GUIDANCE FOR PREPARING

REMEDIATION PLANS

UNDER ALASKA'S GENERAL PERMITS

FOR LOG TRANSFER FACILITIES

Alaska Department of Environmental Conservation

January, 2002

TABLE OF CONTENTS

Introduction 1

The Remediation Challenge 2

Remediation Plan Requirements 4

Preparing A Remediation Plan 4

1.0 EXECUTIVE SUMMARY 5

2.0 INTRODUCTION 5

3.0 SITE CHARACTERIZATION 5

3.1 Historical Operation 5
3.2 Future Operation 5
3.3 Site Description 5
3.4 Site Investigation 6

4.0 REMEDIATION ASSESSMENT 7

4.1 Remedial Action Objective 7
4.2 Description of Remediation Measures 7
4.3 Screening of Remediation Measures 8
4.4 Development of Remediation Alternatives 8
4.5 Evaluation of Remediation Alternatives 9

5.0 PROPOSED REMEDIAION PLAN 9

5.1 Proposed Remediation Plan 9
5.2 Performance Measures 10
5.3 Monitoring 10

6.0 REPORTING 10

7.0 SUBMITTAL OF REMEDIATION PLAN 11

8.0 ACTION BY ADEC 11

9.0 ENFORCEABLE CONDITION 11

Appendix I: Dive Survey Calculation Method
Appendix II: General Permit: Remediation Plan Requirements
Appendix III: Work Group Contributors
Appendix IV: Remediation Technologies

GUIDANCE FOR PREPARING REMEDIATION PLANS UNDER GENERAL PERMITS FOR LOG TRANSFER FACILITIES

Introduction

This guidance sets out a framework for the preparation of Remediation Plans required by the General Permits (GPs) for Log Transfer Facilities (LTFs) issued by the Alaska Department of Environmental Conservation (ADEC). Utilization of this guidance document is not required. ADEC will approve remediation plans that when implemented, will result in a desired remediation outcome. If the permit holder elects to use this framework, there is no requirement to complete every step outlined in the document. The permit holder may even elect to utilize an alternative remediation selection process. The focus must be on remediation results, not the process used to develop the plan.

ADEC issued two Wastewater Disposal GPs[1] applicable to LTFs, effective March 21, 2000. These permits regulate the discharge of bark and wood debris from logs held in marine waters, and the accumulation of bark on the ocean bottom. The two GPs address, respectively, "Pre-1985" and "Post-1985" LTFs. All LTFs on the Southeast and Southcentral coastlines are required to obtain authorization under one of the GPs, unless an individual permit has been issued or applied for.

The Alaska GPs are derived from similar federal NPDES discharge general permits issued by the Environmental Protection Agency (EPA). When the State of Alaska provided water quality Certificates of Reasonable Assurance for the federal permits, those permits "constituted State permits," including the Certificates of Reasonable Assurance. An LTF operator must obtain approval to discharge bark and wood debris from both EPA and ADEC.

The GPs contain siting guidelines; establish required Best Management Practices for operation; require Pollution Prevention Plans; authorize Zones of Deposit for bark accumulation; require annual dive survey monitoring of bark accumulations; require annual reporting; require Remediation Plans; and require certain other measures.

The Certificates of Reasonable Assurance require that LTF operators submit proposed Remediation Plans if continuous cover by bark and wood debris on the ocean bottom exceeds both 1.0 acre and a thickness of 10 centimeters at any point. The Remediation Plans are subject to approval, modification, or denial by ADEC, and become enforceable conditions of the General Permits. The requirements for Remediation Plans are presented below.

There are more than 100 active or potentially active LTFs in Alaska. Traditional LTFs transfer log bundles from land to water by A-frames or rail slides, collect log bundles into rafts, and use tugboats to tow rafts to destinations. Under the GPs, LTFs are defined also to include facilities that transfer logs to water by helicopter, transfer between vessels and water, transfer from water to land, and store logs in water not associated with transfer. When barges are used to transport logs, if logs are not placed in water, there is no discharge and authorization under the GPs is not required.

It is well documented that logs in water discharge bark and wood debris, particularly when logs are transferred to water. Bark tends to sink to the bottom and accumulate as a layer on bottom substrates. The bark can alter benthic (bottom) habitat.

[1] The General Permits and Certificates of Reasonable Assurance can be located on the Internet at http://www.state.ak.us/local/akpages/env.conserv/dawq/waterpermits/ltf/noticeof.htm.

Continuous bark cover can adversely affect some benthic organisms that may have been present before bark and wood debris was introduced. Significant adverse effects do not occur beyond the area of bark accumulation, and are minor where bark cover is not continuous.

An important aspect of the GPs is to authorize Zones of Deposit for bark accumulation at LTFs. The Alaska Water Quality Standards prohibit deposit of any residues in or on the water, or on the bottom. The Zone of Deposit provision in the standards is an exemption provision through which ADEC can allow the deposit of substances on the bottom of marine waters within limits set by the department.

Through individual discharge permits, discrete Zones of Deposit of one acre of continuous bark cover have been allowed since roughly 1985. The GPs alter the approach somewhat. The GPs establish the entire operating area of the LTF as the "project area," and authorize a Zone of Deposit that can include 1.0 acre of continuous coverage, and discontinuous coverage and trace coverage by bark and wood debris within the project area without quantitative limits.

The remediation provision requires that LTF operators submit proposed Remediation Plans if continuous coverage of bark and wood debris cover exceeds both one acre and 10 centimeters in thickness at any point.

The GPs require annual dive surveys to determine the extent of "continuous coverage" and "discontinuous coverage" by bark and wood debris on the ocean bottom. Dive surveys are required at LTFs that are located in water less than 60 feet deep at Mean Lower Low Water (MLLW), and that transfer 15 million board feet of timber or more over the five-year life of the GPs. The permits (including certifications) specify the method by which dive surveys must be carried out. An alternative method may be used if approved by EPA and ADEC. ADEC has established a method for calculating the area of bark and wood debris coverage. It is found in Appendix I.

The Remediation Challenge

In authorizing a Zone of Deposit, ADEC must consider alternatives that would reduce or eliminate adverse effects of the deposit; potential impacts on human health; potential impacts on aquatic life and wildlife; potential impacts on other uses of the waterbody; the expected duration of the deposit and any adverse effects; and the potential transport of pollutants by biological, physical, and chemical processes. The Antidegradation Policy of the Water Quality Standards requires that resulting water quality will be adequate to fully protect existing uses of the waterbody, and that water quality standards are met outside the Zone of Deposit. In addition, the GP requires, in Part A, that

> The operator of an LTF shall employ all reasonable practices to avoid the discharge of bark and wood debris from logs in marine waters, and to contain the discharge to

the smallest area on the ocean surface that is practicable and is consistent with safe and orderly operation of the log transfer facility.

These prescriptions provide the framework within which authorization to discharge and the Zone of Deposit are granted, and within which remediation must be considered.

Remediation technologies have not been applied to bark accumulations at LTFs in Alaska, with the exception of maintenance dredging done by operators at certain locations. Dredging to maintain navigational channels has been done for many years at major facilities in Ward Cove and Thorne Bay. Dredging and "thin capping" were successfully carried out in the Contaminated Site cleanup directed by EPA in Ward Cove in 2000 and 2001.

