

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name	<u>KETCHIKAN (Ward Cove)</u>	ProjectID: 10-09
Last Updated:	08/20/04	
City:	Ketchikan	
County:	Ketchikan Gateway Borough	
State:	AK	
Country:	USA	
Bodies of Water:	Ward Cove	
US EPA Region:	X	
Status (Active, Complete, or Monitoring Only):	Complete	
Date On NPL:	N/A	
ROD/ESD Date:	2000 (ROD)	
Operable Unit:	Marine OU	
Areas of Concern (length or acres):	80 acres within the approximately 250-acre Ward Cove.	
Other Characteristics of Water Body:	Ward Cove is a deep estuary, approximately 1 mile long with a maximum width of 0.5 mile. The shoreline of the cove is mostly rocky (i.e., basalt) and relatively steep. Over two-thirds of the cove is deeper than 100 feet. Sediments in the cove are subtidal (i.e., below the tide line); intertidal sediments are limited to a very small area near the mouth of Ward Creek.	
Contaminants of Concern:	ammonia, sulfide, and 4-methylphenol	
Source of Contamination:	Primarily pulping effluent from the Ketchikan Pulp Company's dissolving sulfite pulp mill operations and logging.	
Contaminated Area Physical Characteristics:	(Source: Reference A-332) "Visual observations of deep sediment cores collected in Ward Cove and the associated chemical data indicate that impacts have resulted in a black, organic-rich layer of sediment that is distinct from native sediments. This layer of sediments is concentrated near the head of the cove offshore of the Ketchikan Pulp Company facility and along the north shore, and generally ranges in thickness from 3 to 10 feet. This layer is distinguished from native sediment by higher concentrations of TOC, BOD, COD, ammonia, sulfide, phenol, and 4-methylphenol." Ammonia, sulfide, and 4-methylphenol were selected as CoCs based on the results of sediment toxicity tests. Maximum concentrations in sediment of each for sampling conducted in 1996 and 1997 were 690 ppm, 27,000 ppm, and 17,000 ppm, respectively.	
Type of Regulatory Action:	Final, CERCLA Action.	
Overall Status Summary:	(Source: Reference A-575) "In September 1995, . . . as part of the Consent Decree, Ketchikan Pulp Company (KPC) agreed to conduct a Ward Cove sediment remediation project to address sediments in the Cove. A technical studies work plan for the Ward Cove sediment remediation project was submitted to EPA in April 1996. The technical studies work plan described the studies and actions necessary to identify an appropriate remedy to address ecological and human health issues associated with Ward Cove sediments. The technical studies were conducted in two phases. In May and June of 1996 (Phase I), surface sediments were sampled at 28 stations throughout Ward Cove and at 2 stations in a reference area (Moser Bay, Alaska) to characterize the horizontal distribution of chemicals of potential concern (CoPCs) and sediment toxicity throughout the Cove. Ecological and human health evaluations of the Phase 1 data were conducted to communicate the implications of the	

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Last Updated: 08/20/04

data to regulators and to build consensus on the appropriate evaluation techniques. The Phase 1 report identified the CoPCs and areas of focus that warranted further study in Phase 2."

(Source: Reference A-594) "The Selected Remedy consists of the following interrelated components:"

- "Placement of a thin layer cap (approximately 6 inches to 12 inches) of clean, sandy material where practicable. Thin layer capping is estimated to be practicable over approximately 21 acres within the AOC. Thin-layer capping is preferable over mounding."

- "Placement of clean sediment mounds in areas where thin-layer capping is either infeasible or impracticable, and where mounding is considered to be practicable. Mounding is currently considered to be practicable in areas where the organic-rich sediments are less than 5 ft thick and have a bearing capacity that is greater than 6 psf. Mounding is estimated to be practicable over approximately 6 acres within the AOC."

- "Dredging of approximately 17,050 cubic yards (cy) of bottom sediments from an approximate 4-acre area in front of the main dock and dredging of approximately 3,500 cy of bottom sediments from an approximate 1-acre area near the shallow draft barge berth area to accommodate navigational depths, with disposal of the dredged sediments at an upland location. After dredging, a thin-layer cap of clean, sandy material will be placed in dredged areas unless native sediments or bedrock is reached during dredging."

- "Removal of sunken logs from the bottom of Ward Cove in areas to be dredged."

- "Natural recovery in areas where neither capping nor mounding is practicable. Natural recovery is estimated to be the remedy for approximately 50 acres of the 80-acre AOC, as follows:

- 1) an 8-acre area in the center of Ward Cove and a 2-acre area near Boring Station 8 that exhibit a very high-density of sunken logs (>500 logs/10,000 m²);

- 2) a 13.5-acre area where water depth to the bottom of the Cove is greater than - 120 ft mean lower low water (MLLW) and depth of the sediment is currently considered to be too great to cap;

- 3) a 14.5-acre area where slopes are estimated to be greater than 40 percent and are currently considered to be too steep for capping or mounding material to remain in place;

- 4) an 11-acre area where the organic-rich sediments do not have the bearing capacity (i.e., strength is less than 6 psf) to support a sediment cap and are too thick (i.e., thickness is greater than 5 ft) to practicably allow for placement of sediment mounds, and,

- 5) a 0.2-acre area near the sawmill log lift where maintenance dredging generally occurs on an annual basis."

