

**Log Transfer Facility
Permit Monitoring Services -
Eight Sites**

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by

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Underwater Bark Debris Survey
Permit Monitoring Services - Eight Sites

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Introduction:

This report is the required Log Transfer Facility (LTF) underwater bark accumulation monitoring of the twelve sites encompassed by the USDA Forest Service Permit Monitoring Services contract (order number 43 - 0116 - 8 - 0043).

Purpose:

The survey is designed to fully comply with the permit monitoring requirements of a National Pollution Discharge Elimination System (NPDES) permit to operate a LTF. The technique described here has evolved over the last few years into a successful means of providing accurate, reproducible data to ascertain compliance.

Methods:

The fundamental aspect of creating reproducible data is the selection of a permanent reference point location. Rather than use some type of marker that will likely be obscured or destroyed by natural or operational causes, we have found that using the exact center of the essentially permanent log transfer structure (A-frame, bulkhead, drive-down ramp, low angle slide, etc.) is best. This allows re-establishment of the reference point regardless of marker condition or presence.

From this center location, the reference point is positioned directly below at a elevation as close to zero feet Mean Low Low Water (MLLW) as possible. This depth may vary with input structure type and site topography. To correct the measured sample point depth to MLLW, the nearest subordinate station in the current NOAA Tide Table is selected and the averaged dive time is used to calculate the exact correction to apply.

Using the centerline axis of the entry structure as the reference, five transects in 30 - degree (magnetic compass headings) intervals are selected, with the middle transect in line with that centerline axis (for example the centerlines of a drive down ramp or low - angle slide). For a site with a bulkhead/A-frame structure, the middle transect is perpendicular to the face of the bulkhead. The permanent reference point is the origin for all transects.

Each transect is sampled at 5 - meter intervals starting from the origin (permanent reference point). Sample points continue to be established along a transect until a water depth of 60 feet MLLW is reached or the measured bark debris depth becomes insignificant. At each sample point the diver measures and records: 1) water depth of sample point in feet; 2) wood debris depth to the nearest centimeter; and 3) the percent of bark cover to the nearest 10 percent of the area within one meter of the sample point. In addition, a qualitative assessment of bark

debris size and character, marine life presence and condition, substrate type, direction and strength of current, and presence of any significant manmade debris is conducted at the same time. Transects are labeled by their magnetic compass heading for individual identification.

Water depth measurements are taken from a SeaQuest Solution Alpha dive computer with an accuracy of +/- 1%. A Suunto compass is used for the transect compass headings, attached to the 3 - foot measuring ruler. All data are collected and recorded *in situ* on waterproof paper.

Photographs are taken of representative sample points to document substrate, bark debris, algal and animal life, and any debris or objects that may be of concern. The normal procedure is to photograph the middle and two outside transects. The camera is positioned vertically over the sample point at a distance of three feet. Using a 20 mm wide angle lens gives an image field of approximately one meter square - or the same area used for debris coverage estimation. The photographs are organized in the report so that photo number one is top left in the holder and number three is the bottom left photograph. The photograph negatives will be archived by the permittee.

The field data were analyzed to meet the criteria of the contract. Areal extent of the survey was calculated with the outermost two transects as the boundaries of bark coverage and the end sample point of each transect. The debris surface area calculation was made by taking the triangle formed by two of the transects and using the transect with the most sample points (longest distance) as the base leg of a right triangle area calculation. The total square footage of the debris field area was a summation these four triangle areas. This figure was converted to acres as required by the guidelines.

To determine areal extent of substrate with at least a trace of bark debris, the percentage of sample points with debris was calculated and multiplied by the total sample area acreage to give the areal extent in acres. The same procedure was used to determine areal extent for the area of 100% debris cover and for the area with 100% debris cover and debris depth 10 centimeters or greater.

Recommendations:

Each of the eight LTF survey sites is completely different in site characteristics such as topography, tidal currents, substrate, natural flora and fauna, and the bundle input method. Despite the uniqueness of each LTF, there are common concerns relevant to all of the sites.

In my estimation, as a diver with considerable experience conducting bark surveys, there

is a pressing need to establish a standardized protocol that clearly defines as many elements of the dive survey as possible. Operating under a set of guideline definitions, the survey diver would then be able to make decisions in the field that would be consistent for all sites despite the variables unique to each site.