If bark material is removed by dredging, acceptable disposal becomes an issue. Bark residue will exist in various states of decomposition. In advanced decomposition, bark can exhibit physical and chemical properties that make dredging and capping technologies difficult to implement. Toxic substances, notably hydrogen sulfide, can be present, and the organic material may present a substantial oxygen demand.

It is likely that the decomposing bark will have no economic value. Options for disposal include upland disposal (i.e. landfilling), and ocean disposal (near shore, off shore). Incineration may be technically feasible but has not been used in Alaska. Each of these options has a set of costs and drawbacks. A primary issue is the environmental impacts of disposal, and the permits necessary in order to authorize disposal.

ADEC is not predisposed to particular remediation measures, and expects that feasible remediation will be strongly influenced by the LTF site. The Remediation Plan must evaluate methods to reduce continuous coverage including alternative methods of log transfer and transport, changes in operational practices, technically feasible methods of bark and wood debris removal, and other methods.

The Remediation Plan guidance, set out below, anticipates that various remediation measures may be included in a "preferred alternative" for a given site. There are several types of potential remediation measures:

- Natural recovery (without monitoring)
- Implementation of new Best Management Practices
- Monitored Natural Succession Processes
- Alternative transfer methods
- Bark dispersal (increase geographic extent and reduce depth)
- Bioremediation
- Capping
- Dredging
- Offsite mitigation
- Other experimental design

Remediation selection ultimately becomes a cost/benefit exercise. Active remediation likely will carry considerable cost, as can monitored natural succession if monitoring is required for many

years. On the other hand, the biological impact within the footprint of continuous bark and wood debris coverage may be significant.

Remediation Plan Requirements

The requirements for preparing and submitting Remediation Plans, taken from the Certificates of Reasonable Assurance, are found in Appendix II. A brief summary of the requirements follows.

- If existing continuous bark and wood debris cover exceeds both one acre and a thickness of ten centimeters at any point, an operator must submit a Remediation Plan to ADEC within 120 days, unless additional time is granted by the Department.
- A proposed Remediation Plan must evaluate historical and future log transfer processes and volumes; environmental impacts of existing deposits of bark and wood debris and the environmental impacts of methods to reduce continuous coverage; and methods to reduce continuous bark coverage, including alternative methods of log transfer and transport, operational practices, technically feasible methods and costs of removing bark, and other methods.
- The Remediation Plan must identify a set of feasible, reasonable, and effective measures to reduce continuous bark cover to both less than one acre and ten centimeters at any point.
- If removal of bark is proposed, the Remediation Plan must specify areas, methods, volume, and timing of removal; and method of disposal of removed material, including practices to assure meeting water quality standards; and the cost of removal by the proposed methods and alternatives considered.
- The plan must include a performance schedule and performance measures for the implementation of the Plan.
- The plan may describe measures that can be implemented in phases, with continued bark monitoring surveys and with future modification of the Remediation Plan based upon progress in reducing the continuous coverage.
- ADEC will approve, approve with modification, or deny a proposed Remediation Plan within 90 days of receipt.
- An approved Remediation Plan constitutes an enforceable condition of the General Permit.

Preparing a Remediation Plan

This section sets out the outline and framework for preparing a proposed Remediation Plan that may be accepted by ADEC. This framework was developed with the assistance of a workgroup of stakeholders enlisted by ADEC for the purpose. Workgroup contributors are listed in Appendix III.

ADEC expects a concise but thorough presentation that provides meaningful information for each topic. The level of information available and the level of detail provided will vary with the LTF site. Information may be obtained from the literature rather from site investigations. Where

essential information is not available, obtaining such information may be an element of the remediation work plan.

ADEC expects to work closely with operators in the development of Remediation Plans. Given the many uncertainties, close cooperation is essential. Because remediation is a new and complex endeavor, the process inevitably will evolve with experience.

1.0 EXECUTIVE SUMMARY

Provide a one- to two-page summary of the contents of the Remediation Plan, particularly its conclusions and proposed actions.

2.0 INTRODUCTION

Identify the LTF site and Remediation Plan.

- "[Operator name] is submitting this proposed Remediation Plan for the [LTF name] Log Transfer Facility (LTF) to the Alaska Department of Environmental Conservation to meet the requirements of the State of Alaska Wastewater Disposal General Permit for Log Transfer Facilities, AK G70 1000 (or AK G70 0000)."
- ADEC General Permit authorization number
- Corps of Engineers waterbody number
- Entity preparing the Remediation Plan, if different from operator.
- Other statements by operator

3.0 SITE CHARACTERIZATION

3.1 Historical Operation

Describe the operating history of the LTF.

- Years of operation and operators
- Estimated timber volumes transferred
- Dates of facility construction and modification
- Transfer methods and modifications
- Operational practices and modifications
- Relation of historical operation to the existing deposits of bark and wood debris.

3.2 Future Operation

Describe the anticipated future operation of the LTF.

- Years of operation and operators
- Estimated timber volumes to be transferred
- Transfer methods
- Operational practices
- Dates of facility modification

3.3 Site Description

Provide the following.

- A map showing location of LTF within the larger waterbody (bay, canal, channel, inlet, strait, passage, etc.).
- A small-scale marine chart of the site showing water depths.
- A depiction of LTF facilities, including sortyard, transfer device, raft make-up area, log storage areas, bulkhead, equipment ramp, docks, moorings, ship loading site, etc.

Based on available information, describe briefly the marine physical and biological setting, and human uses, in the larger waterbody.

Based on available information, describe in detail the natural conditions of the LTF project area and the larger waterbody, focusing on benthic features, including the following aspects:

- Physiography, bathymetry, and sediment substrates
- Oceanography, including currents and physical and chemical properties
- Biology and habitat, noting critical habitat and species of particular significance or value
- Human uses, including commercial, subsistence, recreational

3.4 Site Investigation

Describe the results of site investigations related to bark accumulation, including biology, substrates, and water quality. This discussion must be able to answer two questions: 1) How does the zone of deposit (ZOD) fit into the overall setting (characteristics of the waterbody inside the ZOD versus outside the ZOD) so ecological impacts can be addressed, and 2) What will be the net environmental benefit of an active cleanup (Item 13 (b) (iii) from DEC Certificate of Reasonable Assurance (CRA)). The level of detail will vary significantly from site to site, and should be focused to the level of detail needed to make decisions for a particular site. Net environmental benefit is a term normally used to distinguish between the relative merits of various alternatives in meeting a given Remediation Action Objective and does include a time component – the longer it takes to meet the RAO, the lower the net environmental benefit.

- Dive survey results, including transect data, continuous and discontinuous bark areas, percent bark cover, and bark thickness; a table may be used to present key information over multiple years
- Map showing dive transects and bark accumulation at the site
- Dive survey methods, quality assurance, method of calculation of continuous and discontinuous bark areas
- Nature and condition of the bark and wood debris, including chemical and physical analyses
- Nature and condition of bottom substrates and sediments, including chemical and physical analyses
- Biological observations from dive surveys and other information
- Water quality characteristics, including any physical and chemical measurements in the water column
- Solid waste observed on the bottom
- Other information related to bark accumulation, water column habitat, biology, and chemistry
- Human uses of waters

Describe the adequacy and reliability of available information to characterize bark accumulations, biology, substrates, water quality and environmental impacts. Describe additional site investigations that are needed to characterize these matters sufficiently for evaluation of remediation measures.

4.0 REMEDIATION ASSESSMENT

4.1 Remedial Action Objective

Describe the Remedial Action Objective (RAO).