- "Institutional controls requiring that post-remediation activities within the AOC that materially damage the thin-layer cap or mounds will be required to redress such damage, at the direction of EPA"

- "Implementation of a long-term monitoring program for the remedial action until RAOs are achieved, at the direction of EPA."

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name **KETCHIKAN (Ward Cove)**

ProjectID: 10-09

Last Updated: 08/20/04

- “Subtidal investigation of sediments near the east end of the main dock, and subsequent dredging and disposal of PAH-contaminated sediments, as deemed appropriate by EPA.”

Total cost for the remedy is estimated to be \$4.4 million that includes \$400,000 for long-term monitoring.

The following provides an update on site activities as of about Feb. 12, 2001:

DREDGING-RELATED ISSUES:

- The dredge contractor is J.E. McAmis, Inc., of Washington State; Foster Wheeler is the design engineer and oversight contractor.
- Work began in early November with mobilization to the site. Site preparation and in-water debris removal were completed by the third week of November. The contractor was held up from beginning dredging for a few days while awaiting approval of the Consent Decree. Dredging was allowed to begin the last week of November 2000 and ended on or about January 12, 2001.
- Dredging was performed primarily for navigational purposes except for a small area of PAH contaminated sediment (141 cy) near the north end of the main dock area.
- Three areas were targeted for dredging, a new one-acre shallow berthing area near the north end of the Cove and adjacent to the existing wood pulp processing facility and two areas totaling about 3 acres and located adjacent to the facility’s main dock.
- Dredging was performed primarily using a 6 cy Cable Arm clamshell bucket. An environmental bucket was required by the project specifications as a means of reducing resuspension during dredging and to minimize the dewatering requirements of the removed sediment. The contractor was permitted to use a conventional clamshell bucket when the Cable Arm bucket became ineffective (i.e., when bucket loads reached about one-half of bucket capacity), typically when encountering native sediment. In addition, log tongs were used for removal of submerged pilings and logs missed during debris removal. It is estimated that about one-third of the dredged sediment was removed using a conventional clamshell.
- The contractor began dredging one 9-hr shift per day, six days per week. After a slow start and no ability to extend the schedule (due to fish window constraints), the contractor changed to two 9-hr shifts, 6 days per week and every other Sunday.
- The total volume of sediment removed was 11,865 cy (11,865 tons) vs. the originally estimated volume of 20,550 cy (this includes one-foot of tolerance dredging in all areas). The lower volume of sediment removed was the result of not having to dredge the two areas near the main dock as deep as originally planned. Both areas were originally to be dredged to a depth sufficient to allow installation of a cap over the remaining sediment and to preclude the effects of prop wash on the cap material. The installation of the cap, and thus dredging to the lower depth, was found unnecessary when native sediment was encountered at a much shallower depth than originally anticipated. The total volume of sediment removed from these two areas was 9,563 cy and included about 141 cy of PAH contaminated sediment from the north end of the main dock.
- Water depths in areas targeted for dredging varied from –10 to –44 ft MLLW. Spuds were

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Last Updated: 08/20/04

used to anchor the derrick barge during dredging to about -50 ft.

- Silt curtains were not required; an exclusionary zone, or “short-term variance area,” of 300-foot radius from the point of the dredging operations was used for the purpose of monitoring water quality, primarily turbidity. A turbidity limit of 25 NTU was used based on the Alaska State water quality turbidity standard. DO, temperature, and salinity were also monitored. During monitoring, water samples were collected at 2 ft. below the water surface, midway in the water column, and 2 ft. above the bottom. Turbidity and DO were exceeded on a few occasions but follow-up samples were below WQ limits. No corrective actions were required.
- Removed sediments were stockpiled on-site to allow gravity dewatering and settling. Water draining from the sediment was allowed to percolate into the ground. The sediment will remain in the dewatering area until Summer 2001 and then be disposed of in an industrial landfill located adjacent to the site. The 141 cy of PAH-contaminated sediment were tested and found suitable for disposal in the on-site industrial landfill.

CAPPING-RELATED ISSUES

- The purpose of thin cap placement in Ward Cove is “to reduce surface sediment toxicity and improve benthic habitat so a greater variety of organisms can live there.” Water depths in areas proposed for capping range from about -10 MLLW to -110 MLLW.
- The USEPA originally anticipated placing a thin cap of 6 inches of sand over 15 areas totaling about 27 acres and placing mounds of combined cobbles and sand in another one-acre area. Engineering design calculations (apparently flawed) indicated that the bearing capacity of the sediments was low, such that many of the sediments would not be able to support the proposed 6-inch cap. Of the 27 acres proposed for thin capping, about 18 acres were thought to be potentially unable to support a 6-inch sand cap and would require mounding instead. All sediment targeted for capping was covered by a thin-layer cap; mound capping was not required since all sediment addressed by the capping remedy maintained sufficient bearing capacity to support a thin-layer cap.
- Capping was performed using a standard Cable Arm clamshell bucket. Coverage was based on boom swing speed, bucket opening speed, and bucket volume. The contractor reportedly spent considerable time practicing the cap placement procedure on the haul barge (containing the cap material) prior to implementation in the water. Issues included:
 - The contractor attempted to integrate the recording of the opening and closing of the bucket during material release with the WINOPS system but was unsuccessful. A manual toggle switch was eventually installed in the crane to allow the operator to manually indicate when the bucket opened and closed for electronic recording.
 - The contractor found it difficult to obtain reproducible bucket volumes when picking up sand stockpiled in the haul barge. Initially, workers were used to even out the sand pile after each bucket load removed but this was determined to be labor intensive. Eventually, baffles were installed in the bucket that provided more consistency in the bucket loads. The baffles were installed to provide a 5 ½ cy load, the volume determined to provide the most control during material placement.
 - Cap material placement was originally specified to be performed by opening the bucket below the water at 10 feet above the sediment surface. Cables associated with the barge four point