Another issue of concern are the sites to be surveyed that have not been used for many years (input structure dismantled/removed) or for which the LTF has not been constructed prior to the survey. For these sites, it would be most helpful to provide the precise location of the desired survey point. Possibly the simplest would be to provide GPS coordinates of the desired reference point location. Another method would be to have a Forest Service representative mark the position physically. This would remove any doubts when trying to find the site location by following the very general site maps usually provided or when the input structure is not found at the location shown on the site plan.

Subject: Marguerite Bay dive survey.

Results:

<u>Site:</u> Traitors Cove 8, NPDES No. AK-004559-4 (Marguerite Bay)	
<u>Date Surveyed:</u> 8/30/98	<u>Total # of Sample Points:</u> 47
<u>Time of Sampling:</u> 1106	<u>Average Bark Depth:</u> 16.2 cm
<u>Sampler:</u> C. Sempert	<u>Calculated Survey Area:</u> 0.88 acres

Area with Debris Cover	Area with 100 % Cover	Area with 100 % Cover & Debris Depth \geq 10 cm
0.88 acres	0.52 acres	0.43 acres

The permanent reference point was positioned in the approximate rail slide area at a depth estimated to be close to zero feet MLLW. Actual corrected depth of the reference point was 5 feet MLLW. A total of 47 sample points were taken on the five transects and all sample points had at least a trace of debris present. Of these, 23 had a measured debris depth of 10 centimeters or greater and 100% cover. A total of 28 sample points had an estimated 100% coverage. Surface area covered by bark debris in the survey, using transects 150 and 270 as boundaries, totals to 0.88 acres.

Observations:

Weather conditions at survey time were partly cloudy skies with light northwesterly winds at 10 knots. The diving started at 1017 and took place during the last part of an ebb tide period. Low tide occurred at 1244 with a height of 5.1 feet (corrected to subordinate station # 1427, Traitors Cove, lower section, based on the Ketchikan tide tables) and a tidal exchange of 5.5 feet. Light surface current was experienced during the survey from the direction of the creek which dissipated to negligible current at depth. Water temperature was measured at 55 degrees. Underwater visibility was estimated at approximately 12 feet (due to high freshwater content) increasing to about 20 feet at depth.

The site was not operational at survey time and all input structures had been removed (slide rails and A-frame). Situated in a large, shallow bay in lower Traitors Cove, an alluvial plain of a good sized creek is the dominating feature all the way to the westernmost edges of the site. The alluvial shelf itself is nearly flat up to where it breaks sharply to a steep drop down to a

nearly flat bay bottom of silt and mud. The alluvial shelf tapers off, in horizontal distance from the shoreline, to become the normal substrate slope at the western edge of the survey area. Directly in front of the rails, where the log bundles enter the water, has formed a shallow crater has formed in the sand and gravel substrate due to the hydraulic forces of entry.

Bark debris present was a mixture of sizes, from fine debris characterized as sawdust to larger debris composed of bark chips, and chunks and slabs were present throughout the sample area. There were patchy accumulations of larger - sized debris in certain areas. For example, the base of the steep slope where the larger pieces probably are sliding down the slope and piling up (see photograph # 13 & 14). Scattered branches and old, sunken logs were observed only occasionally. Some woody debris has flushed down from the creek system and is obviously different in character from the log - bundle bark debris. How much of this detritus originates from the creek was very difficult to determine under these survey conditions.

The marine life community has not changed noticeably from previous surveys. However, few horse neck clam siphons were observed (see photograph # 21) compared with the many noted during the last survey. Possible explanations include lowered salinity (especially on the shallow flats of transect 150) due to the recent heavy rainfall, decreasing plankton density and the start of seasonal hibernation given the time of year. Dungeness crabs were numerous on the substrate/debris moving about and also buried in both debris (see photographs # 11, 16 & 17) and substrate. They were observed on all transects and at all depths. Other typical crab species and shrimp also were observed (see photographs # 14 & 15).

The steep slope from the shallow flats to the bay bottom tended to have the deepest accumulation of debris. Because of this steepness the larger woody debris is continually sloughing down which does not allow any life to colonize this zone other than mobile species like the crabs or sea cucumbers. On the bay bottom however, life typical of a muddy habitat was present. Large, white *Metridium* anemones were numerous, attached to whatever solid substrate was available. Sea cucumbers were present in low numbers at the deeper sample points. Sea stars were observed throughout the survey area, represented by the typical species.

