BOOK 111 PAGE 214

AGREEMENT

COUNTY COURT JOURNAL

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COUNTY CLERK

Decision-Making Process for Extraction of Gravel from Tillamook County Rivers #4026

This agreement is made and entered into by and between the Tillamook County Board of Commissioners, the Tillamook County Soil and Water Conservation District, the Tillamook County Economic Council, the City of Bay City, Coastwide Ready Mix, the Oregon Concrete and Aggregate Producers Association, the Oregon Department of State Lands, the Oregon Department of Fish and Wildlife, and the Oregon Department of Land Conservation and Development (DLCD). The parties intend this agreement to revise and augment the 1992 Mediated Agreement and its 1999 Modification #1.

I. RECITALS

A. In November 1991 the Oregon Department of Fish and Wildlife requested the Division of State Lands, "...because of the critical status of Tillamook Bay chum salmon and the importance of gravel to their life history...deny new permits or requests for renewal of existing permits for commercial gravel removal operations on the Nestucca, Trask, Wilson, Kilchis, and Miami Rivers until it is demonstrated that the activity poses no negative impacts to chum salmon."

B. At that time (November 1991) Tillamook County had not yet identified adequate local upland sources of aggregate to meet current or future needs.

C. Consequently, a Mediated Agreement dated September 14, 1992, was executed that set forth goals for fisheries, aggregate, agricultural soils, and the regulatory process.

D. The 1992 Mediated Agreement:

1. Established October 1, 1997, as the date for terminating all commercial instream removal of gravel from the Kilchis, Miami, Trask, Wilson, and Nestucca Rivers. Tillamook County was to complete a Goal 5 process where instream aggregate was not to be treated as a significant resource.

2. Set interim policies for instream removal through October 1, 1997.

3. Established a process to coordinate research and monitoring.

4. Provided for a coordinated resource management plan to address instream habitat issues related to gravel extraction for noncommercial purposes, and provided that after October 1, 1997, all instream noncommercial aggregate removal must be consistent with such a plan.

E. Pursuant to the 1992 Mediated Agreement, the Tillamook County Board of Commissioners approved amendments to its Comprehensive Plan and Land Use Ordinance on June 30, 1993, creating a Mineral and Aggregate Overlay Zone. On June 19, 1996, the Board of Commissioners approved an ordinance amendment identifying 128 existing or potential upland quarry sites. The Goal 5 process culminated on September 25, 1996, when the Board of Commissioners approved the application of the Mineral and Aggregate Overlay Zone to six aggregate sites throughout Tillamook County. A seventh site was added on December 10, 1997, with continuing opportunities to apply the overlay zone to additional sites. Consistent with the 1992 agreement, instream aggregate was not treated as a significant resource in this planning process.

F. Pursuant to the 1992 agreement, all commercial instream removal of gravel from the Kilchis, Miami, Trask, Wilson, and Nestucca Rivers terminated on October 1, 1997.

G. The 1992 agreement provided that a Coordinated Resource Management Plan (CRMP) would be developed to address instream habitat issues related to gravel extraction for "noncommercial purposes". The CRMP was to cover three objectives:

1. Develop a coordinated plan for managing upland, riparian, and stream environments to protect the identified stream resources and protect soils from erosion.

2. Identify appropriate amounts, criteria, and methods of instream gravel removal for noncommercial purposes.

3. Agree upon the amount and type of bar formation that causes unacceptable streambank erosion.

H. The first objective of the proposed CRMP, as set forth in Recital I.G(1) above, continues to be addressed through the county's comprehensive planning process, the Tillamook Estuary Partnership, as well as through the Department of Agriculture's SB 1010 program and the Oregon Department of Forestry's administration of the Forest Practices Act.

I. By September 1999, however, the second and third objectives for the proposed CRMP had not been addressed, and the parties had been unable to complete the CRMP within the timelines set forth in the 1992 agreement.

J. At that time (September 1999), the buildup of gravel bars above tidewater at three particular sites on the Wilson, Kilchis, and Trask Rivers may have been contributing to soil erosion and related problems.

K. Consequently, the parties to the 1992 Mediated Agreement executed "Modification #1" to that agreement on September 30, 1999, that:

1. Defined the organizational structure, schedule, scope of work, funding and technical assistance required to complete a refined CRMP that included the following two objectives:

   a) Identify appropriate amounts, criteria, and methods of instream gravel removal for noncommercial purposes, and

   b) Agree upon the amount and type of bar formation that causes unacceptable streambank erosion.

2. Provided for pilot projects designed to reduce soil erosion at the three sites; and

3. Clarified that neither the 1992 Mediated Agreement nor the Modification #1 was intended to limit or restrict gravel removal in tidally influenced reaches of the various rivers.

L. Pursuant to the 1999 Modification #1, the three pilot projects were initiated by annual bar scalping at these locations, including pre- and post-project surveys.

M. By March 2000, Tillamook County completed a draft CRMP entitled "Tillamook County Stream Corridor Management Plan for the Lower Trask, Wilson, Kilchis, Miami, and Nestucca Rivers." By letter dated May 2, 2002, DLCD identified certain information that was lacking in the March 2000 draft. No further work occurred on the draft plan until Tillamook County put together a focus group on October 10, 2005 to review the CRMP and existing agreements.

N. In 2004, the US Army Corps of Engineers completed a geomorphologic analysis of the Tillamook Bay drainage basin as part of a general investigation (Feasibility Study), documenting that erosion is the dominant geomorphic process occurring in the upland/mountain region. This published analysis found:

1. A series of devastating forest fires between 1933 and 1945 (the so-called "Tillamook Burn") exposed over 228,000 acres of highly erodible soil to severe winter storms, producing pseudo-cycles in which periods of high quantities of sediment were generated and then delivered into the channel networks.

2. As the channels became larger, more soil particles and debris were carried down slope and accelerated erosion problems.

3. From the time of European settlement, the lower flood plains of the rivers have been diked, sloughs have been filled, and river structures have restricted the historic movement of these lower river channels where high-value farmland dominates this alluvial flood plain.

4. As high sediment loads are carried down river during flood events, the artificially constructed lower reaches, cut off from the flood plain, are choked with sediment.

5. As a result of reduced channel capacity, flood problems increase and streambank erosion threatens high value agricultural soils, investments in riparian areas, public structures and facilities, and private development.

6. Given the scale of the rivers in the study area, with the flood plain condition and long relaxation time involved in fluvial processes, it appears unlikely that the river/flood plain zone is in equilibrium.

7. Land use practices also contribute to erosion.

8. Due to the magnitude of the erosion sediment problem, combined with the structurally hardened stream banks along the lower flood plain, "chutes" have been created which result in accumulations of gravels in sizes not characteristically found in the sediment wedge at the river mouths, creating a plugged dish effect.

O. The parties to this agreement continue to have substantial interest in protecting Tillamook County's riparian and agricultural lands and values when threatened by uncontrolled streambank erosion along its rivers, including those streams identified in Modification #1 to the Mediated Agreement.

P. The parties to this agreement continue to have substantial public health, safety and welfare interests in reducing flood damages and hazards occasioned by artificial and excessive accumulations of gravel and sediments within the flood plain reaches of its river systems.

Q. The parties to this agreement continue to have substantial interest in assuring that there is a long term adequate supply of construction grade aggregates for growth and development within the county for years to come.

R. The parties to this agreement continue to have a substantial public interest in ensuring that its Kilchis River Regional Water District wellhead is protected from flooding due to the formation of a gravel/debris plug at the lower "Dill bar" near river mile 5 on the Kilchis River main channel.

S. The parties to this agreement have a substantial State interest in ensuring the protection and conservation of the natural resources including sensitive or threatened salmonid species as well as water quality in Tillamook County rivers covered under this agreement.

T. On June 30, 2005 the Department of State Lands sent a letter to the Tillamook County Commission requesting information on the progress of the CRMP, pilot project monitoring and a revision of the agreement. On October 10, 2005 Tillamook County put together a focus group that led to this agreement and the completion of the CRMP.

U. The completed CRMP, presently entitled "A Stream Channel Management Plan (SCMP) for Tillamook County Rivers", has been modified to include the following for aggregate removal for purposes other than commercial use:

1. Identifies a mechanism that will be used to determine the appropriate location and amounts of in-stream gravel removal necessary to control stream bank erosion, protect public infrastructure and to reduce flood hazards, restore river channels, river banks and riparian areas while protecting fish and wildlife habitat and water quality.

2. In areas prone to chronic streambank erosion, identifies the types of in-stream and riparian habitats that need to be protected and restored.

3. Updates the information on current research, river and bar conditions and applicable standards on in-stream gravel removal for non-commercial purposes.

4. Describes the amounts of gravel that have been and are being removed historically (where such information was available) and amounts that have been removed under recent pilot projects.

V. The completed CRMP has been revised to provide for aggregate removal for purposes of commercial use as a "significant economic resource of limited supply".