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Last Updated: 08/20/04

anchor and wire system (used in water generally greater than 50 feet deep) were found to interfere with the swing of the bucket during placement. As a result, the oversight and dredge contractors agreed to begin releasing the cap material from above the water surface. This resulted in increased turbidity and concerns by USEPA of exceeding WQ criteria. A second modification to the method of placement was made by EPA and the Corps requesting that, if possible, the bucket be below the water surface prior to release of the capping material. Despite this, cap material was typically released with the bucket above the water surface.

- Water quality monitoring requirements are the same as performed for dredging except that the “short-term variance area” includes all of Ward Cove.
- A capping design area of about one-half acre is first tested in each of the target areas to verify that the sediment is capable of supporting the thin cap. The first capping design area was completed on or about January 23, 2001.
- The maximum placement rate during capping was > 1,000 cy per day (achieved during two 9-hr shifts per day). This resulted in an accelerated schedule that allowed completion of the project by the end of February 2001 (based on six days per week and every other Sunday).
- The contractor was required by the work plan to provide a second method of cap placement in the event that the clamshell bucket proved inadequate. The contractor proposed the use of a “square-end skip box.” According to the USEPA, the “square-end skip box” was in such disrepair that it could not possibly be used for the placement of capping material.
- The cap material was obtained from Victoria BC Construction Aggregates. Reportedly, the material was of a consistent high-quality grade containing very little fines, allowing for improved quality control over the cap placement process.
- Reportedly, cap placement resulted in a uniform and consistent cap over each targeted area. Twelve verification samples were collected from each capped area. If samples could not be collected from above the water surface, typically due to debris, divers were used to collect the samples. The primary acceptance criterion for the cap was 40% sand by weight in the top 10 cm of sediment. As a result of mostly positive confirmation sampling results at about the mid-point of the capping project, the contractor was allowed to skip the design confirmation step and begin production capping immediately upon starting a new area.

Dredging was completed on or about January 16, 2001. A total of 11,865 cy of sediment was removed of which only 8,701 cy was paid volume. The final cost for dredging was \$1.4 million (\$159/cy based on 8,701 cy), excluding the cost for disposal which was to an industrial landfill adjacent to the nearby Ketchikan Pulp Company property. Capping was completed on or about February 28, 2001 and resulted in the placement of about 23,000 cy of material over 30 acres of cove bottom. The final cost for capping was \$2.6 million (\$96,000/acre; \$113/cy).

Remedial Action Planned: ☐

Risk Assessment: ☒

Remedial Action Implemented: ☒

Status of Dredging ☐

PRPs: ☒

GENERAL SITE INFORMATION, CHARACTERISTICS, AND STATUS

Project Name ***KETCHIKAN (Ward Cove)***

ProjectID: 10-09

Last Updated: 08/20/04

Contacts: ☒

References: ☒

Modeling: ☐

Fishing Advisory: ☐

Key Conditions: capping, dedicated landfill or CDF, dredging, fish spawning limitations, natural recovery,
navigational dredging component, post monitoring, tidal fluctuations

