Alaska Department of Environmental Conservation
Contaminated Sites Program

FINAL Amendment to the April 1999 Record of Decision
As Amended March 30, 2005
Former Alaska Pulp Corporation Mill Site
April 30, 2014

Contents

Introduction and Background

The Alaska Pulp Corporation (APC) mill located in Sitka ceased operations in 1993. In 1995, the Alaska Department of Environmental Conservation (DEC) required APC to investigate the site using an approach similar to the Comprehensive Environmental Compensation and Liability Act (CERCLA) model. The terms and conditions of the investigation and cleanup were memorialized in a Commitment Agreement signed by Frank Roppel, APC Executive Vice President and General Manager, on September 11, 1995.

In 1997, through restrictive covenants, APC created equitable servitudes running appurtenant to all land within U.S. Survey 2797 and Alaska Tidelands Patent No. 20, as described by Alaska Tideland Survey No. 6. The restrictive covenants were recorded at Book 126, Pages 713 – 716, Sitka Recording District on September 4, 1997. The equitable servitudes prohibited certain uses on the property as follows:

> The property shall not, at any time, be used, in whole or in part, for human habitation, schooling of children, hospital care, child care or any purpose necessitating around-the-clock residency by humans unless said property is first investigated for the presence of dioxins/furans and any such dioxins/furans are reduced to a concentration, or determined to be present at a concentration, which is at or below a site-specific, risk based, cleanup level established by ADEC, based upon actual or reasonably foreseeable exposure pathways for children.

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In April 1999, DEC issued a Record of Decision (ROD) summarizing the history of the mill site and documenting the environmental status based on cleanup actions and institutional controls. The ownership of the former mill site property was conveyed from APC to the City and Borough of Sitka (CBS) shortly after the ROD was issued.

A management plan (Management Plan for the Sawmill Cove Property) incorporated the terms and conditions of the ROD and specified any cleanup work to be performed under a prospective purchaser agreement (PPA) between the State and CBS. The PPA limited CBS liability for existing contamination at the site in exchange for the cleanup and monitoring work that was identified in the Management Plan and the ROD. The plan was signed by DEC Commissioner Michele Brown and the mayor of Sitka, Stan Filler, on April 28, 1999.

A Notice of Restricted Area (No Disturbance Zone) was created due to the existence of pulp residues, relating to approximately a six-acre portion of Alaska Tidelands Patent No. 20, as described by Alaska Tidelands Survey No. 6. To minimize re-suspension of those residues and to facilitate natural recovery of the benthic environment, the Notice of Restricted Area prohibits the use of anchors; restricts vessel usage; and controls in-water construction by certain management practices and other limitations. The notice, signed by Mayor Filler on May 14, 1999 is on file at the Sitka Recorder's Office at Book 137, Page 102.

In order to increase future development options (including housing for seasonal seafood industry workers), CBS hired an environmental consulting firm in late 2004 to review the 1999 human health risk assessment and determine if a residential use scenario could occur without posing human health risks. [1]

The CBS consultant evaluated possible risk scenarios in 2004 based on length of residency and whether the occupants were adults or children. It was determined that future residents at the former mill site (either year-round or part of the year) would not be at risk from hazardous substance contamination at levels determined acceptable by DEC. Based on this information, DEC approved the change in land use restrictions at the Sawmill Cove Property from commercial/industrial to

1 The 1999 Foster Wheeler assessment evaluated risk considering potential exposure across the entire site, but the more conservative residential exposure assumptions were not used. This resulted in the commercial/industrial land use restrictions commensurate with the site's use and borough zoning requirements.

residential use. An amended ROD was issued on March 30, 2005, and the 1997 equitable servitudes were rescinded. The rescissions were recorded on March 29, 2005 (document numbers 2005-000439-0 and 2005-00040-0). DEC completed a Five-Year Review Report in coincidence with the amended ROD.

The former mill property continues to be operated by CBS as the Sawmill Cove Industrial Park (with some parcels now in private ownership). CBS recently requested DEC to evaluate the need for additional monitoring in Sawmill Cove, and whether any of the in-water restrictions could be lifted.