NOW THEREFORE, the parties hereto wish to revise and augment the 1992 agreement and 1999 Modification #1 for the purpose of:

1. Approving and adopting the completed SCMP;

2. Confirming that gravel removal in tidally influenced reaches of various rivers is not restricted under this agreement; and

3. Allowing for aggregate removal for commercial use under the SCMP.

II. AGREEMENT

ACCORDINGLY, IT IS HEREBY AGREED between the parties as follows:

A. The attached SCMP, incorporated herein by reference, is hereby approved and adopted by the Parties.

B. The existing limitation on commercial gravel removal for the Kilchis, Trask and Miami Rivers is hereby modified to allow commercial gravel removal on the seven (7) sites identified in the SCMP under the standards and conditions set forth in the CRMP and in permits issued for those sites.

C. In addition to the seven (7) sites on the Kilchis, Wilson, Trask and Miami Rivers, the SCMP adds two (2) sites on the Nehalem River that are subject to the same objectives, standards and conditions set forth in the SCMP.

D. Neither the 1992 Mediated Agreement, Modification #1, nor this Agreement is intended to limit or restrict gravel removal in tidally influenced reaches of the various rivers. Any such removal is, however, subject to the regulations and permitting requirements of Federal, State and local governments where applicable.

E. Dispute Resolution

1. All disputes among the Parties regarding the obligations of the Parties under this Agreement shall, at the request of any Party, be subject to dispute resolution pursuant to this Section. The Parties agree to devote such time, resources and attention to dispute resolution as are needed and as can be reasonably provided to attempt to resolve the dispute at the earliest time possible; and each Party shall cooperate in good faith to promptly schedule, attend and participate in the dispute resolution.

2. A Party claiming a dispute shall give notice to the Parties of the dispute within thirty (30) days of such Party's actual knowledge of the act, event or omission that gives rise to the dispute or other period of time specifically provided by this Agreement. Within twenty (20) days after receiving such notice, the parties in this Agreement shall convene a meeting to attempt to resolve the dispute. If the Parties are unable to resolve a dispute within thirty (30) days of this meeting, the Parties may attempt to resolve the dispute using a neutral mediator unanimously selected by the disputing Parties. The mediator shall mediate the dispute in accordance with the instructions and schedule provided to it by the Parties. Unless otherwise agreed among the Parties, each Party shall bear its costs for its own participation in the dispute resolution. The decision of the mediator will be binding on the parties but must be in accordance with applicable federal, state and local law.

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3. If any Party to this Agreement acts in a way that is materially inconsistent with this Agreement, any other aggrieved Party may withdraw from this Agreement in accordance with this Section. Such a withdrawal shall not become effective unless and until the aggrieved Party first engages in mediation as set forth herein. In the event that mediation efforts are unsuccessful, the aggrieved Party shall then provide thirty (30) days written notice to the Parties of intent to withdraw from the Agreement. Withdrawal of a party does not terminate the Agreement for the remaining Parties. A Party that withdraws is not bound by and has no rights under the Agreement.

Dennis Johnson — 1/15/09

Coastwide Ready Mix
Dennis Johnson, Owner — Date

R L Engstrom — 1/5/09

Oregon Concrete & Aggregate Producers Assoc.
_____, Managing Director — Date

_____ — _____

Oregon Department of Fish & Wildlife
_____, Director — Date

_____ — _____

Oregon Department of Land Conservation & Development
_____, Director — Date

_____ — _____

Oregon Department of State Lands
_____, Director — Date

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_____ _____

Coastwide Ready Mix Date
Dennis Johnson, Owner

_____ _____

Oregon Concrete & Aggregate Producers Assoc. Date
_____, Managing Director

_____ 1/8/09

Oregon Department of Fish & Wildlife Date
Roy Elicker, Director

_____ _____

Oregon Department of Land Conservation Date
& Development
_____, Director

_____ _____

Oregon Department of State Lands Date
_____, Director

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_____ _____

Coastwide Ready Mix — Date
Dennis Johnson, Owner

_____ _____

Oregon Concrete & Aggregate Producers Assoc. — Date
_____, Managing Director

_____ _____

Oregon Department of Fish & Wildlife — Date
_____, Director

R D Wolt — 12/26/08

Oregon Department of Land Conservation — Date
& Development
Richard Whitman, Director

_____ _____

Oregon Department of State Lands — Date
_____, Director

_____ _____

Tillamook County Board of Commissioners Date
Charles J. Hurliman, Chair

_____ _____

Economic Development Council of Tillamook County Date
_____, Director

_____ _____

Tillamook County Soil & Water Date
Conservation District
_____, Board Chair

_____ _____

City of Bay City Date
_____, Mayor

_____ _____

Mohler Sand & Gravel Date
_____, Owner

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_____ _____

Coastwide Ready Mix Date
Dennis Johnson, Owner

_____ _____

Oregon Concrete & Aggregate Producers Assoc. Date
_____, Managing Director

_____ _____

Oregon Department of Fish & Wildlife Date
_____, Director

_____ _____

Oregon Department of Land Conservation Date
& Development
_____, Director

Louise Solliday 1/8/09

Oregon Department of State Lands Date
Louise Solliday, Director

_____ 2-11-09

Tillamook County Board of Commissioners — Date

~~Charles J. Hurliman~~, Chair
TIM JOSI

_____ _____

Economic Development Council of Tillamook County — Date

_____, Director

_____ _____

Tillamook County Soil & Water — Date
Conservation District

_____, Board Chair

_____ _____

City of Bay City — Date

_____, Mayor

Brian Smith _____ 1-12-09

Mohler Sand & Gravel — Date

Brett A Smith, Owner

BOARD OF COUNTY COMMISSIONERS, TILLAMOOK COUNTY, STATE OF OREGON

Tillamook County Board of Commissioners
Charles J. Hurliman, Chair

Date

Marshall Doak

1/8/09

Economic Development Council of Tillamook County
MARSHALL DOAK, Director

Date

Tillamook County Soil & Water
Conservation District
_____, Board Chair

Date

City of Bay City
SHAENA PETERSON, Mayor

Date

Mohler Sand & Gravel
_____, Owner

Date

Tillamook County Board of Commissioners
Charles J. Hurliman, Chair

Date

Economic Development Council of Tillamook County
_____, Director

Date

Tillamook County Soil & Water
Conservation District
_____, Board Chair

12-18-08
Date

City of Bay City
_____, Mayor

Date

STREAM CHANNEL MANAGEMENT PLAN FOR TILLAMOOK COUNTY RIVERS

December 25, 2008

TABLE OF CONTENTS

APPENDIX
1999 Amendment to Mediated Agreement (with 1992 Agreement attached)
State DSL Application Packet
Tillamook County Development Permit Application

PURPOSE

The Stream Channel Management Plan (SCMP) for gravel removal in Tillamook County is an effort on the part of local and state governments, conservation interests and industry to address critical concerns about preserving Oregon's wild salmon runs while preserving farmland and providing much needed aggregate resources for local use.

The goal of the SCMP is to resolve stream channel management conflicts involving instream gravel removal and river embankment erosion in Tillamook County. The SCMP develops both a short and long term approach to resolving these conflicts. The short term approach is to function as a bridge until a statewide plan for managing instream gravel removal and developing the necessary sediment budgets is completed. The long term plan would include adaptive and dynamic proactive river management tools, based on sediment budgets developed for each system.

The parties to this plan have conducted studies (Stinson & Stinson, Feb. 20, 1998) and a pilot project; and researched the scientific literature that relates to the adverse impacts associated with in stream gravel removal. This research has included review of both National Oceanic Atmospheric Administration Fisheries' (NOAA Fisheries) National Gravel Policy (March 2006) and United States Fish and Wildlife's Sediment Removal from Active Stream Channels in Oregon (March 1, 2006-Version 1.0).

From this research, best management practices (BMPs) (see Standards for Gravel Removal) have been developed to minimize adverse impacts to the life history stages of affected salmon species. Furthermore, state (Department of State Lands) and local (Tillamook County) permit processes are being developed to incorporate the BMPs for gravel removal. All parties to the agreement agree that the key to this plan is to manage gravel removal in a sustainable manner that protects fishery resources in accordance with state and local requirements while addressing local concerns related to protection of property from erosion and the provision of aggregate resources.

The result of this collective effort is the development of the SCMP. This fourteen-year effort advances the knowledge and practices necessary to protect resource and social concerns. The SCMP is designed to facilitate understanding of that long-term process, so individuals and interests reviewing the SCMP will understand the history and the result of this plan.

BACKGROUND

The 1992 Mediated Agreement

In November 1991 the Oregon Department of Fish and Wildlife requested that the Department of State Lands deny new permits or requests for renewal of existing permits for commercial gravel removal operations on the Nestucca, Trask, Wilson, Kilchis, and Miami rivers until it was demonstrated that the activity poses no negative impacts to chum salmon.

At that time, 58,000 cubic yards of gravel were being removed annually from local rivers under commercial permits issued by the Oregon Department of State Lands (DSL). Tillamook County had not yet identified adequate local upland sources of aggregate to meet current or future needs. Most of the local supply of high quality material for production of asphalt and concrete was obtained from riverbeds. In addition, the protection of productive agricultural soils from stream bank erosion was a concern of landowners and bar skimming was used to control erosion.

