$8.66

- ☐ : Fewer permitting and implementation challenges
- ☐ : Medium permitting and implementation challenges
- ☐ : Medium to major permitting and implementation challenges
- : Relatively major permitting and implementation challenges

1. Total Cost = Cost to Permit + (10 yrs x Annual Dredge Cost), in \$/10 yrs
2. Equivalent Slip Fee Unit = [(Total Cost/10 yrs) / (12 mo/yr)(10,140 lineal feet, total slip space)], in \$/lineal foot-mo
3. Equivalent slip fee assumes all costs