REMEDIAL ACTION PLANNED

Project Name	<u>KETCHIKAN (Ward Cove)</u>	ProjectID: 10-09
Last Updated:	04/11/01	
Target Sediment Cleanup Standards (TSCS):	None specified. An Area of Concern was established that "... represents that area and/or volume of sediment within the Marine Operable Unit where cleanup may be warranted for protection of the benthic community."	
How TSCS Established:	(Source: Reference A-332) "The boundaries of the Area of Concern were delineated using a weight-of-evidence approach recommended by EPA for evaluation of contaminated sediments, and is based on exceedences of sediment quality values at individual sampling stations."	
Target Bank and Floodplain Cleanup Levels (if applicable):	N/A	
Other Target:	N/A	
Environmental Sample Data References:	<ul style="list-style-type: none">• Sediment: Reference A-594• Water:• Fish:	
Estimated Target Volume:	20,550 cy to be dredged (navigational); also includes thin-layer capping of approximately 21-22 acres that includes a 2-acre area to be capped following dredging, 2 acres that may be capped or mounded and 4 acres considered transition areas between the different remedial options. Natural recovery is designated for the remaining 50 acres.	
Planned Disposal Method:	Dredged sediments will go to an on-site landfill.	
Estimated Calendar Time to Implement Remedy:	Six months.	
Estimated Time to Implement Remedy:	Less than 10 years for active remediation, 8 to 20 years for the natural recovery portion of the AOC to meet RAOs. "In-water" time estimates are 6 months for cleanup activities.	
Estimated Cost to Implement Remedy:	\$4.4 million; includes \$400,000 for long-term monitoring.	
Stated Remedial Action Objectives (and Source):	<p>(Source: Reference A-594) "RAOs were established for Ward Cove based on an ecological evaluation of toxicity to the benthic community in surface sediments. Toxic effects appear to be related to non-persistent by-products from the decomposition of organic matter that settled on the Cove bottom primarily as result of pulping effluent discharges from the former KPC mill. Attainment of the RAOs will significantly reduce toxic effects to the benthic community in surface sediments. At this site, surface sediments are defined as the top 10 cm because benthic organisms live only in these upper sediments."</p> <p>"The RAOs for surface sediments in the AOC are to:</p> <ul style="list-style-type: none">• Reduce toxicity of surface sediments• Enhance recolonization of surface sediments to support a healthy marine benthic infauna community with multiple taxonomic groups." <p>"A benefit of achieving these RAOs is that a healthy benthic infaunal community serves as a diverse food source to larger invertebrates and fishes. The response action selected in this ROD will achieve these RAOs. It is expected that RAOs will be met over various time periods,</p>	

REMEDIAL ACTION PLANNED

Project Name	<u>KETCHIKAN (Ward Cove)</u>	ProjectID: 10-09
Last Updated:	04/11/01	
	depending on the location within the AOC and the component of the remedy being implemented in the location (e.g., active remediation vs. natural recovery)."	
Measures of Success to be Used:	"The long-term effectiveness of cleanup in Ward Cove is measured by the existence of healthy benthic communities in the sediments."	
Planned Monitoring and Restoration:	Long-term monitoring in capped areas and in natural recovery areas to determine whether RAOs are being attained.	
Agency Position on Sediment Removal (and Source):	<p>(Source: Reference A-322) "Because the contaminated sediments in Ward Cove do not pose unacceptable risks to human health or to wildlife, the key concern is how well the preferred alternative addresses risks to benthic communities living in the sediments.</p> <p>"Placement of a thin-layer cap, or dredging and removal of contaminated sediments followed by capping, provides suitable habitat for benthic communities. A thin layer cap, however, is much less expensive and poses far fewer implementation difficulties associated with disposal of tens or hundreds of thousands of cubic yards of sediments. At this site, EPA believes that dredging is only necessary and cost-effective in areas where dredging is necessary to accommodate navigational depths. In such areas, placing a thin layer cap after dredging will provide habitat for benthic communities."</p> <p>"In areas where placement of a thin cap is impracticable (e.g., areas that are too steep or too deep) or cannot be performed (e.g., sediments are too soft), reliance on natural recovery is reasonable. EPA expects that such areas will become suitable habitat for benthic communities through natural processes of decay of toxic materials and additions of sediments. The "tradeoff" is that these natural processes are estimated to take 8 to more than 20 years to provide recovery of healthy benthic communities."</p> <p>"This alternative is particularly suitable for the type of problem sediment present in Ward Cove, which has limited toxicity and does not contain persistent chemicals that are highly toxic or that have the potential to bioaccumulate. The applicability of thin capping is limited by physical constraints within Ward Cove (i.e., steep slopes along portions of the shoreline) and by the physical properties of Ward Cove sediments (i.e., where the soft, organic-rich layer is thick)."</p> <p>"For most alternatives, dredging of sediments in the vicinity of KPC's main dock is considered because it is believed that a cap could not be placed in this portion of the Area of Concern without affecting potential future navigation. The remedial alternatives considered different dredging volumes based on various navigational scenarios that considered dredging different areas and different depths offshore of the main dock at the KPC facility. The alternatives also considered different upland and in-water disposal options for the dredged materials. There are few potential disposal sites in Ward Cove for dredged sediment because of the geographic characteristics and limited size of the cove. In part, the different dredging volumes were also evaluated to illustrate capacity limitations of disposal sites and the very high unit costs involved in dredging and confining Ward Cove sediments."</p> <p>(Source: Reference A-594) "EPA does not intend to restrict vessel access or restrict anchoring of vessels in the Marine Operable Unit. Those types of restrictions are not necessary because the sediment cap and mounds are not intended to physically isolate problem sediments from the marine environment – the purpose of the cap and mounds is to simply provide new substrate for benthic organisms to inhabit. As an example, if vessels occasionally "dragged bottom" or dropped anchors into the sediment cap or mounds, then there may be some resuspension of problem sediments into the water column. However, the occasional resuspension of problem</p>	

REMEDIAL ACTION PLANNED

Project Name

KETCHIKAN (Ward Cove)

ProjectID: 10-09

Last Updated:

04/11/01

sediments is not a concern because the types of contaminants present in the sediments (e.g., ammonia, sulfide, 4-methylphenol) are short-lived and would quickly be dispersed in the water column and biodegraded to levels that are not considered toxic to marine organisms. Further, through mixing, the more elevated concentrations of non-persistent chemicals could be reduced in surface sediments to levels that are acceptable for benthic recolonization. As shown in the RI/FS, none of the contaminants in the sediments were found to pose unacceptable risk to either humans or wildlife through bioaccumulation.”