The remediation plan must include a Remedial Action Objective (RAO). A RAO is a site-specific remediation objective that will allow the Operator, at the minimum, to comply with the requirements of EPA's General NPDES Permit and the DEC Certificate of Reasonable Assurance. The RAO must be defined before potential remediation alternatives can be identified and evaluated for a LTF site. See Appendix V for more information about RAO development for the remediation plan.

4.2 Description of Remediation Measures

The purpose of this section is to identify the technologies that the operator is considering for use at the LTF. The technologies identified below represent a selection of technologies that have been used often to remediate sediments. The operator can propose technologies not listed. This Section provides an overview of how each proposed technology might be used at the LTF. The specific advantages and disadvantages of each technology are discussed in Appendix IV. This section simply describes the available technologies that were considered. It is not an all-inclusive list nor is it a screening level.

Additional investigations that are needed to characterize the site in order to develop or evaluate remediation should be considered along with remediation measures. One example is characterization of the condition of the bark and wood debris to determine whether dredging and disposal are feasible. Another example is determining if decomposition of existing bark and wood debris is producing hydrogen sulfides

- **4.2.1** Natural Recovery (without monitoring)
- **4.2.2** Monitored Natural Succession Processes
- **4.2.3** Alternative methods of log transfer and transport
- **4.2.4** Operational practices, including handling of logs out of water, handling of logs in water, movement of logs in water, and other operational elements
- **4.2.5** Removal of bark debris by dredging, and disposal of the dredged material
- **4.2.6** Active bark dispersal
- **4.2.7** Bioremediation
- **4.28** Capping
- **4.2.9** Other methods
- **4.2.10** Additional investigations

4.3 Screening of Remediation Measures

The screening process is modeled after the guidance of ADEC (18 AAC 75.325) and the EPA CERCLA process. The purpose of screening is to eliminate remediation measures that are not feasible to apply, or will not be effective in achieving the RAO. It is possible that different measures could be suited to different areas of the site. In this case, the site may be divided into different operable units, with differing measures applied.

Screen each remediation measure identified in Section 4.2 for the following factors in terms of the feasibility of application and effectiveness in meeting the RAO.

- Implementability, including the availability of the technology; the measure's constructability; logistical feasibility; and other technology-specific factors
  - Site Constraints, including site access, weather conditions, water depth, currents, bottom slope, and type of substrate (e.g. soft bottom, rocky)
  - Characteristics of the bark and wood debris, including thickness of deposit, condition of bark and wood debris, substrate intermixing, chemical properties (pore water results, toxic substances), and physical properties (density, shear strength, settling characteristics)
- Reliability, including the level and scale of technology development; performance record; and inherent construction, operation and maintenance issues. Technologies that are unreliable, perform poorly, or are not fully demonstrated should be eliminated
- Cost-Effectiveness, technologies judged to be equally reliable should be assessed. For instance, if two technologies are judged to be equally reliable and effective in remediation, but Technology A costs significantly more to implement than Technology B, Technology A may be screened out by this criterion.
- Short and long term effectiveness. For example, this is where temporary exceedences of the water quality standards are considered while dredging for the greater good of remediation and where the remedial alternative are evaluated inn terms of how long it takes to achieve the RAO (6 months or 60 years).
- Compliance with federal and State laws and regulations, and the General Permits

In conclusion, for each remediation measure, summarize the feasibility of application and effectiveness in meeting the RAO, and indicate whether the measure should be eliminated from consideration, or retained.

4.4 Development of Remediation Alternatives

The RAO and measure of success for the remediation of the bark and wood debris and other sediments present at the LTF were discussed in Section 4.1. Examples are provided in Appendix V. The technologies and process options retained for the development of remedial alternatives were identified in Section 4.2. In this Section, the technologies and process options are assembled into alternatives that address the remedial action objective. The alternatives identified are those most likely to be considered at the site. Identify site-specific conditions that could result in other alternatives.

For each of the alternatives developed, describe the monitoring program, its objectives, and a contingency plan that would be implemented in the event that recovery does not meet the management goals established for the recovery process.

A single remediation measure may not be sufficient to achieve the RAO. For example, dredging alone might not constitute a complete remediation alternative. A combined alternative might include dredging in deep areas and capping in shallow areas. Another alternative might include BMPs, capping, and monitoring.

Remediation alternatives will vary among sites, because the sites themselves vary greatly with respect to physical conditions, bark accumulations and conditions, and the remaining timber volume that will be processed at the LTF.

4.5 Evaluation of Remediation Alternatives

Evaluate and compare the remediation alternatives developed in Section 4.4 to determine which alternative will be selected for the proposed Remediation Plan. Summarize the evaluation results for each alternative. A quantitative ranking method may be employed. Evaluate each remediation alternative for the following factors in terms of the feasibility of application and effectiveness in meeting the RAO.

- Overall Protection of the Environment; This evaluation criterion is used to measure how an alternative will eliminate or educe adverse effects on the environment consistent with the use of the ZOD. The RAO for the site can be developed to either reduce the extent of continuous bark and wood waste coverage (physical endpoint) or to reduce the ecologically significant adverse effects to populations of bottom dwelling life from bark and wood debris to acceptable levels (biological endpoint).
- Implementability, including the availability of the technology; the measure's constructability; logistical feasibility; and other technology-specific factors
- Reliability, including the level and scale of technology development; performance record; and inherent construction, operation and maintenance issues. Technologies that are unreliable, perform poorly, or are not fully demonstrated should be eliminated
- Compliance with federal and State laws and regulations, and the General Permits
- Effectiveness in achieving the RAO;

  Short-term impacts to the environment; This criterion addresses the short-term risks to remediation workers and the impacts posed to the environment during implementation of an alternative, the potential effects on workers during the remedial action, the potential environmental effects of the remedial action, and the time until protection is achieved

  Long-term impacts to the environment; Alternatives are assessed for their long-term effectiveness along with the degree of certainty that the alternative will be a successful and permanent solution. The assessment includes long-term reliability, the magnitude of residual impacts, the residuals remaining at the conclusion of the remedial activities, and the adequacy and reliability of controls such as containment systems and institutional controls.

- Time required to achieve RAO; The time expected for remediation to be completed is assessed. The time frame must be reasonable when considering 1) the effects to the environment, 2) practicability of achieving a shorter remediation time frame, 3) current use of the site and the resources that may be impacted by releases from the site, and 4) potential future uses of the site, and the potential effects to resources that future releases from the site may cause.

- Cost of implementation**;** This criterion addresses the costs associated with the alternative including direct capital costs (i.e., construction, equipment, land, services), indirect capital costs (i.e., engineering, supplies, contingency), long-term monitoring costs, operation and maintenance costs, and total net present value of the alternative.

Identify the preferred remediation alternative and summarize the basis for its selection. The preferred alternative must meet the RAO and its measure of success.

5.0 PROPOSED REMEDIATION PLAN

5.1 Proposed Remediation Plan

The Certificates of Reasonable Assurance require that, "The proposed Remediation Plan must identify, as a result of the evaluation, a set of feasible, reasonable, and effective measures that the operator proposes to implement to reduce existing and future continuous coverage by bark and wood debris to less that both 1.0 acre and a thickness of 10 centimeters at any point."
Describe the proposed Remediation Plan, based on the preferred remediation alternative. The information contained in Section 4 can be used to support the selection of the preferred remediation alternative.