The fish most commonly observed were small flatfish of undetermined species. A large school of shiner perch were attracted by the survey activity. Several snake pricklebacks were observed throughout the area. A sturgeon poacher, several gobys, and sculpins also were noted during the dive.

No prominent manmade debris was observed. The small - diameter plastic pipe and small concrete pier blocks observed last year were seen again. Little operational debris was noted other than banding wire.

Conclusion:

This old site with a large volume of wood transferred in the past, including recently, making the distinction between old bark debris and natural sediment difficult for two main reasons. First, the estimation of bark depth was hampered by lack of clear distinction between old debris and the silt/mud sediment where the depth of recently deposited debris occurred. The second bark debris identification problem is the apparently large volume of natural woody detritus washed down from the creek watershed. The transects most affected by this problem are 150, 180 and 210, which are directly in the path of the creek debris, but lighter debris such as leaves and needles were present on all transects and especially at the base of the steep slope.

Removal of the slide and A - frame structure caused a slight change in the orientation of the survey transects (20 degrees magnetic). The depth of bark accumulation over part of the survey area is significant enough to cause a shift from a benthic filter feeding community to mostly detrital feeding organisms.

Transect Location:

Transects; 150, 180, 210, 240, 270

Reference Point Location; At the approximate location of the former centerline axis of the rail slide, now at the base of the fill rock slope. Actual measured depth was 11 feet, corrected to MLLW depth of 5 feet.

Table 1
Transect Data

Transect/ Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
Ref. Pt.	5	3	50
270/1	8	46	100
270/2	10	33	100
270/3	15	20	100
270/4	25	25	100
270/5	33	23	100
270/6	41	20	100
270/7	45	15	90
270/8	49	10	75
270/9	50	5	50

Table 1 (cont.)