RISK ASSESSMENT

Project Name ***KETCHIKAN (Ward Cove)***

ProjectID: 10-09

Last Updated: 11/20/00

RA Type: Baseline Human Health & Ecological; Public Health

RA Status: Complete

RA Objectives: (Source : Reference A-332) "A human health risk assessment was conducted to identify potential risks posed by chemicals detected in sediments or seafood (e.g., fish, shellfish, other edible marine invertebrates) from Ward Cove. . ."

"The ecological evaluation of Ward Cove sediments consisted of an assessment of sediment toxicity throughout the cove and a food-web assessment to estimate risks of CoPCs in sediments to representative birds and mammals at the top of the Ward Cove food web, as discussed below. Surface sediments were collected from 44 different stations in Ward Cove for these assessments. Surface sediments (i.e., the top 10 cm), were collected and analyzed because bottom-dwelling organisms (i.e., worms, clams), known as the "benthic community," live only in these upper sediments; benthic organisms do not live in the deeper sediments."

***Company
Performing RA:*** EPA

RA Reference Report: Proposed Plan, July 1999

***RA Summary and
Conclusions:*** HHRA
(Source: Reference A-332) "Conclusion -- . . . No chemicals of concern were identified for human health. Thus, sediments in Ward Cove do not pose unacceptable risk to humans. . ."

ERA
(Source: Reference A-332) "Sediment Toxicity Assessment
Conclusion -- Sediment contamination in certain portions of Ward Cove poses a risk to bottom-dwelling animals (i.e., the benthic community) that live in the sediments. The chemicals of concern (CoCs) identified for sediment toxicity are ammonia, sulfide, and 4-methylphenol. . ."

"Food Web Assessment
Conclusion -- No chemicals of concern were identified for the food-web assessment. Thus, sediments in Ward Cove do not pose unacceptable risks to wildlife. . ."

REMEDIAL ACTION IMPLEMENTED

Project Name:	<u>KETCHIKAN (Ward Cove)</u>	ProjectID: 10-09
Last Updated:	12/30/03	
Physical Target:	Dredging a small area of PAH-contaminated sediment and two areas totaling about 1.5 acres in front of the main dock and a 1.25-acre area near a shallow draft barge berth area; thin-layer capping about 30 acres; and natural recovery only in about 50 acres.	
Goals:	To reduce surface sediment toxicity and improve benthic habitat.	
Primary Contractor:	J.E. McAmis, Inc. (Washington State); Foster Wheeler (construction and engineering oversight)	
Other Contractors:		
Generic Remediation Method:	Mechanical dredging; capping; natural recovery	
Equipment:	6 cy Cable Arm environmental bucket; 5 cy conventional clamshell bucket; 8 cy Cable Arm conventional bucket (used for offloading sediment); 4-fine timber tongs; two tugs; two 1,500 cy barges	
Material Handling:	<p>DREDGING</p> <p>Work began in early November with mobilization to the site. Site preparation and in-water removal of approximately 680 tons of logs and wood debris were completed by the third week of November. The contractor was held up from beginning dredging for a few days while awaiting approval of the Consent Decree. Dredging was allowed to begin during the last week of November 2000.</p> <p>Dredging was primarily performed using a 6 cy Cable Arm clamshell bucket. An environmental bucket was required by the project specifications as a means of reducing resuspension during dredging and to minimize the dewatering requirements of the removed sediment. The contractor was permitted to use a conventional clamshell bucket when the Cable Arm bucket became ineffective (i.e., when bucket loads reached about one-half of bucket capacity), typically when encountering native sediment. In addition, log tongs were used for removal of submerged pilings and logs missed during debris removal. It is estimated that about one-third of the dredged sediment was removed using a conventional clamshell. The WINOPS system was used for dredge positioning.</p> <p>The contractor began dredging one 9-hr shift per day, six days per week. After a slow start and no ability to extend the schedule (due to fish window constraints), the contractor changed to two 9-hr shifts, 6 days per week and every other Sunday.</p> <p>Water depths in areas targeted for dredging varied from –10 to –44 ft MLLW. Spuds were used to anchor the derrick barge during dredging to about –30 ft. Greater depths required the use of an anchor and cable system.</p> <p>CAPPING</p> <p>EPA originally anticipated placing a thin cap of 6 inches of sand over 15 areas totaling about 27 acres and placing mounds of combined cobbles and sand in another one-acre area. Engineering design calculations (apparently flawed) indicated that the bearing capacity of the sediments was low, such that many of the sediments would not be able to support the proposed 6-inch cap. Of the 27 acres proposed for thin capping, about 18 acres were thought to be potentially unable to support a 6-inch sand cap and would require mounding instead. All sediment targeted for capping was covered by a thin-layer cap; mound capping was not required since all sediment addressed by the capping remedy maintained sufficient bearing capacity to support a thin-layer cap.</p>	

REMEDIAL ACTION IMPLEMENTED

Project Name: KETCHIKAN (Ward Cove)