Pertinent Study Results

A Remedial Investigation (RI) was launched in early 1996, followed by other studies and a human health and ecological risk assessment. Pulp process residue and other wood debris were found to cover approximately 100 acres in Sawmill Cove. Four acres in the immediate vicinity of the former process wastewater outfall (001) were found to have pulp waste accumulation from 10 feet to 24 feet thick. The residue was found to cover the sea floor from about 20 feet to 180 feet below the water surface. In the northern end of Sawmill Cove near the former log storage area and utility dock, the deposited wood solids were found to consist mainly of chips or bark that will not readily decompose. The deposited wood material (pulp residue) near outfall 001 was determined to decompose more easily. This material had become a source of the production of degradation-related chemicals such as ammonia, 4-methylphenol, and sulfides.

Evidence of benthic and epibenthic colonization was provided by an initial photographic survey (July 1997) of sediments in the western portion of Sawmill Cove. In addition, sediment profile image data shows three broad zones extending outward from outfall 001:

- an organically enriched area with minimal evidence of life within the sediments;
- a transitional zone dominated by surface and near-surface deposit feeding worms; and
- a relatively undisturbed zone characterized by brown muds and a diversity of species.

A follow-up video survey was conducted in January 1999.

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Area of Concern Remedy

After weighing a number of possible options, DEC concluded in the 1999 ROD that ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** was the most appropriate remedy for the 100-acre Area of Concern (AOC). This alternative, DEC determined, would achieve recovery without the adverse short-term impacts and significantly disproportionate costs associated with other remedial alternatives. DEC further determined that ***Natural Recovery with Long-Term Monitoring and Institutional Controls*** was supported by the localized nature and extent of the environmental risks and impacts related to wood waste residue, hazardous degradation by-products, and any commingled hazardous substances that may have been released by the mill.

Among other criteria, DEC considered the following factors in its 1999 decision:

- Discharges into the AOC have been absent since the mill closed in 1993, resulting in no new source material or contaminants being added to the existing wood waste residues.

- No significant existing sources of pollution elsewhere were exacerbating the risks to ecological receptors in Silver Bay.

- No significant new impacts were expected within the AOC that would prevent achieving the RAO.

- Future permits would control new discharges of contaminants into the AOC so that any such discharges would not set back the natural recovery process or cause further degradation to water quality.

- Institutional control measures would ensure that natural recovery proceeds with minimal disturbances.

Fifteen years later, the AOC remains stable and has not experienced any additional significant impacts. The most noteworthy development is the addition of a new fish processing business that discharges process water into Silver Bay through a new deep water outfall located beyond the AOC. The company, Silver Bay Seafoods, operates under an Alaska Pollution Discharge Elimination

System (APDES) permit.

Remedial Action Objective

The following Remedial Action Objective (RAO) was presented in the 1999 ROD:

- Reduce the ecologically significant adverse effects to populations of bottom dwelling life in Sawmill Cove from hazardous substances, including wood waste degradation chemicals, to acceptable levels.

The performance measure for this RAO was the observable succession of benthic species living both on and in the sediments that will result in a balanced, stable community as evaluated by measures of abundance and diversity at various locations over time.

Due to the uncertainties associated with the duration of recovery, DEC developed management milestones to evaluate the predicted ecological succession in Sawmill Cove. The 40-year recovery goal was based on DEC's determination in 1999 that the length of recovery would be proportionate with the scope of the ecological risks and impacts. Although locally significant, DEC also determined that the compromised benthic community in western Sawmill Cove did not appear to be causing serious impacts to the rest of Silver Bay.

Progress toward the RAO was to be evaluated by monitoring ecological succession. The management milestones developed in 1999 are listed in the table below.

Ecological Recovery Management Milestones		
Area	**Time (years)**	**Successional Status**
> 75% of the AOC	5-10	Presence of decomposers and primary producers
> 75% of the AOC	10-20	Presence of primary consumers
> 75% of the AOC	20-40	Presence of secondary consumers
> 75% of the AOC	>40	Climax (balanced and stable) communities

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Long-Term Monitoring Program

Baseline monitoring was conducted in 2000 under the framework of the Adaptive Management Plan (Monitoring Plan) developed by APC's consultant, Foster Wheeler Environmental (available for viewing on DEC's web site at: http://dec.alaska.gov/Applications/SPAR/CCReports/IC_Closure_Report.aspx?Hazard_ID=410 under Site Related Documents) EVS Environmental Consultants, the firm hired by CBS to conduct the monitoring, concluded the following:

"While the AOC is still showing impacts due to organic enrichment (the widespread occurrence of sulfur-reducing bacterial mats, high SOD, high TOC values, presence of methane at depth), there is absolutely no doubt that natural recovery is occurring. The first two RAO recovery milestones have already been achieved: 81 percent of the site is covered with decomposers (sulfur-reducing bacterial colonies, most likely *Beggiatoa* spp.) (**Milestone 1**), and primary consumers (Stage I polychaetes) were present at all but 2 grab stations and in sufficient densities at 33 (89 percent) of the grab stations sampled (**Milestone 2**). Approximately 16 percent of the AOC (Stratum 3) has fully recovered and achieved the final management milestone, and 22 percent of the AOC (Stratum 2) is in transition to the final recovery stage with notable abundances of deposit-feeding taxa. Sixty-two percent of the AOC (Stratum 1) is still considered seriously impaired in regard to benthic community status."

The second monitoring event, undertaken by Germano and Associates, occurred in 2011. The final report, issued in 2012, stated the following:

"Out of the approximately 100 acres that were designated initially as the "Area of Concern", there are now approximately 83 acres of seafloor that have achieved Milestone 3 (Table 1-1, Section 1) from the original ROD, which was originally anticipated to occur sometime between 2020–2040. It is quite impressive to realize that the milestones originally anticipated to occur in 10-30 years from now have already been achieved through natural recovery processes. Once an additional 21 acres of Stratum 2 has Stage 3 benthic assemblages, then all of the ROD recovery milestones will have been met. At the current rate of recovery, this could mean that all milestones will have been achieved by the time of the next scheduled monitoring event (2020-2021), which would signal the end of all future monitoring requirements related to the original APC impacts."

The second part of the 2011 monitoring event was to conduct a dioxin bioaccumulation study. The report concluded that:

"Although mean sediment dioxin concentrations in both strata exceeded draft guidelines considered protective of west coast marine habitats, dioxin was neither bioavailable nor did it bioaccumulate in benthic organisms exposed to AOC sediment. Therefore, our recommendation is that sediment chemistry samples will no longer need to be taken as part of any future monitoring efforts related to the original APC impacts, and there is no future monitoring required for dioxin, because there is no potential for bioaccumulation in the Sawmill Cove marine food web from AOC sediment."

Amended Decision

Sawmill Cove recovery is clearly ahead of what was predicted in 1999; greater than 75% of the AOC has achieved recovery milestone 3 after only 10 years, and 54% of the AOC has achieved recovery milestone 4. DEC believes the AOC is well on its way to full recovery and that significant adverse effects have been reduced to acceptable levels.

As a result of faster than expected natural recovery, DEC has concluded the monitoring program. Additional monitoring or other measures are not precluded in the future if DEC believes the AOC has suffered a serious setback, or if pulse events (such as massive methane or hydrogen sulfide gas releases) begin to regularly occur.[2]

Due to its location just offshore of the Sawmill Cove Industrial Park, the majority of the AOC is ideal for vessel anchoring. Other than the 6-acre No Disturbance Zone, described in the revised Sawmill Cove Management Plan, as well as a designated corridor along the length of the new outfall pipe, anchoring is allowed in the AOC. DEC recognizes that temporary setbacks may occur as a result of this lifted restriction, but impacts are expected to be small-scale. Moreover, these small-scale anchoring impacts will actually aid overall recovery by aerating the sediments (akin to turning over a compost pile). It is also important to note that even under natural conditions, setbacks to earlier ecological succession stages are not uncommon. For example, a storm event in a nearshore environment may cause bottom disturbances that would disrupt the established benthic community.

2 There has not been an observed H2S release since the mill closed in 1993.

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Appendix A - Response to Comments

A 10-day public comment period was issued on the draft ROD on April 16, 2014. Supporting comments were received from the Sitka Economic Development Association and the Greater Sitka Chamber of Commerce.

In November 2013, DEC and CBS met with representatives from the Sitka Tribe of Alaska, the Sitka Conservation Society, and Greenpeace to discuss the proposed conclusion of the monitoring program. Meeting participants were invited to review the report entitled *2011 Long Term Benthic Monitoring and Bioaccumulation Survey in Sawmill Cove, AK* (Germano & Associates, 2012) and submit comments by the end of January 2014.

