

BEACHES AND DUNES ELEMENT

(Goal 18)

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BEACHES AND DUNES ELEMENT

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1. IDENTIFICATION OF BEACH AND DUNE AREAS

1.1 Introduction

Tillamook County has 111 miles of shoreline. Of this total, 61 miles consist of small beaches, alternating with headlands and steep terrace scarps, and 50 miles are shores along bays. This diversity of coastal features provides the individual with an opportunity to enjoy a variety of recreational experiences in addition to space for housing and commercial activities. It is this mix of uses that make coastal communities unique.

It is not surprising that this area's values and diversified uses are sought after, often resulting in conflicting uses, such as off road vehicles activity adjacent to residential development.

Additionally, the beach and dune systems are quite sensitive to human activities as well as the natural forces of wind, rain, and ocean waves.

When planning for these diverse land uses, it becomes imperative that the County make an effort to provide a wide spectrum of uses while maintaining the physical integrity of the beach and dune areas.

1.2 Inventory

Beaches and dunes are classified as a variety of different forms. The following list of definitions from the Statewide Planning Goals provides one system of classification.

BEACH: Gently sloping areas of loose material (e.g. sand, gravel, and cobble) that extend landward from the low-water line to a point where there is a definite change in the material type or landform, or to the line of vegetation.

DEFLATION PLAIN: The broad interdune area which is wind scoured to the level of the summer water table.

DUNE: A hill or ridge of sand built up by the wind along sandy coasts.

DUNE, ACTIVE: A dune that migrates, grows, and diminishes from the face of wind and supply of sand. Active dunes include all open sand dunes, active hummocks, and active foredunes.

DUNE, CONDITIONALLY STABLE: A dune presently in a stable condition, but vulnerable to becoming active due to fragile vegetative cover.

DUNE, OLDER STABILIZED: A dune that is stable from wind erosion, and that may include diverse forest cover. They include older foredunes.

DUNE, PARABOLIC: A dune which is parabolic in shape and is oriented with the convex side away from the wind.

DUNE, RECENTLY STABILIZED: A dune with sufficient vegetation to be stabilized from wind erosion, but with little, if any, development of soil or cohesion of the sand under the vegetation. Recently stabilized dunes include conditionally stable foredunes, conditionally stable dunes, dune complexes, and younger stabilized dunes.

DUNE, YOUNGER STABILIZED: A wind stable dune with weakly developed soils and vegetation.

DUNE COMPLEX: Various patterns of small dunes with partially stabilized intervening areas.

FOREDUNE, ACTIVE: An unstable barrier ridge of sand paralleling the beach and subject to wind erosion, water erosion, and growth from new sand deposits. Active foredunes may include areas with beach grass, and occur in sand spits and at river mouths as well as elsewhere.

FOREDUNE, CONDITIONALLY STABLE: An active foredune that has become conditionally stable with regard to wind erosion.

FOREDUNE, OLDER: A conditionally stable foredune that has become wind stabilized by diverse vegetation and soil development.

HUMMOCK, ACTIVE: Partially vegetated (usually with beach grass), circular, and elevated mounds of sand which are actively growing in size.

INTERDUNE AREA: Low-lying areas between higher landforms which are generally under water during part of the year.

An inventory of beach and dune areas in Tillamook County was prepared by the U. S. Department of Agriculture, Soil Conservation Service and published

in the report "Beaches and Dunes of the Oregon Coast". This constitutes the County's inventory of beaches and dunes. Maps 1 through 9 are reproduced from this report. Where greater accuracy and detail is needed, the County will consult the USDA Soil Conservation Service Soils Survey for coastal Tillamook County and will perform field inspections using criteria described in "A System of Classifying and Identifying Oregon's Beaches and Dunes" in the "Beaches and Dunes Handbook for the Oregon Coast".

The classification system used by Soil Conservation Service is slightly different from the LCDC system listed above. The table below matches equivalent dune forms.

TABLE 1

SCS CLASSIFICATION	LCDC CLASSIFICATION
Active Inland Dune (AID)	Dune, Active
Beach (B)	Beach
Dune Complex (DC)	Dune Complex
Younger Stabilized dunes (DS)	Dune, Younger Stabilized
Recently Stabilized Foredunes (FD)	Foredune, Conditionally Stable
Active Foredune (FDA)	Foredune, Active
Active Dune Hummocks (H)	Hummock, Active
Older Stabilized Dunes (ODS)	Dunes, Older Stabilized
Open Dune Sand (OS)	Dune, Active/Dune, Parabolic
Open Dune Sand Conditionally Stable (OSC)	Dune, Conditionally Stable
Wet Interdune (W)	Interdune (Note: This is not the same as a deflation plain)
Wet Deflation Plain (WDP)	Deflation Plain

The following table shows the amount of land of each type of beach or dune form (SCS classification) in the County.

TABLE 2

SCS CLASSIFICATION	ACRES
Dune Complex (DC)	135
Younger Stabilized Dunes (DS)	2,745
Recently Stabilized Foredunes (FD)	325
Active Foredunes (FDA)	730
Active Dune Hummocks (H)	145
Older Stabilized Dunes (ODS)	1,700
Open Dune Sand (OS)	1,170
Open Dune Sand Conditionally Stable (OSC)	1,275
Wet Interdune (W)	1,025
Wet Deflation Plain (WDP)	450

Source: Beaches and Dunes of the Oregon Coast, p. 25.

Major Impacts in Management

Table 3
Major Impacts in Management
Beaches and Dunes, Oregon

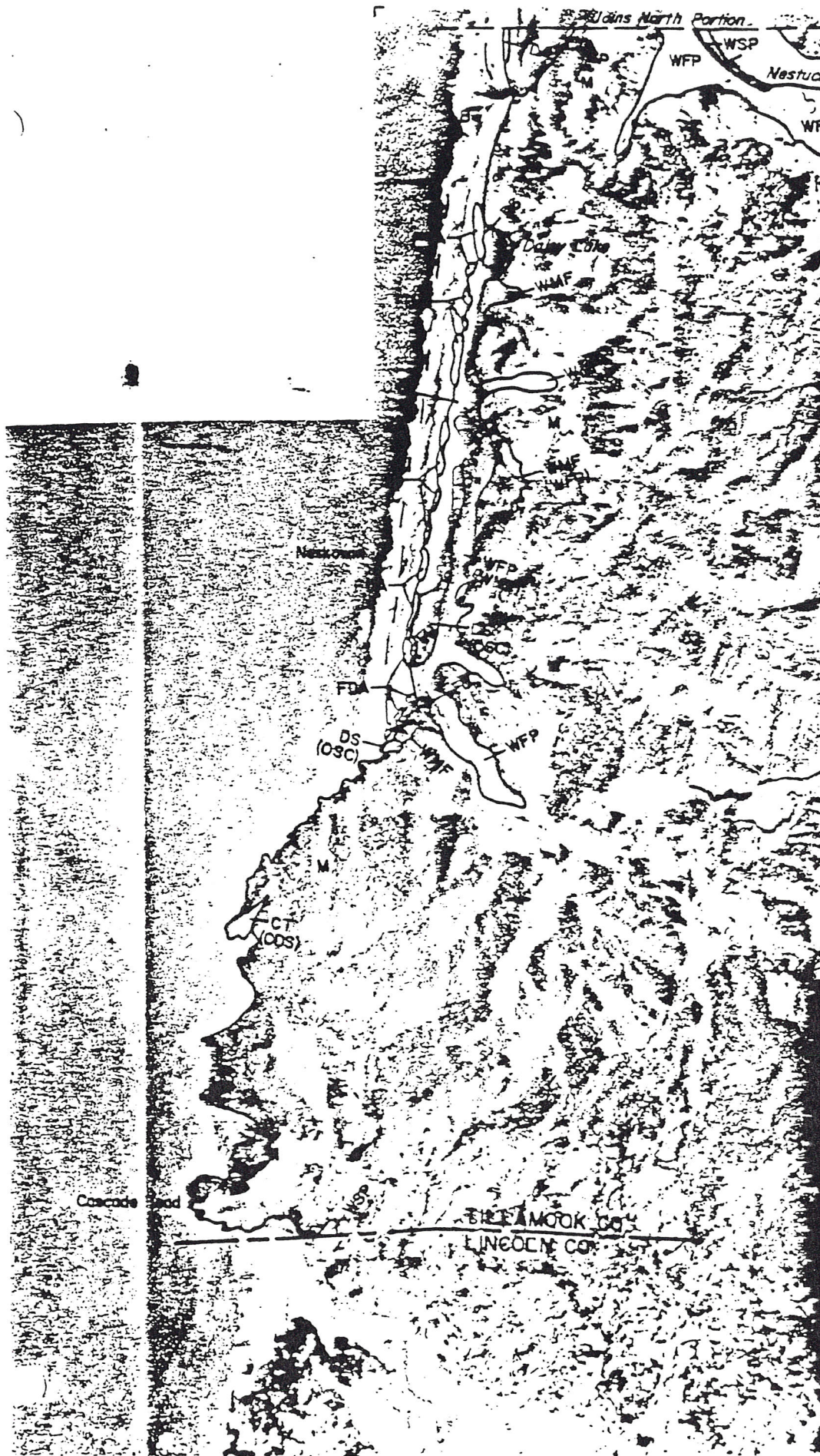
Mapping Units		Wildlife Habitat	Mining	Grazing	Step Action	Stream Undercutting	Ocean Undercutting	Debris Removal (driftwood)	Vegetative Stabilization Enhancement (Chance of success)
Symbol	Name								
B	Beach	3	2A	-					
DC	Dune complex of OS, OSC, DS, and W	2	0	0		- 0	3A 0	3A -	- 2
DS	Younger stabilized dunes	3	2	2		1	1	-	3
FD	Recently stabilized foredunes	3	0	0		0	1	0	3
FDA	Active foredune	3	0	0		0	1	0	1
H	Active dune hummocks	3	0	0		0	0	-	1
OOS	Older stabilized dunes	3	2	2		2	2	-	3
OS	Open dune sand	1	3	-		0	0	-	1-2
OSC	Open dune sand condi- tionally stable	1	0	0		0	0	-	3
W	Wet interdune	3	1	1		0	-	-	3
WDP	Wet deflation plain	3	0	1		0	-	2A	3
IFD	Inland foredune	3	0	2		0	0	-	3
OFD	Older foredune	3	0	2		2	1	-	3

- Not applicable
 0 No tolerance
 1 Tolerance level low
 2 Tolerance level medium
 3 Tolerance level high
 A Site Specific
 B Specialty Crop
 C Seasonal

0

0

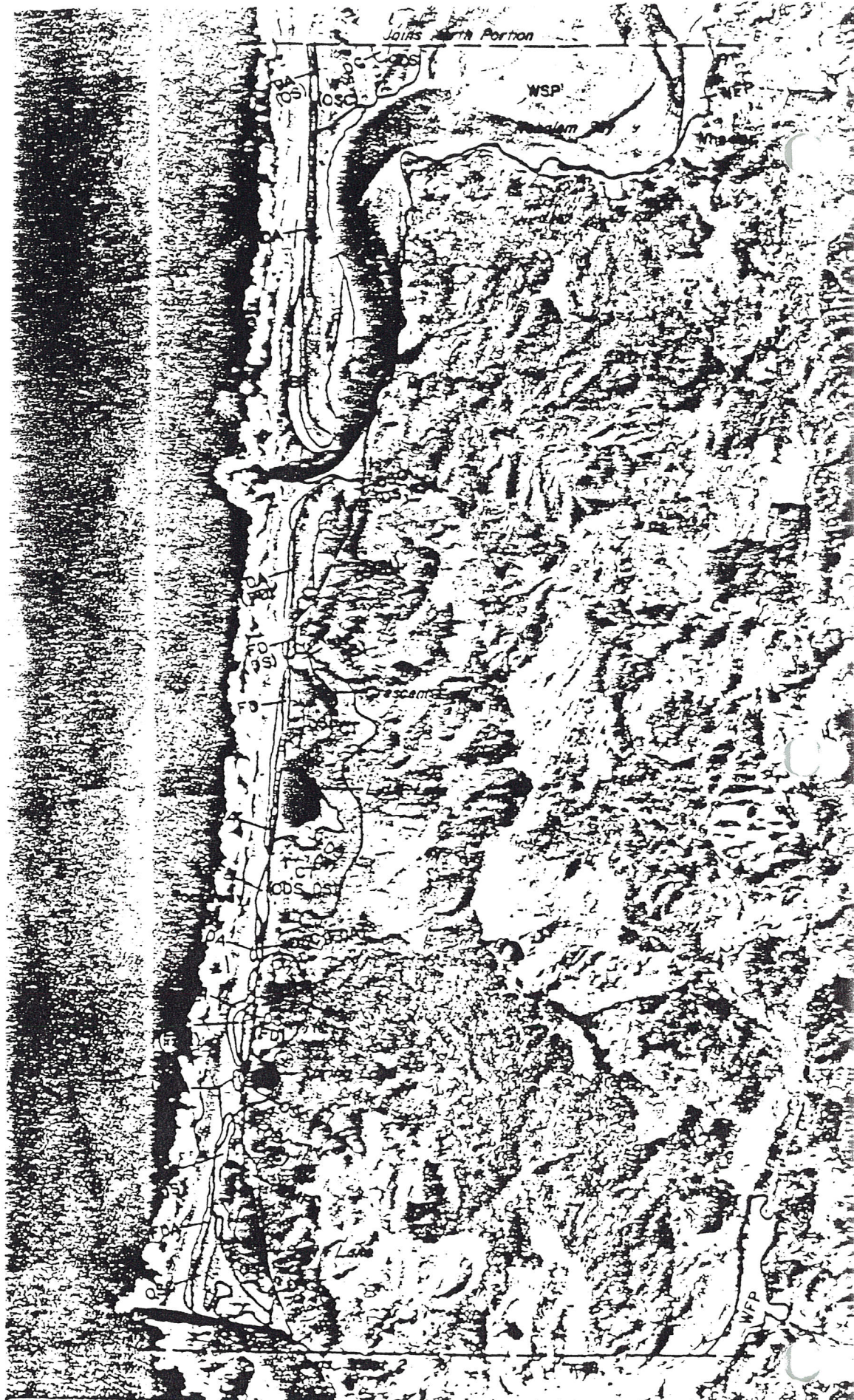
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2. MANAGEMENT OF IDENTIFIED BEACH AND DUNE AREAS

2.1 Introduction

The beach and dune forms identified in Section 1.2 have different suitabilities for human use and alteration. Hazards associated with some of these areas may be significant enough to justify prohibiting development that have any value. In areas prone to less severe hazards, developments of value are reasonable if they are built according to standards that reasonably assure their safety and the safety of surrounding areas. This section evaluates the suitabilities of the dune forms for the uses commonly considered in the planning process and provides guidelines for regulating uses in these areas.

This element of the comprehensive plan will focus on hazards in evaluating use suitabilities. The need to protect areas of critical environmental concern, areas having scenic, scientific, or biological importance, and significant wildlife habitat was assessed in the Goal 17 element for the beach and dune areas within the shorelands boundary, and in the Goal 5 element for other dune areas. (Please note that all beaches and most dune areas are included in the shoreland boundary.)

A number of hazards are associated with beach and dune areas. They include erosion, flooding, groundwater drawdown or pollution, and sliding. One or more hazards may be present in any given beach or dune area.

Erosion of the beach and dunes behind it can be caused by water movement or the wind. Waves and river or stream currents will easily erode sand from a beach or dune area. In areas where such losses are severe or areas where losses are not replaced, it is inadvisable to place structures or facilities of value. Wind will also transport sand where a thick vegetative cover is not present. The dangers of sudden destruction are not present but longer term hazards of inundation are.

Flooding is particularly hazardous in beach and dune areas because of the basic instability of these land-forms. In addition, storm driven waves are powerful as they carry logs and other debris that act as battering rams.

Dune aquifers, because of their very porous nature are susceptible to over-withdrawal and pollution. Because dune sand is not a good filter, pollutants can travel long distances and foul dune aquifers. Some areas such as interdune areas are particularly susceptible because water tables are near the surface. Over-withdrawal of water can also foul a dune aquifer by causing saltwater to intrude. Finally, over-withdrawal of groundwater can kill off stabilizing surface vegetation and ultimately lead to dune erosion.

Sliding may be a hazard where dune slopes exceed 30 degrees, the angle of repose for unconsolidated sand. Development of steeper slopes stabilized only by surface vegetation can trigger sliding if adequate stabilization of the sand substrate is not retained.

2.2 Beach and Dune Use Capabilities

The following discussion of beach and dune use capabilities is based on the analysis provided by the USDA Soil Conservation Service in *Beaches and Dunes of the Oregon Coast*. Table 3, reproduced from that publication, summarizes the tolerances that the various mapped beach and dune forms have for various uses.

2.2a Beach

Beaches are very hazardous environments subject to strong ocean waves and their erosive forces. The beach profile varies considerably throughout the course of a year, undergoing erosion, sometimes sudden, during the winter months and gradual build-up during the summer. The beach acts as the primary dissipater of storm wave energy as the summer sand build-up is redistributed by winter storm waves into off-shore bars.

The harsh beach environment is unsuitable for any type of structure or facility. Elevating structures on fill or by other means does not provide for their safety because they are still located in the area of greatest storm wave attack and erosion of adjacent beach areas will undermine their footings.