ProjectID: 10-09

Last Updated: 12/30/03

Capping was performed using the 8 cy Cable Arm conventional clamshell bucket. Coverage was based on boom swing speed, bucket opening speed, and bucket volume. The contractor reportedly spent considerable time practicing the cap placement procedure on the haul barge (containing the cap material) prior to implementation in the water. Issues included:

- The contractor attempted to integrate the recording of the opening and closing of the bucket during material release with the WINOPS system but was unsuccessful. A manual toggle switch was eventually installed in the crane to allow the operator to manually indicate when the bucket opened and closed for electronic recording.
- The contractor found it difficult to obtain reproducible bucket volumes when picking up sand stockpiled in the haul barge. Initially, workers were used to even out the sand pile after each bucket load removed but this was determined to be labor intensive. Eventually, baffles were installed in the bucket that provided more consistency in the bucket loads. The baffles were installed to provide a 5 ½ cy load, the volume determined to provide the most control during material placement.
- Cap material placement was originally specified to be performed by opening the bucket below the water at 10 feet above the sediment surface. Cables associated with the barge four point anchor system used in water depths generally exceeding 50 ft. were found to interfere with the swing of the bucket during placement (two spuds were used to anchor the barge in water depths generally less than 50 ft). As a result, the oversight and dredge contractors agreed to begin releasing the cap material from just above the water surface. Because this resulted in increased turbidity during capping material placement, EPA and the Corps requested that, if possible, capping material be released from below the water surface. Despite this request most releases were made from above the water surface and resulted in a few WQ impacts.
- A capping design area of about one-half acre is first tested in each of the target areas to verify that the sediment is capable of supporting the thin cap. The first capping design area was completed on or about January 23, 2001.
- Cap production averaged 875 cy per day (45 to 55 cy per hour). The maximum placement rate during capping was > 1,000 cy per day (achieved during two 9-hr shifts per day). This resulted in an accelerated schedule that allowed completion of the project by the end of February 2001 (based on six days per week and every other Sunday).
- Approximately 23,300 cy of cap material were placed over about 30 acres (including the areas previously dredged). The cap material was obtained from Construction Aggregates Ltd. near Victoria, British Columbia. Reportedly, the material consisted of high-quality grade fine-medium and coarse sands containing very little fines, allowing for improved quality control over the cap placement process.

Volume Removed: 11,865 cy (11,865 tons); of this volume only 8,701 cy were paid volume – the remainder resulted from overdredging for which the dredge contractor was not compensated.

Calendar Time:

- On-site preparations and debris removal from about November 1 to November 20, 2000;
- Dredging from about November 20, 2000 to on or about January 16, 2001; and
- Capping from about January 23, 2001 to on or about February 28, 2001.

Time To Implement: 4 months (working two 9-hour shifts, six days per week, and every other Sunday). For dredging, 28

REMEDIAL ACTION IMPLEMENTED

Project Name:	<u>KETCHIKAN (Ward Cove)</u>	ProjectID: 10-09
Last Updated:	12/30/03	
	days total of which 17 days were single-shift days and 11 days were double-shift days. For production capping, a total of 24 days of which 5 were single-shift days and 19 were double-shift days.	
Total Cost:	\$4 million (for the RI work plan through completion of construction); \$70,000 for water quality monitoring.	
Dredging Cost:	\$1.4 million for dredging not including disposal (\$159/cy; 8,701 cy); \$2.6 million for thin-layer placement (\$96,000/acre).	
Disposal of Sediment:	Removed sediments were stockpiled on-site in a constructed ponding area to allow gravity dewatering and settling. Water draining from the sediment was allowed to percolate into the ground. The sediment remained in the dewatering area until June 2001 and then was disposed of in an industrial landfill located on adjacent KPC property. The 141 cy of PAH-contaminated sediment were tested and found suitable for disposal in the on-site industrial landfill.	
Volume of Water:	See "Disposal of Sediment."	
Method of Water Treatment:	See "Disposal of Sediment."	
Water Discharge Limit:	See "Disposal of Sediment."	
Air Monitoring During Remediation:		
Water Monitoring During Remediation:	Silt curtains were not required; an exclusionary zone, or "short-term variance area," of 300-foot radius from the point of the dredging operations was used for the purpose of monitoring water quality, primarily turbidity. A turbidity limit of 25 NTU was used based on the Alaska State water quality turbidity standard. DO, temperature, and salinity were also monitored. During monitoring, water samples were collected at 2 ft. below the water surface, midway in the water column, and 2 ft. above the bottom. Two hundred and thirty six monitoring events were performed over 78 days of in-water work. The turbidity limit was exceeded on only a few occasions (DO, turbidity), and results from follow-up samples were all below established WQ criteria. No corrective actions were required.	
Outcome:	<p>DREDGING</p> <p>The total volume of sediment removed was 11,865 cy (11,865 tons) vs. the originally estimated volume of 20,550 cy (this includes one-foot of tolerance dredging in all areas). The lower volume of sediment removed was the result of not having to dredge the two areas near the main dock as deeply as originally planned. Both areas were originally to be dredged to a depth sufficient to allow installation of a cap over the remaining sediment and to preclude the effects of prop wash on the cap material. The installation of the cap, and thus dredging to the lower depth, was found unnecessary when native sediment was encountered at a much shallower depth than originally anticipated. The total volume of sediment removed from these two areas included about 141 cy of PAH contaminated sediment from the north end of the main dock.</p> <p>CAPPING</p> <p>Reportedly, cap placement resulted in a uniform and consistent cap over each targeted area. Twelve verification samples were collected from each capped area. If samples could not be collected from above the water surface, typically due to debris, divers were used to collect the samples. The primary acceptance criterion for the cap was 40% sand by weight in the top 10 cm of sediment. As a result of mostly positive confirmation sampling results at about the mid-point of the capping project, the contractor was allowed to skip the design confirmation step and begin</p>	