Describe the implementation of each constituent remediation measure. Describe regulatory and permitting requirements, and other constraints or difficulties. Describe maintenance activities that are required to assure that the RAO continues to be met.

Explain how the RAO will be achieved. Describe the site conditions, with respect to bark accumulation, physical conditions, and biological conditions, which will exist upon completion of implementation, and upon achievement of the RAO.

Provide a clear timeline for the implementation, and for achievement of the RAO.

Provide a clear justification for the remediation alternative proposed, and for not selecting other feasible and effective measures.

A proposed Remediation Plan may describe measures that will be implemented in phases, with continued monitoring, and with future modification of the Remediation Plan based on progress in meeting the RAO.

5.2 Performance Measures

Describe performance measures that will document the implementation of remediation measures, and that will determine whether and when the RAO is achieved. The performance measures must describe quantitative endpoints and may include:

- Implementation endpoints (implementation of operating practices, construction of alternate transfer method; completion of capping or dredging)
- Physical endpoints (less than 1 acre of continuous bark coverage)
- Biological endpoints (colonization by certain species)
- Other appropriate endpoints

Describe a schedule for documenting implementation or assessing achievement of the performance measures. If the performance measures are not achieved within the specified timeframes, the RAO is not met.

5.3 Monitoring

Describe a proposed program to document implementation of remediation measures, and to monitor bark accumulations; biological and habitat conditions; and physical and chemical conditions in bark accumulations, substrates, and water column, as appropriate. The monitoring program should include dive surveys or remote surveys of the bottom to document benthic conditions, with periodic reporting on an annual basis or at the frequency approved by the Department.

6.0 REPORTING

The Remediation Plan must include:

- Submittal of a status report annually or at another frequency approved by the Department.
- Notification to ADEC of the commencement and completion of each remediation measure, and the accomplishment of each performance measure.

7.0 SUBMITTAL OF REMEDIATION PLAN

Two copies of the Remediation Plan must be submitted to:

Alaska Department of Environmental Conservation
Division of Air and Water Quality
Log Transfer Facility Program
410 Willoughby Avenue
Juneau, Alaska 99801

8.0 ACTION BY ADEC

The GPs require the following action by ADEC.

Within 90 days of receipt of a proposed Remediation Plan, the Department will approve, approve with modification, or deny the proposed Remediation Plan. In acting on a Remediation Plan, the Department will consider the extent of exceedance; environmental impacts of accumulated bark and wood debris; environmental impacts of methods to reduce continuous coverage; the feasibility, reasonableness,

effectiveness, and cost of proposed and alternative measures; the timing of recovery under various alternatives; and other pertinent factors.

9.0 ENFORCEABLE CONDITION

The GPs State that, "An approved Remediation Plan constitutes an enforceable condition of the State wastewater disposal general permit."

Appendix I

Required Method for Bark Surveys and Area Calculation under the LTF General Permits

Alaska Department of Environmental Conservation June 9, 2000

Each permittee is responsible for meeting the bark monitoring survey requirements of the LTF General Permits and certifications (AK-G70-1000, "post-1985"; and AK-G70-0000, "pre-1985"). The following summary addresses most requirements for bark monitoring surveys, but is not a substitute for the full text of the permits and certifications.

1. The bark monitoring survey methods are identical in the pre-1985 and post-1985 GPs and certifications.

2. EPA and ADEC may approve an alternate survey method if it meets the stated purpose of determining compliance with the Alaska Water Quality Standards. Any departure from the method described is an alternate method, and must be documented in the bark monitoring report.

3. Each permittee must develop and implement a Quality Assurance Project Plan for bark monitoring surveys within 6 months of authorization (AK-G70-1000) or within 6 months of the effective date (AK-G70-0000), and must by those dates submit a statement to EPA and DEC that the plan has been completed and implemented.

4. Bark monitoring is required annually for all LTFs which transfer a total of 15 mmbf or more during the life of the permit, and which are located in water depths less than 60 feet at MLLW. Type V LTFs (less than 15 mmbf), and Type VI pre-1985 LTFs (inactive), are not required to conduct bark monitoring.

5. For a post-1985 LTF (AK-G70-1000), an underwater pre-discharge survey, including a biological survey, must be submitted with the Notice of Intent (see V.D.7), except for off-shore LTFs and LTFs transferring less than 15 mmbf during the life of the permit. For a pre-1985 LTF (AK-G70-0000), the first bark monitoring survey (a biological survey is not required) must be conducted within 6 months of the effective date (by September 21, 2000), and must be submitted within 9 months of the effective date (by December 21, 2000). For both pre-1985 and post-1985 LTFs, all dive surveys thereafter must be submitted within 60 days of the date conducted.

Although AK-G70-1000 requires the pre-discharge survey to evaluate whether the discharge site meets the requirements of Part III of the post-1985 GP (V.D.7.f.), the Department believes this evaluation must be the responsibility of the permittee.

6. The survey must determine the total area of continuous cover by bark, and the total area of discontinuous cover by bark. Continuous cover is defined as an area of bark and wood debris that is estimated to cover 100 % of the ocean bottom, as measured within a three-foot-square sample plot. Discontinuous cover is defined as an area of bark and wood debris that is estimated to cover 10 % or more, but less than 100 %, in a three-foot-square sample plot. The bark monitoring report must clearly state the area of continuous cover and the area of discontinuous cover.

7. Measurements along each transect must continue until MLLW water depth reaches 60 feet, or bark cover is *less than 10%*, i.e., trace cover. Depth of bark does not affect either the stopping point (e.g., one cm.), or the calculation of area (e.g., 10 cm.).

8. The preferred time for a dive survey is March through May, or prior to operation.

9. Monitoring is not required during years when the LTF is inactive, except if item 10 applies.

10. If a bark monitoring survey indicates that continuous cover by bark and wood debris is 0.9 acre or greater, and log transfer occurs in that year after that survey, an additional survey must be conducted either: (i) in that year, after cessation of log transfer; or (ii) in the following year, prior to any additional log transfer.

11. The survey may use radial or parallel transects. To simplify area calculation, ADEC requests that radial transects be set exactly 30 degrees apart (see calculation method, below), unless bark distribution, bottom topography, or other factors warrant other transect spacing. Parallel transects must be no more than 75 feet apart. See general permits for radial and parallel method requirements. Alternate methods may be acceptable. In particular, the Department will not require a preliminary dive, establishment of hard transect lines, or a central permanent marker. However, a rigorous, repeatable method must be set out in the Quality Assurance Project Plan.

12. ADEC requests operators to assure that measurements are taken every 15 feet (not 15 meters!) along each transect, although the GP states that measurements along a transect must be taken no more than 50 feet apart in continuous cover, and no more than 100 feet apart in discontinuous cover.

13. At each sample point, the survey must record bark depth; percentage of area covered by bark (estimated within a three-foot-square); water depth (adjusted to MLLW); and presence of metal and other debris.

14. Still photographs that clearly depict the nature of bark cover must be taken for all stations with continuos cover (100%) and at least half the stations with discontinuous cover (10%-99%).

15. If continuous cover extends more than 15 feet beyond and perpendicular to the lateral transects that bound the two sides of the survey area, then additional transects must be established to determine the lateral extent of continuous cover. The additional transects may be short perpendicular transects sufficient to encompass the lateral bark.