The beach is very tolerant of all forms of recreation because little or no vegetation and waves and wind will easily re-sculpt disturbed areas. However, off-road vehicle use should be limited in critical Snowy Plover habitat (See Goal 17 element).

2.2b Active Foredune (FDA)

Active foredunes are growing barrier ridges of sand located immediately above the high tide line and paralleling the beach. They typically have 15% of their surface in open sand patches in the summer and 40% in open sand in the winter. Because of their incomplete surface cover, they are prone to wind erosion. Hazards present in active foredune areas include wind erosion, wave erosion, flooding, and sand inundation.

Table 3 indicates that active foredunes have no tolerance for any type of development. However active foredunes have been developed in Tillamook County with some success where they have become stabilized with dune vegetation over time. In fact, many of the foredune areas identified as active foredunes in the SCS study have become conditionally stable in the years since that study was done. Wave and wind erosion and sand deposition have caused problems in a number of these areas. In the Nedonna, Pacific City, and Neskowin areas, severe wave erosion necessitated the placement of riprap. In the Pacific City area, sand inundates several houses along Sunset Drive every year.

Certain management practices are necessary in order to minimize the hazards of developing on active foredunes. They are as follows:

- 1) Vegetate open sand areas and protect existing vegetation;
- 2) Minimize dune alteration and disturbance of vegetation, temporarily protect disturbed areas and revegetate as soon as possible;
- 3) Locate structures and facilities as far from the beach as possible; and,
- 4) Elevate structures, preferably on piling, to protect against wave damage and to allow for sand build-up.

Active foredunes have little tolerance for forms of recreation other than pedestrian recreation because of the fragile nature of the vegetation present. Off-road vehicle use is a particularly destructive form of recreation on these dune forms. Where possible, access across active foredunes should be limited to elevated walkways.

Active foredunes have no tolerance for sand mining.

2.2c Active Dune Hummocks (H) - Bay Ocean Spit

Active dune hummocks are those hummocks which are actively growing or deflating from wind erosion or deposition. They have no tolerance for development, off-road vehicles, or sand mining. Wind erosion is a hazard associated with this dune form. Wet hummocks that are associated with active dune hummocks present additional hazards of high water tables and quicksand.

A portion of Bayocean Spit is the only area of Tillamook County where this dune type is mapped.

2.2d Recently Stabilized Foredunes (FD)

These are foredunes that have sufficient vegetative cover to retard wind erosion. They are typically larger than active foredunes and have a more diverse vegetative cover. Recently stabilized foredunes may, however, be no more resistant to wave erosion than active foredunes. They are prone to activation if the vegetative cover is removed. Conditionally stable foredunes can be susceptible to wave overtopping as well. Sand transport and dune growth is not as pronounced as with active foredunes but still can cause sand build-up problems around structures.

The Soil Conservation Service indicates that recently stabilized foredunes have a low tolerance for low levels of urban development and no tolerance for deep excavations.

The tolerance of recently stabilized dunes for recreation activities and sand mining is similar to that for active foredunes.

2.2e Open Dune Sand (OS)

Open dune sand, essentially devoid of vegetation, has no tolerance for development. Wind drifted sand is a severe hazard that can readily inundate structures. Advancing open dune sand can also pose hazards to adjacent areas as it covers farmland, forestland, roads, structures, and everything else in its path. This dune form does have a high tolerance for all forms of recreation and sand mining.

2.2f Open Dune Sand Conditionally Stable (OSC)

This dune form includes active open dune sand areas that have been planted to European beachgrass and secondary plants, conditionally stable foredunes that have been flattened by earth moving equipment, and some drained deflation plains.

As with recently stabilized foredunes, this dune form is vulnerable to becoming reactivated when the vegetative cover is removed. Some of these areas are subject to flooding although this typically is hydrostatic flooding rather than velocity flooding. High groundwater may also be a problem in some of these areas.

Pacific City

The Soil Conservation Service identifies this dune form as having a low tolerance for low levels of urban development. It is a less hazardous formation than recently stabilized foredunes and it has some tolerance for deep excavations.

Conditionally stable open sand areas have no tolerance for recreation other than pedestrian forms. It also has no tolerance for sand mining.

2.2g Younger Stabilized Dunes (DS)

These dunes are surface stabilized with vegetation including native, grasses, European beachgrass, shrubs, and trees.

They are distinguished from older stabilized dunes by having less developed soil and cementation. Younger stabilized dunes have a moderate to high suitability for urban development. Use of these areas must proceed with caution, however, because removal of large areas of vegetation exposing the poorly cemented sand below can result in wind erosion and sliding. For this reason, logging, sand mining, ORV use, and deep excavation should not occur indiscriminately.

2.2h Older Stabilized Dunes (ODS)

Older stabilized dunes have high levels of tolerance for urban development. They are well stabilized by vegetation as with younger stabilized dunes but they have a higher level of soil cementation. Because of this, they can better tolerate deep excavation but may be unsuitable for on-site sewage disposal. These dunes have a moderate or high level of tolerance for all forms of recreation and for sand mining.

2.2i Wet Deflation Plain (WDP)

Wet deflation plains have almost no tolerance for development because of high water tables. Some specific areas within mapped deflation may be suitable for low levels of urban development. These areas are intolerant of sand mining and ORV use.

Wet deflation plains in Tillamook County are confined to the Nehalem Spit, Barview County Park, Bayocean Spit, and Nestucca Spit. These are recreation areas where development is slight.

Goal 18 implementation requirement 2 applies to deflation plains that are subject to ocean flooding. Tillamook county is not taking an

exception to this requirement in any area because all mapped wet deflation plains are in state or county parks.

2.2j Wet Interdune (W)

Wet interdunes are diverse sand forms varying from wet open dune sand forms to wet areas in recent and older stabilized dunes. Many wet interdunes are old deflation plains.

Wet interdunes have tolerances similar to those for wet deflation plains. They can tolerate low levels of urban development in certain areas. Development in these areas creates difficulties for construction, drainage, and on-site sewage disposal. Potential groundwater pollution hazards are considered in Section 4.

2.2k Dune Complex (DC)

Areas mapped as dune complex include other dune types occurring together including open sand conditionally stable, active open dune sand, wet interdunes, and stabilized areas. Use suitabilities for this dune form are similar to those for open dune sand. Where conditionally stable open sand is present, there is a higher level of tolerance of development but a lower tolerance for sand mining or recreation.

2.3 Beach and Dune Management Requirements and Findings

Goal 18 includes several requirements for managing uses and activities in beach and dune areas. This section discusses implementation requirements 1, 2, 3, and 6. Implementation requirement 5 is discussed in Section 4.

2.3a Implementation Requirement 1

2.3a.1 Implementation Requirement 1 states that:

Local governments and state and federal agencies shall base decisions on plans, ordinances, and land use actions in beach and dune areas, other than older stabilized dunes, on specific findings that shall include at least:

- (a) The type of use proposed and the adverse effects it might have on the site and adjacent areas;
- (b) Temporary and permanent stabilization programs and the planned maintenance of new and existing

vegetation;

- (c) Methods for protecting the surrounding area from any adverse effects of the development; and,
- (d) Hazards to life, public and private property, and the natural environment which may be caused by the proposed use.

2.3a.2 As Table 3 shows, the adverse effects of developing or otherwise using dune areas varies with the beach and dune types. For example, some areas such as beaches, foredunes, and open sand areas have little or no tolerance for development whereas younger and older stabilized dunes have moderate to high levels of tolerance. For other uses, however, tolerances can be completely different. Beaches have a high tolerance for ORV use whereas younger stabilized dunes have low tolerance.

2.3a.3 Agricultural Uses

In general, Tillamook County is not including beach and dune areas in agricultural zones, F-1 and SFW-20. The only exception is in the Sandlake area, where some areas of Yaquina and Netarts soils are included in these zones. These soil types correspond to younger stabilized dunes and wet interdunes, both of which can tolerate grazing and other agricultural practices. Pasturelands are well established in these areas. Therefore there are no adverse effects or hazards to life, public and private property, and the natural environment anticipated to result from agricultural practices in dune areas in Tillamook County. Customary farm practices are adequate for maintaining vegetation and for protecting surrounding areas. (Please note that this pertains only to farm practices and not to other uses allowed in the farm zone. These are included in Section 2.3a.5 below.)

2.3a.4 Forest Practices

A number of different dune areas have been included in forest zones. Most of these areas are located north of Sand Lake and a part of the Siuslaw National Forest. Tillamook County is relying on the Forest Practices Act to govern forest operations in these areas. (Please note that other uses allowed in the

Forest and SFW-20 zones are included in Section 2.3a.5 below.)

2.3a.5 Sand Mining

Beaches, younger and older stabilized dunes, open dune, and wet interdunes have some tolerance for sand mining. Other dune types have no tolerance for this activity. Sand mining should not occur on any foredunes because it may create a breach or other weakening of the dune. A site investigation is necessary prior to approval of sand mining in all beach and dune areas in order to assess the adverse effects and hazards that may result from development and to determine appropriate methods for protecting the surrounding area from any adverse effects of the development.

2.3a.6 Urban and Rural Development

This section includes all construction of dwellings, buildings, and other structures.

Younger and older stabilized dunes are the most suitable dune forms for urban and rural development. Residential, commercial, and industrial development can easily occur in these areas without creating any adverse effects or hazards on the site or in surrounding areas. Potential hazards, aside from the potential groundwater pollution hazards discussed in Section 4, are wind erosion and deposition due to removal of surface stabilizing vegetation and sliding due to vegetation removal or excavation on slopes greater than 30 degrees, the angle of repose for unconsolidated sand. Development on slopes less steep than 30 degrees will not create adverse effects on the site or in adjacent areas and will not pose hazards to life, public and private property, and the natural environment providing that there is stabilization of disturbed areas with vegetation. Site investigations are necessary prior to approval of development on steeper slopes in order to assess the adverse effects and hazards that may result from development and to determine appropriate methods for protecting the development and the surrounding area.

Areas mapped as conditionally stable open dune sand are rated as having a low tolerance for low levels of urban development. The main hazards present in this dune type are wind erosion, sand deposition, and flooding. (Groundwater

pollution hazards are discussed in Section 4.) Only where vegetation is removed and not restored would there be adverse effects and hazards from wind erosion and sand deposition. The method of protecting the surrounding area from these adverse effects is to minimize vegetation removal and to provide temporary and permanent stabilization of disturbed areas. Almost all conditionally stable dune areas in Tillamook County are subject to flooding, but almost none are exposed to velocity flooding (waves). Flood damages in these areas are water damage, but not the structural damage that is a threat in velocity flooding areas. Methods of protecting the area from the hazards of flooding include flood proofing or elevating structures.

Active foredunes and conditionally stable foredunes have little to no tolerance for urban development. Portions of all of such dune areas are described by FIRM flood hazard maps as being located in either a V zone (velocity zone) or an AO zone (area of shallow flooding). Such dune areas can also be described as subject to ocean undercutting or wave overtopping.

Many of the active foredune and conditionally stable foredune areas in the County were developed before the hazardous nature of such areas was realized. The County is providing for continued residential development on these dune forms only where the area is irrevocably committed to development. The four developing foredune areas that the County is taking an exception to Goal 18 to permit continued residential development and commercial and industrial buildings include the following communities: Cape Meares, Tierra del Mar, Pacific City, and Neskowin. Section 5 of this element contains the findings justifying this exception for selected tax lots in each community.

For residential infill within the boundaries of the communities of Cape Meares, Tierra del Mar, Pacific City, and Neskowin, a site investigation report which addresses the ocean erosion rates at the site will be required prior to residential development proposed in areas identified as an AO, B, or C flood hazard zone. The County is adopting findings that residential infill in the AO, B, and C flood zones in these areas will conform to the remaining criteria in Implementation Requirement 1 (Section 2.3a.6 of this element).

Site investigation reports are necessary prior to the approval of development in all beachfront areas identified by the FIRM flood hazard maps as a velocity (V) zone or for development in the remaining active and conditionally stable foredune areas in the County, in order to assess the adverse impacts and hazards that may result from the development and to determine methods for protecting the development and surrounding area from such proposed development.

Certain management practices are necessary in order to minimize the hazards of developing on foredunes. They are:

- 1) Vegetate open sand areas and protect existing vegetation;
- 2) Minimize dune alteration and disturbance of vegetation, temporarily protect disturbed areas and revegetate as soon as possible;
- 3) Locate structures and facilities as far from the beach as possible; and,
- 4) Elevate structures, preferably on piling, to protect against wave damage and to allow for sand build-up.

Little or no development is appropriate on beaches because of the magnitude of hazards present there. These include velocity flooding, wave and wind erosion, and sand deposition. Beaches have been included in development zones only because they are part of front and abutting ownerships that include non-beach upland areas that are developable. The beach portion of these ownerships, however, must not be developed unless there is some overriding public need. Examples of this include the Cape Kiwanda boat ramp, necessary for dory access to the ocean, and the sewage outfall for the Netarts Oceanside Sanitary District. In such cases, a site investigation is necessary prior to approval of development in order to assess the adverse effects and hazards that may result from development and to determine appropriate methods of protection.

Open dune sand has no tolerance for development because of the wind erosion and deposition hazards present. This dune form has been included in development zones only where it is incidental to other dune types. Some development on the

margins of areas mapped as open dune sand may be possible providing that the sand surface can be stabilized and that dunes are not moving towards the area. A site investigation is necessary prior to approval of development in order to assess the adverse effects and hazards that may result from development and to determine appropriate methods of protection.

Wet deflation plains and wet interdunes can tolerate low levels of development in very limited instances. Hazards may include ocean flooding, ponding, and groundwater contamination (included in Section 4). Very little of these dune types have been included in development zones. Where these areas are subject to ocean flooding, development is permitted only if the areas are irrevocably committed to development (See Section 2.3b). In all cases, a site investigation is necessary in order to assess the adverse effects and hazards that may result from development and to determine appropriate methods for protecting the surrounding area from any adverse effects of the development.

Dune complexes, because of their varied nature can not be assessed in a general manner. Site investigations are necessary prior to development in order to assess the adverse effects and hazards that may result from development and to determine appropriate methods for protecting the surrounding area from any adverse effects of the development. Very little of this dune type is included in County development zones.

2.3a.7 Findings - Conformance to Goal 18 Implementation Requirement 1 for Residential Infill of Goal 18 Exception Areas

For residential infill within the boundaries of the Goal 18 exception areas defined for the communities of Cape Meares, Tierra del Mar, Pacific City, or Neskowin, the County is adopting the following findings that continued residential infill will conform to the criteria in Implementation Requirement 1. These findings apply only to residential development, other than multi-family dwellings, proposed in an AO, B, or C flood hazard zone.

Dune landforms present at the communities of Cape Meares, Tierra del Mar, Pacific City, and Neskowin are for the most part conditionally stable foredunes, susceptible to varying degrees of ocean flooding, ocean undercutting, or wave over-topping.

Prior to development in a coastal high hazard area (V zone) in one of these areas, a site investigation will be required prior to construction. The site investigation report requirement is implemented through Section 3.085 of the Beach and Dune Overlay zone.

- “(1) The type of use proposed and the adverse effects it might have on the site and adjacent areas.”
- (a) The type of proposed use is single-family residential buildings (including mobile homes) and duplexes, as provided for in the County zoning designations of Rural Residential (RR), and Low to High Density Residential (R1, R2, R3).

Past and future development in these areas is anticipated to be characterized by single-family residential structures.

- (b) Sensitive environmental resources such as rare or endangered species or endangered species or unique habitat:

The affected areas do not constitute an important or critical wildlife habitat. Bayocean peninsula and Nestucca Spit, which are adjacent to the communities of Cape Meares and Pacific City, do have unique wildlife habitats such as nesting areas for snowy plover. These areas are protected by a Goal 17 significant shoreland habitat designation in the Comprehensive Plan.

- (c) Dune Vegetation: The foredunes and interdune systems present in the four community areas are primarily conditionally stable dunes mixed with older stabilized foredunes. Impacts on dune vegetation will be minimized through the requirements of Section 3.085, Beach and Dune Overlay zone, of the Land Use Ordinance. Land grading proposals in dune areas must demonstrate that the removal of dune vegetation is limited to what is necessary for the placement of structures and public utilities. Also, plans for temporary and permanent dune stabilization, and the planned maintenance of restabilized areas, must be submitted by the developer for dune areas disturbed during building site preparation.
- (d) Wind Erosion and Sand Deposition: Section 3.085 of the Land Use Ordinance requires that vegetation removal shall be limited to what is necessary to place buildings or to install utilities and that following construction, all excavated areas are

stabilized. These requirements will minimize wind erosion and sand deposition onto adjoining properties. The location of new oceanfront buildings, landward of the crest of the active foredune, will also minimize sand inundation of buildings in active foredune areas (Section 3.085 (4) (a) (1) (b)). Findings to allow the removal of sand which periodically builds up against houses on foredune lots in Tierra del Mar, Pacific City, and Neskowin are provided in section 5.6 of this element.

- (e) Coastal Erosion and Shoreline Protection Measures: There is the potential for coastal erosion of all beachfront property in the County. Only in Pacific City and Tierra del Mar have landowners utilized riprap to impede erosion in the past. Presently these areas are not identified in the Comprehensive Plan as experiencing significant erosion hazards.