Several comments were submitted to DEC as a result of this informal solicitation. Due to the technical nature of the comments received, DEC requested that CBS enlist the help of Germano & Associates as the foremost expert on the Sawmill Cove benthic environment. The comments and responses are presented below.

Comment: "Our main concern is the long-term impacts of the deposits of toxic materials in Silver Bay and the potential for them to be disturbed and to re-enter the water-column."

Reply: The Remedial Investigation (RI) conducted in the 1990s howed that there are no toxins in the sediments within the AOC. This is one of the reasons natural recovery with long-term monitoring was selected as the remedial alternative in the 1999 ROD. The key point to remember is that there are no elevated concentrations of contaminants of concern (COCs) within the AOC, so they are not a potential source for contamination to the water column.

Comment: "We are concerned that the report on a 'speedier recovery' than expected might make future care and monitoring of this area less urgent. This is problematic because our understanding of recovery of this area is based on deposition of materials that cover the pollutants and lack-of-disturbance of sediments that hold pollutants. It is therefore essential that this area not get disturbed by anchoring, construction, prop wash, or anything else that might disturb the ocean floor in this area."

Response: All evidence collected by the monitoring both in 2000 and 2011 showed that natural recovery and recolonization is occurring in the AOC following the exact pattern documented in multiple studies at a wide variety of sites (cited in both the EVS 2001 and G&A 2012 reports) and is following the classic infaunal successional sequence in response to organic enrichment documented by Pearson & Rosenberg (1978) and Rhoads et al. (1978). Selecting natural recovery alone as the remedy (as opposed to monitored natural recovery) would have been a leap of faith in 1999 because this particular "experiment" had not been done before in Alaska waters under the specific site conditions present in Silver Bay. Sufficient data now exist that one can accurately predict the outcome with a fair amount of confidence precisely because: a) the source of disturbance (discharge from the mill) has been removed, and b) there are no toxic or deleterious substances in the accumulated deposit that pose a threat to any biological receptors.

The benthic ecosystem recovery that is occurring is not because of "deposition of materials that cover the pollutants", i.e., what in essence would be a form of "natural capping", but it is occurring because of a lack of continued deposition of organic-rich substances from mill operations. There are no "pollutants" to be covered in the AOC (which is why capping as a selected remedy would have been an unnecessary, expensive choice). The surface sediments in the AOC are not serving as a "lid" on a container of underlying contaminants; if capping had been selected as the preferred remedy because bioavailable contaminants were actually present, then the commenter's concerns would be more than justified: disrupting the cap would indeed defeat the purpose of the remediation. However, there is no cap in place and recovery is not occurring because of "natural capping" or sedimentation covering the surface. Any physical disturbance to the sediments will actually promote aeration of the sediments, similar to how one would aerate a compost pile on land to promote aerobic decomposition, so it would actually have a beneficial effect as far as benthic community recovery. The only dissolved components that would be released into the water column from physical disturbance of the sediments from anchoring activities would be sulfides and ammonia, as is the case on any nearshore mud bottom in the marine environment where any type of commercial boating, fishing, or anchoring activities occur.

Comment: "Monitoring done for (G&A 2012) and the earlier monitoring studied only the surface and top several centimeters of the bottom in the AOC. This is all that the recommendations in G&A (2012) are based on."

Response: While the comment is correct that the monitoring performed both in 2000 by EVS (2001) and 2011 by G&A (2012) were only done on the top 20 cm of the seafloor, the comment is incorrect that this is all that the recommendations in G&A (2012) are based on. The monitoring done in 2000 and 2011 are a small part of the accumulated data collected in Sawmill Cove that started in the mid-1990s as part of the original RI. The recommendations made in G&A (2012) are based on the accumulated body of evidence collected in the 1990's during the RI performed by Foster Wheeler, the initial baseline monitoring done in 2000 by EVS, and the subsequent monitoring done in 2011 by G&A. The thickness of the deposit was extensively characterized by the coring done as part of the RI; the reason all subsequent monitoring in 2000 and 2011 was confined to the surface is because there were no COCs at depth that required continued monitoring, and, given the specified milestones in the ROD, the only part of the sediment column that required future monitoring was the biologically-active zone (top 20 cm). There is no need to repeat the extensive coring done in the 1990s during the RI, because there is no reason to believe that the chemical composition of the sediments at depth or the thickness of the deposit have changed at all since the initial, extremely thorough, characterization.