Although the various parties with an interest in this issue agreed that it was important to stabilize chum salmon runs, they did not agree on the extent to which removal of gravel was detrimental to chum salmon habitat. In an attempt to resolve this issue, the parties entered into mediation. The Department of State Lands, in consideration of the mediation process, renewed commercial gravel permits on the rivers of the Tillamook system for the 1992 removal season. Although the issue of state versus private ownership of the bed and banks of these rivers was raised in the course of discussions, resolution of the ownership question remained and was not a part of the agreement. The Department of State Lands reserved the right to require leases, easements, or licenses for any activity that resulted in a commercial interest within navigable waters of the state.

The parties to the September 14, 1992 mediated agreement were Coastwide Ready Mix, Oregon Concrete and Aggregate Producers Association, Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Land Conservation and Development (DLCD), Oregon Department of State Lands (DSL), Tillamook County, Tillamook County Economic Development Commission, and Tillamook County Soil and Water Conservation District (SWCD). The key provisions of the agreement were as follows:

A. Established October 1, 1997 as the date of termination for the end of all commercial in-stream removal of gravel from the Kilchis, Miami, Trask, Wilson and Nestucca Rivers. To assure adequate supplies of commercial aggregate after 1997, Tillamook County agreed to complete the Goal 5 process and for purposes of Goal 5, in-stream aggregate would not be treated as a significant resource.

B. Set policies for in-stream gravel removal during the interim period from the date of the agreement through October 1, 1997.

C. Established a process to coordinate the gathering and review of information obtained from monitoring and research. Provide for a coordinated resource management plan to address in-stream habitat issues related to gravel extraction for noncommercial purposes.

D. Provided that after October 1, 1997 in-stream gravel removal would be allowed only for the purpose of soil conservation.

As part of the 1992 Mediated Agreement, Tillamook County agreed to complete its Goal 5 planning process. On June 30, 1993 the Board of Commissioners approved amendments to its Comprehensive Plan and Land Use Ordinance creating a Mineral and Aggregate Overlay Zone. On June 19, 1996 the Board of Commissioners approved an Ordinance Amendment identifying 128 existing or potential upland quarry sites. The Goal 5 process culminated on September 25, 1996, when the Board of Commissioners approved the application of the Mineral and Aggregate Overlay Zone to six aggregate sites throughout Tillamook County. A seventh site was added on December 10, 1997, with continuing opportunities to apply the overlay zone to additional sites. As discussed later in this document, many if not all of these sites are of low quality aggregate material that would not meet construction or road aggregate specifications. Consistent with the 1992 Agreement, in-stream aggregate was not treated as a significant resource in this planning process. Since then, an additional three mine sites have been added to the County's Goal 5 inventory.

Pursuant to the 1992 Agreement, all commercial in-stream removal of gravel from the Kilchis, Miami, Trask, Wilson and Nestucca Rivers terminated on October 1, 1997.

Following the February 1996 floods, gravel was accumulating along the lower river reaches. By the winter of 1998-99, stream bank erosion was occurring opposite a number of gravel bars, causing the removal of important riparian vegetation and the loss of valuable pastureland. In one location, gravel accumulations were so extensive that the Wilson River was in danger of being diverted into the north Tillamook City business district. The U.S. Army Corps of Engineers subsequently undertook an emergency advance measure to stabilize that location.

The 1999 Modification to the Mediated Agreement

By the summer of 1999 local concerns over the extent of gravel bar accumulation and related erosion brought the parties to the original 1992 mediated agreement back to the table. A modification to the 1992 agreement was executed during the first week of September 1999 addressing three issues.

Due to the lack of county staff and resources, the CRMP (Coordinated Resource Management Plan) required by the 1992 agreement had not been completed. The 1999 modification defined the organizational structure, schedule, scope of work, funding and technical assistance required to complete the CRMP.

Secondly, the modification provided for a pilot project designed to reduce stream bank erosion at three sites: one at RM 7.3 on Trask River, one at RM 4 on Wilson River and one at RM 3.5 and 3.2 on Kilchis River. These are described in the following section **(1999 Bar Skimming Pilot Project).**

Finally, the Modification clarified that gravel removal in tidally influenced reaches of the various rivers was not restricted under the agreement but was subject to the regulations and permitting requirements of federal, state and local governments where applicable.

1999 Bar Skimming Pilot Project

The sites for the pilot project were each subject to stream bank erosion on the opposite side of the channel from accumulations of gravel. Both local and state agencies, including the Oregon Department of Fish and Wildlife (ODFW) and the Oregon Department of State Lands (DSL) were involved in design of the project and mitigation measures.

At each site, in August 1999, ODFW staked the exterior boundaries of the gravel bar above the water surface elevation for protection of water quality and adjoining spawning habitat. Setbacks were maintained from the stream and adjoining riparian vegetation. No large woody debris was disturbed in the gravel removal areas. All work was completed prior to September 15, 1999.

A monitoring program for in-stream gravel removal on the project was developed by Tillamook County and consisted of the following:

A. Permanent survey reference stations were installed so that gravel removal monitoring data was consistent with initial surveys. Upland benchmarks were established at appropriate locations and cross sections are to be taken annually to determine whether the riverbeds are accreting, eroding, or remaining unchanged.

B. Cross-sectional surveys of the gravel bar were made prior to in-stream gravel removal operations and after gravel removal has taken place.

C. Photo points were established at each project site for the purpose of documenting soil erosion before and periodically after in-stream work.

Though the monitoring plan was developed, the plan was never implemented. Gravel removal at the subject sites continued.

None of the projects involved building of a ramp or alteration of the stream bank. Gravel was extracted, loaded immediately into a truck and hauled off site to an upland stockpile area. At each of the erosion sites (except at RM 3.2 on the Kilchis) stream bank stabilization measures were constructed.

Kilchis River Site

County staffed observed an extensive gravel bar at RM 3.7. Extensive bank erosion was observed at RM 3.5 and RM 3.2 during the same timeframe. Erosion control had already been completed at the lower site and consisted of tree revetment, willow planting and fencing. However, the flow conditions created by the upper bar were beginning to undermine the stream bank protection measures at the lower site. These observations are supported by information provided by a qualified Oregon licensed engineer or geologist which is contained in the Department of State Lands file for the site.

Wilson River Site
County staff observed that accumulations of gravel at the confluence of Dougherty Slough and Wilson River (RM 4.0) had increased flows into the slough. The gravel buildup at this location was so extensive that the Wilson River was in danger of being diverted through the slough into the north Tillamook City business district. These observations are supported by information provided by a qualified Oregon licensed engineer or geologist which is contained in the Department of State Lands file for the site.

Trask River
County staff observed active erosion continuing at RM 7.4 even after gravel removal was completed in 1998. The permit granted for this site involved the placement of rock, the slope of the stream bank, tree planting and rearranging of 300 yards of gravel under an existing DSL permit. These are supported by information provided by a qualified Oregon licensed engineer or geologist which is in the Department of State Lands file for the site.

AGGREGATE GEOLOGY IN TILLAMOOK COUNTY

Coastal Geology

The quality of aggregate resources on the Oregon coast is highly variable due to different geologic materials that occur along the coast. The variable nature of the geologic deposits creates highly variable conditions for developing aggregate resources. The coast is situated in a diverse geologic environment with many bedrock types. The northern coast is generally characterized by volcanic bedrock that flowed at one time into the ocean, creating "pillow" basalts. These basalts tend to yield mediocre quality aggregate due to a high degree of weathering and sodium content. The central coastal area consists of highly variable basalts of pillow origin with sporadic areas of dense, hard columnar jointing. These sporadic, isolated areas are a good source of aggregate.

Tillamook County is generally underlain by a variety of volcanic rock that was laid down in different geologic environments. The volcanic rock in this area is often described as "punky to crumbly" due to its nature of deposit. The molten rock either flowed into the ocean and cooled quickly or was pyroclastic (air fall) that resulted in variable weathered, fragmented pieces of volcanics. The basalt rock is generally dark gray to black, a variety of hardness, with interbeds of siltstone, claystone and sandstone.

In the Nehalem and Cascade Head areas of the coast, the rock is the "pillow" nature where the basalt lava flowed into the ocean, cooling quickly. The result is that pillow basalts weather and break down into the very red soils that typically forma a "rind" over the harder basalt flows. These soils can be clay rich and tens of feet thick, creating overburden thicknesses that can be difficult to work with. Where large thicknesses of overburden occur in steep terrain, there is a potential for landslides as a result of the mining process. These areas can also place

downslope streams in danger of siltation. Oregon Department of Geology and Mineral Industries (DOGAMI) requires detailed overburden management plans in order to protect against landslides initiated as part of the mining process.

The central coastal areas, such as the Neskowin area consist of sandstones and siltstones that have been intruded by volcanic rock in the form of "sills" and "dikes". These two structures essentially describe the nature of when the basalt is intruded into the surrounding bedrock, becoming a sill, which is generally horizontal, or a dike that is near vertical. These form good quality rock resources, however, occur sporadically and may not be continuous. These sills and dikes are sometimes underlain by softer soils which when eroded, result in landslides, which include the upper rock resources.