Where new oceanfront development is proposed in a velocity (V) flood hazard zone, a site investigation report will be required. At a minimum, all new oceanfront residential development will be setback in line with existing dwellings, unless the site investigation report provides evidence that a more conservation building setback line is necessary. Where new oceanfront residential development is proposed in an AO, B, or C flood hazard zone and there is evidence of recent active ocean erosion, a site investigation report will be required which will specifically address beach and dune erosion rates. Evidence of active beach or foredune dune erosion can include information provided by the following: (1) permits for shoreline protection measures that have been issued in the area within the last five years and (2) results of field investigations by County officials or staff of the State Parks and Recreation Division and Division of State Lands.

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In all cases, where shoreline protective structures are requested, they will be designed and sited to minimize impacts to adjacent properties, as required by Section 3.085 of the Land Use Ordinance.

- (f) Groundwater Resources: Most of the dune areas in the County where there is existing development or which are planned for development are serviced with public water supplies, not by individual wells. These include the Tierra del Mar area, the Pacific City area, and the Neskowin area. Residential infill in these areas will have less significant impacts on groundwater resources than in an undeveloped dune area.

Most of these built and committed dune areas are likewise served by public sanitary sewers. Areas not served by public sewers include Tierra del Mar and Neskowin. The formation of a Neskowin sewer district is anticipated within the next five years. The quality of groundwater in these areas will be protected consistent with known limitations of subsurface sewage disposal according to County sanitation and DEQ requirements.

- (g) Historical or Archaeological Sites: There are no national, state, or county identified historical or archaeological sites in these areas.
- (h) Air and Water Quality: Residential development permitted by County zoning designations in dune areas will have no adverse effect on air or water quality.

“(2) Temporary and permanent stabilization programs and planned maintenance of new and existing vegetation.”

- (a) This requirement is implemented through Section 3.085 of the Land Use Ordinance. The ordinance requires that plans for temporary and permanent stabilization programs, and the planned maintenance of restabilized areas, are provided by the developer and that the site is stabilized within nine months of the termination of major construction activities.

“(3) Methods of protecting the surrounding area from any adverse effects of the development; and “

Providing residential infill in each of the four oceanfront communities mentioned above will have less significant impacts to surrounding areas than new residential development in an undeveloped oceanfront area. Through the requirements of the specific zone in which the development is located and standards for development in beach and dune areas, the Land Use Ordinance will ensure that methods will be employed to protect development on the property as well as development on adjoining properties. For example, the Land Use Ordinance provides review standards for shoreline protective structures, construction requirements, and building designs in active dune and flood hazard areas, building height

requirements, minimum lot size, and building setbacks.

“(4) Hazards to life, public and private property, and natural environment which may be caused by the proposed use.”

Providing residential infill on vacant lots in built and committed dune areas will present less significant hazards to life, property, or the natural environment compared to new residential development in a non-built and committed oceanfront dune area. As provided in Findings 1 (b) through (h), the adverse effects of continued residential infill in these areas have or will be addressed through requirements of the Land Use Ordinance.

2.3b Implementation Requirement 2

Implementation Requirement 2 states that:

Local governments and state and federal agencies shall prohibit residential developments and commercial and industrial buildings on beaches, active foredunes, on other foredunes which are conditionally stable and that are subject to ocean undercutting or wave overtopping, and on interdune areas (deflation plains) that are subject to ocean flooding. Other development in these areas shall be permitted only if the findings required in (Implementation Requirement 1) are presented and it is demonstrated that the proposed development:

- (a) Is adequately protected from any geologic hazards, wind erosion, undercutting, ocean flooding, and storm waves; or is of minimal value; and
- (b) Is designed to minimize adverse environmental effects.

Tillamook County is continuing to allow development in foredune areas which are irrevocably committed to development. An exception to this Goal requirement is included in Section 5. In all other foredune areas and interdune areas subject to ocean flooding, this goal requirement is being met.

2.3c Implementation Requirement 3

Implementation Requirement 3 states that:

Local governments and state and federal agencies shall regulate actions in beach and dune areas to minimize the resulting erosion. Such actions include, but are not limited to, the destruction of desirable vegetation (including inadvertent destruction by moisture loss or root damage), the exposure of stable and conditionally stable areas to erosion, and construction of shore structures which modify current or wave patterns leading to beach erosion.

Section 2.3a reviewed the problems of vegetation destruction and the exposure of stable and conditionally stable areas to erosion. Policies below address those problems. Section 3 addresses the problem of erosion caused by shore structures and Section 4 addresses the problem of destruction of vegetation by moisture loss.

2.3d Implementation Requirement 4

Foredune erosion

Implementation Requirement 4 requires that foredunes shall be breached only to replenish sand supply in interdune areas, or on a temporary basis in an emergency (e.g., fire control, cleaning up oil spills, draining farm lands, and alleviating flood hazards), only if the breaching and restoration after breaching is consistent with sound principles of conservation.

Tillamook County is taking an exception to this requirement in order to allow removal of sand from houses located on foredunes that are being inundated. This exception is contained in Section 5. Otherwise the county is adopting policies and implementing ordinances that are consistent with this goal requirement.

2.4 Policies

2.4a All decisions on land use actions in beach and dune areas other than older stabilized dunes shall be based on the following specific findings unless they have been made in the comprehensive plan:

- (a) The type of use proposed and the adverse effects it might have on the site and adjacent areas;
- (b) The temporary and permanent stabilization programs and the planned maintenance of new and existing vegetation;
- (c) Methods for protecting the surrounding area from any adverse effects of the development; and,
- (d) Hazards to life, public and private property, and the natural

environment which may be caused by the proposed use.

- 2.4b Development in beach and dune areas shall comply with the requirements of the Flood Hazard Overlay zone.
- 2.4c Grading and vegetation removal shall be the minimum necessary to accommodate the development proposed. Removal should not occur more than 30 days prior to the start of construction. Open sand areas shall be temporarily stabilized during construction and all new and pre-existing open sand areas shall be permanently stabilized with appropriate vegetation.
- 2.4d Excavated, filled, or graded slopes shall not exceed 30 degrees unless adequate structural support is provided. Clearing of these slopes shall be minimized and temporary and permanent stabilization measures shall be applied to safeguard the slope from erosion and slumping.
- 2.4e Cluster development in dune areas is strongly encouraged. Development shall occur on the most stable portion of the site.
- 2.4f Residential, commercial, and industrial buildings shall be prohibited on beaches, active foredunes, on other foredunes which are conditionally stable and that are subject to ocean undercutting or wave overtopping, and on interdune areas (deflation plains) that are subject to ocean flooding except on lots where such development is specifically authorized by Section 5. Ocean flooding includes areas of velocity flooding and associated shallow marine flooding mapped by the Federal Emergency Management Agency (FEMA). Other development in these areas shall be permitted only if the findings required in policy 2.4a are presented and it is determined that the proposed development:
 - (a) Is adequately protected from any geologic hazards, wind erosion, undercutting, ocean flooding and storm waves; or is of minimal value; and,
 - (b) Is designed to minimize adverse environmental effects.
- 2.4g Foredunes shall be breached only on a temporary basis in an emergency (e.g., fire control, cleaning up oil spills, draining farm lands, and alleviating flood hazards), and only if the breaching is consistent with sound principles of conservation. Policy 2.4a shall apply.

2.4h Because of the sensitive nature of active and conditionally stable dunes, vehicular traffic and recurring pedestrian and equestrian traffic should be limited to improved roads and trails.

2.4i Tillamook County shall continue to participate in the joint management program for off-road vehicle use and associated activities in the Sand Lake area.

3. FOREDUNE MANAGEMENT

3.1 Introduction and Inventory

Foredunes are an inherently unstable landform, subject to the hazards of wind deposition and erosion, and ocean flooding and erosion. They function not only as an effective natural storm wave defense system for shoreline development, but they also serve as a reservoir of sand for rebuilding the beach during severe ocean storms. Three characteristics of a foredune contribute to their ability to withstand ocean flooding: bulk, height, and shape. The greater the bulk of a foredune, the more resistance the dune has to ocean flooding and erosion. The greater the height of the dune, the greater its ability to withstand wave overtopping or breaching that could flood back dune areas. A smooth, low, sloping foreslope will direct ocean waves up the foredune, dissipating wave energy.

Since storm resistance increases with dune height, large areas of a foredune that have been lowered by grading, either in preparation for development, or to provide for easy beach access, or to provide an ocean view, can increase the potential for ocean flooding and erosion damage to shoreline development. For this reason, Goal 18 prohibits new residential development and commercial and industrial building in active foredunes and other foredune which are conditionally stable and that are subject to ocean undercutting or wave overtopping.

Although undeveloped foredunes in the County remain protected by Goal 18, many active foredune and conditionally stable foredune areas were platted for residential subdivisions before the unsuitability of such areas for development was realized. In the Necarney City, Nedonna, Tierra del Mar, Pacific City and Neskowin areas sand periodically inundates houses on foredune lots. The County is providing for sand removal under emergency conditions in the Tierra del Mar, Pacific City, and Neskowin areas.

Necarney City is within the city of Manzanita urban growth boundary area, however their Comprehensive Plan does not provide for foredune grading. Nedonna is within the City of Rockaway Beach urban growth boundary and

a Foredune Management Plan pursuant to Goal 18 implementation requirement 7, is included in the City's Comprehensive Plan to allow foredune grading.

The Nedonna Beach Foredune Management Plan consists of three parts: a Technical Report analyzes the factors affecting the stability of the dunes in the area, a Grading Plan which specifies how and when grading may occur in Nedonna Beach, and a Management Plan which recommends how other alterations should be regulated to enhance the stability of the foredune. While this foredune study focused on the Nedonna/Rockaway Beach shoreline, many of the management recommendations, standards for foredune grading, and general information on coastal processes can be applied to the Tierra del Mar, Pacific City, and Neskowin foredune areas, when the County develops Foredune Management Plans for these areas.

3.2 Management Requirements

Implementation Requirement 7 states "Grading or sand movement necessary to maintain views or to prevent sand inundation may be allowed for structures in foredune areas only if the area is committed to development and only as part of an overall plan for managing foredune grading".

3.3 Policies

3.3a A foredune grading plan in areas subject to Goal 18 Implementation Requirement 7 shall include the following elements based on consideration of factors affecting the stability of the shoreline: (1) sources of sand, (2) ocean flooding, (3) patterns of accretion and erosion (including wind erosion), and (4) effects of beachfront protective structures and jetties. The plan shall:

- (a) Cover an entire beach and foredune area subject to an accretion problem, including adjacent areas potentially affected by changes in flooding, erosion, or accretion as a result of dune grading;
- (b) Specify minimum dune height and width requirements to be maintained for protection from flooding and erosion. The minimum height for flood protection is 4 feet above the 100-year flood elevation;
- (c) Identify and set priorities for low and narrow dune areas which need to be built up;
- (d) Prescribe standards for redistribution of sand and temporary

and permanent stabilization measures including the timing of these activities; and,

(e) Prohibit removal of sand from the beach-foredune system.

3.3b Sand on foredune areas subject to an exception to Goal 18 Implementation Requirement 6 shall be removed only if necessary as part of an approved plan for development or to remove sand which is inundating existing structures.

Removal shall be the minimum necessary to accomplish the purpose and shall be stabilized according to sound standards of conservation.

3.3c Tillamook County strongly urges that the Department of Land Conservation and Development initiate studies of dune management for view maintenance in the communities of Pacific City, Tierra del Mar, and Neskowin.

4. COASTAL EROSION

4.1 Inventory

Erosion is the primary geologic hazard in beach and dune areas. Rates of erosion in these areas can be very rapid because of the unconsolidated nature of the sand land forms. One vivid example of such erosion in Tillamook County was the destruction of the resort town of Bayocean on the Bayocean Spit. From 1940 to 1960, coastal erosion occurred at an average rate of 50 feet per year eventually resulting in the breaching of the spit in 1952. The following discussion and policies consider the land management issues related to coastal erosion. Erosion of coastal land forms other than beaches and dunes is included in this section because of the related nature of the hazards involved. The Beaches and Dunes Handbook for the Oregon Coast was the source for this discussion except where noted otherwise.

Map 7 summarizes coastal erosion, storm wave damage, and landslide hazards along the Clatsop, Tillamook, and Lincoln County coasts. This map also shows the number of structures which have been damaged or destroyed. Maps 8, 9, and 10 show hazards for the Tillamook County coastline in more detail.

Tillamook County's coastline is composed of a set of beach reaches located between major coastal headlands which include Cape Falcon, Cape Meares, Cape Lookout, and Cascade Head. (See figure 1). Sand moves north or south along the different beach reaches depending on the season. In the summer, when prevailing winds and waves are from the northwest, beach

sand gradually moves southward. In the winter, sand moves northward in response to the wind and waves which come from the southwest. Figure 2 shows the direction of summer and winter winds and coastal currents. There is no net movement of sand when averaged over several years.

Sand is lost from these beach reaches primarily by wind transport into dune areas and by offshore water transport into deeper water and submarine canyons. New sand is carried to these beaches primarily by sea cliff erosion. The gains and losses of beach sands on most Oregon beach reaches are small.

Erosion of the beach and adjacent dunes occurs on a yearly cycle. Winter storm waves erode the beach and deposit sand in offshore bars. The beach profile steepens as a result. In the summer, gentler waves redistribute the sand in the offshore bars back onto the beach and form a wide berm and a gentle beach profile. Thus the beach is a dynamic protector of adjacent upland areas from wave erosion. If summer beach build-up does not equalize winter losses over the period of several years, there is a net erosion of the beach. Maps 8, 9, and 10 show where this has occurred over the past 40 years.

Maps 8 through 10 show general erosion trends along portions of the Tillamook Coast. Although a particular area is shown as stable or prograding on these maps, it does not mean that the areas are not subject to severe winter storms which can threaten homes and other structures. For example, the Nedonna area which is shown as prograding on Map 8 was subject to heavy erosion in 1953 (Stembridge, p. 67) and in the winter of 1971-1972 (Schlicker, p. 115). Riprap was placed along the beach in the northern portion of the Nedonna Beach subdivision to protect homes from further erosion. The Cape Kiwanda area which is shown in Map 7 to be erosion stable, suffered severe erosion during the winter of 1977-1978. Large portions of the foredune were lost and riprap was placed to protect homes. The Nestucca Spit was breached by the 23 foot high breakers.

In any coastal area there are localized embayments of erosion that are the result of rip currents. These embayments may extend through the beach and provide a corridor for wave attack on the adjacent foredunes or other landforms. Rip currents were an important factor in the erosion of the Nestucca Spit. Tillamook County's flood insurance rate maps show major areas where low beach and dune permits storm waves to pass beyond foredunes to subject the dunes behind them to wave erosion. This is especially prevalent in the Neskowin area and is shown on Map 11.

Foredunes are the second line of defense against wave attack in most beach areas. They serve as a direct barrier to flooding as well as a dynamic buffer

which supplies sand to eroding beaches. They are inherently unstable landforms subject to erosion (Clark, p. 336).

Ocean erosion also impacts landforms other than foredunes. Map 8 shows that the Neahkahnie area, a coastal terrace, is slowly retrograding. Map 9 shows that the Short Beach and Oceanside area, a mountain scarp, coastal terrace, and older stabilized dune is slowly retrograding as well. Cascade Head is also slowly retrograding as is shown on Map 10.

4.2 Management Considerations

The primary means of guarding residences or other structures from damage due to coastal erosion is to locate them back from any eroding coastline. Structures should not be located on foredunes, but if development must occur on the foredune, as in committed areas, then structures should be located as far back as possible on the foredune. On coastal bluffs it is also important to minimize added weight near the edge of the bluff and to properly drain the site to minimize seepage into the ground.

In cases of severe erosion, it may be necessary to use some means of structural shoreline stabilization such as a revetment or seawall. These structures, when properly designed, can withstand the force of ocean waves and protect the shoreline behind them. They do however have impacts which are exacerbated if they are improperly designed. These include visual impacts and impacts on erosion in the surrounding area.

The visual impact depends on the size and type of structure. Revetments, especially riprap revetments, have the least potential for visual disruption because they may be covered by summer sand build-up. The impacts of various structural shoreline stabilization methods on the beach and surrounding shoreline areas is listed in Table 4.

TABLE 4

EFFECTS ON COASTAL PROCESSES AND ADJACENT PROPERTIES

STRUCTURE	ANTICIPATED EFFECT
Bulkheads	Protect eroding shorelines that may have been supplying material to downdrift areas, which may then experience accelerated erosion. The fronting beach may experience increased erosion due to wave reflections.
Revetments	Protect eroding shorelines that may have been supplying material to downdrift areas, which may then experience accelerated erosion.
Breakwaters	Diminished wave energy behind such structures induces deposition. If the amount of sediment accumulation is significant, the downdrift shore may experience accelerated erosion.
Groins	Impede longshore transport and induce sedimentation. The downdrift shoreline may experience accelerated erosion due to lack of material supply. (See note below)

Source: Low Cost Shore Protection, p. 77

NOTE: In Oregon where there is no net littoral drift, there would probably be no net erosion but the disruption of winter drift would probably accelerate erosion of downdrift areas in the winter. There would be net erosion however where groins are not perpendicular to the beach. See Komar's discussion on jetties in the Beaches and Dunes Handbook of the Oregon Coast.

There are particular concerns with structural stabilization of sea cliffs since they are the principal source of new sand for beaches.

