

THE CITY OF WHEELER

Comprehensive Plan Background Data

ADOPTED
OCTOBER 1979
WITH AMENDMENTS THROUGH
~~MARCH 1987~~
DEC 1997

THE CITY OF WHEELER

COMPREHENSIVE PLAN BACKGROUND DATA

ADOPTED OCTOBER 1979

WITH AMENDMENTS THROUGH DECEMBER 1997

The preparation of this report was financially aided through a federal grant from the Department of Housing and Urban Development, under the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954, as amended, and a state planning assistance grant from the Department of Land Conservation and Development.

	PAGE
INTRODUCTION.....	1.
Setting for the Study.....	1.
Study Purpose and Scope.....	1.
LAND USE.....	1.
Potential for Urbanization.....	1.
Existing Land Use.....	3.
Commercial Land Use.....	3.
Industrial Land Use.....	3.
Residential Land Use.....	4.
Public & Semi-Public Land Use.....	5.
Waterfront.....	5.
Buildable Land.....	11.
Vacant Land.....	13.
NATURAL FEATURES ELEMENT SUMMARY.....	17.
Geology.....	18.
Soils.....	23.
Slopes.....	26.
The Nehalem Watershed.....	29.
HYDROLOGIC FEATURES.....	34.
Estuarine Planning.....	43.
Restoration and Mitigation.....	44.
Dredge Material Disposal.....	49.
COASTAL SHORELANDS.....	66.
Air Quality.....	72.
NATURAL RESOURCES ELEMENT SUMMARY.....	74.
Mineral, Aggregate & Energy Resources.....	75.
Fish & Wildlife Areas.....	75.
Cultural & Historical Sites.....	78.
Scenic Resources.....	80.
GOAL 5.....	84.
SOCIAL RESOURCES ELEMENT SUMMARY.....	91.
Economic Element.....	92.
Employment.....	92.
Income.....	93.
Key Sectors of the Nehalem Bay Economy.....	94.
Housing.....	98.

SUMMARY OF HOUSING ISSUES.....	106.
SUMMARY OF POPULATION, HOUSING & INCOME.....	113.
POPULATION.....	114.
PUBLIC FACILITIES ELEMENT.....	118.
Water System.....	118.
Storm Drainage.....	119.
Sanitary Sewer System.....	119.
Solid Waste.....	120.
Schools.....	121.
Recreation & Open Space.....	122.
Police & Fire Protection.....	122.
Health Services.....	123.
Energy.....	123.
Energy Forecast.....	123.
Wind Energy.....	123.
Wood Energy.....	124.
Solar Energy.....	124.
TRANSPORTATION.....	125.
Highway.....	125.
City Streets.....	125.
Bike.....	126.
Rail.....	126.
Bus.....	126.
MAP SECTION	
Appendix 1.....	131.
A Field Investigation of Geologic Hazards in Wheeler.....	132.
Purpose & Scope.....	132.
Methods.....	132.
Rock Units Mapped.....	133.
Geologic Hazards.....	135.
Recommendations.....	141.
Appendix 2.....	152.
Community Watershed.....	152.
Intent.....	152.
Permitted Principal Uses.....	153.
Conditional Uses.....	153.
Uses Standards.....	153.
Bibliography.....	158.