Comment: "A concern is continuing anaerobic decomposition at greater depths in the deposit than have been studied by the monitoring. This decomposition has led to substantial 'burps' in the past, when an extensive gas bubble was able to overcome the cohesive strength of the overlaying layers……I am aware of two burps that caused extensive fish kills, in the early 1970s and early 1980s."

Response: The commenter's concern about anaerobic decomposition producing hydrogen sulfide and methane that occurred when the mill was still in operation is certainly understandable based on his past experience at the site. There are two major "components" or "fractions" of the organic waste that was discharged in Sawmill Cove when the mill was in operation, both a labile (readily decomposed or "reactive') fraction and a refractory (bound and effectively inaccessible) fraction. The "burps" that occurred in the 1970s and 1980s were a result of anaerobic decomposition of the labile fraction; because the mill shut down in 1993 and no further discharge of labile organics occurred, there have been no continued "substantial burps" or massive fish kills in the past 30 years. The remaining deposit has the organic carbon in a refractory form, tied up in the lignin fibers of the wood waste on the bottom. While there is subsurface methane being produced from the slow decomposition of the wood (as is the case along the majority of the shoreline in Alaska where nearshore land runoff from the forests results in accumulated leaves, bark, twigs, and evergreen

needles on the bottom), it will be released in small bubbles that are a natural part of the marine organic decomposition process; this phenomenon has been documented and imaged in the biologically-active surface layer in both the 2000 and 2011 surveys.

Comment: "This view is reinforced by the fact that G&A (2012) observed that woody material in the thin top layer of the deposit is decomposing at only a small rate. This means that there continues to be a substantial reservoir of decomposable material (perhaps including more than just wood) that should be expected to continue to produce H_2S and other gases for years to come. Gas-filled voids were mentioned in the report (pp. 2-7 to 8) even in upper layers that were surveyed."

Response: The commenter is correct that there is a substantial reservoir of decomposable material, but the reason there have been no "substantial burps" in the last 30 years is because the mill is no longer in operation and discharging a labile organic fraction into the AOC. The remaining deposit will continue to decompose anaerobically at an extremely slow rate given the refractory nature of the remaining wood waste, and gases such as methane or H_2S will be released in the form of small bubbles as they slowly work their way to the surface; however, there is no reason to suspect any deleterious side effects will occur from this natural process. This type of anaerobic decomposition occurs naturally in many urban estuaries where sediments are organically enriched, which is why one can smell H_2S in any sample of marine muds if one digs beneath the aerated surface layer (the infamous "rotten egg" smell that one frequently encounters at low tide in tidal flats anywhere muddy sediments exist).

Comment: "My concern is that over time, anchoring could weaken top layers that presently (or in the future) contain anaerobically generated gases, and that a large burp could occur. Because the gasses are toxic to fish and potentially, if the air borne concentration is high enough, to people I ask that DEC prohibit anchoring in AOC. Consideration should also be given to excluding ships from the AOC (even if not anchored), since propwash could be a destabilizing factor. In addition, a burp even could redistribute other toxins (e.g. dioxins) to environmentally accessible locations, affecting bioavailability."

Response: The commenter is correct that any of the anaerobically generated small gas voids in the surface sediments would be released if the sediments are disturbed by any type of movement, regardless if it is propwash, anchoring, commercial fishing activity, or infaunal burrowing activity. It will cause a release of a small stream of methane bubbles to percolate up through the water column

to the surface, but not a massive large burp as he fears for the reasons outlined above. As pointed out in previous comments, any physical disturbance of the top layer will actually have a beneficial effect and promote aeration and stimulate benthic recovery.

As far as the concern about "redistributing other toxins (e.g. dioxins)", it is essential to keep in mind that dioxins were detected in ALL the sediment samples taken (even at the reference location), i.e.., dioxins are present throughout the nearshore sediments in entire region of Sitka as part of the "anthopogenic background" conditions for the reasons outlined in the G&A (2012) report: forest fires, burning of municipal trash, and leaching from treated pier pilings. However, none of the dioxin from any of the locations sampled (within the AOC or off Galankin Island) is bioavailable, so any sediment disturbance in any of these areas is not going to release dioxin or change the bioavailability of this COC in any of the sediments.