16. Each discrete area of continuous or discontinuous cover must be calculated as the area enclosed by a line connecting the outermost measured points of that continuous or discontinuous cover, respectively, unless another method is approved by EPA and ADEC. In a typical survey, the measured boundary of continuous cover also is the boundary of the adjacent discontinuous cover. The total area of continuous cover and the total area of discontinuous cover are cumulative and may include more than one discrete area of cover. Area should be reported in acres to the nearest tenth, and need not be reported in square meters.

17. There must be a statement as to whether the project area Zone of Deposit has been exceeded; that is, whether bark has been determined to exist outside the project area.

Bark Monitoring Survey Method

EXAMPLE: Calculating the area of bark cover

The Alaska Department of Environmental Conservation has developed and made available a document titled "**Required Method for Bark Surveys and Bark Area Calculation under the LTF General Permits June 9, 2000.**" This document is available on our website at the following address: http://www.state.ak.us/dec/dawq/waterpermits/ltf/measurebark.htm

The following diagram shows "typical" radial transects set 30 degrees apart. Points of measurement are at 15-foot intervals along the transects. There is continuous cover bark in the inner, nearshore area, and discontinuous bark in the outer, deeper area, but the two areas easily could be reversed.

EXAMPLE: Calculating the area of bark cover
The following diagram shows "typical" radial transects set 30 degrees apart. Points of measurement are at 15-foot intervals along the transects. There is continuous cover bark in the inner, nearshore area, and discontinuous bark in the outer, deeper area, but the two areas easily could be reversed.

Figure 1

The continuous-cover area is calculated as the sum of the four continuous-cover triangles between transects.

The discontinuous-cover area is calculated as the sum of the four *total-area* triangles, minus the *continuous-cover area*.

The formula for the area of any triangle is *1/2 x base x height*, or *1/2 bh*. The long side of the triangle is viewed as the base. The height is a vertical line perpendicular to the base. Fortunately, in a 30-degree triangle, the height is equal to 1/2 the length of the upper side adjacent to the 30-degree angle, or *1/2 a*. Substituting *1/2 a* for *h* means that the area of a 30-degree triangle is equal to *ab/4*. This makes it easy to calculate areas between transects, based on the various transect segment lengths.

h = 1/2 a ***Area = 1/2 bh = 1/2 b x 1/2 a = ab/4***

In the following example, the five transects left to right are labeled as T_1, T_2, T_3, T_4, T_5. The transect lengths are shown for the continuous cover area (CC) and the total area (TA):

	T_1	**T_2**	**T_3**	**T_4**	**T_5**
CC:	**60'**	**75'**	**75'**	**60'**	**45'**
TA:	**120'**	**150'**	**135'**	**105'**	**90'**

Find the CC area by calculating the area of each of the four triangles, then adding those four areas. The area of the first CC triangle is *60 x 75 / 4*, or *1125 square feet*. The table of calculations follows (values are rounded to the nearest whole number).

60 x 75 / 4 = 1125 ft^2
75 x 75 / 4 = 1406
75 x 60 / 4 = 1125
60 x 45 / 4 = 675
4331 ft^2, continuous cover area

Similarly, for the total survey area, the calculation is as follows.

120 x 150 / 4 = 4500 ft^2
150 x 135 / 4 = 5063
135 x 105 / 4 = 3544
105 x 90 / 4 = 2363
15,470 ft^2, total survey area

The discontinuous cover area, then, is the *total survey area* minus the *continuous cover area*.

15,470 ft^2 - 4,331 ft^2 = 11,139 ft^2

To convert any of the areas to acres, divide by 43,560 ft^2/acre.

Continuous cover: 4,331 ft^2 / 43,560 ft^2/acre = 0.10 acre

Discontinuous cover: 11,139 ft^2 / 43,560 ft^2/acre = 0.26 acre

To convert an area to square meters, divide ft^2 by 10.76 ft^2/m^2.

Continuous cover: 4,331 ft^2 / 10.76 ft^2/m^2 = 402 m^2

Discontinuous cover: 11,139 ft^2 / 10.76 ft^2/m^2 = 1,035 m^2

A similar method can be used to calculate continuous cover if there is discontinuous cover inside of the continuous cover (nearer to shore). The diagram would be similar to that above, but with continuous cover farther from shore and discontinuous cover near shore. In that case, calculate the inner discontinuous area, and subtract the inner discontinuous area from the total area of continuous plus inner discontinuous area. If there is additional discontinuous area beyond the continuous area (farther from shore), subtract the continuous area from the total survey area to get the sum of the inner and outer discontinuous areas.

To aid in calculation, the tables on the next page provide triangle areas in square feet, rounded to the nearest whole number, for various transect lengths (triangle sides). The first table is based on 15-foot measurement intervals (preferred!). The second table is based on 5-meter intervals (16.4 feet, sometimes used previously). Select one transect length from the top row, e.g., 150 feet. Select the other transect length from the left column, e.g., 135 feet. The triangle area, *150' x 135' / 4 = 5063 ft^2*, is found in the table at the intersection of the 150' column and the 135' row.

A computer spreadsheet may be constructed to handle calculations for typical situations.

Other methods may be used to calculate area, including computer mapping, planimeter, and dot grids. The method used must be described in the bark monitoring report to a degree that allows DEC and EPA to check the calculation.

15-foot Table. Area values are shown in square feet for a 30-degree triangle having sides of lengths given in the top row and left column headers, in increments of 15 feet.

	15'	30'	45'	60'	75'	90'	105'	120'	135'	150'	165'	180'	195'	210'
15'	56	113	169	225	281	338	394	450	506	563	619	675	731	788
30'	113	225	338	450	563	675	788	900	1013	1125	1238	1350	1463	1575
45'	169	338	506	675	844	1013	1181	1350	1519	1688	1856	2025	2194	2363
60'	225	450	675	900	1125	1350	1575	1800	2025	2250	2475	2700	2925	3150
75'	281	563	844	1125	1406	1688	1969	2250	2531	2813	3094	3375	3656	3938
90'	338	675	1013	1350	1688	2025	2363	2700	3038	3375	3713	4050	4388	4725
105'	394	788	1181	1575	1969	2363	2756	3150	3544	3938	4331	4725	5119	5513
120'	450	900	1350	1800	2250	2700	3150	3600	4050	4500	4950	5400	5850	6300
135'	506	1013	1519	2025	2531	3038	3544	4050	4556	5063	5569	6075	6581	7088
150'	563	1125	1688	2250	2813	3375	3938	4500	5063	5625	6188	6750	7313	7875
165'	619	1238	1856	2475	3094	3713	4331	4950	5569	6188	6806	7425	8044	8663
180'	675	1350	2025	2700	3375	4050	4725	5400	6075	6750	7425	8100	8775	9450
195'	731	1463	2194	2925	3656	4388	5119	5850	6581	7313	8044	8775	9506	10238
210'	788	1575	2363	3150	3938	4725	5513	6300	7088	7875	8663	9450	10238	11025

Triangle areas in square feet

5-Meter Table. Area values are shown in square feet for a 30-degree triangle having sides of lengths given in the top row and left column headers, in increments of 5 meters (16.4 feet).