The highly variable geology on the Oregon Coast makes it difficult to find upland mine sites of construction grade aggregate material. Because of this, instream sources of gravel continue to be the main supply of quality construction aggregates.

Aggregate Mining

There are two predominant methods that are utilized when removing sand and gravel: instream extraction and land mining. Bar scalping has occurred in many streams throughout Oregon and is currently the most common type of instream mining utilized in the state. Bar scalping occurs throughout western Oregon, but on the Oregon Coast instream mining is concentrated in the Chetco, Coquille, Rogue, Tillamook and Umpqua basins.

Bar scalping typically occurs during low water periods. The aggregate is removed from exposed bar areas (typically alternate bars) with scrapers, front end loaders or other heavy equipment, and then the material is generally carried to a collection point where it is transferred to a processing facility. Excavation depths are often limited to an elevation above the low water surface. Depending upon the water year, this datum can fluctuate considerably. During wet years, the depth of excavation may be quite minimal, while dry years may allow significant excavation due to the greater exposure of river gravel. The amount of material removed is also dependent on the level of sediment transport that occurs in any given year. A significant amount of sediment is not necessarily transported every year, but is rather episodic and is related to high flow and event history in the watershed (i.e., bank erosion, landslides, and debris flows).

Even though bar scalping is the most common method for instream gravel removal in Oregon, each operation is conducted differently and each stream reach has unique characteristics. It *is* important *to* evaluate potential *effects and* recommendations *in* light of site specific constraints and opportunities.

Economic of Aggregate Mining

Aggregate mining generally occurs within 30 to 50 miles of the intended market because the cost of transport is the primary expense in this industry (Meador and Layher 1998). In Oregon, haul costs are approximately $0.25 per cubic yard per mile (Frost 2004). Hence, many large-scale aggregate operations are found near cities and along major roadways. According to Oregon Department of State Lands (DSL) records, there are currently about 50 active sand and gravel operations in streams in Oregon. Almost all operations except those on the Columbia River utilize bar scalping to obtain material. Most aggregate is used for construction purposes including concrete, road fill, asphalt, and drain rock. Instream deposits of gravel are valuable because they are easily and cheaply accessible, well-sorted, and are generally free from fine sediments such as silt and clay.

In Oregon, aggregate extraction that occurs outside of the active channel is regulated by the Oregon Department of Geology and Mineral Industries (DOGAMI) through their Mineral Land Regulation and Reclamation Program housed in the Albany Field Office. For State purposes, instream aggregate extraction is regulated by DSL. DOGAMI indicates that annual removal of aggregate from floodplains and upland sites ranges from 44 to 52 million cubic yards per year (based on records from 1998 to 2003). DSL reports that annual permitted aggregate extraction rate (based only on the operations that pay royalties to the state) from streams is approximately 12 million cubic yards per year. However, the amount permitted is generally 30 to 50 percent greater than the actual amount extracted (OWWRI 1995). Based on these numbers, an average of 8 percent of commercial aggregate is derived from Oregon streams each year, although the distribution of instream extraction is not equal throughout the state (OWRRI 1995). Whelan (1995) reported similar findings for sand and gravel obtained from Oregon waterways in 1993; 5.8 percent of the total apparent consumption for the year was derived from Oregon streams. Additionally, the State of Oregon owns and manages submerged and submersible lands in tidal and navigable waterways – including tidal waters in the Tillamook system. Materials extracted from state-owned submerged and submersible lands are subject to a royalty payment to the state when such material enters into commerce. Proceeds from the royalties on these materials are deposited into the state Common School Fund.

Sand and gravel usage also varies temporally throughout the state, and is dependent upon major construction activities such as highway and dam building projects. In the near future, aggregate usage will again increase as the ODOT undertakes a vast program to replace Oregon's highway bridges. ODOT uses approximately 8.5 million tons of aggregate products annually (22% of project costs), which composes 90 percent of every roadway (Frost 2004).

FINANCIAL FORECASTS

In 1995, DOGAMI prepared a study entitled "An Economic Analysis of Construction Aggregate Markets and the Results of a Long-Term Forecasting Model for Oregon". The study evaluated the long-range forecast of aggregate needs for each county through 2050.

Some of the major findings of this study, pertinent to Oregon Coast, include the following:

- The per capita aggregate consumption will decrease over the next 50 years due to an increase in recycling of aggregate, slower population growth, greater urbanization and less need for logging roads.
- The per capita aggregate consumption tends to be much higher in rural areas (such as the majority of the coast) than in cities. Roads in rural areas use more aggregate per person per mile due to the sparse amount of roads serving a large area.
- Construction utilizing poor quality aggregate will require more maintenance and more aggregate use in the long run.
- Other economic factors impacting development of coastal aggregate resources include the shortage of high-quality aggregate sites, shipping costs in terms of travel time and coastal traffic congestion, and the distance from the aggregate resource to the place of use.

PLANNING FRAMEWORK

The particular resource issues that stem from the 1992 mediated agreement and its 1999 modification drive this plan. This plan is intended to be adaptive in nature (see *Review Period,* below). It will apply best available science about gravel removal; its adverse affects on anadromous salmon and fish habitat in general and the best management practices that can minimize those affects. Once new information is obtained regarding BMPs for gravel removal, modifications may be necessary for existing authorizations.

This section of the plan presents information and rationale for the policies, standards and guidelines contained in the plan (short term approach), as well as opportunities for a comprehensive approach for managing the resource in the Tillamook river systems (long term strategy).

REVIEW PERIOD

Because the SCMP is designed as an adaptive management plan, the parties covered by the plan will review the SCMP every 5 years or sooner as conditions may require, to determine necessary changes in the BMPs regulating the removal of gravel material for both commercial or erosion control (Note: DSL permits for gravel removal will likely be issued for less than a full five year term. Such permits are currently issued annually and permit conditions are adjusted annually based on BMP's and local conditions in the waterway and at the location where gravel is removed - this is consistent with DSL and other state agency commitments to the Oregon Plan for Salmon and Watersheds. To meet its commitments under the Oregon Plan and associated salmon recovery efforts, DSL needs to maintain some flexibility in conditioning gravel permits in the Tillamook system from year to year.). The 5 year review should evaluate new information in the

scientific literature about gravel removal, gravel removal studies conducted on Tillamook County Rivers, and information derived from computer modeling addressing sediment transport and aggregate supply. If the parties agree to the changes to the SCMP, an addendum to the management plan outlining the new conditions, restrictions or other changes will be included in the SCMP by reference and mailed to all the parties to the agreement.

SHORT TERM APPROACH

The short-term's purpose is to provide an intermediate management tool until sediment budgets are developed for the Tillamook County's rivers. The approach protects salmon species with management practices that use the best available scientific information and existing river conditions.

In terms of setting objectives for the plan, the parties agree to the following two objectives:

A. Identify appropriate amounts, criteria and methods of in-stream gravel removal for commercial purposes; and

B. Agree upon the amount and type of bar formation that causes unacceptable (the term "unacceptable" needs more defining) stream bank erosion.

An appropriate amount of in-stream gravel removal for "commercial purposes" would be an amount that meets the construction needs of Tillamook County in a given year; however, gravel removal for "commercial purposes" shall not result in unacceptable impacts to salmonid species.. Until a sediment budget is developed, the primary means to limit impacts to salmon is to only allow "commercial" operations on nine gravel removal sites. Furthermore, strict management practices for commercial (and any stream bank erosion) sites will be followed. These BMPs address the concerns outlined in the section on Environmental Effects of Gravel Accumulations and Extraction.

The second objective is to address stream bank erosion in Tillamook County. To understand the issue the following background is outlined for reference: Channel morphology involves the shape and form of stream boundaries and associated boundary materials. Morphological features include channel width, irregularities of bank shape, bank slope, bank overhang or undercut, and the presence of bars, riffles, rapids and pools within the channel and the corresponding depths of flow at different locations in the channel. They are quite important in establishing the channel hydraulics.

Some fairly consistent trends in channel morphology can be described from headwater to lowlands. For example, steep slopes and narrow streams, dominated by step-pools and pool-riffle sequences, typify headwater reaches of streams. Flat, wide meandering streams, dominated by numerous gravel bars and opposing eroding banks typify lowland stretches of streams. Such gravel bars often occur on the inside bends of the lower stream reaches where slower water velocities cause the gravel to settle out (so called "point bars"). The resulting bar formations force water velocities to the outside of the stream

bend often resulting in stream bank erosion. The rate of erosion may be accelerated where riparian vegetation is lacking, banks are armored or diked, or where agricultural practices are conducted on the margin of the stream bank.

Because such conditions typically occur in the lower river reaches there are serious implications for numerous natural and human resources in addition to the immediate effects on in-stream and riparian habitats. On the one hand the landscape of the lower reaches and agricultural lands supporting the local dairy industry dominate adjoining floodplains of the Tillamook Bay. Moreover, 90% of the County's 24,000 population lives along the 10% coastal strip, resulting in interspersed areas of residential and business developments, roads, bridges and drainage works along the lower rivers. An increase in gravel accumulations and corresponding stream bank erosion presents a series of resource concerns and challenges. However, the standards and guidelines in this plan present an opportunity to avoid or minimize such resource conflicts while protecting and enhancing riparian and aquatic habitat.