Sand mining of beaches and dunes can also affect shoreline erosion. Along most of the Oregon coast, the sources and natural losses of beach sands are quantitatively small. For this reason, removal of beach sand by sand and gravel companies or others may have a major impact on the beach, this unnatural loss being a major factor in the total budget of sediments. Komar concludes that the annual removal of 12,000 cubic meters of sand annually from 1965-1971 contributed to the dramatic erosion of the Siletz Spit. The impact that sand mining has depends on the quantity of sand removed and the total available sand supply on the beach reach where it is being removed.

Beach logs can play an important role in retarding beach erosion because they act as buffers which absorb some of the force of storm waves.

(Lindberg, p. 5) (Komar, p. 50). They also act as sand traps which assist in the formation of new foredunes and in the restoration of existing storm damaged foredunes. The removal of beach logs will reduce the protective function that they provide and may subject adjacent coastal areas to significant increases in erosion and flooding hazards.

The Oregon Department of Transportation regulates the removal of beach logs west of the zone line. Such removal is prohibited unless it can be shown to be a public benefit. Among their management objectives for log removal is the protection of shorelines subject to erosion. They do not regulate firewood or souvenir wood removal.

4.3 Management Requirements

Goal 18 Implementation Requirement 1, discussed in Subsection 2.3 of this element requires an evaluation of all uses in beach and dune areas other than older stabilized dunes. The impacts of most uses were discussed in that subsection. The impacts of sandmining in beaches was briefly discussed in Section 2.3 but was elaborated on in this section because of the impacts on coastal erosion. Policies below and implementing measures are designed to comply with this requirement.

Goal 18 Implementation Requirement 3, discussed in Subsection 2.3 of this element, requires that:

Local governments shall regulate actions in beach and dune areas to minimize the resulting erosion. Such actions include construction of shore structures which modify current or wave patterns leading to beach erosion.

The discussion in Subsection 3.1 evaluated the anticipated impacts of shore structures on erosion. Policies below and implementing measures adopted pursuant to them are designed to minimize erosion caused by shore structures.

Goal 18 Implementation Requirement 5 regarding beachfront protective structures reads as follows:

Permits for beachfront protective structures shall be issued under ORS 390.605 - 390.770, only where development existed on January 1, 1977. Local comprehensive plans shall identify areas where development existed on January 1, 1977. For the purposes of this requirement and implementation requirement 7 "development" means houses, commercial and industrial buildings, and vacant subdivision lots which are physically improved through the construction of streets

and provision of utilities to the lot and includes areas where an exception to (2) above has been approved.

Policies below and implementing measures adopted pursuant to them are designed to comply with this goal requirement.

4.4 Policies

- 4.4a The removal of sand from beaches shall be permitted only where a geological investigation establishes that a historic surplus exists at the site and that it can be removed without impairing the natural functions of the beach and dune system, water circulation, and littoral drift. Compliance with ORS 390.275 is also required.
- 4.4b Tillamook County supports the efforts of the Oregon Department of Transportation to regulate the removal of logs west of the zone line particularly in areas where logs play an important role in protecting adjacent upland areas from erosion. Tillamook County discourages the removal of logs east of the zone line where they help stabilize dune areas.
- 4.4c Beachfront protective structures (sea walls, bulkheads, riprap, and other revetments) are permitted only where development existed on January 1, 1977 or where buildings are authorized by Section 5.

For the purposes of this requirement, "development" refers to the definition of development in Implementation Requirement 5 above.

Tillamook County has 61 miles of shoreline along the Pacific Ocean. Four beachfront communities in the County, (i.e. Cape Meares, Tierra del Mar, Pacific City, and Neskowin) totaling 11 miles of ocean shoreline, have approved exceptions to Goal 18 Implementation Requirement 2 to allow continued residential development. The findings for justifying these exceptions, and the foredune lots where permits for beachfront protective structures can be issued, are contained in Section 5 of this element.

An inventory of beach and dune areas within the remaining 50 miles of shoreline was prepared to identify where development existed on January 1, 1977. The inventory was based on Tillamook County building permit records and the 1973 through 1978 Oregon State Highway Ocean Shores aerial photos of Tillamook County. Structures built as of January 1, 1977, are identified on the 1978 Oregon State Highway Ocean Shores aerials. These 1978 ODOT aerials are

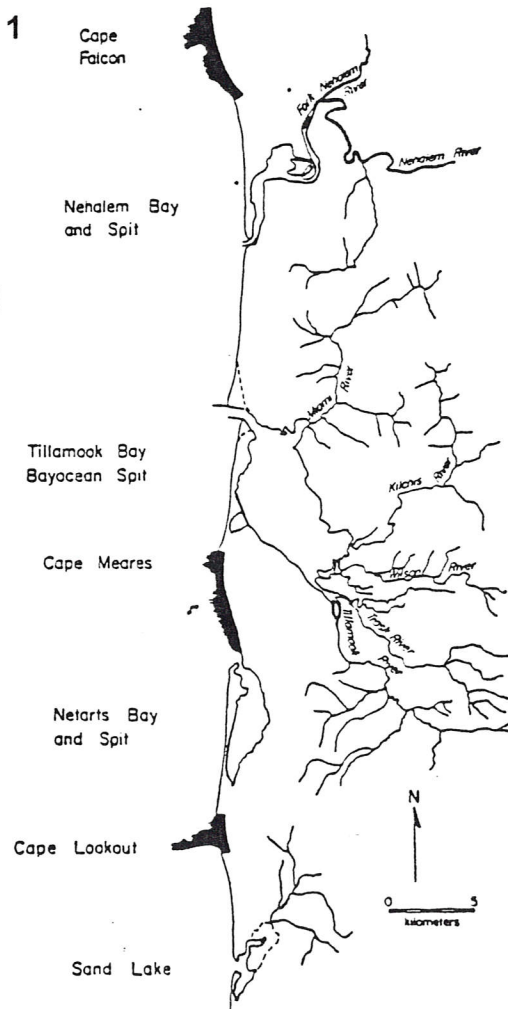
adopted as part of the Goal 18 element of the Comprehensive Plan to meet Goal 18 Implementation Requirement 5.

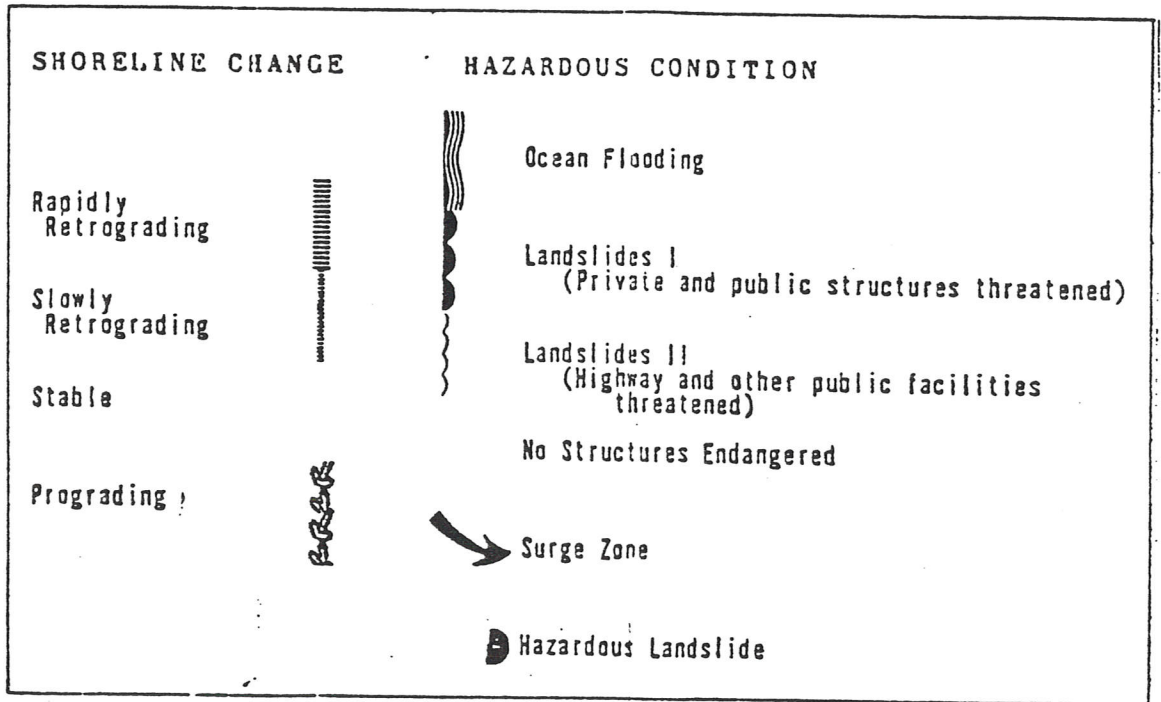
The results of the inventory can be briefly summarized according to ownership (public or private) of the shoreline in Tillamook county. All ocean shoreline in public ownership was determined to be undeveloped for purposes of Goal 18 implementation requirement 5 except for an area within Cape Lookout State Park, where riprap has been placed to protect the day use area. The remaining areas on the ODOT aerials are scattered pockets of developed ocean shoreline in private ownership.

- 4.4d The shoreline stabilization policies in Section 7.5 of the Goal 16 element shall apply to beachfront protective structures.
- 4.4e Policy 2.4a shall apply to beachfront protective structures.
- 4.4f Shoreline protection measures shall not restrict existing public access.
- 4.4g In selecting sites for the disposal of dredged spoils, sites that allow for the nourishment of eroding beaches shall be preferred.

FIGURE 1

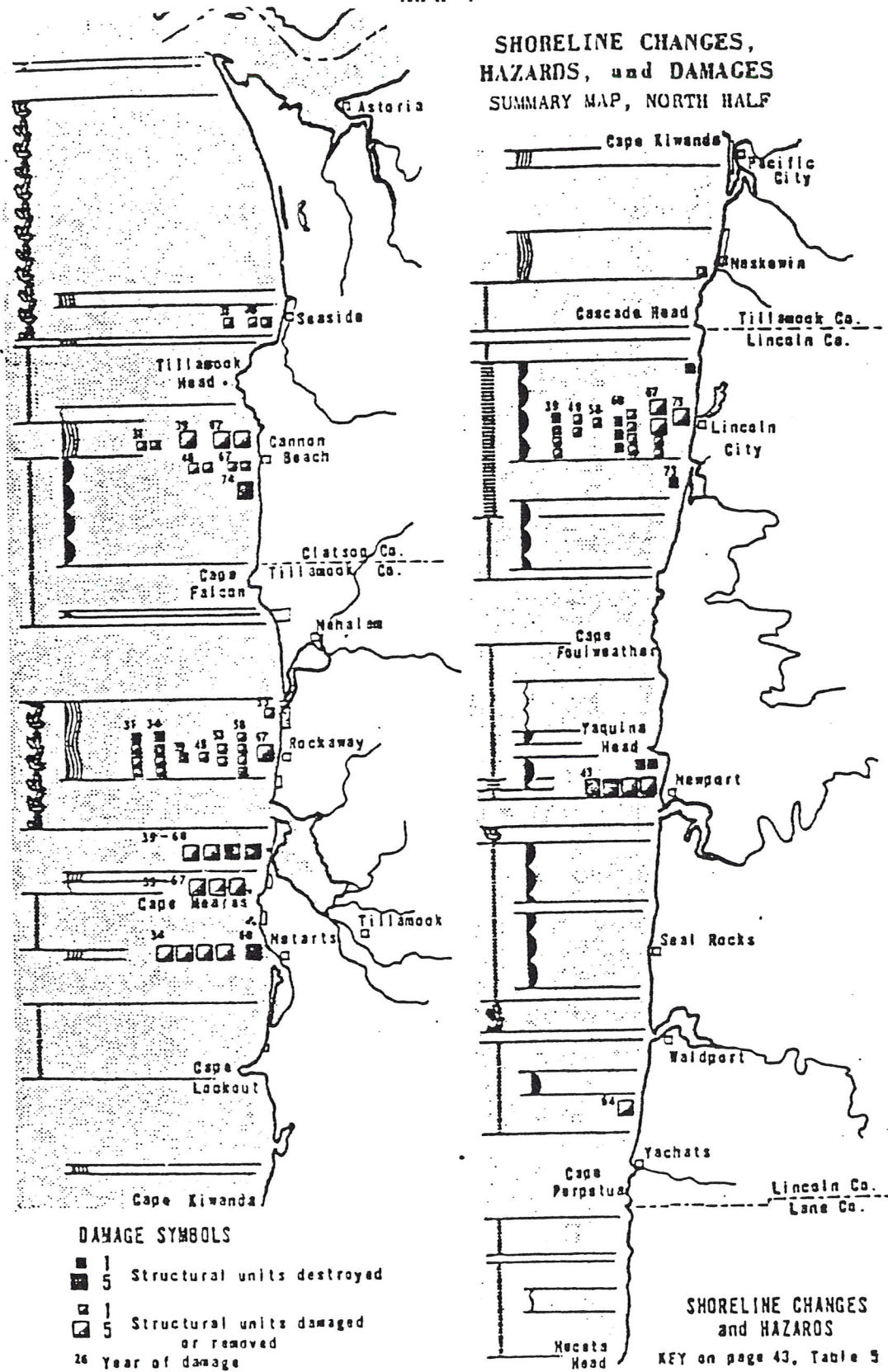
Figure 1. A portion of the north Oregon coast illustrating how it consists of a series of pocket beaches separated by pronounced rocky headlands.
Source: Komar