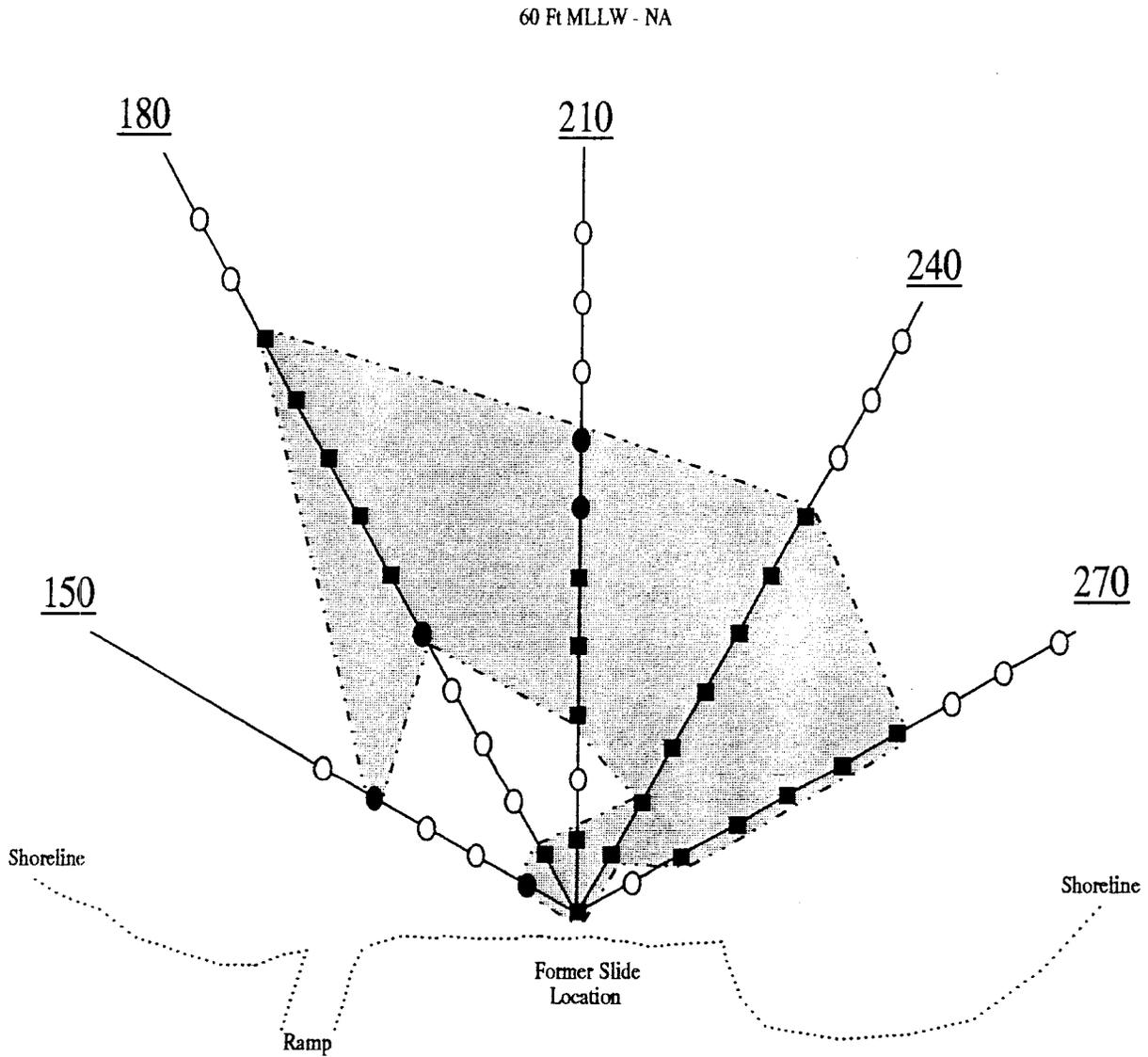
Transect/ Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
240/1	8	28	100
240/2	6	58	100
240/3	15	20	100
240/4	26	23	100
240/5	37	15	100
240/6	41	13	100
240/7	46	10	100
240/8	49	8	90
240/9	50	8	75
240/10	52	5	50
210/1	6	20	100
210/2	5	3	50
210/3	6	41	100
210/4	18	31	100
210/5	32	20	100
210/6	38	8	100
210/7	44	8	100
210/8	46	8	90
210/9	47	5	75
210/10	48	3	25
180/1	4	15	100
180/2	4	10	90
180/3	4	10	90
180/4	5	8	90
180/5	12	8	100
180/6	20	20	100
180/7	29	25	100
180/8	35	20	100
180/9	40	38	100
180/10	43	25	100
180/11	44	15	90
180/12	44	5	75

Table 1 (cont.)

Transect/ Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
150/1	4	8	100
150/2	4	<3	25
150/3	4	<3	25
150/4	2	8	100
150/5	3	<3	50

- Sample point - No debris
- Sample point - Debris present
- Sample point - Debris with 100 % coverage
- Sample point - Debris depth \geq 10 cm, 100 % coverage

Not to Scale
 Sample Point Interval = 5 m
 Area of 100 % Cover



8/30/98 Marguerite Bark Debris Survey

Table 2
Photograph Key

Photo #	Transect/ Sample Pt.	Description
1	Ref. Pt.	Sea star on fill rock, gravel; few bark chips
2	270/1	Small bark sizes filling in trough
3	270/2	Silt layer on surface of fine debris zone
4	270/3	Silt layer on surface of fine debris zone
5	270/4	Continued homogeneous fine debris zone
6	270/5	Silt layer on debris again
7	270/6	Silt layer on debris, some detrital algae
8	270/7	Crab shell parts on surface, more silt
9	270/8	Silt now more extensive
10	210/1	Variety of debris sizes
11	210/2	Dungeness crabs, bark chips and natural
12	210/3	Wire, silt on total bark cover
13	210/4	Some natural debris mixed in
14	210/5	Crab, detrital algae and natural debris
15	210/6	Crab on branch, silt now covering debris
16	210/7	Buried Dungeness crab, sea cucumbers
17	210/8	Crab on silt/bark mix
18	210/9	Some detrital algae, more silt
19	150/1	Patch of LTF and stream woody debris
20	150/2	Silt and little bark on sand, gravel & shell
21	150/3	Silt and little bark on sand, gravel & shell
22	150/4	Patch of LTF and stream woody debris
23	150/5	Silt and little bark on sand, gravel & shell