	16.4' 5m	32.8' 10m	49.2' 15m	65.6' 20m	82.0' 25m	98.4' 30m	114.8' 35m	131.2' 40m	147.6' 45m	164.0' 50m	180.4' 55m	196.8' 60m	213.2' 65m	229.6' 70m
16.4'	67	134	202	269	336	403	471	538	605	672	740	807	874	941
32.8'	134	269	403	538	672	807	941	1076	1210	1345	1479	1614	1748	1883
49.2'	202	403	605	807	1009	1210	1412	1614	1815	2017	2219	2421	2622	2824
65.6'	269	538	807	1076	1345	1614	1883	2152	2421	2690	2959	3228	3496	3765
82.0'	336	672	1009	1345	1681	2017	2353	2690	3026	3362	3698	4034	4371	4707
98.4'	403	807	1210	1614	2017	2421	2824	3228	3631	4034	4438	4841	5245	5648
114.8'	471	941	1412	1883	2353	2824	3295	3765	4236	4707	5177	5648	6119	6590
131.2'	538	1076	1614	2152	2690	3228	3765	4303	4841	5379	5917	6455	6993	7531
147.6'	605	1210	1815	2421	3026	3631	4236	4841	5446	6052	6657	7262	7867	8472
164.0'	672	1345	2017	2690	3362	4034	4707	5379	6052	6724	7396	8069	8741	9414
180.4'	740	1479	2219	2959	3698	4438	5177	5917	6657	7396	8136	8876	9615	10355
196.8'	807	1614	2421	3228	4034	4841	5648	6455	7262	8069	8876	9683	10489	11296
213.2'	874	1748	2622	3496	4371	5245	6119	6993	7867	8741	9615	10489	11364	12238
229.6'	941	1883	2824	3765	4707	5648	6590	7531	8472	9414	10355	11296	12238	13179

Triangle areas in square feet

There's also a simple way to approximate the area of bark coverage. For a given set of four adjacent 30-degree triangles, the approximate total area is the square of the average side length. If the average side length is 120 feet, the approximate area is $120 \times 120 = 14{,}400\ ft^2$.

Here's why it works, using the transect diagram on page 3 as an example. First, view the four large triangles as being averaged so that all have equal sides. This side length then is the average of the five actual transect lengths.

To find the average side, add up the five actual transect lengths and divide by five. Call that length *a*. In the standard case, transect intervals are 15 feet, and each transect length is a multiple of 15. Dividing by five means the average length always will be a whole number and a multiple of three.

As above, the area of any 30-degree triangle is $ab/4$. With equal sides, the area is $a^2/4$. Therefore, the area of the four triangles is $4 \times a^2/4$, or a^2.

In the diagram on page 3, the average side length is 120 feet, and the estimated area is 14,400 ft^2. The actual total area of the transect diagram on page 3 was calculated to be 15,470 ft^2. The estimated area of 14,400 ft^2, is 93 % of the actual area.

If six or seven transects are present--five or six triangles--the method still can be used. Average the six or seven sides and square that length to get the area of four triangles. Then add 25% if there are five triangles, and 50% if there are six triangles, to approximate the total area.

As always, converting to acres requires dividing by 43,560 ft^2/acre: 14,400/ 43,560 = 0.3 acre.

Note that a^2 also is the area of a square with side *a*, which can be drawn superimposed on the transects for rough visual confirmation of the method. Draw the square so that two sides are the same as the outer sides of three adjacent triangles, with a common 90-degree corner.

For various reasons of geometry, this method is only an approximation. The more "even" the triangles are, the greater the accuracy of the approximation. The more "irregular" the triangles are, the less the accuracy of the approximation. Generally, the method gives a result that is within 10 % lower than the calculated area.

APPENDIX II

LTF General Permit

Certificate Of Reasonable Assurance

Remediation Plan Requirements

(Excerpt)

13. Proposed Remediation Plan. (a) If continuous coverage by any existing bark and wood debris, whenever deposited, exceeds both 1.0 acre and a thickness of 10 centimeters at any point, the operator shall submit a proposed Remediation Plan to the Department within 120 days, unless additional time is granted by the Department.

(b) A proposed Remediation Plan must:

(i) Describe, to the extent that information is reasonably available, the historical log transfer processes, volumes, and responsible parties at the site, and their apparent relation to the existing deposition of bark and wood debris;
(ii) Describe the expected future log transfer processes and volumes at the site;
(iii) Evaluate environmental impacts caused by existing deposits of bark and wood debris, and environmental impacts of methods to reduce continuous coverage; and
(iv) Evaluate methods to reduce continuous coverage, including:

(1) Alternative methods of log transfer and transport;
(2) Operational practices, including handling of logs out of water, handling of logs in water, movement of logs in water, and other operational elements;
(3) Feasible methods and costs of removing bark and wood debris from the ocean bottom; and
(4) Other methods.

(c) A proposed Remediation Plan must identify, as a result of the evaluation, a set of feasible, reasonable, and effective measures that the operator proposes to implement to reduce existing and future continuous coverage by bark and wood debris to less than both 1.0 acre and a thickness of 10 centimeters at any point. The proposed Remediation Plan must provide justification for the measures identified.

(d) If removal of bark and wood debris is proposed, the Remediation Plan must specify the following:

(i) The proposed areas, methods, and timing of removal;
(ii) The volume and nature of material to be removed;

(iii) The method of disposal of removed material, and management practices at the disposal site to assure meeting water quality standards and other applicable standards and to assure prevention of objectionable odors; and
(iv) The costs of removal by the proposed methods and alternatives considered.

(e) A proposed Remediation Plan must include a performance schedule and performance measures for implementation of the plan. A proposed Remediation Plan may describe measures that will be implemented in phases, with continued bark monitoring surveys, and with future modification of the Remediation Plan based on progress in reducing continuous coverage.

14. Departmental Action. Within 90 days of receipt of a proposed Remediation Plan, the Department will approve, approve with modification, or deny the proposed Remediation Plan. In acting on a Remediation Plan, the Department will consider the extent of exceedance; environmental impacts of accumulated bark and wood debris; environmental impacts of methods to reduce continuous coverage; the feasibility, reasonableness, effectiveness, and cost of proposed and alternative measures; the timing of recovery under various alternatives; and other pertinent factors.

15. Enforceable Condition. An approved Remediation Plan constitutes an enforceable condition of the State wastewater disposal general permit.

APPENDIX III

Contributors

The Alaska Department of Environmental Conservation would like to recognize the contributions made by the following individuals who contributed to the development of this guidance document.

Dave Barto, Alaska Department of Fish & Game
Andy Grossman, National Marine Fisheries Service
Linda Shaw, National Marine Fisheries Service
Cindy Hartmann, National Marine Fisheries Service
Jim Rhodes, US Forest Service
Ed Grossman, US Fish & Wildlife Service
Steve Brockmann, US Fish & Wildlife Service
Carl Schrader, ADEC
Ernest Ballard, Alaska Forest Association
Dan McCarthy, Sealaska Corporation
Les Williams, Sealaska Corporation
Teresa Michelsen, Southeast Alaska Conservation Council

APPENDIX IV

Remediation Measures

This appendix identifies remediation measures or technologies that may be considered for incorporation in a Remediation Plan. Remediation measures include natural recovery, monitored natural succession, adjustments to operating practices, dredging technologies, capping technologies, and other measures. Although active technologies have not been used to remediate bark accumulations at LTFs in Alaska, they have been used successfully to remediate sediments elsewhere. Various remediation measures are discussed briefly below. Other remediation measures not listed may also be proposed.

1. Natural Recovery

Natural recovery is the "no action" alternative of letting mother nature take its course. This option does not include monitoring.