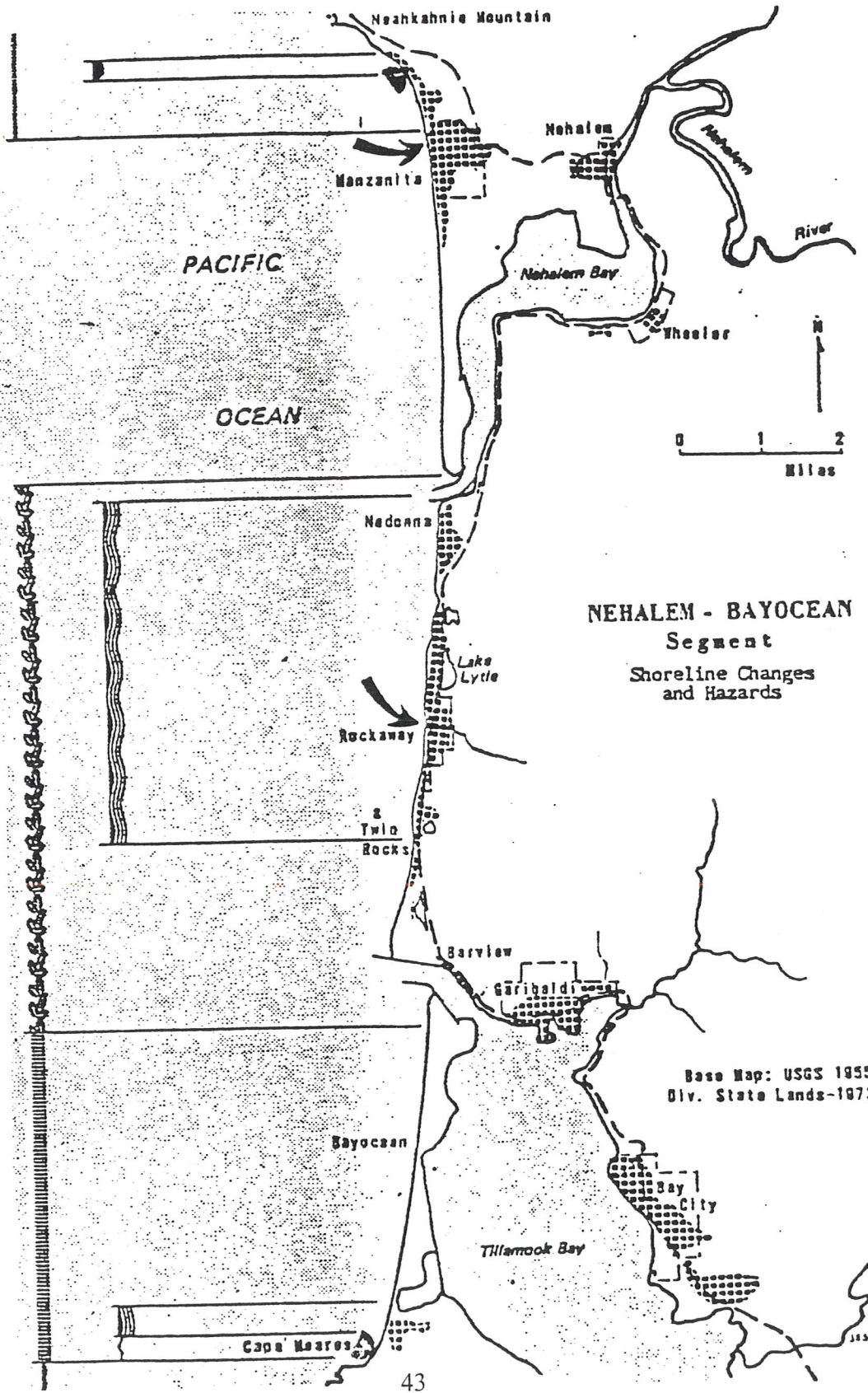
MAP 7

SHORELINE CHANGES,
HAZARDS, and DAMAGES
SUMMARY MAP, NORTH HALF



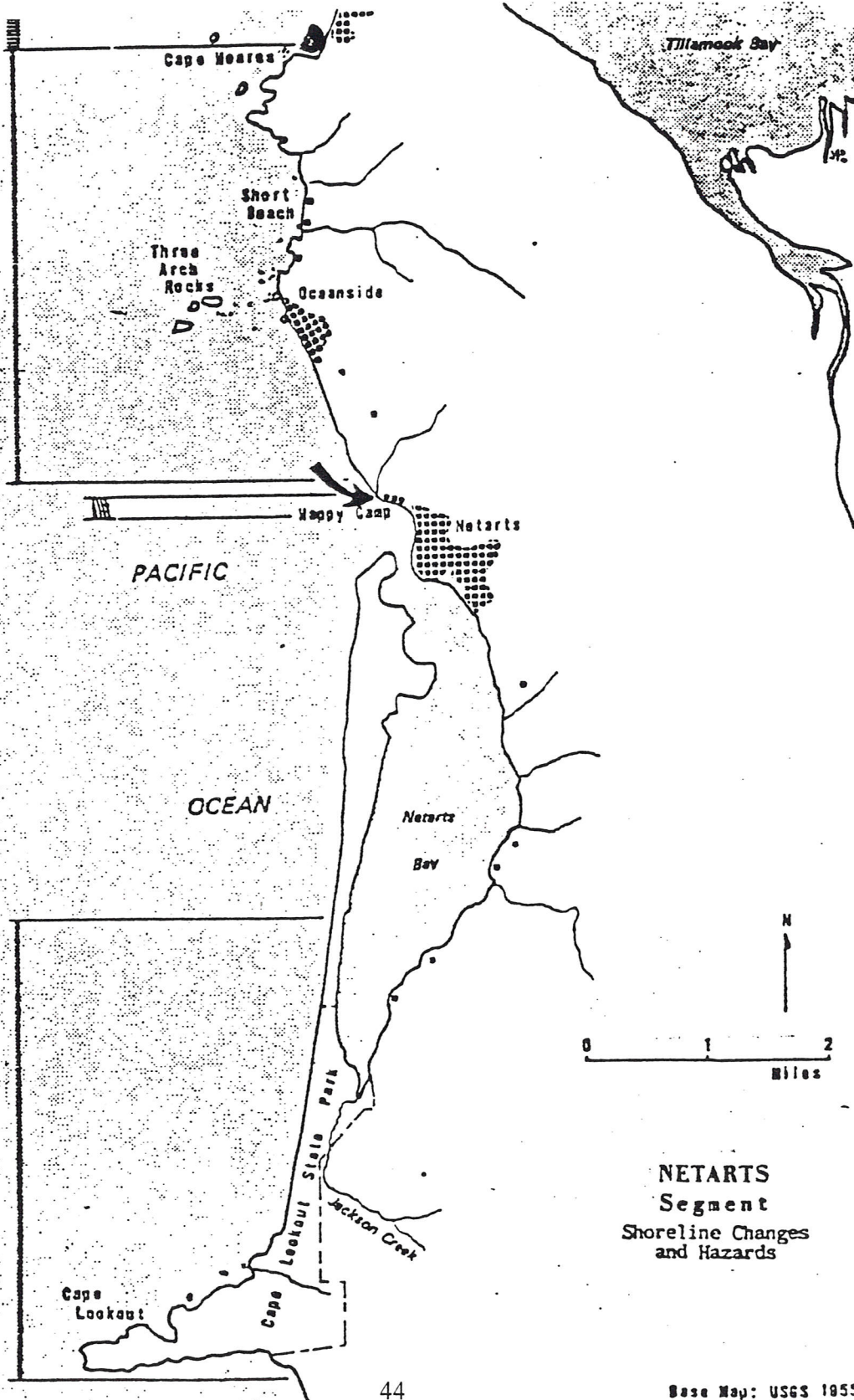
source: Stembridge

MAP 8



source: Stembridge

MAP 9



NETARTS
Segment
Shoreline Changes
and Hazards

MAP 10

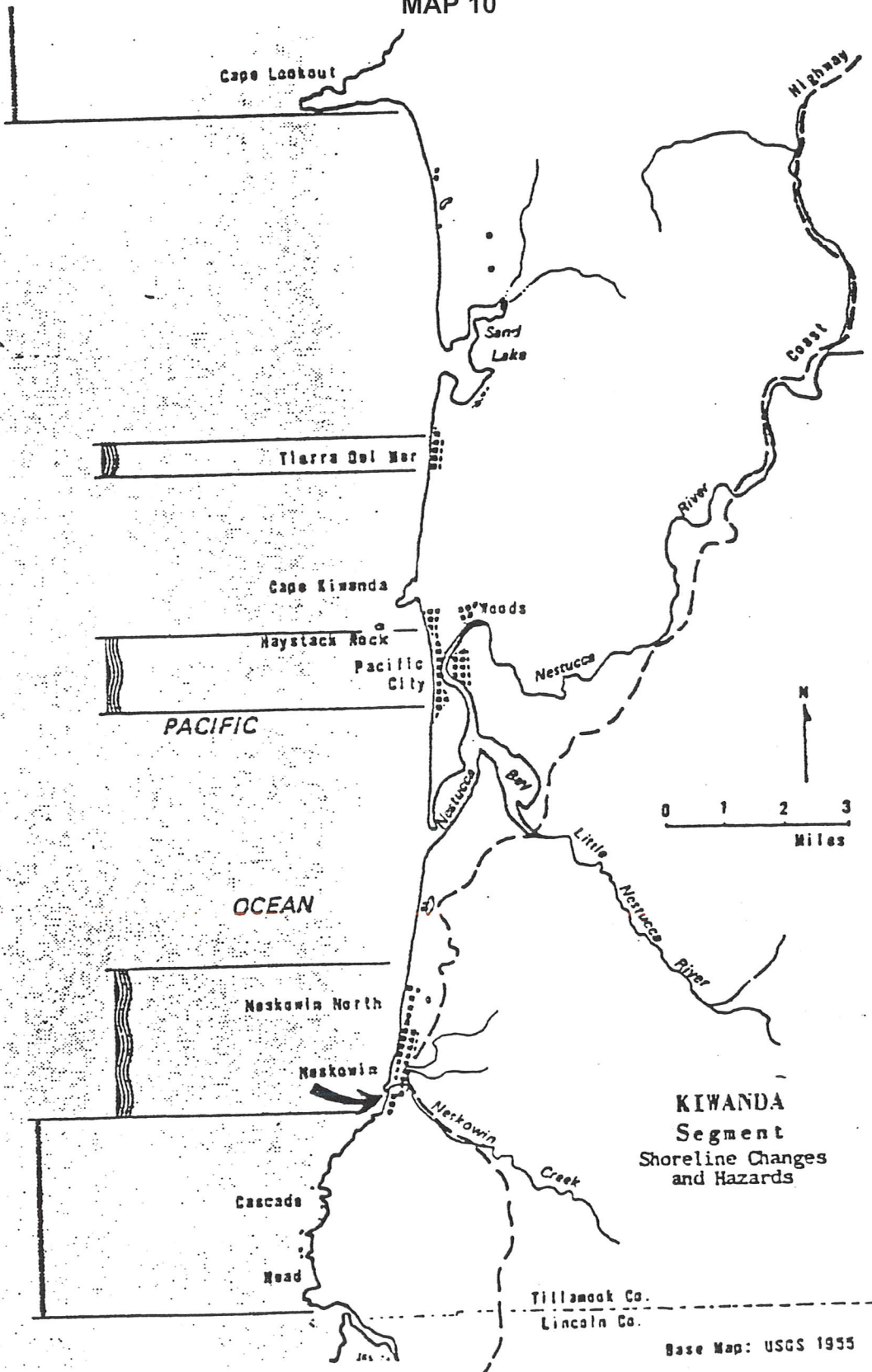
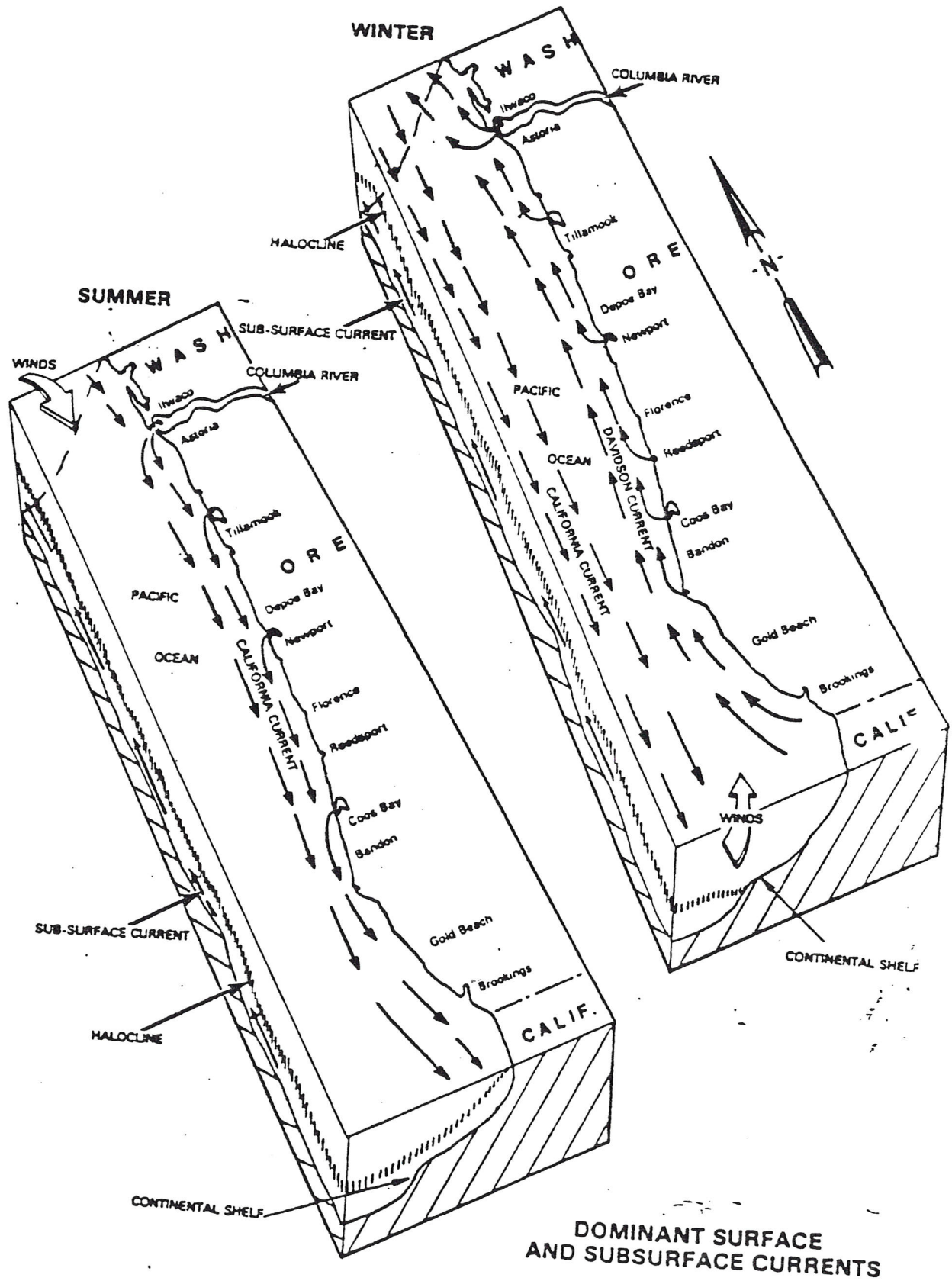


FIGURE 2



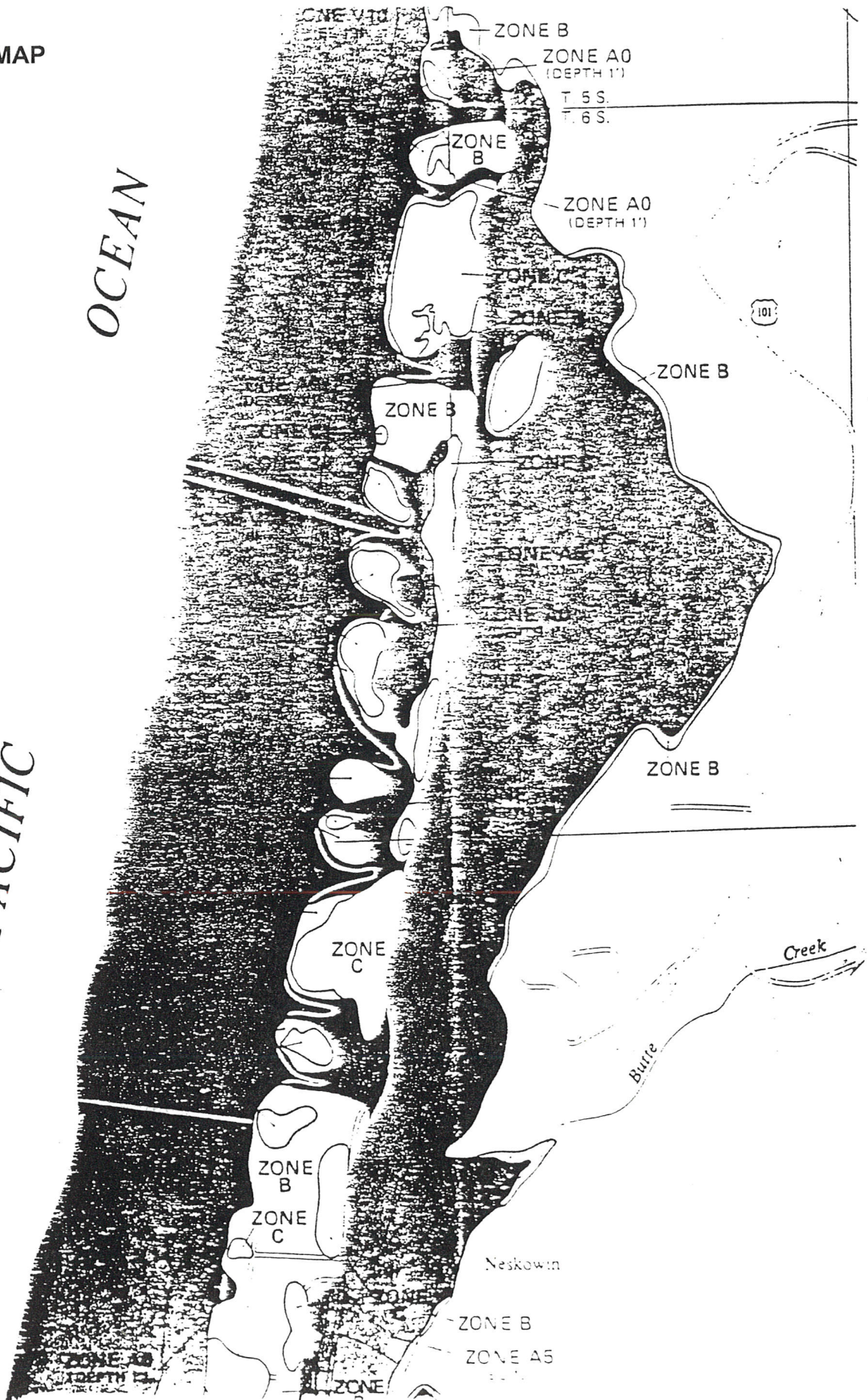
DOMINANT SURFACE AND SUBSURFACE CURRENTS

Source: USDA Soil Conservation Service

ZONE MAP

PACIFIC OCEAN

PACIFIC OCEAN



5. GROUNDWATER RESOURCES

5.1 Introduction and Inventory

Not much is known about dune aquifers in Tillamook County, but what is known indicates that coastal dunes harbor some of the better groundwater supplies in the county. According to DOGMI Bulletin 74, dune sand on Nehalem Spit, Kincheloe Point, Netarts Spit, and in areas west of Sand Lake and west and south of Pacific City probably contain sufficient water for local water supply. According to this same source, groundwater will not accumulate in significant quantities in the dune area north of Manzanita and north of Sand Lake towards Cape Lookout because impermeable bedrock is present above mean sea level beneath these areas.