TABLES AND CHARTS

Buildable Land (Within City & Urban Growth Boundary).....	11.
Vacant Land (Within City & Urban Growth Boundary).....	13.
Land Requirements for Projected Residential Growth.....	13.
Major Variables Which Influence Landslide Potential.....	21.
Soil Limitations for Urban Uses.....	24.
Soil Suitability for Agriculture & Woodland.....	25.
Site-Specific Use of Slope Information.....	26.
Nehalem River-Minimum Perennial Stream Flows (cfs).....	31.
Summary of Pollution Indicators - Nehalem River.....	33.
Climatic Conditions of Seaside & Tillamook, OR. Comparison.....	35.
Nehalem Tide Levels.....	36.
Total Water Rights.....	40.
Surface Water Rights by River Mile.....	40.
Plant Habitats in the City of Wheeler Planning Area.....	76.
Estuarine Area by Subtype.....	77.
Matrix for a Program to Retain Natural, Scenic & Other Resources.....	83.
Tillamook County Resident Labor Force, Unemployment & Employment.....	92.
Personal Income by Household (1975).....	93.
Tillamook County Nonagriculture Ware & Salary Employment.....	97.
<hr/>	
Housing Mix.....	99.
Housing Age.....	100.
Vacancy Rate (1977).....	100.
Housing Conditions (1977).....	101.
Housing Repair Needs.....	102.
Housing Costs.....	103.
Monthly Household Income.....	103.
Monthly Housing Costs.....	104.
Population Forecasts Gathered from Other Sources.....	108.
Distribution of Population by Age & Sex, Oregon & Tillamook County for the Year (1970).....	110.
Population Estimates for Wheeler.....	111.
Population Data - Historical Trend.....	112.
Recreational Standards for Wheeler, in Acres.....	122.

CITY OF WHEELER

TABLE OF MAPS

MAP NO.	MAP TITLE	SOURCE	PAGE NO.
M-1	Existing Land Use	CTIC	2.
M-2	Vacant Buildable Land	CTIC	9.
M-3	Bedrock Geology	Ross	16.
M-4	Generalized Slope	Ross	24.
M-5	Forest Land	CTIC	25.
M-6	Floodplain	HUD	27.
M-7	Habitat Values	*NWR	73.
M-8	Housing Condition	CTIC	96.
M-9	Water System	CTIC	116.
M-10	Sanitary Collection System	HGE	117.
M-11	Storm Drainage	HGE	118.
M-12	Street Conditions	CTIC	119.

*Nehalem Wetlands Review

INTRODUCTION

Setting for the Study

The City of Wheeler, located on the north coast of Oregon in Tillamook County (latitude 45° - 42° north, longitude 123° - 54° west), was incorporated in 1913 on a hillside along the Nehalem Bay.

Existing land use in the region surrounding Wheeler consists of agriculture, forestry, low-intensity recreation activities, scattered residences, and marina development at various locations.

Study Purpose and Scope

Information found in this support document has been collected for the City of Wheeler and the surrounding area. A study area of approximately 1,200 acres was established, including area with potential for future urban development surrounding the city and area which impacts the city planning area.

The support document is for the purpose of collecting and synthesizing information for use in developing a comprehensive plan. Furthermore, the data comprising this document are intended to satisfy inventory requirements of the State Planning Goals.

As in a plan, this document is divided into elements or chapters. Each element opens with a summary naming important studies found in the chapter, listing relevant maps for reference, and describing where information can be applied by statewide goal. Each element then has a narrative text of information about various aspects of the Wheeler study area.