Removing sediment from the tops of river gravel bars without excavating below the summer water level is a method of controlling or minimizing stream bank erosion. In specific cases, gravel removal can be used to remove stresses on stream banks and streambeds resulting in greater stabilization. In this manner, gravel removal can result in reduced needs for fill, less stream bank stabilization, and greater stability of some spawning beds. (OWRRI, 1995)

Because channel bars are submerged by higher flows, gravel removal generally occurs during seasonal low flow. This approach eliminates the need for work in the wetted channel and maximizes the amount of material exposed, and hence, maximizes the amount of material that may be removed. The bars are almost always connected to the banks and are frequently located on the inside of bends.

By removing material from the opposite bank and enlarging the river cross section to reduce flow velocities, gravel removal from the tops of bars results in a reduction in the scouring stresses exerted by the flow against an eroding bank. In general, wide, shallow stream channels without complexity are not a goal of fish habitat management. Thus such projects should be beneficial to the extent they control channel widening and filling. However, skimmed bars may reform quickly after the first high water event. As a result, bar skimming projects should include adjacent riparian vegetation plantings to minimize subsequent scouring.

It is important that the rate of gravel extraction not exceed the rate of resupply on an annual basis. One approach for managing the amount of in-channel gravel removed is the so-called "safe yield" method, where extraction is limited to removal that does not exceed seasonal recruitment. This requires the ability to evaluate gravel recruitment at any site of interest. In the short term, until the hydrodynamic computer model can be completed (see long term plan) and a sediment budget calculated, the standards and guidelines in this plan incorporate conservative provisions to ensure that cumulative gravel extraction does not exceed recruitment within any river system. The key habitat

goals of the SCMP for Tillamook County Rivers would be to protect and enhance riparian and in-stream habitats, as well as stabilize stream banks using alternatives to gravel removal, rip rap or diking.

LONG TERM STRATEGY TO DETERMINE SEDIMENT TRANSPORT

Long-term strategies are needed to address the hydrological, geological and biological issues associated with gravel extraction in rivers. These can be accomplished through the development and implementation of various models, studies, and advances in technology.

The goal of the SCMP is to function as a bridge until a statewide plan for instream gravel removal, and sediment budget can be developed, which would include dynamic proactive river management tools to replace the reactive short-term approach. However, developing these models is contingent on receiving adequate funding. The parties shall convene every 12 months from the date of the Agreement and assess whether adequate funding has been identified to fund the Long Term Strategy and, based on the best available science, make adjustments to mining operating permits. If funding is determined to be insufficient, then the parties shall reevaluate the Long Term Strategy and identify other options to implement the strategy. It is a primary responsibility for all parties to the plan to look for resources during the 12 month period identified above to fund sediment transport studies for the Tillamook and Nehalem river systems. DSL will be responsible for convening the annual meeting of interested parties.

The long-term plan is intended to allow for future modifications to the SCMP as science and technology evolves. The following models will be developed and evaluated as part of this plan:

- Biological Model - to evaluate impacts on biota and fishery habitat.
- Water Quality Model - to evaluate impacts of suspended solids and deposition of fine sediments.
- Hydrological Model - to evaluate impacts of gravel extraction on erosion, channel morphology, sediment supply and transport, etc.

In addition, parties to the plan should review conclusions and recommendations from the Gravel Executive Team set up to evaluate mining operations on Oregon's south coast for modification of this plan. This will make gravel extraction policy consistent throughout the state.

The baseline information acquired through the development of each model will be utilized for the development of the adaptive/future management plans, and for supporting the permit process. This information will also be utilized to address key issues that need clarification in permitting complex aggregate removal projects. The implementation of these models will allow for the

development of a sediment budget. Important not only to the monitoring of alterations in sediment supply and protection of habitat, this information will also be utilized for the regulation of gravel extraction for both commercial and non-commercial purposes.

ENVIRONMENTAL EFFECTS OF GRAVEL ACCUMULATIONS AND EXTRACTION

Extraction of alluvial material from within or near a streambed can have a direct impact on the streams physical habitat parameters such as channel geometry, bed elevation, substrate composition and stability, in-stream roughness elements (large woody debris, boulders, etc.) depth, velocity, turbidity, sediment transport, stream discharge and temperature (Rundquist 1980; Pauley et al. 1989; Kondolf 1994a, b; OWRRI 1995). OWRRI, (1995) states that:

> "Channel hydraulics, sediment transport, and morphology are directly affected by human activities such as gravel mining and bank erosion control. The immediate and direct effects are to reshape the boundary, either by removing or adding materials. The subsequent effects are to alter the flow hydraulics when water levels rise and inundate the altered features. This can lead to shifts in flow patterns and patterns of sediment transport. Local effects also lead to upstream and downstream effects."

Altering these habitat parameters has deleterious impacts on in-stream biota and the associated riparian habitat (Sandecki, 1989). For example, impacts to anadromous fish populations due to gravel extraction include: reduced fish populations in the disturbed area, replacement of one species by another, replacement of one age group by another, or a shift in the species and age distributions (Moulton, 1980). In general terms, Rivier and Seguier (1985) suggest that the detrimental effects to biota resulting from bed material mining are caused by two main processes: (1) alteration of the flow patterns resulting from modification of the river bed, and (2) an excess of suspended sediment. OWRRI (1995) adds:

> "Disturbance activities can disrupt the ecological continuum in many ways. Local channel changes can propagate upstream or downstream and can trigger lateral changes as well. Alterations of the riparian zone can allow changes in channel conditions that can impact aquatic ecosystems as much as some in- channel activities."

One consequence of the interconnectedness of channels and riparian systems is that potential disruptions of the riparian zone must be evaluated when channel activities are being evaluated. For example, aggregate mining involves the channel and boundary but requires land access and material storage that could adversely affect riparian zones; bank protection works are likely to influence riparian systems beyond the immediate work area.

The potential effects of gravel extraction activities on stream morphology, riparian habitat, and anadromous fishes and their habitats are summarized as follows from the revised NMFS National Gravel Extraction Guidance document:

A. **Instream gravel mining can disrupt the preexisting balance between sediment supply and transporting capacity, and can result in channel incision and bed degradation** (Kondolf 1997, 1998a; Florsheim et al. 1998; Meador and Layher 1998; Langer 2001, 2003). This is partly because gravel "armors" the bed, stabilizing banks and bars, whereas removing this gravel causes erosion (Lagasse et al. 1980; OWRRI 1995; Kondolf 1997, 1998a). Degradation and erosion can extend upstream and downstream of an individual extraction operation, and can result from bed mining either in or above the low-water channel (Collins and Dunne 1990; Kanehl and Lyons 1992; Kondolf 1994a, 1994b, 1997, 1998a; OWRRI 1995; Pringle 1997; Brown et al. 1998). For example, headcutting (upstream erosion), increased velocities, concentrated flows, and bank undercutting with subsequent loss of riparian habitat can occur upstream of the extraction site due to a steepened river gradient (Kanehl and Lyons 1992; OWRRI 1995; Kondolf 1997; Pringle 1997), resulting in the release of additional sediment to downstream reaches, where the channel may aggrade and become unstable (Kondolf 1997). Accelerated delivery of sediment from upstream can falsely indicate recruitment in balance with removal. Degradation can deplete the entire depth of gravel on a channel bed, exposing other substrates that may underlie the gravel, reducing the amount and quality of usable anadromous spawning and rearing habitat (Collins and Dunne 1990; Kondolf 1994a, 1997, 1998a; OWRRI 1995). For example, gravel removal from bars may cause erosion if they subsequently receive less bed material from upstream than is being carried away by fluvial transport (Collins and Dunne 1990). Thus, gravel removal not only impacts the extraction site, but also may reduce gravel delivery to downstream spawning and rearing areas (Pauley et al. 1989; Brown et al. 1998). Gravel mining itself often selectively removes gravels of approximately the same sizes as needed by salmonids for spawning (median diameters between 15 and 45 mm [Kondolf and Wolman 1993; see also Kondolf 2000]), again reducing the amount of usable spawning and rearing habitat.

