TOLSTOI 1

Underwater Bark Debris Survey
Tolstoi Log Storage Facility
Prince of Wales Island, Alaska
May 1998

Submitted to: Sealaska Timber Corporation
2030 Sea Level Dr., Suite 202
Ketchikan, AK 99901

Prepared by: Craig's Dive Center
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Subject: Tolstoi LTF dive survey.

Abstract:

The requested underwater survey to determine the extent of bark debris accumulation at the Tolstoi Bay 1 Log Transfer Facility (LTF), Prince of Wales Island, Alaska, was performed on February 21, 1998. Purpose of the survey is to satisfy the LTF's N.P.D.E.S. permit requirement for a bark deposition monitoring program. Permit number for the facility is AK - 004784 - 8.

Protocol for operating a bark monitoring program are given in the LTF Siting, Construction, Operation and Monitoring/Reporting Guidelines, 1985.

Methods:

The survey technique described follows the method recommended by government agencies for conducting LTF surveys.

A permanent reference point location is selected, ideally in the center of the bundle entry structure/ramp and located measurably close to an essentially permanent structure/landmark so that the reference point can be relocated in the future for continuation of the monitoring program. Depth of the reference point is positioned as close to 0 feet Mean Low Low Water (MLLW) as possible using the NOAA Tide Tables for tide correction calculations. Using the outer horizontal face of the entry structure as a reference plane (centerline of a drive down ramp/low angle slide), magnetic compass headings for five transects in 30 degree intervals are selected with the permanent reference point as the origin for each of the five transects. The middle transect is perpendicular (parallel to and in line with the ramp/slide axis) to the face of the entry structure.

Each transect is sampled at five meter intervals starting from the origin at the permanent reference point. Debris depth measurements are made with a hand held ruler at the sample point. The measurement is taken by vertically inserting the ruler into the debris until the natural substrate is felt or its location estimated as closely as possible. Percentage of areal coverage by bark debris is determined by using the ruler, which is randomly dropped at the sample point, as the base of a one meter square which is visually estimated. The percent cover is objectively estimated by the amount of cover within that meter square.

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 several data are recorded by the diver; water depth, debris depth, percent coverage of debris, debris composition and character, substrate type, general algal and animal species and condition, abiotic factors such as direction and strength of current (if present) and the presence of

any notable manmade debris. Water depth measurements are taken from a SeaQuest dive computer with an accuracy of +/- 1%. A Suunto compass will be used for the transect compass headings, attached to the three foot measuring ruler. Transects are labeled with their magnetic compass heading for identification purposes.

35mm photographs are taken of representative sample points to document substrate, bark debris, algal and animal life and any other debris/objects that may be of concern. The camera is positioned vertically over the sample point and aligned with the ruler as the bottom of the photograph. It is put at a distance from the bottom of three feet so that the field of view is approximately one meter square (using a 20 mm wide angle lens), or approximately the same as when estimating percent cover.

Areal extent of bark coverage was calculated with the outermost two transects as the boundaries of bark coverage. Calculation of the bark debris-covered surface area was made by taking the triangle formed by two adjacent 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 of the areas of these four triangles. This figure was converted to acres as required by the guidelines.

To determine areal extent of substrate with 100 percent coverage of bark debris, the percentage of sample points with 100 percent coverage was calculated and multiplied by the total sample area to derive the areal extent in acres. The same procedure was used to determine areal extent for the area with debris depth of 10 cm or greater and 100 percent coverage.

Results:

Site: Tolstoi Bay 1	
Date Surveyed: 2/21/98	Total # of Sample Points: 50
Time of Sampling: 1718	Average Bark Depth: 18.8 cm
Sampler: C. Sempert	Calculated Survey Area: 0.81 acre

Area with some Debris Cover	Area with 100% cover	Area w/ 100% Cover and Debris Depth > 10 cm
0.81 acre	0.5 acre	0.5 acre

The re-established permanent reference point is in the center of the drive down ramp and located at a depth of approximately +1 feet MLLW. A total of 50 sample points were taken on the five transects. Of these, 28 (56%) had a measured debris depth of four inches or greater and

an estimated 100% coverage. 30 sample points (60%) had 100% bark debris cover. Sample points with the greatest bark depth are in the immediate vicinity of the input point at the base of the ramp's fill rock slope. The surface area covered by a continuous layer of bark debris extends out to the cutoff depth limitation where sampling is stopped, except on the rocky reefs of transects 020 and 050, and was calculated to be approximately 0.8 acres.