REMEDIAL ACTION IMPLEMENTED

Project Name:	<u>KETCHIKAN (Ward Cove)</u>	ProjectID: 10-09
Last Updated:	12/30/03	

production capping immediately upon starting in a new area.

Restoration and Post-Monitoring: A long-term monitoring plan is reportedly to be prepared with monitoring targeted to begin in 2003. This has not been confirmed.

Site-Specific Difficulties:

- The contractor was required by the work plan to provide a second method of cap placement should the use of the clamshell bucket prove inadequate. The contractor proposed the use of a “square-end skip box.” According to EPA, the “square-end skip box” was in such disrepair that it could not possibly be used for the placement of capping material.
- The Cable Arm clamshell was found ineffective for use on some of the harder materials encountered (e.g., debris, logs, shot rock). EPA concluded that the conventional clamshell would have been the correct bucket for the project based on conditions encountered during project implementation. Additionally, accurate or reliable vertical positioning of the bucket was reportedly difficult to achieve with the WINOPS system.

Monitoring Data

References:

- **Sediment**
- **Water:**
- **Fish:**

POTENTIALLY RESPONSIBLE PARTIES

Project Name **KETCHIKAN (Ward Cove)**

ProjectID: 10-09

PRP Name: PRP INFORMATION NOT RELEASED

PRPID:

Street Address:

City:

State:

KEY CONTACTS

Project Name **KETCHIKAN (Ward Cove)**

ProjectID: 10-09

Last Name: KEY CONTACT INFORMATION NOT RELEASED

Contact ID:

First Name:

Title:

Company:

Address:

City:

State:

Postal Code:

Work Phone # :

Other Phone #:

Fax # :

Email Address:

REFERENCES

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Reference Type: A

ReferenceID: 332

Title: *Proposed Plan for the Marine Operable Unit "Ward Cove Sediment Remediation Project" - Ketchikan Pulp Company, Ketchikan, Alaska*

Location: AEM

Category: Site Update

Prepared by/Author: US EPA Region X

Preparer/Author Address: 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: July 1999

Key Words and Phrases:

Reference Type: A

ReferenceID: 575

Title: *Ward Cove Sediment Remediation Project, Detailed Technical Studies Report, Volume I, Remedial Investigation and Feasibility Study*

Location: BBL

Category: Site Update

Prepared by/Author: Exponent

Preparer/Author Address: 15375 SE 30th Place, Suite 250
Bellevue, WA 98007

Prepared For: Ketchikan Pulp Company

Date Published: May 1999

Key Words and Phrases:

REFERENCES

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Reference Type: A

ReferenceID: 592

Title: ***Final Remedial Action Work Plan - Ward Cove Sediment Remediation***

Location: AEM

Category: Remedial Action Plan/Work Plan

Prepared by/Author: Foster Wheeler Environmental Corporation

**Preparer/Author
Address:**

Prepared For: Ketchikan Pulp Company

Date Published: October 2000

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 593

Title: ***Water Quality Monitoring Plan - Ward Cove Sediment Remediation Project***

Location: AEM

Category: Monitoring, Remediation (Pre- and during)

Prepared by/Author: Exponent and Hartman Consulting Corporation

**Preparer/Author
Address:**

Prepared For: Ketchikan Pulp Company

Date Published: September 2000

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 594

Title: ***Record of Decision: Ketchikan Pulp Company Marine Operable Unit, Ketchikan, Alaska***

Location: AEM

Category: ROD/Proposed Plan/Action Memo/Decision Document

Prepared by/Author: US EPA Region X

**Preparer/Author
Address:** 1200 Sixth Avenue
Seattle, WA 98101

Prepared For: General Public

Date Published: March 29, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Reference Type: A

ReferenceID: 854

Title: *Final Construction Report - Ward Cove Sediment Remediation*

Location: AEM

Category: Close-Out Report

Prepared by/Author: Foster Wheeler Environmental Corporation

**Preparer/Author
Address:**

Prepared For: Ketchikan Pulp Company

Date Published: July 2001

**Key Words and
Phrases:**

Reference Type: A

ReferenceID: 1136

Title: *Long-Term Monitoring and Reporting Plan for Sediment
Remediation in Ward Cove*