B. **Instream gravel extraction can increase suspended sediment, sediment transport, water turbidity, and gravel siltation** (Kanehl and Lyons 1992; OWRRI 1995; Kondolf 1997). The most significant change in the sediment size distribution resulting from gravel removal is a decrease in sediment size caused by fine material deposition into the mining site (Rundquist 1980). Brown et al. (1998) also note that the fine material can travel long distances downstream as a plume of turbidity while the gravel is being removed and, during floods, turbidity is likely to be higher than normal for even longer distances downstream due to the higher flow rate and increased entrainment of sediments as a result of channel deformation or armor layer removal. As reviewed by Everest et al. (1987), fine sediments in particular are detrimental to salmonid redds (nests)

because (1) interstitial spaces blocked by deposited silt prevents. oxygenated water from reaching the incubating eggs within the redd, and inhibits the removal of waste metabolites; (2) embryos or sac fry can be smothered by high concentrations of suspended sediments that enter the redd; and (3) emerging fry can become trapped if enough sediment is deposited on the redd (Koski 1966, 1981; Chapman 1988; Reiser and White 1988; Waters 1995). High silt loads may also inhibit larval, juvenile, and adult behavior, migration, or spawning (Snyder 1959; Cordone and Kelly 1961; Koski 1975; Bisson and Bilby 1982; Berg and Northcote 1985; Bjornn and Reiser 1991; Kanehl and Lyons 1992; Servizi and Martens 1992; OWRRI 1995). Excessive amounts of suspended material can abrade the protective slime coatings on the surface of the fish and their gills, which can lead to increased bacterial and fungal infections (Cordone and Kelly 1961; Rivier and Seguier 1985). Increased suspended sediments may block vision and impede feeding (Sigler et at. 1984; Rivier and Seguier 1985). Siltation, substrate disturbances and increased turbidity also negatively affect the invertebrate food sources of fishes and severely alter the aquatic food web, thus affecting the growth and survival of the fish (Kanehl and Lyons 1992; OWRRI 1995; Spence et al. 1996; Brown et al. 1998).

C. **Bed degradation can change the morphology of the channel and decreases channel stability** (Moulton 1980; Rundquist 1980; Sullivan et at. 1987; Collins and Dunne 1990; Kanehl and Lyons 1992; Kondolf 1994a, 1994b, 1997; OWRRI 1995; Brown et at. 1998; Florsheim et at. 1998). Gravel extraction can cause a diversion or a high potential for diversion of flow through the gravel removal site (Rundquist 1980). Mined reaches of a river or stream that show decreased depth and/or surface flow, which can occur where the flow is spread over a wide area and there is considerable intergravel flow, could block fish migration during periods of low flows (Moulton 1980). This could be caused by gravel bar skimming in particular (see Environmental Effect Number 4, below), and may compound problems in many areas where flows may already have been altered by hydropower operations, irrigation, or other human uses. Even if the gravel extraction activity is conducted away from the active river channel during low water periods (see Environmental Effect Number 8, below), substrate stability and channel morphology outside the excavated area's perimeter could be affected during subsequent high water events (Kondolf 1997, 1998a).

D. **Gravel bar skimming can significantly impact aquatic habitat.** Bar skimming creates a wide, flat cross section, eliminating confinement of the low flow channel, which can then result in a thin sheet of water at baseflow (Kondolf 1994a, 1997). Sediment transport efficiency may be reduced through the unconfined reach due to the increased width-to-depth ratio, causing deposition and subsequent instability (Kondolf 1998a). Removal of the bar may alter channel hydraulics upstream as well as at the gravel extraction site (Kondolf 1998a). Bar skimming can also remove the gravel "pavement," leaving the finer subsurface particles vulnerable to entrainment (erosion) at lower flows (Kondolf 1994a, 1998a; OWRRI 1995). A related effect is that bar skimming lowers the overall elevation of the bar surface and may reduce the threshold water discharge at which sediment

transport occurs (OWRRI 1995). Salmon redds downstream are thus susceptible to deposition of displaced alluvial material, resulting in egg suffocation or suppressed salmon fry emergence, while redds upstream of scalped bars are vulnerable to regressive erosion (Pauley et al. 1989). Gravel bar skimming also appears to reduce the amount of side channel areas, which can reduce and/or displace juvenile salmonid fishes that use this habitat (Pauley *et* al. 1989). All these effects can be particularly problematic *if* upstream flows are already reduced by diversions, dams, or other human activities.

E. **Operation of heavy equipment in the channel bed can directly destroy spawning habitat, rearing habitat, the juveniles themselves, and macroinvertebrates; can produce increased turbidity and suspended sediment downstream; and has the potential to cause toxic chemical spills** (Forshage and Carter 1973; Kondolf 1994a). Heavy equipment usually crosses stream channels where the stream is shallowest, at riffles. Riffle habitat is important for juvenile salmonids (Bradford and Higgins 2001) because, for example, the juveniles often respond to disturbances by entering the interstitial spaces between the gravel substrate at riffles (Shrivel) 1990; Meehan and Bjornn 1991). These pore spaces in the gravel substrate are important sources of cover or refuge (Raleigh et al. 1984). Therefore, juveniles in this riffle habitat could be susceptible to crushing from heavy equipment. Additional disturbances to redds may occur from increased foot and vehicle access to spawning sites, due to access created initially for gravel extraction purposes (OWRRI 1995). Also, heavy equipment is powered by diesel fuel and lubricated by other hazardous petroleum products, leading to the potential for toxic chemical spills.

F. **Stockpiles of overburden and gravel left or abandoned in the channel or floodplain can alter channel hydraulics during high flows.** During high water, the presence of stockpiles can cause fish blockage or entrapment, and fine material and organic debris may be introduced into the water, resulting in downstream sedimentation (Follman 1980). The stockpiles may also concentrate flows on the stream bed or floodplain resulting in increased, localized erosion.

G. **Removal or disturbance of instream roughness elements during gravel extraction activities can negatively affect both quality and quantity of anadromous fish habitat.** Instream roughness elements, including the gravel itself and large woody debris, play a major role in providing structural integrity and complexity to the stream or river ecosystem and provide habitat critical for anadromous fish (Koski 1992; Naiman et al. 1992; Franklin et al. 1995; Murphy 1995; OWRRI 1995; Abbe and Montgomery 1996; Collins and Montgomery 2002; Collins et al. 2002). These elements are important in controlling channel morphology and stream hydraulics; in regulating the storage of sediments, gravel and particulate organic matter; and in creating and maintaining habitat diversity and complexity (Franklin 1992; Koski 1992; Murphy 1995; OWRRI 1995). Large

woody debris in streams creates pools and backwaters that fish use as foraging sites, critical overwintering areas, refuges from predation, and spawning and rearing habitat (Koski 1992; Maser and Sedell 1994; OWRRI 1995). Large wood jams at the head of gravel bars can anchor the bar and increase gravel recruitment behind the jam (OWRRI 1995). Loss of large woody debris from gravel bars can also negatively impact aquatic habitat (Weigand 1991; OWRRI 1995). The importance of large woody debris has been well documented, and its removal results in an immediate decline in salmonid abundance (e.g., see citations in Koski 1992; Franklin et al. 1995; Murphy 1995; OWRRI 1995). It is also important to remember that gravel deposits are themselves instream roughness elements, which is key to recognizing that the same type of effects apply (i.e., linking hydraulics and habitat is also applicable for gravel deposits underwater or on bars).

H. **Dry pit and wet pit mining in floodplains may reduce groundwater elevations, reduce stream flows, increase water temperature, and create potential for fish entrapment** (Langer 2003; NMFS 2004). A reduction in groundwater elevation may occur when floodplain pits are pumped by operators to increase production, and by evaporation of surface water in large pits. Reductions in groundwater elevations can consequently result in a decrease in stream flow, which is particularly hazardous to fish during low flow periods. Subsurface connectivity between pits and streams also presents a possibility of increased stream temperatures when pit surface water is heated by the sun and eventually drains to the stream. The risk of fish entrapment associated with floodplain pit mining is due to two processes: (1) floods overtopping the pit perimeter, and (2) natural migration of the channel into the excavated area (Kondolf 1998a). Ponded water isolated from the main channel may strand or entrap fish carried there during high water events (Moulton 1980; Palmisano et al. 1993; Kondolf 1997). Fish in these ponded areas could experience higher temperatures, lower dissolved oxygen, increased predation compared to fish in the main channel, an altered food web, desiccation if the area dries out, and freezing (Moulton 1980; Spence et al. 1996; Kondolf 1997, 1998a).

   The likelihood and extent of groundwater, stream flow, water temperature, and entrapment effects associated with floodplain mining are directly related to the pit's proximity to the active stream channel, pit size relative to the stream, and the frequency of flood inundation (Langer 2003; NMFS 2004).

I. Destruction of the riparian zone during gravel extraction operations can have multiple deleterious effects on anadromous fish habitat. The importance of riparian habitat to anadromous fishes (Koski 1993) should not be underestimated. For example, Koski (1992) states that a stream's capacity to produce salmonids is controlled by the structure and function of the riparian zone. The riparian zone includes stream banks, riparian vegetation, and vegetative cover. Damaging any

one of these elements can cause stream bank destabilization resulting in increased erosion, sediment and nutrient inputs, and reduced shading and bank cover leading. to increased stream temperatures. Destruction of riparian trees also means a decrease in the supply of large woody debris. This results in a loss of instream habitat diversity caused by removing the source of materials partially responsible for creating pools and riffles that are critical for anadromous fish growth and survival, as outlined in Environmental Effect Number 7, above (Koski 1992; Murphy 1995; OWRRI 1995).

Gravel extraction activities can damage the riparian zone in several ways:

- If the floodplain aquifer discharges into the stream, groundwater levels can be lowered because of channel degradation. Lowering the water table can kill riparian. vegetation (Collins and Dunne 1990).