Observations:

Weather conditions at survey time were overcast skies with occasional light rainshowers, winds from the southeast at ten knots, air temperature in the low forties. The diving started at 1630 and took place during flooding tide period. The low slack tide occurred at 1444 with a height of 2.6 feet (corrected to subordinate station #1461, Hadley, and based on the Ketchikan tables) and the closest high tide was at 2125 at 11.5 feet. A tidal exchange of 8.9 feet produced little to no current. Water temperature was measured to be 46 degrees, visibility was estimated at 30 feet.

The location of the LTF near the mouth of a small bay well up into the larger Tolstoi bay and the prominent reefs extending out from shore in the vicinity of transects 020 and 050 are some of the factors that create a dominant east to west current pattern during most tide conditions. This prevailing current causes the primary debris deposition plume in a westerly direction. The reefs also probably form a physical barrier to bark deposition in that direction.

On the steep rock slopes of the ramp rock structure the bark debris was composed of a wide variety of bark debris sizes. The gaps and crevices between the boulders of the ramp slope have been pretty much filled in by debris with fewer rocks protruding through the debris on this survey. Quite a few large and small branches have also accumulated on this slope, as well as splinters and chunks of wood. Beyond the base of the fill rock on the natural bottom, the first several sample points past had a uniform layer of fine, deep bark dust (<1.3 cm in particle size) with occasional fresh branches and some bark chunks mixed in. There was a large pile of branches out on the flats of transect 290. The debris surface in this area also had the appearance of a more homogenous mixture as though significant settlement and/or decay has taken place.

Other than the accumulation of bark debris itself, no visible signs of an unhealthy ecosystem were observed. Waste products excreted by wood eating organisms appear to be accumulating rapidly around large chunks of wood and sunken logs, indicating an active wood boring community of undetermined species. There was no sign of the debris acting as a barrier to oxygen exchange leading to anaerobic conditions; no gas bubble evolution was observed and no black, anaerobic layers were found when random sample trenches were dug by hand in the debris layer.

Some marine life was observed throughout the entire sample area, mostly those organisms that are typically seen at LTF sites. Even on the steep ramp slopes where the bark debris accumulation is unstable, a few organisms like a moon snail, sea stars, green sea urchins, sea cucumbers and a Kelp greenling were observed. In areas of uniform, thick bark debris the predominant species were sea cucumbers, brittle stars and hermit crabs with a light, patchy bacterial layer on the surface of the debris. Where rocky substrate was available, mostly on the reef crossing transects 020 and 050, kelp, nudibranchs, rock scallops and typical encrusting organisms were present. Green urchins were numerous on the shallow reef during this particular survey.

Where the bark layer was thin enough, out towards the end of the transects, benthic organisms such as tube anemones and some evidence of clams were observed. A Sun star was observed actively digging down through the debris into the substrate after the clam prey.

No significant manmade debris was observed. Operational debris like banding wire was the only debris noticed during the dives.

If there are any questions about the survey or this report, please call us at 907-826-3481. Thank you for allowing Craig's Dive Center to be of service.

Report by:

Craig Sempert

Craig Sempert

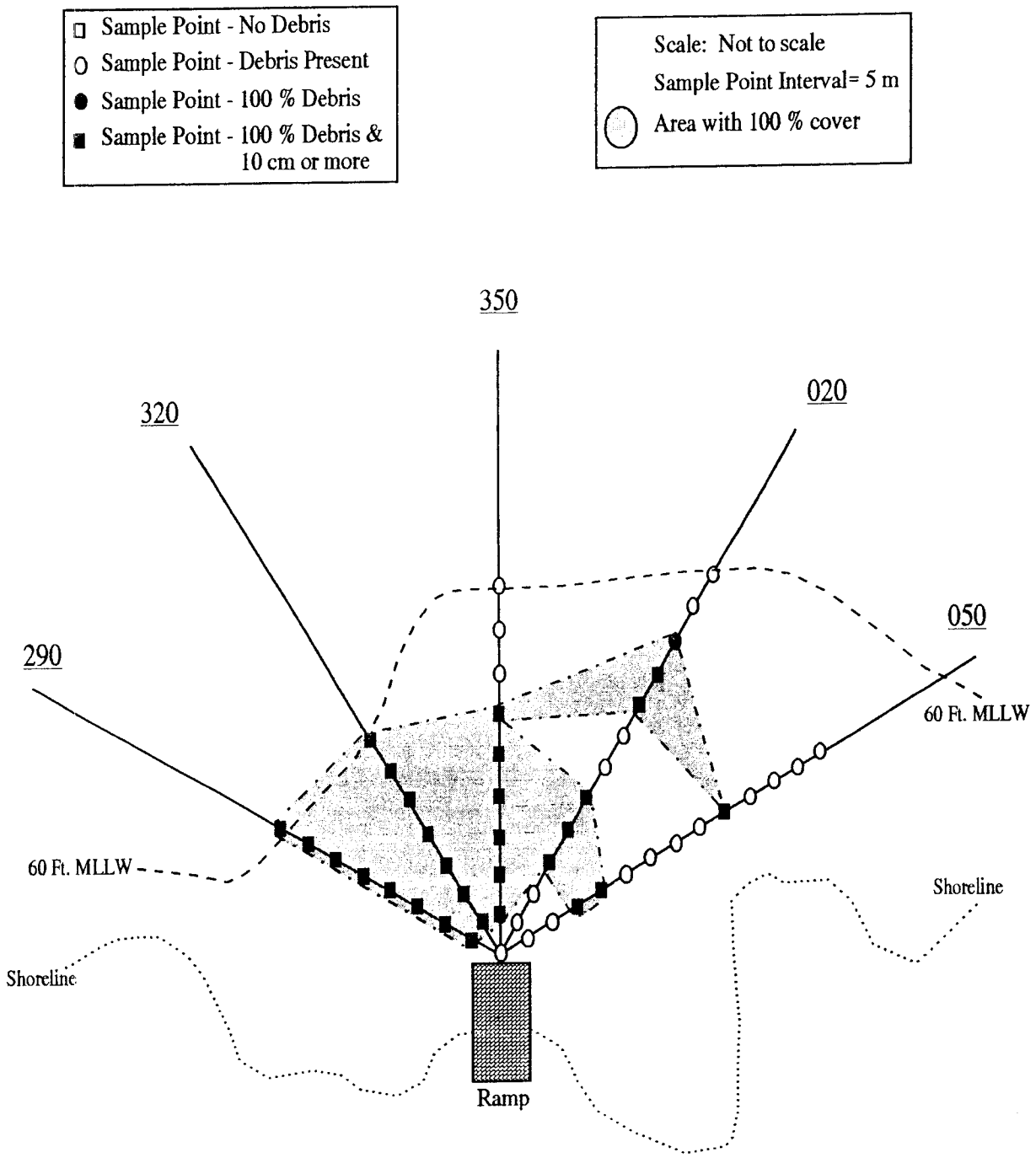
Diver

Table 1
Transect Data

Transect-Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
Ref. Pt.	+1	<3	50
290/1	3	18	100
290/2	13	34	100
290/3	29	42	100
290/4	35	50	100
290/5	42	30	100
290/6	47	30	100
290/7	53	26	100
290/8	61	12	95
320/1	3	22	100
320/2	6	18	100
320/3	15	42	100
320/4	30	56	100
320/5	42	44	100
320/6	49	33	100
320/7	58	21	100
350/1	3	12	100
350/2	7	7	100
350/3	20	28	100
350/4	35	31	100
350/5	41	20	100
350/6	48	15	100
350/7	47	5	50
350/8	46	3	25
350/9	62	19	100

Table 2 (cont.)

Transect-Sample Pt.	Depth from MLLW	Debris Depth (cm)	Percent Coverage
020/1	3	3	90
020/2	4	3	75
020/3	15	38	100
020/4	17	46	100
020/5	20	43	100
020/6	15	<3	10
020/7	20	<3	10
020/8	29	36	100
020/9	34	25	100
020/10	41	8	100
020/11	52	3	90
020/12	59	<3	75
050/1	3	<3	10
050/2	4	5	50
050/3	8	35	100
050/4	8	22	100
050/5	+2	<3	10
050/6	+1	<3	10
050/7	12	3	50
050/8	15	5	90
050/9	20	12	100
050/10	25	5	95
050/11	29	3	90
050/12	34	3	90
050/13	38	3	75



2/21/98 Tolstoi LTF U/W Bark Debris Survey