LAND USE

Potential for Urbanization

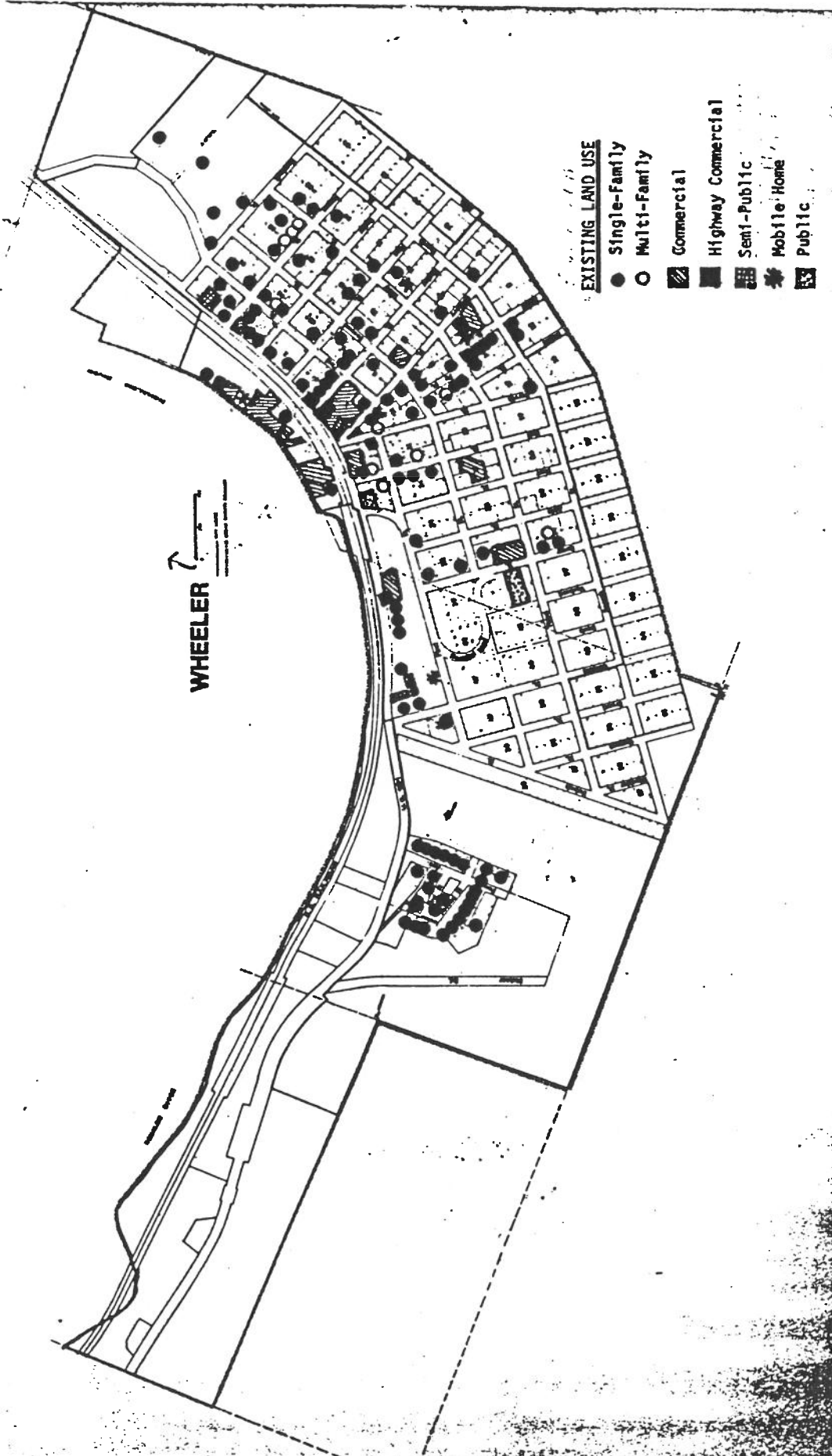
The highest concentrations of development occur in the incorporated towns of Nehalem, Wheeler, and Manzanita, and in the unincorporated area called Bayside Gardens. All of the above-mentioned areas have presently or are anticipated in the future to have those water and sewerage services characteristically necessary in concentrated development.

It is also significant that Nehalem, Wheeler, Manzanita, and Bayside Gardens all front or are bisected by Highway 101. Along Highway 101 from Manzanita through Wheeler is a distance of approximately five miles.

WHEELER

EXISTING LAND USE

- Single-Family
- Multi-Family
- ▨ Commercial
- Highway Commercial
- ▤ Semi-Public
- ⊞ Mobile Home
- ▩ Public



A general study by the Oregon Coastal Conservation and Development Commission identified the Manzanita/Nehalem/Wheeler area (1,530 acres) as potentially suitable for urbanization, i.e., development potential of two or more dwelling units per acre. The 1975 survey identified: 280 acres urban density; 750 acres in various stages of development; and an additional 500 acres of vacant but potentially urban land. The potential for future urbanization of the area is addressed in depth in this resources document.

Existing Land Use

An August, 1977 survey inventoried existing land use in the city by lot. The results, in the following table, indicate that approximately 50% of lots in the study area are vacant. Developed road and railroad rights-of-way occupy 19% of land area in the study. In addition, 13% of the study area consists of unimproved platted street rights-of-way. The remaining land, only 17% of the city (28 acres) is built-up in residential, commercial, public and semi-public uses.