- Long-term loss of riparian vegetation can occur when gravel is removed to depths that result in permanent flooding or ponded water. Also, loss of vegetation occurs when gravel removal results in a significant shift of the river channel that subsequently causes annual or frequent flooding into the disturbed site (Joyce 1980).

- Heavy equipment, processing plants, and gravel stockpiles at or near the extraction site can destroy riparian vegetation (Joyce 1980; Kondolf 1994a; OWRRI 1995). Heavy equipment also causes soil compaction, thereby increasing erosion by reducing soil infiltration and causing overland flow. As mentioned in Environmental Effect Number 5 above, the use of heavy equipment also leads to the increased risk of chemical pollution; hazardous chemicals may also be used in nearby sediment processing plants. In addition, roads, road building, road dirt and dust, and temporary bridges can also impact the riparian zone.

- Removal of large woody debris from the riparian zone during gravel extraction activities negatively affects the plant community (Weigand 1991; OWRRI 1995). Large woody debris is important in protecting and enhancing recovering vegetation in streamside areas (Franklin et al. 1995; OWRRI 1995).

- Rapid ' bed degradation may induce bank collapse and erosion by undercutting and by increasing the heights of banks (Collins and Dunne 1990; Kondolf 1994a, 1997).

- Portions of incised or undercut banks may be removed during gravel extraction, resulting in reduced vegetative bank cover, causing reduced shading and increased water temperatures (Moulton 1980).

- Banks may be scraped to remove overburden to reach the gravel below. This may result in destabilized banks and increased sediment inputs (Moulton 1980).

- The reduction in size or height of bars can cause adjacent banks to erode more rapidly or to stabilize, depending on how much gravel is removed, the distribution of removal, and the geometry of the particular bed (Collins and Dunne 1990).

J. **Gravel mining can cause a change in disturbance regimes and patterns with a concomitant change in habitat and species** (Castro and Cluer, unpublished report). Stream and river systems are disturbance driven, which can temporarily or permanently alter the character of the system. These disturbances include natural variations in flow regimes and flood events, sediment delivery to the system, large inputs of organic materials, changes in base level, etc. Disturbances can be described by their frequency (e.g., the 100-year flood), duration (length of time), magnitude (areal extent), intensity (force exerted), and severity (biological response) (OWRRI 1995). The bed within the active stream channel experiences the greatest disturbance frequency, which could be as often as every year (i.e., sediment transport events). The side channel and backwater areas are not as frequently disturbed, but are affected by higher flow events and channel avulsions (perhaps 5- to 10-year flows). Floodplains are disturbed even less frequently than the main and side channels; it may take a major flood event on the order of a decade or longer before the floodplain shows significant alteration. Finally, terraces and hillslopes have the lowest disturbance frequency (e.g., slope failures and mass movements).

Common to all these disturbances is that the episode of disturbance is followed by a period of recovery (OWRRI 1995). If the disturbance events become so frequent that the system cannot fully recover before the next event, then the system is held in a constant state of disequilibrium or instability (Castro and Cluer, unpublished report). Organisms in these habitats show different responses to these disturbances, depending on such factors as their differences in developmental times, behavior, and their responses to environmental factors (OWRRI 1995). Pringle (1997) contends that anthropogenic activities downstream, including urbanization, dams, gravel mining, etc., can cause effects on organisms upstream, such as genetic isolation, population-level changes, and ecosystem-level changes. Alteration of a punctuated disturbance regime (as described above) to one of chronic disturbance overlain with larger infrequent disturbances often results in a shift of the plant and animal communities to ones that are more adapted to constant disturbance (OWRRI 1995). Incised streams and rivers may be subject to chronic disturbance because of the disconnection of the floodplain. Instream gravel mining may cause chronic disturbance with a concomitant change in the habitat and associated species. Although sediment transport events may occur annually, and may be compared to gravel mining activities, the latter are temporally distinct from natural events.

COMMERCIAL GRAVEL REMOVAL GOALS AND STANDARDS

A. **Goals:**

1. Gravel removal operations shall be limited spatially, and in volume and frequency, such that natural waterway channel characteristics, riparian habitats, and other fish and wildlife habitat values are conserved.

2. Gravel removal operations shall be designed such that stranding areas for juvenile salmon are not created.

3. Gravel removal operations shall be designed such that salmon spawning areas are not adversely affected.

The operating conditions below are subject to modification by the Department of State Lands, in consultation with ODFW, based on any new biological, ecological or scientific information learned that is needed to protect salmon in all aspects of their life stages and associated habitat. These conditions should be viewed as adaptive in nature to changing knowledge and environmental conditions. Where practicable DSL may make conditions consistent statewide.

B. **Standards:**

1. Gravel removal shall be limited to the following bars on the Kilchis, Miami, Nehalem, Wilson, and Trask rivers: Kilchis (Gomes RM 3.2, Gomes RM 3.5 and Dill RM 6.0); Wilson (Barker RM 4.0; Donaldson RM 5.0); Trask (Bush RM 7.0); Miami (Waldron RM 3.0) Nehalem (Mohler Sand & Gravel RM 9.3 & 9.8). No expansions of in-channel gravel removal to new sites, except for purposes of soil conservation, shall be considered.

2. No more than two sites, listed in Standard #1 may be scalped on a river system in any year.

3. Gravel removal shall be conducted in a manner that assures the persistence of the bar feature at the same location in the river. For example, a buffer of suitable size and configuration, as determined on a case-by-case basis, shall be maintained. It shall be the responsibility of the applicant to demonstrate compliance with this requirement.

4. Natural waterway features (e.g. sloughs, backwaters, side channels, etc.) shall be protected during removal operations.

5. Scalping shall be limited to a depth of 1-foot above the average low (summer) water level as measured throughout the site.

6. Gravel removal should only occur during low-flow periods and from above the water level. ODFW recommended in-water work period shall apply to gravel removal operations.

7. Other than the sites listed in Standard #1, gravel removal shall not be allowed in areas vegetated with woody plant species. On commercial sites, if woody plant species are removed, compensatory mitigation would be required.

8. The gravel removal cut-line shall consist of a single-plane cut, leaving no berms or depressions below the leave-strip area at the head of the bar.

9. Removal must be to final grade with a .5% slope or greater from a level plane or stream gradient that is downstream and toward the river to reduce the risk of fish stranding. The final grading of the gravel bar shall not significantly alter the flow characteristics of the river during periods of high flows (OWRRI 1995).

10. All machinery used during a gravel operation shall be fueled and cleaned off-site in an appropriate upland area. A hazardous material plan shall be developed for any heavy equipment used on site. The equipment operator shall have an approved spill containment kit on-site at all times.

11. Extracted aggregates and sediments should not be washed directly in the stream or river or within the riparian zone.

12. Removal or disturbance of in-channel roughness elements (logs, boulders, etc.) during gravel removal activities should be avoided. Those that are inadvertently disturbed should be replaced or restored below the bar, or other locations shall be coordinated with ODFW.

13. All disturbed soils, particularly those in ingress and egress areas, shall be immediately mulched with chopped straw and planted with native grass seed upon completion of the removal project. This standard does not apply to established ingress and egress areas.

14. No gravel removal should be allowed for non-priority uses such as fill. Priority uses are construction grade material that meets ODOT specifications for base rock, asphalt rock or concrete rock.

15. Gravel stockpiles, overburden and/or vegetative debris shall not be stored within the riparian zone or waters of the state.

16. Following a freshet covering a previously scalped gravel bar, the applicant will inspect gravel bars scalped the previous year to determine if there have been any pools that have developed that could capture and hold juvenile salmon. If the applicant sees pools or ponds on the gravel bar the applicant will immediately contact ODFW for assistance.

17. DSL may modify existing authorizations to include revised permit conditions, based on any new biological, ecological or scientific information depending upon site-specific characteristics after consultation with other agencies and private interests during the annual meeting identified under the Long Term Approach. The final decision to modify an existing authorization rests with DSL.

NON-COMMERCIAL GRAVEL REMOVAL

The 1992 Mediated Agreement called for the development of a Coordinated Resource Management Plan (CRMP) that addressed gravel extraction for purposes of soil conservation and other non-commercial uses. The CRMP was to cover three objectives: (1) Develop a coordinated plan for managing upland, riparian, and stream environments to protect the identified stream resources and protect soils from erosion, (2) identify appropriate amounts, criteria, and methods of in-stream gravel removal for non-commercial purposes, and (3) agree upon the amount and type of bar formation that causes unacceptable streambank erosion. The first objective of the SCMP continues to be addressed through the County's comprehensive plan. The second and third objectives are addressed in this SCMP as set forth below.

The parties to this agreement acknowledge that gravel removal for streambank protection is the least preferred option for controlling erosion. DSL will require applicants for non commercial gravel removal activities to demonstrate the purpose and need of the gravel removal, and an alternatives analysis that justifies less environmentally damaging options are impracticable. Non-commercial gravel removal is an activity that is undertaken for the primary purpose of streambank protection and not for commercial enterprise.