Comment: "The effect of 'seasonal changes' and differing water temperatures on monitoring is mentioned (p.2-5), but no mention is made of how this would affect results or what compensations may have been made."

Response: This was apparently an oversight in the G&A (2012) report. As mentioned in the methods section, seasonal water temperature changes affect bioturbation rates; in warmer water temperatures, invertebrates have a higher metabolic rate, will bioturbate to greater depths, and thereby increase the depth of the aRPD as well as the biologically mixed depth. Because one of the study objectives was to compare the 2011 monitoring results to the 2000 baseline results, G&A did not want any of the measured SPI parameters to be affected by this potentially confounding variable, i.e., a substantial change in aRPD depths could be attributed to sampling at a different time when the water was warmer. The 2000 sampling was carried out in April; G&A attempted to sample during the same seasonal time frame when bottom water temperatures would be comparable to conditions found in April 2000 (the 2011 sampling was done in May). The bottom line is that the comparisons G&A made between 2000 and 2011 were not affected by different temperatures, so no compensations needed to be made in the data interpretation.

Comment: "Survival of test organisms is discussed at 4-7. The maximum lethality could be 20% to 27% for Strata 1 and 2 respectively (Table 4-5) over a 28-day period. The report characterizes 20% lethality in 28 days as low……further, I find all of these lethality indicators (even if only 10%) to be

alarming., particularly given the basically one-month period. The AOC (in both strata) should be considered contaminated."

Response: There is a difference between acute and chronic toxicity testing. Acute testing (which was done as part of the RI) is carried out over a 10-day period; long-term, chronic testing for bioaccumulation is carried out over a 28-day period as specified by ASTM standards. There was no need to do acute toxicity testing because the sediments are NOT toxic in the AOC (hence the benthic faunal recovery); there was a low level of toxicity in some of the RI studies in the 1990s, but these were caused by what are considered natural confounding factors (sulfides and ammonia in the sediments which can build up in the test chambers) and not by any anthropogenic pollutants. The only reason sediments were tested once more in 2011 for dioxin was to address previous public concerns. The reason there was not 100% survival in the test organisms over a 28-day period is not because there are any "lethal" compounds in the test sediments, but because the laboratory set-up is just that: a non-natural condition. Some proportion of the animals will die off because of build-up of waste products in the test chamber or competition/predation by other animals in the same container. There are minimum acceptable standards specified by ASTM protocols for survival in chronic bioaccumulation tests to determine whether or not results are compromised by either stress or the lack of organism survival. The G&A study met those standards, so the bioaccumulation results can be considered valid.

While one can argue that all sediments are contaminated to some degree or another (if one does a bulk chemical analysis of any sediment along any coast where people are living, one will detect concentrations of any variety of EPA's priority pollutants), the real issue (and what determines if a sediment is "polluted") is whether these contaminants are in a form that is bioavailable. The sediments in Sawmill Cove are not toxic, and the low concentrations of dioxin measured (not only in Sawmill Cove sediments but also in Galankin Island sediments) are **not** bioavailable, so while sediments in the AOC have detectable concentrations of both trace metal and hydrocarbon compounds, they should not be considered "contaminated" because these chemical concentrations are either below screening level guidelines or in a form such that they are not bioavailable. The AOC sediments do not pose any known risk to biological receptors, which is why the site has recovered so quickly and why natural recovery with long-term monitoring was an acceptable remedial alternative in the first place.

Comment: "However, the G&A (2012) study did not survey the deeper layers of the deposit, and did not consider in any manner past burps emanating from the deposit and the potential for future burps. DEC should disregard the G&A recommendation"

Response: As pointed out above, the reason G&A did not survey the deeper layers of the deposit was because these were thoroughly characterized as part of the investigations in the 1990s; there is no reason to suspect a current characterization of those deeper layers would present different results. The deeper deposits were not considered a concern after the exhaustive investigation in the 1990s, so there is no reason to repeat the characterization to come to the same conclusion. The reason G&A did not consider the past burps and potential for future burps is because the mill is no longer in operation, so these are not a relevant issue. The only reason future "burps" might occur is if the permitted outfall for Silver Bay Seafoods ceased to work as designed and labile organic fish waste began to accumulate in significant amounts on the bottom of Silver Bay.