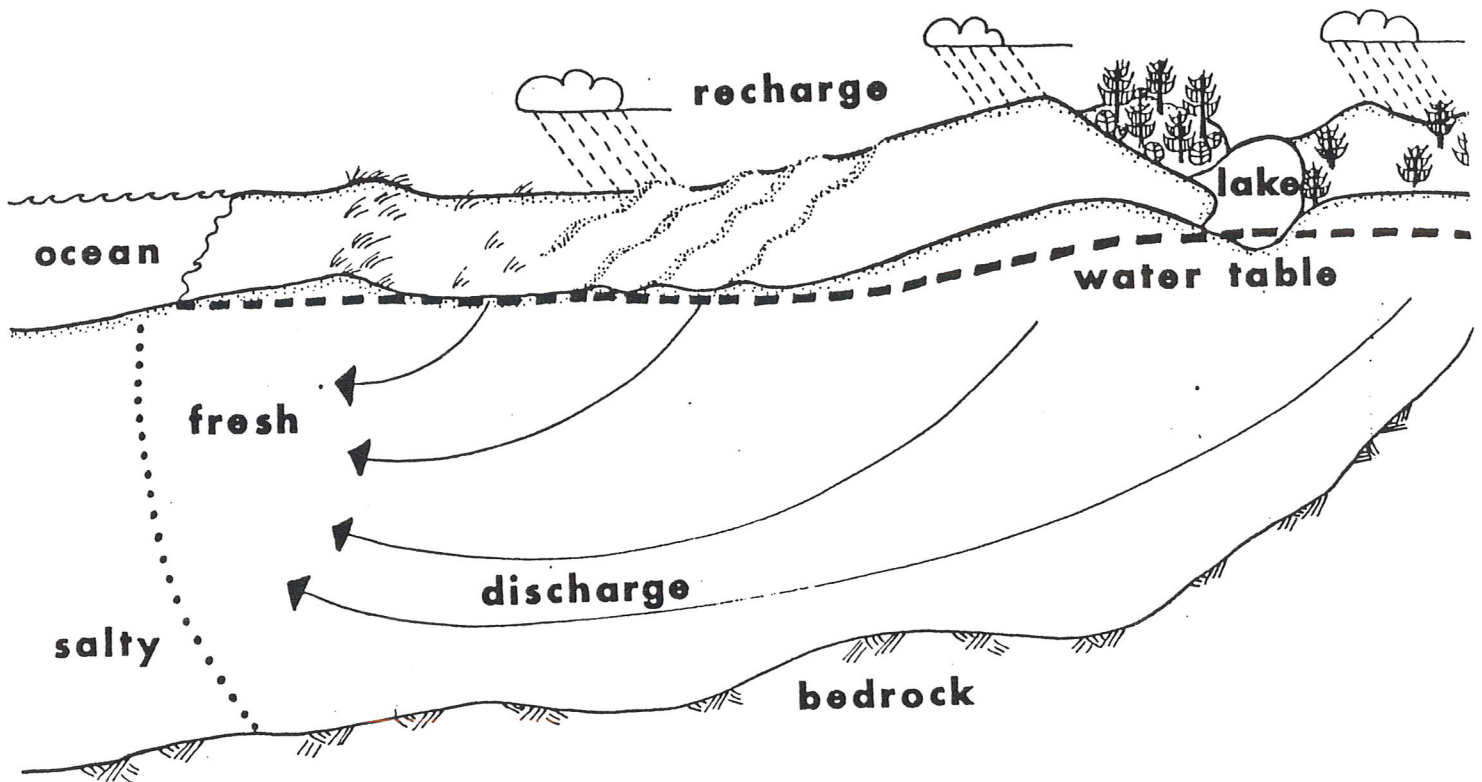
The following discussion extracted from the Beaches and Dunes Handbook of the Oregon Coast summarizes the hydrology of dune groundwater. "Groundwater exists as a large coherent body of water (or aquifer) which underlies dune sands. The boundaries of the groundwater are formed by underlying bedrock and relatively impervious terrace deposits, bedrock margins exposed at the surface (i.e. the basal western slopes of the Coast range), and the ocean to the west, (see figure 2). Impermeable silt and clay lenses are found within the deeper parts of the sand deposits which often-times restrict the vertical movement of water."

"The top surface of the zone of groundwater is the water table. The general shape of the water table is a subdued replica of the land surface. It is farthest from the surface under the larger oblique-ridge dunes and closest at topographic lows. Most surface water (lakes, streams, and marshes) is a surface expression of this water table, occurring where the land surface dips to intersect the water table. Locally, "perched" water tables may exist. These are created by discontinuous bodies of impermeable materials located beneath the land surface but higher than the main water table. This impermeable layer catches and holds the water reaching it from above. On the western margin of the aquifer, the water position of the freshwater/saltwater is not clearly understood, but it most commonly appears to extend somewhat seaward of the beach."

"The water table reflects a seasonal variation, being higher in the winter recharge months and lower in the summer. Recharge of dune aquifers occurs primarily from infiltrating precipitation. It is estimated that fully 75 to 80 percent of the 50 to 70 inches of annual precipitation received on the Oregon coast reaches the groundwater. The remainder is lost through surface runoff in streams, evaporation, and plant use. Most of the groundwater eventually seeps directly into the ocean under the beach. Locally, lesser amounts enter lakes and streams especially during recharge

months. Throughout the year, the interaction between the lakes, streams, and the water table appears to be one of mutual dependence. During the summer months the water table may be lowered from three to ten feet, at which time it appears that lakes may discharge water back to the water table."

FIGURE 3



Schematic illustration of groundwater interactions common to coastal beach and dune areas indicates the cycle of discharge and recharge and the confines of groundwater between bedrock and the surface (source: U.S.G.S. unpublished materials).

5.2 Management Consideration

Several hazards are associated with dune groundwater. The problems that ponding and high water tables create for development were mentioned in Section 2. The following discussion explores the problems of groundwater pollution and drawdown.

5.2a Groundwater Pollution

Sand dune aquifers are very porous and experience very high infiltration rates. Because of this, all sand dune areas downstream or in close proximity to sources of pollution may become polluted. Those areas of particular concern include all deflation plains and their fringes, areas near lakes, streams and marshes, and near beach sites.

Although bacterial travel a maximum distance of only 100 feet through dune aquifers, sand is ineffective in filtering chemical contaminants. Chemicals such as those present in household detergents can make groundwater unfit to drink. Viruses, too, appear to be unfilterable by sand.

Nitrate nitrogen may also be a harmful contaminant present in some areas. Sources of this pollutant include septic tank emissions and agricultural fertilizers.

Residential development using septic tanks or other on-site sewage disposal which discharges into the sand represents the primary threat to groundwater quality in Tillamook County. In other areas where industrial facilities including waste lagoons are situated in dune areas, industrial waste may also present a significant threat. No such development exists or is planned for in Tillamook County.

Residential pollution presents the greatest problem when on-site sewage disposal occurs in areas where the water table is near the surface. The hazard can be managed by placing areas where groundwater pollution is the greatest threat, and where there are no sewers, in resource or low density development zones.

An additional tool for managing groundwater pollution is the regulation of the placement of on-site sewage disposal systems. This is presently done by the County according to the rules established by the Oregon Department of Environmental Quality.

5.2b Drawdown and Saltwater Intrusion

Removal of substantial quantities of water from a dune aquifer can lead to a local or regional lowering of the water table. This can in turn have several adverse consequences including lowering the level of the water table below the depth of wells, reduction of lake levels, draining of wetlands, loss of vegetation, saltwater intrusion, and intrusion of water of poor quality from underlying bedrock. Saltwater intrusion is a particular concern on sand spits and the thinner beach and dune strips which do not receive a large amount of infiltration and recharge of the aquifer. Over pumping of water in these areas can lead to intrusion of saltwater into the aquifer causing temporary or permanent pollution of the resource.

The primary ways of managing this hazard include limiting densities of individual wells and by limiting the placement of public wells to areas where there is sufficient groundwater recharge to offset the amount of water withdrawn.

5.3 Management Requirements

5.3a Implementation Requirement 4

Implementation Requirement 4 states that:

Local, state, and federal plans, implementing actions, and permit reviews shall protect the groundwater from drawdown which would lead to loss of stabilizing vegetation, loss of water quality, or intrusion of salt water into water supplies.

Building permits for single family dwellings are exempt from this requirement if appropriate findings are provided in the comprehensive plan or at the time of subdivision approval.

This requirement among other things, reiterates Implementation Requirement 3 to limit the destruction of desirable vegetation resulting from moisture loss. This requirement is being satisfied by limiting densities in areas unserved by public water, by prohibiting the drainage of deflation plains, and by requiring compliance with Implementation Requirement 4 for all permits issued by the Department of Water Resources.

Most of the dune areas where there is existing development or which are planned for development are serviced with public water supplies, not by individual wells. These include the Manzanita/Nearney City

area, the Nedonna/Rockaway Beach/Twin Rocks/Barview area, the Oceanside/Netarts area, the Tierra del Mar area, the Pacific City area, and the Neskowin area. Only a limited area on the northwest of Sand Lake is proposed for low density rural development and is not serviced by a public water system. Approximately 140 acres of this area is within the Planned Development Overlay zone which requires approval. In the remainder of the area, the minimum lot size of two acres will limit the total development to 42 homes on an outright basis although in many areas, topography and wet soils will limit development even upon special approval, but only if it is determined that water supplies are adequate. The upland area of Whelen Island which encompasses approximately 69 acres is also subject to planned development requirements. According to DOGMI bulletin 74, these Sand Lake areas probably have enough groundwater to develop a local water supply.

Groundwater in Oregon is public property. The Oregon Department of Water Resources regulates the pumping of groundwater except for stock watering purposes, watering any lawn or non-commercial garden not exceeding one-half acre, and single or group domestic uses up to 15,000 gallons per day.

The Department of Water Resources has existing statutory authorization to apply this implementation requirement. ORS 535.505 authorizes the Department to protect public health and welfare by regulating groundwater withdrawal to include drawdown considerations. In addition, ORS 197.180 requires all state agencies to apply the Statewide Planning Goals to all actions that they take.

The Department of Water Resources is also better able to apply this implementation requirement because its staff has more expertise and experience than the Tillamook County Planning Department in these matters.

Groundwater withdrawals that are unregulated by the Department of Water Resources will be reviewed by Tillamook County in the course of reviewing subdivisions, planned developments, and partitions of lots smaller than two acres in the Rural Residential Zone.

Review of the effects of draining or filling of deflation plains will be accomplished in the course of reviewing development permits, building permits, major partitions, subdivisions, and planned developments.

5.3b Implementation Requirement 1

On-site sewage disposal in dune areas has the potential adverse effect and hazard of groundwater pollution. The methods of protecting dune aquifers from this hazard include limiting the density of unsewered development and requiring compliance with DEQ regulations for on-site sewage disposal.

Most of the dune areas where high density development will occur are within urban growth boundaries and are or will be served with public sewers. The exceptions include the Tierra del Mar and Neskowin areas which are irrevocably committed to this development. The Sand Lake area includes the most extensive dune area zoned for residential development. This is primarily older stabilized duneland within the Planned Development or Coast Resort Overlay zones which require an evaluation of appropriate densities and sewage disposal. In addition, the Rural Residential Zone, which applies to all unsewered residentially zoned properties, limits development densities to one unit per two acres unless it is demonstrated that the quality of groundwater will not be impaired.

5.4 Policies

- 5.4a The programs and rules of the Department of Water Resources regarding groundwater appropriations and withdrawals shall be carried out in such a manner as to protect the groundwater from drawdown which would lead to loss of stabilizing vegetation, loss of water quality, or intrusion of salt water into water supplies.

Building permits for single-family dwellings are exempt from this requirement if appropriate findings are submitted at the time of subdivision review.

- 5.4b The programs and rules of the Department of Environmental Quality regarding subsurface sewage disposal shall be carried out in such a manner as to protect groundwater from contamination.
- 5.4c Tillamook County will plan and zone dune areas not serviced by a public water system consistent with the known limitations of dune groundwater supply.
- 5.4d Tillamook County will plan and zone dune areas not serviced by a public sewer system consistent with known limitations for subsurface sewage disposal. Exceptions to this policy include the communities

of Tierra de Mar and Neskowin where development and lotting patterns commit unsewered dune areas to dense development.

- 5.4e Reviews of subdivision, planned developments, and the creation of lots smaller than two acres in the Rural Residential Zone shall be carried out in a manner that will protect dune groundwater from drawdown which would lead to loss of stabilizing vegetation, loss of water quality, or intrusion of salt water into water supplies.
- 5.4f All development shall comply with the programs and rules of the Department of Environmental Quality and the Department of Water Resources.
- 5.4g The filling or draining of deflation plains is only permissible if it will not lead to loss of stabilizing vegetation, loss of water quality, or intrusion of salt water into water supplies.

6. EXCEPTIONS, BUILT AND COMMITTED AREAS

6.1 Exception to Goal 18 Implementation Requirement 2

Goal 18 Implementation Requirement number 2 specifically states:

“Local governments and state and federal agencies shall prohibit residential developments and commercial and industrial buildings on beaches, active foredunes, on other foredunes which are conditionally stable and that are subject to ocean undercutting or wave overtopping, and on interdune areas (deflation plains) that are subject to ocean flooding.

Two basic considerations must be taken into account in evaluating this requirement. First, the County finds that land availability for beachfront development is limited to six areas; those being Necarney City, Nedonna, Cape Meares, Tierra de Mar, Pacific City, and Neskowin. All these areas have realized levels of development that exceed 50 percent of their platted areas. Necarney City is within the city of Manzanita Urban Growth Boundary and an exception for continued development of the area has been included in the City’s acknowledged plan. Nedonna is within the City of Rockaway Urban Growth Boundary and an exception for continued development of the area has been included in the City’s plan.

Second, consideration is given to the fact that of the County’s 61 miles of coastline, approximately 11 miles can realize development. The remainder is primarily in public ownership and reserved for public recreational and resource conservation uses.

Based on these general observations, Tillamook County finds it necessary to take exception to the Beaches and Dunes Goal as allowed under Statewide Goal No.2 (Land Use Planning) for four developing areas, Cape Meares, Tierra del Mar, Pacific City, and Neskowin, and as required under the exceptions process has developed findings to substantiate its action. The findings for taking these exceptions primarily focus on the scarcity of buildable beachfront properties, lack of alternate locations, the level of development, economic value, and compatibility. Additionally, those properties that are included in the exceptions process are required to meet standards regarding building design, setbacks, and soil stabilization techniques to insure a reasonable level of safety against such hazards as ocean flooding.

6.1a Cape Meares

Tillamook County takes exception to the State of Oregon's Beaches and Dunes Goal (#18) for those properties that are considered not to be active or conditionally stable dunes but are susceptible to potential ocean floodings (map 12 and 12a). The concerned lots include Township 1 South, Range 10 West, Section 7BD (Tax lots 2100-4100, 200, 400-500); Township 1 South, Range 10 West, Section 7AC (Tax lots 3500, 1900-2500, 3000-3200, 1300, 1500-1800); Township 1 South, Range 10 West, Section 7CA (Tax lots 1600-2000, 3300-3900, 4300-4500).

The County's findings for the exception are as follows:

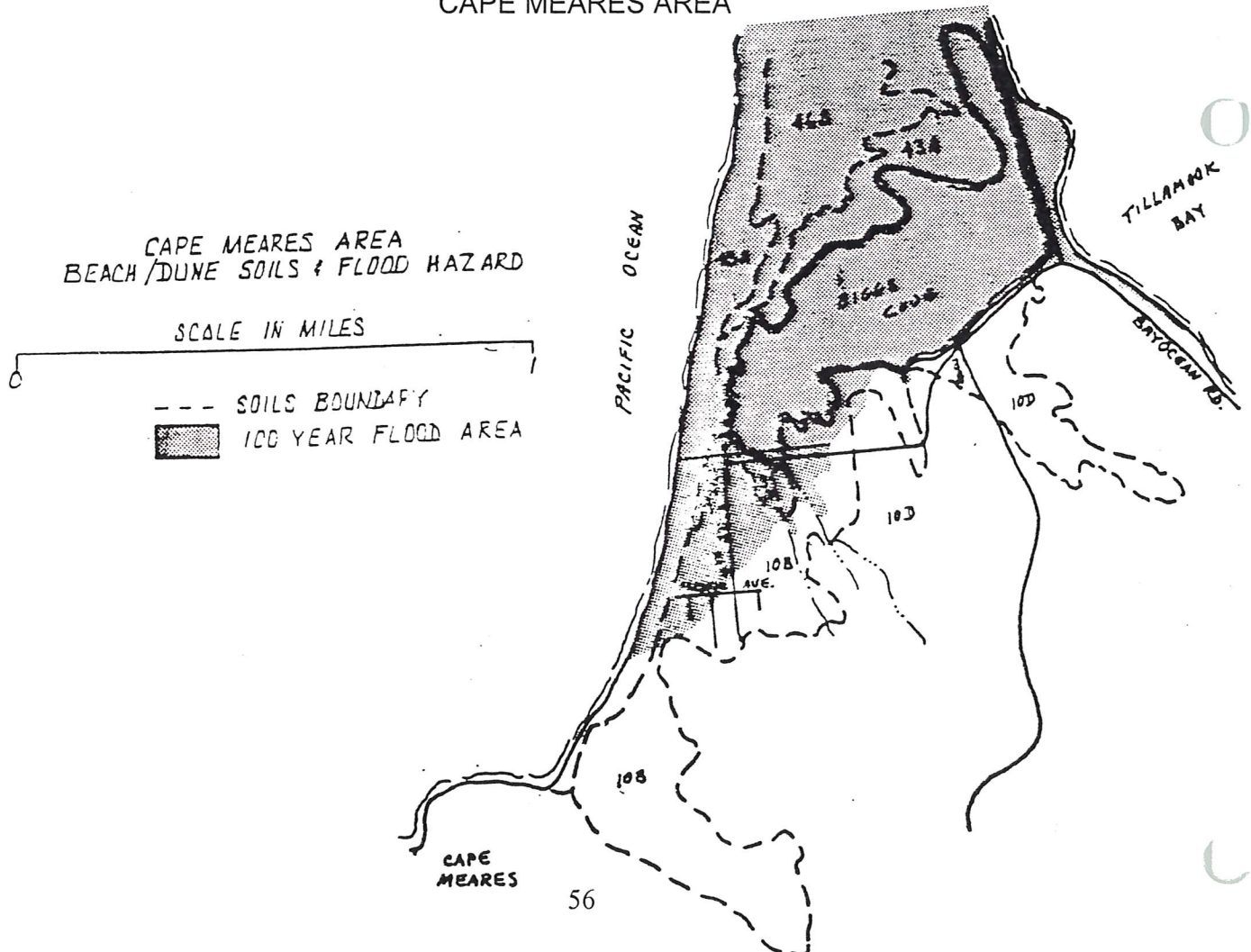
- a. The area within the flood hazard zone was originally platted in the 1920's and presently consists of 57 platted lots that have the potential of being inundated by ocean flooding. (Flood Insurance Rate Map 011BA). Thirty of those lots have already realized development. The lots are located on stabilized dunes with varying soil depths from one to several feet.
- b. Water is provided by the Cape Meares Water District and septic tanks accommodate effluent. There is electricity and telephone service available with asphalt and graveled roads providing access to the concerned lots.
- c. Ocean Beach Avenue provides public access and parking adjacent to the beach; however, parking is poorly designated.
- d. Property in Cape Meares in which this exception is being taken is presently selling for between \$12,000 and \$16,000 per site. This value is substantially lower than what the sale value of beach properties is elsewhere in the County. However, it does provide