Guidance for non-commercial gravel removal for purposes of streambank protection:

- The gravel bar considered for removal shall be located immediately adjacent to, or directly across from, the eroding streambank.
- The extent of streambank erosion is considered to be significant where a qualified professional has determined that: 1) a hydraulic relationship exists with the erosion; and 2) there is a threat to public health or safety or a significant loss of private property; and 3) the erosion can not be controlled in the short-term by other control measures such as bioengineering, revetments or other constructed solutions.

- Where a qualified professional determines that stream bank erosion threatens a state or county bridge, a public road, public water system or other public facility, such erosion is considered significant. There is a separate process for emergencies and certain maintenance exempt activities per OAR Chapter 141 Division 85 and ORS 196.850.
- Stream bank protection projects shall include other elements such as riparian plantings, bioengineering techniques, or other methods determined to be appropriate by the project designer.
- Removal standards and goals for streambank stabilization projects shall be the same as those listed in Section I (above), where practicable.
- Gravel removal for non-commercial purposes must comply with other applicable state law in addition to the requirements within this plan.

MITIGATION CONSIDERATIONS AND ANALYSIS

Commercial and non-commercial gravel removal operations will be carefully designed to minimize impacts to sensitive fisheries and habitat. Appropriate rates and locations for in-stream gravel extraction shall be determined on the basis of:

- The rate of upstream recruitment.
- Whether the river bed elevation under undisturbed conditions remains the same over the course of decades, or the rate at which it is aggrading or degrading.
- Historic patterns of sediment transport, bar growth, and bank erosion.
- Prediction *of the specific,* local effects *of* gravel *extraction on* bed *elevations,* and the stability of banks and bars, taking into account an analysis of present or past effects of gravel extraction at various rates; and
- A determination of the desirability or acceptability of the anticipated effects.

The following comments identify elements of the stream management plan that address the impacts or concerns regarding instream mining on the geology, hydrology and aquatic habitat within the identified streams of Tillamook County.

A. Instream gravel mining can disrupt the preexisting balance between sediment supply and transporting capacity, and can result in channel incision and bed degradation.

1. This stream management plan has been developed to minimize impacts to channel morphology and bed degredation.

2. Only two sites per stream system have been approved to maintain the balance between supply and transporting capacity.

3. Operational conditions within this plan require that gravel removal shall not impact the location, morphology or size of the bar.

4. Operational conditions require that final grading of post mining area shall not alter flow characteristics of the river during periods of high flow.

5. Long term strategies will implement a modeling and monitoring program to evaluate the relationship of extraction quantity with sediment supply and transporting capacity; data will provide a basis for adjusting operating conditions to maintain balance within the drainage system.

B. Instream gravel extraction can increase suspended sediment, sediment transport, water turbidity, and gravel siltation.

1. This stream management plan requires that extracted aggregates and sediments will not be washed directly into the stream or river, or within the riparian zone; thereby eliminating the water quality impacts identified in prior instream bar scraping operations.

2. BMPs and best available science will be used to minimize downstream sediment transport and turbidity during gravel extraction and transport.

3. Operating conditions require that downstream water quality will be monitored to ensure that state turbidity standards are not exceeded.

4. Long term strategies will implement a modeling and monitoring program to evaluate sediment impacts on water quality and habitat and provide input to an adaptive management program.

C. Bed degradation can change the morphology of the channel and decreases channel stability.

1. Operating conditions require that bar feature, size and location are maintained to minimize impacts to stream bed stability.
2. Operating conditions require that natural waterway features are protected.

3. Gravel extraction depths will adhere to accepted standards to minimize bed degredation.

4. Long-term baseline evaluation of stream bed conditions upstream and downstream of bar skimming operations will provide information to minimize impacts to channel morphology and maintain channel stability.

D. Gravel bar skimming can significantly impact aquatic habitat.

1. This stream management plan has been developed to address the aquatic impacts associated with bar skimming as an element in permit approval.

2. Best available science and best management practices will be implemented to minimize impacts to aquatic habitat.

3. Long-term baseline evaluation of geology, hydrology and biological conditions will support an adaptive management approach to modifying bar skimming operations if required.

E. Operation of heavy equipment in the channel bed can directly destroy spawning habitat, rearing habitat, the juveniles themselves, and macroinvertebrates; can produce increased turbidity and suspended sediment downstream; and has the potential to cause toxic chemical spills.

1. The operating standards with this management plan require that machinery be fueled and cleaned offsite in an upland location.

2. A hazardous material spill plan would be required for any heavy equipment used on-site.

3. An approved spill containment kit would be required for equipment operators.

4. All identified spawning areas would be avoided during bar skimming

5. BMPs would be implemented to minimize turbidity and suspended sediments downstream.

6. Operating conditions would be reviewed by ODFW to avoid impacts to significant rearing areas.

F. Stockpiles *of* overburden and gravel left *or* abandoned *in the* channel *or* floodplain can alter channel hydraulics during high flows.

1. Operating standards within this management plan require that stockpiles be stored outside of the creek or beyond the riparian zone to avoid hydraulic impacts.

G. Removal or disturbance of instream roughness elements during gravel extraction activities can negatively affect both quality and quantity of anadromous fish habitat.

1. Operating standards within this management plan indicate that removal or disturbance of instream roughness shall be avoided.

2. If roughness is impacted, areas identified would be replaced or restored by the operator in coordination with ODFW.

H. Dry pit and wet pit mining in floodplains may reduce groundwater elevations, reduce stream flows, increase water temperature, and create potential for fish entrapment.

1. No dry pit or wet pit mining would be permitted within the streams identified within this management plan.

Destruction of the riparian zone during gravel extraction operations can have multiple deleterious effects on anadromous fish habitat.

1. Gravel removal operations would avoid riparian zones and significant salmon habitat according to operating standards within this management plan.

2. Long term approaches recommended within this plan will evaluate effects of bar skimming on riparian zones and implement adaptive management strategies to further minimize impacts.

J. Gravel mining can cause a change in disturbance regimes and patterns with a concomitant change in habitat and species.

1. The number and location of bars to be selectively scraped would be coordinated with ODFW to select optimal areas that represent stabilized regimes.

2. On-going evaluation of gravel extraction on channel morphology, habitat and species will be implemented by the plan to provide a basis for adaptive response to operating standards.

3. Long-term approaches will involve a detailed modeling of hydrology, geology and habitat changes associated with proposed mining operations. This information will be used to modify operations in destabilized areas.

ADMINISTRATIVE PROCEDURES FOR THIS PLAN

Applicants wanting to remove gravel for commercial purposes or to control erosion must apply for a Department of State Lands (DSL) permit. DSL will coordinate permit applications with Tillamook County, the Oregon Department of Fish and Wildlife, and the local Soil and Water Conservation District. Once this plan is included in the Tillamook County's Comprehensive Plan, the DSL permit will serve as the single permit process under the SCMP. Applicants must pay all required fees to DSL and Tillamook County. DSL will process permit applications in accordance with state law and regulations governing the permit decision making process. Additionally, applicants seeking authorization to remove gravel from state-owned submerged or submersible lands must first obtain a license from the Department of State Lands governing the payment of royalties for this material in accordance with OAR Chapter 141 Division 14. Nothing in this plan controls or addresses Federal interests or jurisdiction over channel management of instream gravel removal.

Because the restrictions imposed in the SCMP on gravel removal affect the time to process an application, all completed applications must be received by DSL no later than March 1 of a given year (consistent with 120 day statutory process for permit applications and decisions). It is recommended that applications be submitted to DSL as early as possible in advance of that date. After determining an application is complete, DSL will arrange a meeting and site visit with all the affected resource agencies including staff from Tillamook County Community Development Department, Tillamook County Soil and Water Conservation District, Oregon Department of Fish and Wildlife, and the Natural Resource Conservation Service. The applicant and his representative will also be invited to attend. DSL may also seek to arrange such a meeting at any time prior to receiving an application or determining an application is complete.

For erosion control projects, recommendations from the resource agencies shall be based on an analysis of the following criteria, as applicable to their authority:

- the severity of erosion at the site;
- the extent to which gravel accumulations are contributing to the erosion;
- the extent to which other non-structural stabilization solutions might be successful in the absence of the proposed project;
- the prevalence, location and size of other gravel bars on the river system;
- the degree to which the proposed project affects fish and wildlife resources;
- the estimated gravel recruitment over the previous winter on each river system generally;
- the estimated gravel accumulation at the proposed project site over the previous winter;

- the extent to which the project combined with the proposed non-structural stream bank measures will provide stabilization at the site.

The Department shall process the applications in accordance with OAR Chapter 141 Division 85. All landowners submitting an application deemed complete (in accordance with OAR Chapter 141 Division 85) will be notified in writing by July 1 whether the DSL approved or denied the permit, unless the applicant requests the deadline be extended. DSL will note any reasons for a denial with written findings. If the permit is approved, DSL will note any modifications to the permit application and include a comprehensive, specific listing of all applicable requirements to be met by the authorization holder in order to complete the removal-fill activity in a manner that complies with all applicable jurisdictions.