Location: AEM

Category: Monitoring, Post

Prepared by/Author: Exponent

**Preparer/Author
Address:** 15375 SE 30th Place, Suite 250
Bellevue, WA 98007

Prepared For: Ketchikan Pulp Company

Date Published: September 2001

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 423

Title: *Subcontracts likely at Ketchikan*

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: July 25, 1997

**Key Words and
Phrases:**

REFERENCES

Project Name **KETCHIKAN (Ward Cove)**

ProjectID: 10-09

Reference Type: C

ReferenceID: 487

Title: ***Contractors May be Needed to Remove and Cap Sediment at Ketchikan Pulp Site***

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: July 3, 1998

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 488

Title: ***\$4M-\$5M Sediment Dredging, Capping Proposed for Ketchikan's Ward Cove***

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: July 9, 1999

**Key Words and
Phrases:**

Reference Type: C

ReferenceID: 592

Title: ***PRP Soon to Choose Prime Contractor, Which Will Subcontract Ketchikan Work***

Location: AEM

Category: Site Update

Prepared by/Author:

**Preparer/Author
Address:**

Prepared For: Superfund Week

Date Published: June 2, 2000

**Key Words and
Phrases:**

REFERENCES

Project Name **KETCHIKAN (Ward Cove)**

ProjectID: 10-09

Reference Type: C

ReferenceID: 628

Title: ***Dredging Sediments Finishing at KPC; Capping to Begin for Far North Site***

Location: AEM

Category: Site Update

Prepared by/Author:

***Preparer/Author
Address:***

Prepared For: Hazardous Waste/Superfund Week

Date Published: January 1, 2001

***Key Words and
Phrases:***

REFERENCES

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Reference Type: E

ReferenceID: 221

Title: ***Engineering Case Study - Ward Cove Sediment Remediation Project, Ketchikan, Alaska***

Location: AEM

Category: Site Update

Prepared by/Author: (1) Mark J. Herrenkohl, (2) John Lally, (3) Bernadette Johnston, (4) Greg L. Hartman, (5) Eric Snow, (6) Tom Fowler, (7) Barry Hogarty, (8) Karen Keeley, (9) John Wakeman

Preparer/Author Address: (1) Foster Wheeler Environmental
321 Summerland Road
Bellingham, WA 98229
(2) Bean Environmental
5316 NE 74th Street
Seattle, WA 98115
(3) Foster Wheeler Environmental
1050 NE Hostmark Street, Suite 202
Poulsbo, WA 98370
(4) Dalton Olmsted & Fuglevand, Inc.
10705 Silverdale Way NW, Suite 201
Silverdale, WA 98383
(5) Foster Wheeler Environmental
3947 Lennane Drive, Suite 200
Sacramento, CA 95843
(6) Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, MA 02110
(7) Consultant to Ketchikan Pulp Corporation
603 Deumount Street
Ketchikan, AK 99901
(8) US Environmental Protection Agency, Region X
1200 Sixth Avenue
Seattle, WA 98101
(9) U.S. Army Corps of Engineers, Seattle District
4735 East Marginal Way South
Seattle, WA 98124

Prepared For: WEDA Journal of Dredging Engineering

Date Published: June 2003 (Volume 5, No. 2)

Key Words and Phrases:

REFERENCES

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Reference Type: G

ReferenceID: 44

Title: *Planning for Cap Design and Construction during the RI/FS
(for complete presentation see Reference G-41)*

Location: AEM

Category: Capping/Placement

Prepared by/Author: (1) Karen Keeley, (2) John Wakeman

**Preparer/Author
Address:** (1) U.S. EPA Region X
(2) U.S. Army Corps of Engineers
Seattle, WA

Prepared For: EPA Forum on Managing Contaminated Sediments at Hazardous Waste Sites

Date Published: May 30 - June 1, 2001

**Key Words and
Phrases:**

Reference Type: G

ReferenceID: 47

Title: *Remedy Effectiveness: Comparison of Remediation Technologies
(for complete presentation see Reference G-41)*

Location: AEM

Category: Dredging: Equipment

Prepared by/Author: (1) William Elmer, (2) John Lally

**Preparer/Author
Address:** (1), (2) Foster Wheeler Environmental

Prepared For: EPA Forum on Managing Contaminated Sediments at Hazardous Waste Sites

Date Published: May 30 - June 1, 2001

**Key Words and
Phrases:**

Reference Type: L

ReferenceID: 96

Title: *Memo re: Ketchikan (Ward Cove) Dredging and Capping Project*

Location: AEM

Category: Site Update

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:** Malvern, PA 19355

Prepared For: General Electric

Date Published: February 22, 2001

**Key Words and
Phrases:**

REFERENCES

Project Name KETCHIKAN (Ward Cove)

ProjectID: 10-09

Reference Type: L

ReferenceID: 115

Title: *Sediment Remediation Projects in the U.S. Using Capping or Burial*

Location: AEM

Category: Capping/Placement

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: Distribution

Date Published: September 25, 2001

**Key Words and
Phrases:**

Reference Type: L

ReferenceID: 124

Title: *Contaminated Sediment Projects in the U.S. Using Monitored Natural Recovery*

Location: AEM

Category: Capping/Placement

Prepared by/Author: AEM, Inc.

**Preparer/Author
Address:**

Prepared For: Distribution

Date Published: September 25, 2001

**Key Words and
Phrases:**