2. Monitored Natural Succession Processes

Monitored natural succession can occur in two respects. First, the area of continuous cover bark and wood debris may diminish through physical dispersal, sedimentation, and decomposition. Second, organisms may colonize the bark accumulation and develop biological communities over time.

Natural succession can apply to two aspects of remediation. If active remediation such as dredging, or capping, is not feasible, monitored natural succession processes may be the preferred remediation measure.

If active remediation does take place, monitored natural succession inherently will be required to reestablish biological communities on the remaining substrate, a process that may take many years to complete.

Dive surveys have documented that bark accumulations can persist for decades. In some cases, however, bark seems to disperse fairly rapidly. Key factors in bark diminishment may be physical conditions at the site (bottom slope, sediment transport by currents, storm exposure); the additional volume of logs transferred; sediment deposition; and rate of bark decomposition.

Bark accumulations will go through stages of decomposition. Relatively fresh bark may be subject to colonization by organisms such as crabs, starfish, and sea anemones. Evidence indicates that bark in advanced decomposition offers little attractive habitat to these organisms but the bark may still be undergoing beneficial remineralization processes.

Evidence also indicates that the rate of sediment accumulation in some locations is substantial. Dive surveys have found that bark sometimes is mixed equally with sediment (50% bark, 50% native sediment. It appears that sediment accumulation at some sites can be a major factor in fostering natural succession processes.

In cases where continuous bark accumulation is not much over one acre, or where the LTF was established after 1985, natural successional processes may be effective within a reasonable

period. Factors that would promote reduction of bark area to less than one acre would be expected to include cessation of additional bark input, bark dispersal by natural forces, and a high rate of natural sedimentation.

An operator may wish to consider alternate transfer methods in conjunction with natural recovery. For instances, the barging of logs keeps logs and bark out of the water, but has other impacts, particularly infrastructure requirements on-shore at both ends of transportation link. "Easy let down" transfer devices can drastically reduce log bundle entry velocity, and may significantly reduce bark discharge to the water.

Discussion of natural recovery should include the following:

- Remineralization (describe how raw wood degrades, identify the state of degradation at the site, identify sources of natural sediment, if any) [Descriptions of how wood mineralizes have already been prepared for APC, KPC, Hylebos, the LTF permitting process, and other forums, and do not need to be repeated here. It will suffice to attach copies of existing information.]
- Reestablishment of Benthic Communities (describe successional stages that can be expected, and the biological community that can be expected to be achieved ultimately … describe existing assemblages and compare to pre-construction data, if it exists, if any]
- Potential for Recovery (what measurement would be used to determine the potential for recovery at the site?)

3. Operating Practices

Operating practices required for LTF operation are set out in the Best Management Practices Section of the LTF General Permits, based on the guidelines developed by the Alaska Timber Task Force in 1985. The LTF General Permit also requires preparation and implementation of Pollution Prevention Plans. The Certificates of Reasonable Assurance further require that:

> The operator of an LTF shall employ all reasonable practices to avoid the discharge of bark and wood debris from logs in marine waters, and to contain the discharge to the smallest area on the ocean surface that is practicable and is consistent with safe and orderly operation of the log transfer facility. The Pollution Prevention Plan required to be developed and implemented in accordance with Section VII of the NPDES General Permit must identify specific operational practices that will be used to minimize the discharge quantity and area. Practices addressed in the Pollution Prevention Plan must include handling of logs out of water, method of transfer, handling of logs in water, and other operational elements.

The GPs require the operator to "employ all reasonable practices." However, if a Remediation Plan is prepared, operating practices must be reassessed, as to both specific measures and effectiveness of implementation. Further assessment of operating practices should be an element of the Remediation Plan, unless the remediation alternative screening and evaluation process is able to conclude that current operating practices are reasonable and sufficient.

An analysis of operating practices could include: how to manage log transfer to water, handling and storage in water, and transfer out of water, in order to minimize the discharge of loose bark, and to avoid further damage to the bark. However, it is not clear to what extent enhanced

operating practices can reduce bark loss, particularly in the initial land-to-water transfer at traditional LTFs. Developing enhanced operating practices will require creative analysis of LTF operations, and attention to effective implementation.

Enhanced operating practices may reduce future bark accumulation, but will not reduce existing bark deposits. Operating practices may be an important supplement to active remediation measures, and may be especially important where active remediation measures are constrained by site-specific factors.

4. Dredging Technologies

4.1 Hydraulic Dredging

Hydraulic dredges usually are barge-mounted systems that use centrifugal pumps to remove the sediment and water mixture from the bottom, then transport the waste material to a disposal location. Unmodified hydraulic dredges are capable of operating in 80 to 100 feet of water.

Hydraulic dredging may have limited applicability to bark and wood debris because of the tremendous volume of water that is removed along with the material. De-watering the dredged material becomes a permitting issue involving both state and federal agencies. For bark and wood debris the dredge may have to be equipped with a cutterhead so that the material is ground up and does not plug the dredge. The requirement for a cutterhead will be dependent on the size of the waste material.

Bark and wood debris in advanced decomposition may not a good candidate for hydraulic dredging because of the high water content and the difficulty of separating the water from the wood debris. Dredged material can be piped directly from the site for distances exceeding one mile. This could eliminate the need to de-water sediments if the disposal site is in range.

4.2 Mechanical Dredging

Mechanical dredging uses equipment such as a clamshell bucket to excavate material from the bottom and haul it to the surface, where it is placed either directly into a confined disposal area or into a barge or truck to be hauled to a disposal site. In situations where the ocean bottom is steep or rocky, it will not be possible to remove all the bark and wood debris with mechanical dredging equipment. It is likely that some bark or wood debris will be left behind. Clamshell dredges can operate at depths up to 135 feet.

5. Capping Technologies

The following is an excerpt from the Alaska Pulp Corporation's Bay Operable Unit Feasibility Report Study: "In-place capping is the most straightforward and least intrusive of the sediment remedial techniques. Capping material, typically a clean sand, or silty to gravelly sand, is placed on top of problem sediments. The type of capping material that is appropriate is usually determined during the design phase of the project after a remediation technology has been selected. Capping material is usually brought to the site by barge and put in place using a variety of methods, depending on the selected remedial action alternative."

General issues are: 1) obtaining the desired cap thickness over the target area; GPS technology has simplified this, 2) placing the cap material without displacing the target sediment, and 3) maintaining long-term cap integrity, which may require institutional controls.

5.1 Thick Capping

Thick capping usually requires the placement of 18 to 36 inches of sand over the area. The goal of thick capping is to isolate the bark and wood debris and recreate benthic habitat that diverse benthic infauna would inhabit.

5.2 Thin Capping

Thin capping requires the placement of approximately 6 – 12 inches of sand on the project area. It is intended to enhance the bottom environment by creating new mini-environments, not necessarily to isolate the bark and wood debris. With thin capping, surface coverage is expected to vary spatially, providing variable areas of capped surface and amended surface sediment (where mixing between capping material and problem sediment occurs) as well as limited areas where no cap is evident.

5.3 Mounding

Mounding places small piles of sand or gravel dispersed over the waste material to create habitat that can be colonized by organisms. Mounding can be used where the substrate will not support capping.

6.0 Dredged Material Disposal

6.1 Upland Disposal

Dredged waste can be placed into approved upland landfills for disposal after de-watering the dredged materials (bark and wood debris and other sediments), and disposal of the water removed from dredged materials. If there is no permitted facility, upland disposal will include the permitting and construction of a disposal area.