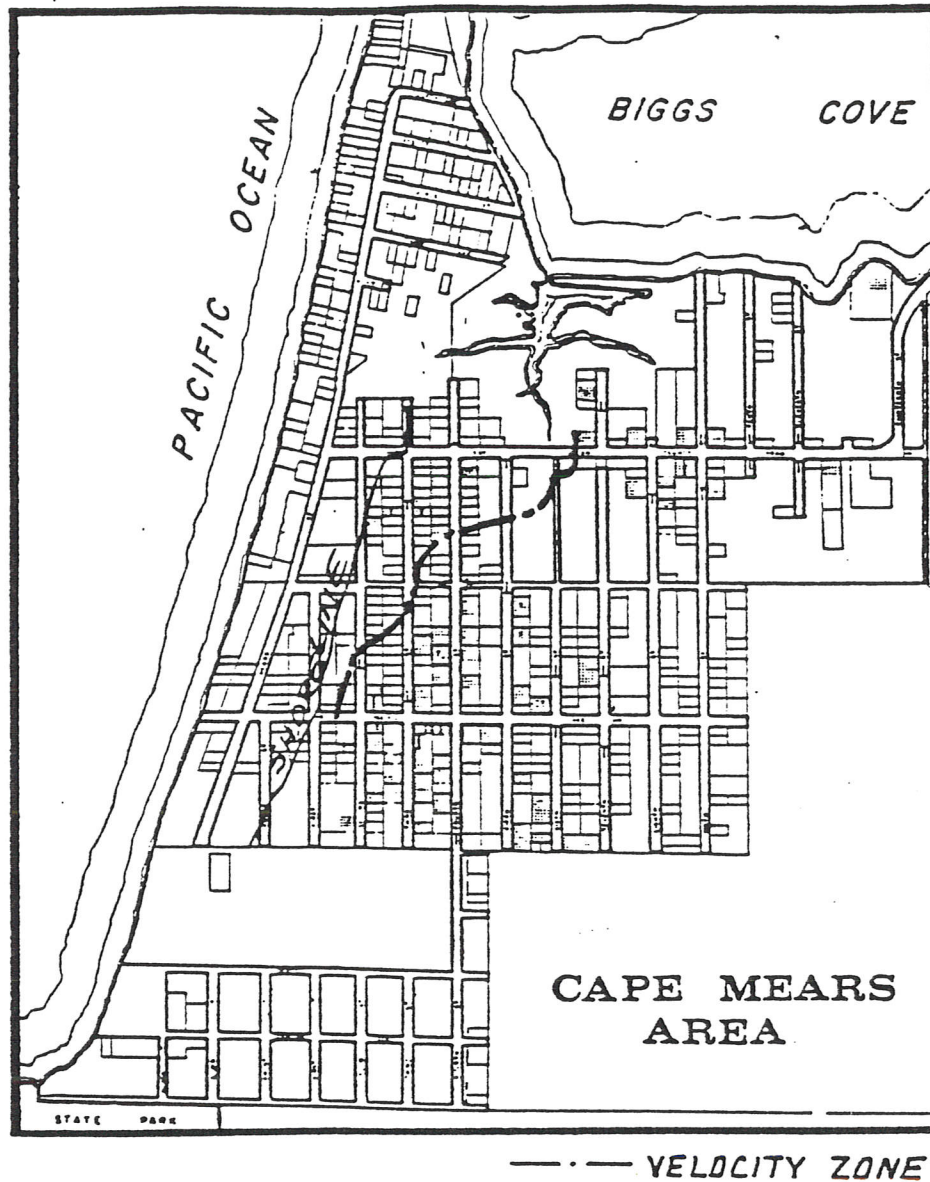
persons of medium income an opportunity to purchase beach properties that they could not otherwise afford.

- e. Beach erosion is the primary threat with measures to impede this process possibly becoming necessary in the near future. Ocean flooding on those areas included in the exception, will have to meet all County flood criteria measures.
- f. The area regarded in this exception does not appear to constitute an important or critical wildlife habitat. However, Bayocean peninsula which is adjacent to the developed area does have wildlife habitats such as nesting areas for the snowy plover.
- g. The compatibility of the area would be maintained since development would continue to be single family residential.

MAP 12

CAPE MEARES AREA





6.1b Tierra del Mar

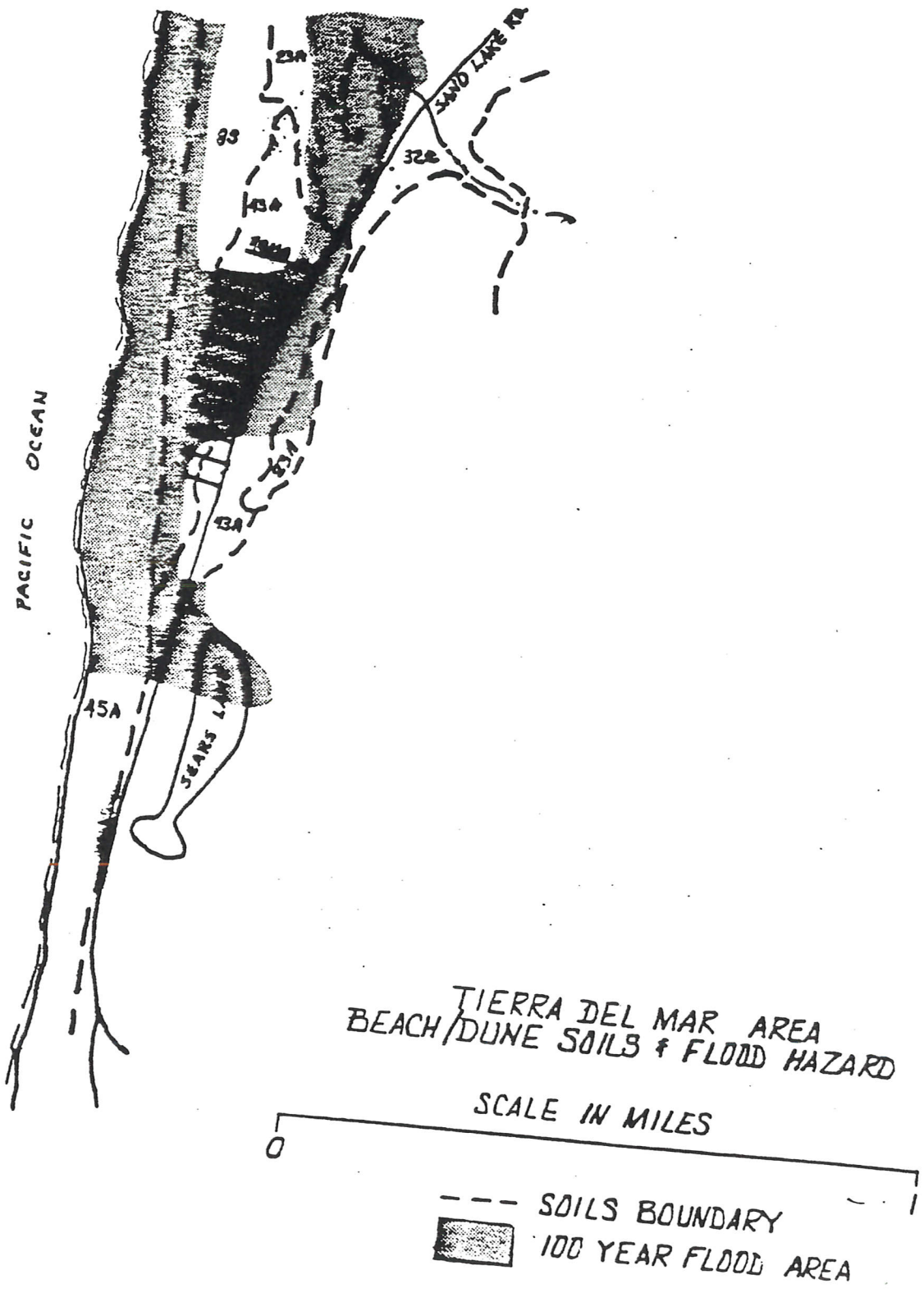
Tillamook County takes exception to the State of Oregon's Beaches and Dunes Goal (18) for those properties in the Tierra del Mar area that are considered to be conditionally stable foredunes. The beach front lots in question consist of Section 6BC, Township 4 South, Range 10 East, (Tax lots 100, 2700, 4600-4700, 6900-7200, 10500-10700, and 13200-13600). Section 6CB, Township 4 South, Range 10 West (Tax lots 2200, 2201, 2100, 4700, 7000-7300, 9700-9900, 12400-12600, and 14400-14600) and Section 1DD, Township 4 South, Range 11 West, (Tax lots 600-900, 1700-2000, 2600-2900, 3200, 3600-4100, and 3300).

The County's findings for exception of the Tierra del Mar area are as

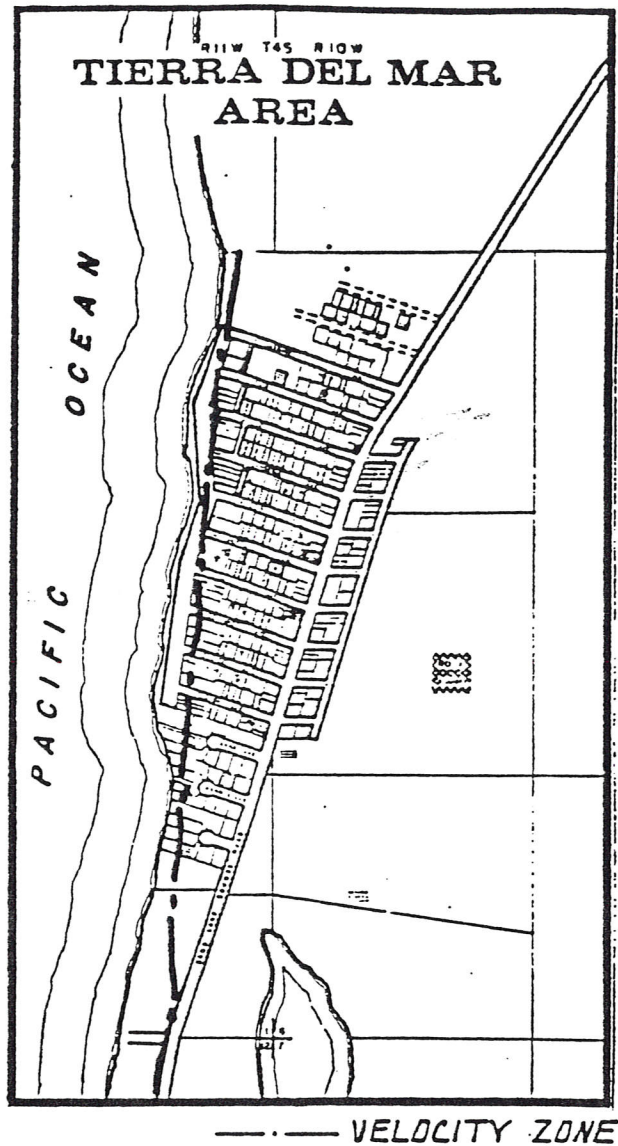
follows:

- a. Tierra del Mar was an area that was platted in the 1950's. It presently consists of 49 platted beachfront lots of which 27 have realized residential development (See Map 13a). The zoning is a combination of R-R (Recreational Residential) and R-3 (High Density Residential) which are primarily oriented towards single family residences.
- b. Portions of this area (map 13) are subject to ocean flooding to water depths of one foot in the 100-year base flood, while other portions would be subject to the 500-year flood potential, i.e., .05% chance of occurrence in any one year. There are an additional 266 interior lots of which 150 have been developed.
- c. A majority of the lots have received sanitarian approvals. However, several lots due to their small size (2,560 sq. ft.) cannot accommodate a septic tank and drainfield. It is estimated that 20% of the lots fall into this category and are unacceptable for septic tank placement.
- d. All lots are or have availability to electricity, telephone, and water services. The roads however, are marginal in regard to County standards and in some instances are in a state of disrepair.
- e. The cost of property is similar to those beach lots that are available in other areas of the County.
- f. As is the case with many of the beach front properties along the Tillamook County coast, there does exist the potential for beach erosion. Tierra del Mar is no exception since the development has occurred on conditionally stable foredunes and interdunes. To date little or no measures have been taken to prevent beach erosion since it has not been a factor as of yet.
- g. There are presently 12 access points (road rights-of-way) to the beach.
- h. Because of the present level of development any habitat values that do exist unfortunately are minimal.
- i. Future development would be similar to what already exists, that being single family residential.

MAP 13



Map 13a



6.1c Pacific City

Tillamook County takes an exception to the State of Oregon's Beaches and Dunes Goal (18), Implementation Requirement 2, for those properties that are considered (Map 14 and 14a) to be conditionally stable and are in some areas subject to oceans wave overtopping.

The exceptions are for beachfront properties of 4 South, 11, 24AA, (Tax lots 2000-3100, 4 South 11, 24AD (Tax lots 100-500), 4 South, 11, 24DA (Tax lots 2100-2600, 5800-7300), 4 South, 11, 24DD (Tax

lots 3200-3700, 8000-9300), 4 South, 11, 25AA (Tax lots 400, 600,1200-2700), and 4 South, 11, 25AD (Tax lots 100-2700).

The County's findings for the exception for the Pacific City area are as follows:

- a. Approximately 50 percent of the Pacific City land area, as described in the Urban Service Boundary, is either foredune or part of an interdune system. (See Map 5). The dune systems for the most part are conditionally stable and are to varying degrees susceptible to ocean flooding.

Several subdivisions occupy this area which constitute a total of 106 buildable lots. Of those 65 have realized development with single family residential dwellings being the primary use.

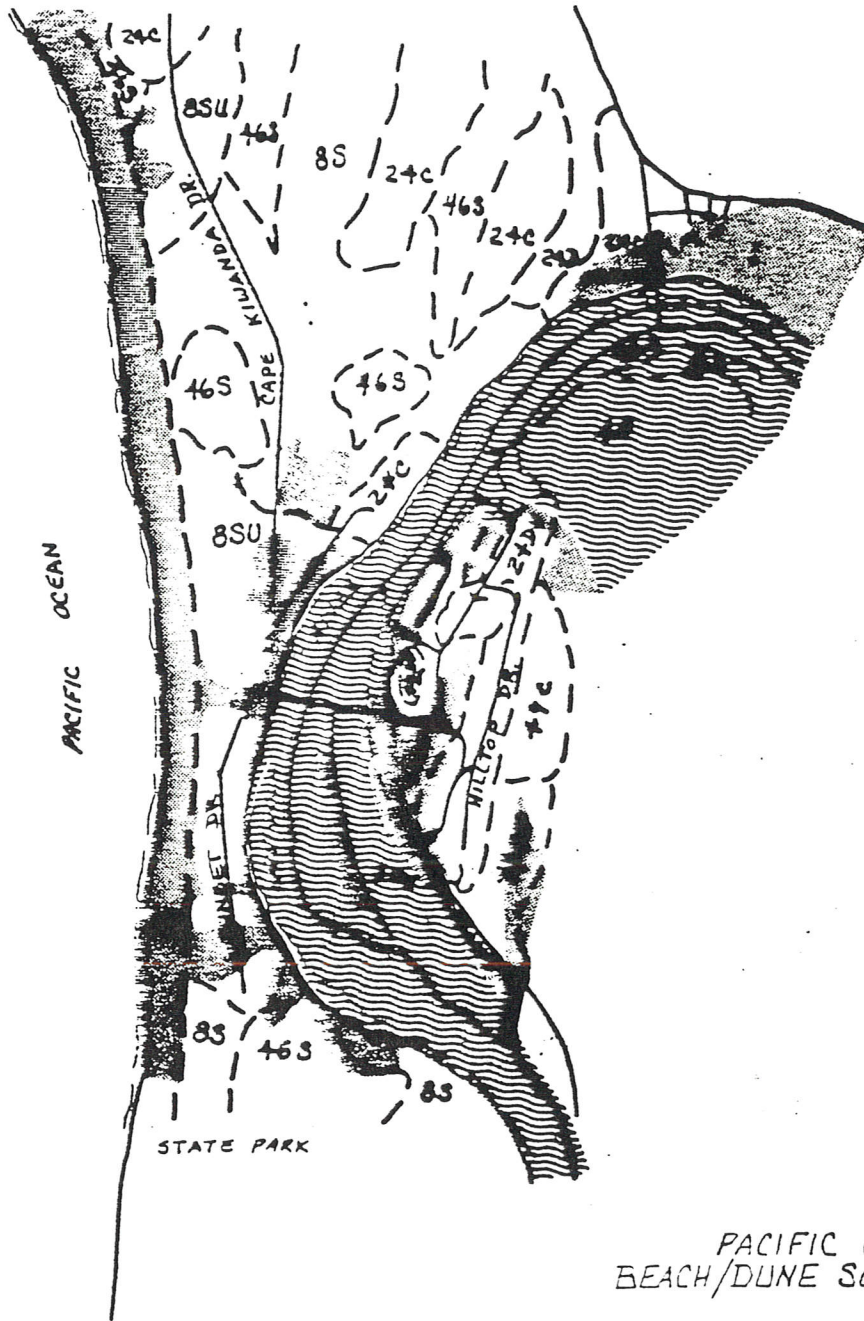
- b. The Pacific City Sanitary District is responsible for providing sewerage service to this area with the potential to accommodate future growth within the Urban Service Boundary.
- c. A majority of the roads are paved with others made with a crushed rock base and gravel. There are several access points to the beach provided by street rights-of-ways besides a County parking lot and dory launching area at Cape Kiwanda and a public boat launching ramp on the Nestucca River.
- d. Other public facilities available are water, electricity, phone service, and fire protection.
- e. Undeveloped residential beach lots in the Pacific City area range in selling price between \$20,000 and \$25,000 with those on the west side of Sand Lake Highway selling for \$15,000 to \$20,000. Commercially zoned vacant properties adjacent to Sand Lake Highway are selling for \$30,000 to \$50,000.
- f. The long term environmental impacts of development in this area have to a certain degree been realized. Beachfront properties in Cape Kiwanda have utilized riprap to impede erosion of the conditionally stable foredunes, an economic cost that has been borne by the property owners. However, the preventative measures to stop erosion will not alleviate ocean and river flooding of the 100-year base flood.