Commercial Land Use

Commercial land use in the planning area caters to serving tourist and recreational needs, (especially in providing food and lodging) in addition to being a small community business district serving residents.

Most commercial land use is located along the waterfront, the Highway, or in central Wheeler. Commercial uses on the hillsides area are limited to motel development.

Industrial Land Use

Within the planning area there are no existing manufacturing sites. However, along the waterfront, several locations in the planning area have historically been used for industrial processing.

The history of major industries in north Tillamook County emphasizes the change in the economic base. (See "Economics" or "Cultural and Historic Sites and Areas"). For example, the major industrial resources in the past have been commercial fishing, dairy farming, and timber. However, processing of fish was discontinued in 1956, when commercial fishing in the Bay was banned.

As for dairy farming, since the 1960 consolidation of cheese factories at Tillamook, local dairy products have been transported out of the area. Meanwhile, a variety of factors and economic trends have impacted the timber industry; these include the short and long-term impact of the Tillamook Burn, and a lack of advanced transportation facilities - especially highway and water commerce. For the north county as a whole, the Economics section details manufacturing activities currently in operation.

There is some prospect for renewed industrial development in the planning area, based on the following factors:

- * Each site has access to the waterfront, to transportation facilities (railroad and highway), and to public water, sewer and fire protection services.
- * Two potential sites for industrial development exist in fill areas; use of them would pose little environmental threat to the surrounding land resources, and both areas are large enough to accommodate at least one industrial building.
- * The only engineering and building constraints on the sites would be flood-proofing requirements, if applicable.
- * The severe regional scarcity of industrial sites in other areas of North Tillamook or South Clatsop counties enhances the viability of the Wheeler sites.
- * Over time, the availability of industrial raw materials (such as timber) will improve as regrowth from the Tillamook Burn reaches maturity. Industrial redevelopment of the area is also possible in the sense that some traditional industries of the bay (such as commercial fishing) could be replaced by aquaculture management.

Residential Land Use

The 1977 inventory of the city land use identified 114 single-family structures, 5 units mobile homes, and 46 units duplex or multiple-family. There are a total, therefore, of 165 housing units in the city.

Housing age results indicate that the total number of homes in the Wheeler area has historically remained relatively small, and in recent years has not increased dramatically. Several major factors have influenced growth in the area; these include employment and economic opportunities, topography, groundwater limitations, and the need for public sewer and water. Construction, operation and orderly expansion of public water and sewer facilities should help to permit housing development in planned growth areas.

Public and Semi-Public Land Use

Developed public and semi-public land uses (covering 1.42 acres) includes a firehall, city hall, hospital and lodge buildings.

Undeveloped or underdeveloped public land includes city land at the Nehalem waterfront and the Jarvis Creek community watershed. The county owns slightly more than five acres of undeveloped platted land located in a six-block area and dedicated by the county for park use.

A total of about 30 acres is currently paved or graveled right-of-way. Also, the railroad right-of-way, about 2.5 acres, parallels the waterfront and U. S. Highway 101. There are 22.14 acres of platted but unimproved streets.

Waterfront Needs.

In developing land-use designations for the Wheeler waterfront, two elements were analyzed. One, the types of water-dependent development which are likely to occur in the Nehalem Bay Estuary. Two, the suitability of Wheeler's waterfront to accommodate these types of water-dependent development given the location of existing development, topography and parcel size.

The following types of water-dependent uses have been identified: transshipment of cargo, portions of manufacturing operations requiring a waterfront location, commercial marina and support facilities, and portions of aquaculture facilities.

Given Nehalem Bay's isolation from major transportation and population centers and the limited transportation network serving the area, the only potential transshipment commodity is the export of logs originating from the maturing "Tillamook Burn" forest. Such an operation does not appear likely for the following reasons. First, there is an unused log/forest products transshipment site located in Garibaldi that is available. Second, the Nehalem River channel would have to be improved before any operation could begin. There is no authorized Army Corps of Engineers channel in Nehalem Bay. Sufficient local financial resources are not available to develop and maintain a navigation channel for barge traffic. Third, discussions have centered on a 12 foot channel. Such a channel could accommodate river barges that have a 9-12 foot draft. However, it could not accommodate ocean-going barges that have a 14-18 foot draft. It appears likely that a log transshipment facility would have to accommodate ocean-going barges to effectively compete with other potential or existing port facilities.