ADEC has information on permitting requirements for upland disposal. The DEC website can be found at http://www.state.ak.us/dec/deh/solidwaste/wood1.htm. There are two permitting options for upland disposal. The first permit is a MONOFILL DISPOSAL OF WOOD WASTE REGULATED BY 18 AAC 60.480. The second permit is General Permit #9740-BA005. The general permit allows the disposal of up to 25,000 CY of small sized wood waste in rock pits (http://www.state.ak.us/dec/deh/solidwaste/debris.doc).

6.2 Near-shore Confined Disposal

Near-shore confined disposal facilities (NCDFs) are constructed adjacent to the shoreline. The sediment is confined using retaining dike structures that are constructed to extend out of the water, with an opening left for access by disposal barges during the sub-surface placement of the sediment. The dredged material must be allowed to de-water which requires a NPDES permit along with mixing zone from DEC.

6.3 Confined Aquatic Disposal

Confined aquatic disposal (CAD) is the placement of dredged material followed by capping material in an aquatic disposal site. Sediment is either placed on the bottom in a mound and then covered with clean material to create a CAD site, or it is placed within a subaqueous bermed area on the bottom and then clean material is placed within the berm over the sediment to create a CAD site.

6.4 Geotextile Bag Disposal

Geotextile bag containment has been used in conjunction with hydraulic dredging to provide temporary containment of sediment. Permeable geotextile fabric bags are placed inside barges and the sediment is pumped or mechanically placed into the bags. The bag is sewn shut when full. The full bags are disposed of by opening the barge bottom over the disposal site.

7.0 Alternative methods of log transfer and transport

7.1 Barging

7.2 Easy Let Down transfer mechanism. This is a hydraulically operated bundle rack that places bundles in the water at very slow speeds.

8.0 Other Methods

8.1 Bark confinement (in-water revetment structure)

8.2 Active bark dispersal (chaining or other operation that disperses bark over a wider area resulting in depths less than 10 cm and reduced extent of continuous cover)

8.3 Bioremediation (i.e. aerate and fertilize to accelerate decomposition. This is an untested approach)

8.4 In-Kind Mitigation

DEC has the latitude to consider in-kind mitigation but the operator would have to present convincing information that off-site remediation would be in the best interest of the state. In-kind mitigation means remediation activity within the marine waters of the state.

8.5 By-product Marketing

This would require the operation of a de-barker at the LTF. The bark material could be sold as landscaping mulch for example. This might be proposed along with natural succession and long term monitoring.

APPENDIX V

Remedial Action Objective

A Remedial Action Objective (RAO) is a site-specific objective—or set of objectives--that describes the endpoints of remedial action. The RAO is, in effect, the goal of the remediation effort as represented by the proposed Remediation Plan. The RAO should achieve compliance with the requirements of the General Permit and Certificate of Reasonable Assurance. The RAO must be defined before potential remediation measures and alternatives can be identified and evaluated.

The RAO must be accompanied by performance measures (or measures of success), which state how the operator will determine whether and when the RAO is met. The performance measures must include quantitative endpoints and a timeframe. If the endpoints are not achieved within the specified timeframe, the RAO is not met. The Remediation Plan will contain a Quality Assurance / Quality Control Plan or a Monitoring Plan that will describe how the operator will respond if the endpoints are not achieved within the specified timeframe**.**

There are a number of approaches to be considered in developing a RAO for a particular facility. The operator may develop RAOs that exceed the requirements of the General Permit and State Certification.

An RAO may have:

- Physical endpoints (reduce continuous bark to less than 1 acre)
- Implementation endpoints (implementation of operating practices)
- Biological endpoints (colonization by certain species)

In an effort to provide assistance to developers of remediation plans, the following RAOs and measure of success are provided as examples. ADEC does not consider these examples prescriptive but provides them as examples of RAOs that the qualifying LTF permit holder could consider in developing a site-specific RAO for their facility. RAO 1 is an example of an RAO that uses a physical endpoint approach to compliance with the General Permit and State Certification. RAO 2 is an example of an RAO that uses a successional processes and biological endpoint approach to compliance.

RAO 1: Manage the ZOD to reduce the extent of continuous bark and wood debris coverage greater than 1.0 acre and 10 cm at any point by a given date. (Physical endpoint)

Measure of Success 1: Annual dive surveys as defined in the monitoring plan, will document a progressive decline in the area of continuous bark and wood debris coverage exceeding 1.0 acre. By insert date, total continuous coverage will be less than 1.0 acres. The monitoring plan will define target progressive rates of decline as a function of time. If the measure of success is not being met, the monitoring plan will define the actions that will be taken to bring the site into compliance with the General Permit and State Certification.

RAO 2: Manage the zone of deposit to reduce the adverse impacts to bottom dwelling life from bark and wood debris, to acceptable levels. (Successional processes and biological endpoint)

Measure of Success 2: The observable succession of benthic species as defined in the monitoring plan 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.

The Operator/permit holder will prepare a monitoring plan that will measure abundance and diversity over time. The monitoring plan will specify abundance and diversity milestones such as those listed below. The listed milestones are examples only! Other milestones will be appropriate for many sites. The monitoring plan will include an adaptive management plan that will describe measures that the Operator/permit holder will undertake to become compliant with the General Permit and State Certification if the milestones proposed are not met.

The monitoring plan may include milestones such as:
Within insert number year, benthic species diversity and abundance will be at least 50% of that in reference areas, except in a 1-acre or less area within the ZOD
Within insert number years, benthic species diversity and abundance will be at least 70% of that in reference areas, except in a 1-acre or less area within the ZOD
Within insert number years, benthic species diversity and abundance will be at least 80% of that in reference areas, except in a 1-acre or less area within the ZOD (Biological endpoint)

RAOs 1 & 2 satisfy the minimum requirements of the General Permit and the Certificates of Reasonable Assurance. The following RAOs and Measures of Success exceed the requirements of the General Permit and the Certificate of Reasonable Assurance.

RAO 3A: Restore bottom sediments to a condition that approximates the physical/chemical habitat characteristics of the sediments prior to bark deposition and is suitable for rapid re-colonization by benthic organisms."

RAO 3B: Restore bottom sediments to a condition in which sediments exhibit no significant adverse effects to the benthic community, and all applicable provisions of the Alaska Water Quality Standards (e.g., residue standard) are met.

Measure of Success 3: Within insert number year insert number % of the remediated area is colonized by opportunistic species; within insert number years insert number % if the area is characterized by transition assemblages; within insert number years insert number % of the area is characterized by an equilibrium assemblage typical of pre-deposition conditions; within insert number years insert number % of the area is characterized by an equilibrium assemblage typical of pre-deposition conditions. (Biological endpoint)

RAO 4 Manage the zone of deposit for the propagation of shellfish.

Measure of Success 4**:** Shellfish populations documented in the area within the ZOD outside of the 1.0 acre area of continuous deposits are restored to at least insert number % of that of regional reference sites within insert number years. (Restoration endpoint)

RAO 5: Restoration of the bottom sediments to a condition in which no more than 1 acre of sediments exhibits significant adverse effects to the benthic community. [Operating facilities]
Measure of Success 5: Within a maximum of insert number years, species diversity within the ZOD is documented to equal insert number % of the pre-discharge condition. (Restoration endpoint)