To minimize the hazards associated with these risks require that protective measures be employed such as shoreline protection, site investigation, and building designs that meet flood standards.

- g. The compatibility of future development in the exception area would be in keeping with other elements of the Comprehensive Plan.
- h. Because of the level of development that has already taken place, wildlife habitats are not an issue in the area of the exception. However, caution will have to be exercised with future conflicts that may arise with high density development adjacent to the Nestucca Sand Spit.

MAP 14



PACIFIC CITY AREA



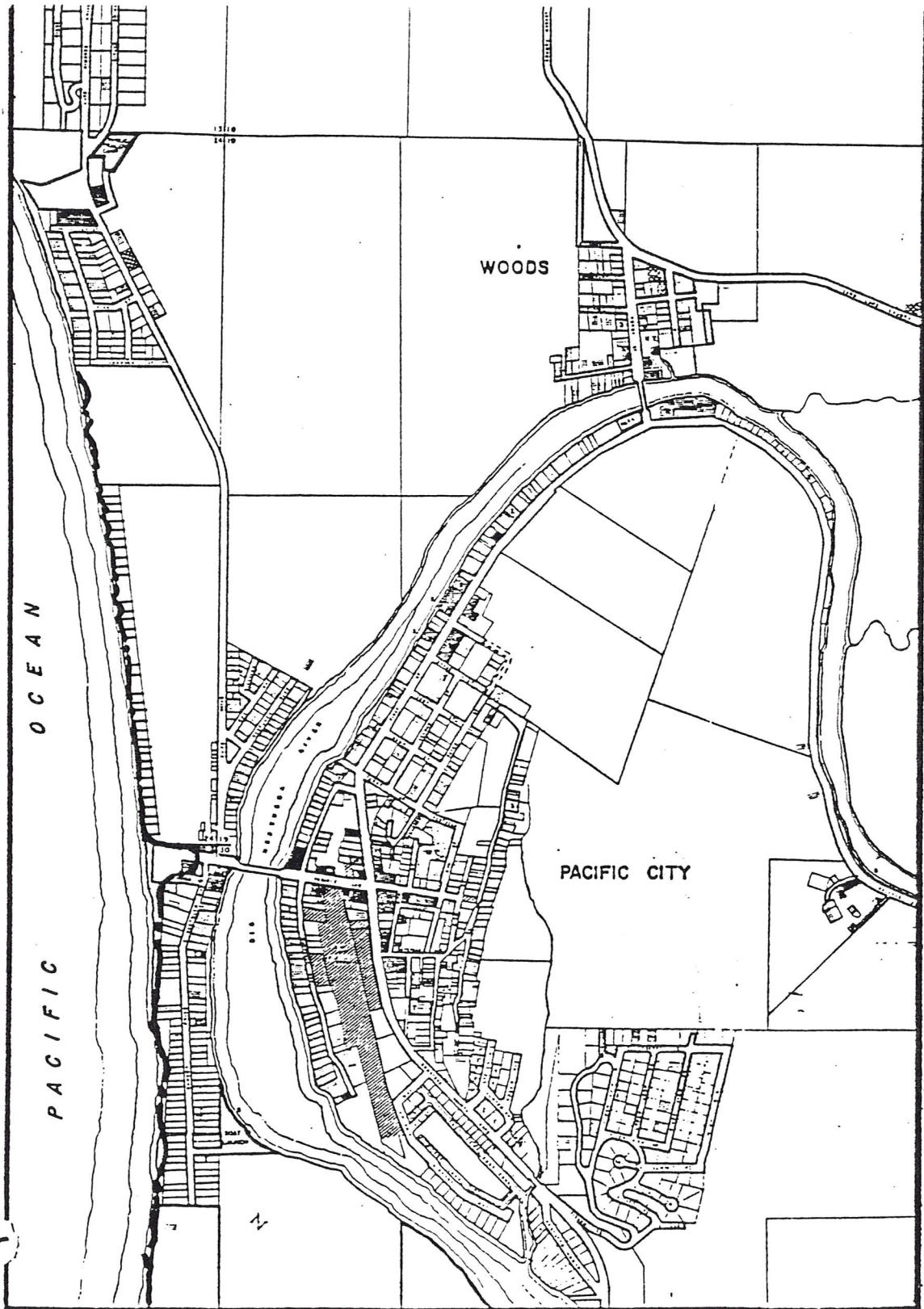
PACIFIC CITY AREA
BEACH/DUNE SOILS & FLOOD HAZARD

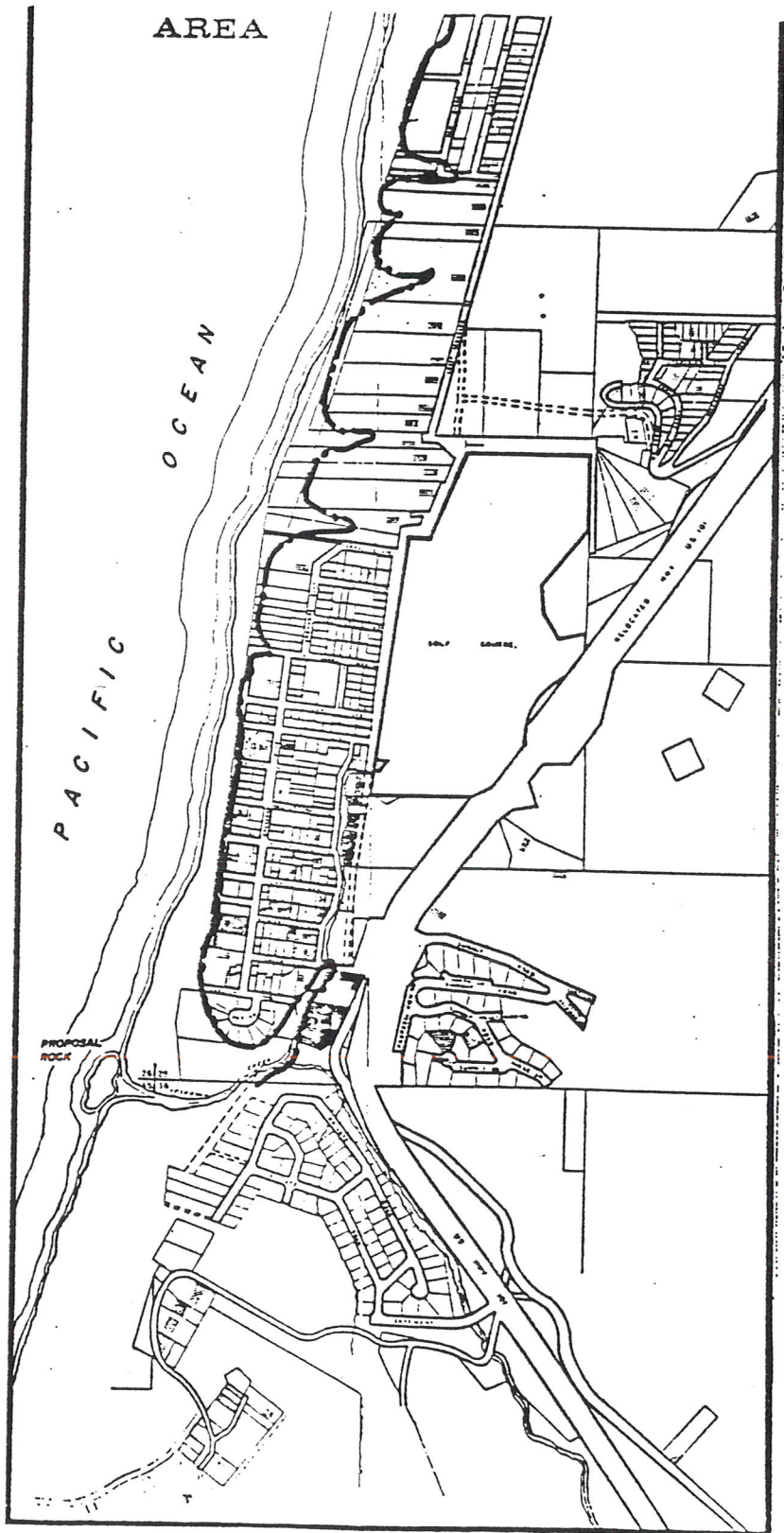
SCALE IN MILES



- SOILS BOUNDARY
-  FLOODWAY
-  100 YEAR FLOOD AREA

Pacific City Area

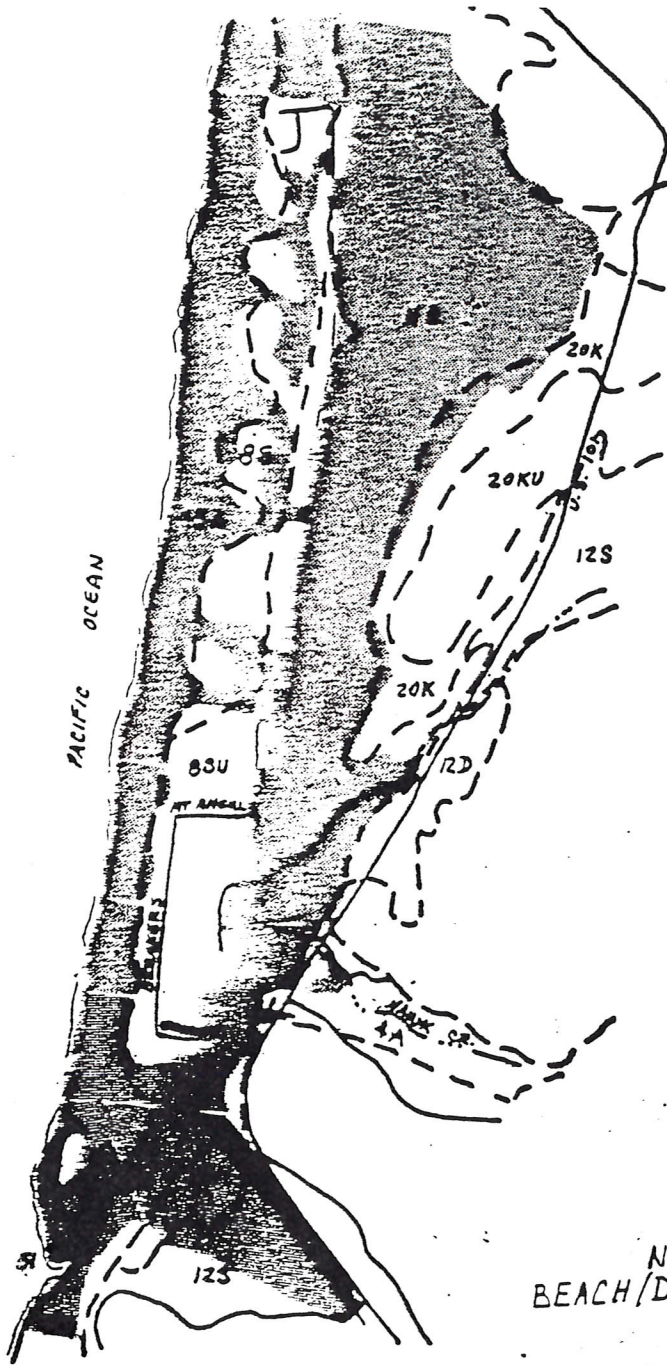




--- VELOCITY ZONE

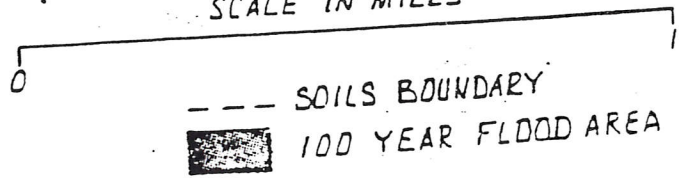
NESKOWIN AREA

BEACH/DUNE SOILS & FLOOD HAZARD



NESKOWIN AREA
BEACH/DUNE SOILS & FLOOD HAZARD

SCALE IN MILES



6.1d Neskowin

Tillamook County takes exception to the State of Oregon's Beaches and Dunes Goal 18 for those properties in the Neskowin area that are considered to be conditionally stable foredunes or subject to ocean flooding. Those lots consist of Township 5 South, Range 11 West, Section 24BD (Tax lots 1100-2500); Township 5 South, Range 11 West, Section 24CA (Tax lots 100-1800); Township 5 south, Range 11 West, Section 24CD (Tax lots 100-1800); Township 5 South, Range 11 West, Section 25BC (Tax lots 600, 800-1700); Township 5 South, Range 11 West, Section 25CB (Tax lots 92401-92412, 2900-3000, 80101-80324, 8800-9400, 11500-11700); Township 5 South, Range 11 West, Section 25CC (Tax lots 2100-2300, 90001-90008, 4600-4900, 6500-7400); Township 5 South, Range 11 West, Section 36BB (Tax lots 3000-3800); Township 5 South, Range 11 West, Section 36BC (Tax lots 1600-2000).

The County's findings for the exception for the Neskowin area are as follows:

- a. All subdividing took place in the Neskowin area prior to 1970. Of the total 126 lots within the exception area, 58 have yet to realize development.
- b. The foredunes and interdune systems are primarily conditionally stable mixed with older foredunes. These areas would be subject, based on the Flood Insurance Rate Map, to ocean flooding having a one percent chance of being equaled to or exceeded in any given year. (See Map 4)
- c. All subdivision lots within the area under exception have roads that meet County standards; additionally, electrical power lines are placed underground in much of the area, with water service, although questionable as to quality, and available septic tanks and drainage systems accommodate effluent.
- d. Neskowin is a community that appears to be very desirable for single family residence with beach front lots selling on the average for approximately \$40,000. The exception would not jeopardize those values due to the fact that any future development will have to conform to the Comprehensive Plan.
- e. Beach access points (public roads) are primarily concentrated in the mid-portion of the Neskowin area. Additionally, there is

a public parking lot that can accommodate approximately 30 vehicles.

- f. The formation of the Neskowin water and sewer districts should improve the quality of water service and provide adequate measures to handle any future sanitation problems.
- g. Wildlife habitat would be minimally affected by additional development, since the area has not been identified by any jurisdiction, agency, or group to be of wildlife habitat value.

6.2 Exception to Goal 18 Implementation Requirement 6

6.2a Tillamook County is taking exception to Goal 18 Implementation Requirement 6 in order to allow removal of sand which periodically builds up against houses on the following lots:

(1) In Tierra del Mar:

- a. Tax lots 100, 2700, 4600, 4700, 6900-7200, 10500-10700, and 13200-13600 in Section 6BC, Township 4 South, Range 10 West;
- b. Tax lots 2200, 2201, 2100, 4700, 7000-7300, 9700-9900, 12400-12600, and 14400-14600 in Section 6CB, Township 4 South, Range 10 West; and
- c. Tax lots 600-900, 1700, 2000, 2600-2900, 3200, 3600-4100, and 3300 in Section 1DD, Township 4 South, Range 11 West.

(2) In Pacific City:

- a. Tax lots 2000-3100 in Section 24AA, Township 4 South, Range 11 West;
- b. Tax lots 100-500 in Section 24AD, Township 4 South, Range 11 West;
- c. Tax lots 2100-2600 and 5800-7300 in Section 24DA, Township 4 South, Range 11 West;
- d. Tax lots 3200-3700 and 8000-9300 in Section 24DD, Township 4 South, Range 11 West;