The only potential manufacturing operation which would require a waterfront location would be a lumber and wood products export facility adjacent to a sawmill. Recent analysis undertaken by Crown-Zellerbach for its proposed Tongue Point facility indicates a need for a minimum of 15 acres to accommodate an export facility. The Wheeler waterfront contains no sites of sufficient size to accommodate both a sawmill and an export facility.

There are a number of commercial marinas on Nehalem Bay: Jetty Fishery, Brighton Moorage, Paradise Cove Marina, and Dart's Marina. In addition, a new marina has been proposed for Bott's Marsh. The Land Conservation and Development Commission recently (March 1984) approved an exception to the Estuarine Resources Goal to permit marina development in this area. Suitability of a site to provide upland support facilities for marina development is dependent upon the size of the site, the proximity of the site to adjacent estuarine areas which would require little dredging or fill or use as marinas, and which are protected from strong waves and currents.

The likelihood of aquaculture operations on Nehalem estuary is difficult to evaluate. The Oregon Department of Fish and Wildlife has placed a moratorium on salmon release and recapture facilities. However, it is possible that an out-bay aquaculture facility (such as an oyster spat hatchery) could be located on the Wheeler waterfront. Out-bay aquaculture facilities have less defined site suitability requirements than other water dependent uses, for the following reasons. First, the size requirements for an out-bay aquaculture facility vary greatly with the type of facility proposed. Second, the only portions of an out-bay aquaculture facility which are truly water-dependent are the water intake and outlet facilities, which can be located on a relatively small land area. Although desirable, it is not always necessary to locate all portions of an aquaculture facility adjacent to the estuary. Any proposed out-bay aquaculture facilities can be accommodated in areas which are zoned to allow for a mixture of water-dependent and water-related uses.

Waterfront Areas.

The waterfront area is bounded by the Nehalem Bay Estuary and U.S. Highway 101. On the basis of natural features, existing land uses, parcel size and potential for future development, the waterfront portion of the study area can be segmented into four areas. From north to south, these areas are as follows:

Area 1.

This area consists of approximately seven acres of vacant upland adjacent to the proposed marina development at Bott's Marsh. The approved goal exception for Bott's Marsh provides for a broad range of commercial moorage support facilities, hotel, restaurant, R-V parking, charter boat offices at the Bott's Marsh site. The developer of Bott's Marsh is proposing a range of uses for this parcel, including some water-related uses, such as dry boat storage, and some nonwater-related industrial uses. Designation of the site as Water-Related Industrial will provide for the mix of water-dependent, water-related uses authorized by the Goal 16 exception for the Bott's Marsh Marina development. Water-dependent and water-related uses are priority uses in this zone (permitted outright), but nonwater-related industrial uses are permitted on a Conditional Use basis. The designation of this site as Water-Related Industrial is consistent with the Goal 9 element of the Tillamook County Comprehensive Plan. The Tillamook County Economic Development Fact Book (p.52) identifies the site as a potential water-related industrial site.

Area 2.

This area comprises the main developed portion of Wheeler's waterfront. The area is characterized by a variety of land uses; marina, motel, houses and a restaurant. Parcel sizes are small, less than one acre. There are several scattered vacant parcels, with the largest being slightly larger than half an acre. Although the area contains one water-dependent use, a marina, the primary use of the area is for tourist oriented establishments that take advantage of their waterfront location. The promotion of tourism and the provision of tourist facilities has been identified as an element of the City economic development program. Area 2 is unsuitable for water-dependent development, given its existing development pattern, and small parcel size. The area has been designated Water-Related Commercial to provide for continuation of the existing tourist oriented commercial development.

Area 3.

This area (Kahr's property) consists of approximately nine acres that is bisected by a railroad right-of-way. Two acres are located on the estuarine side of the railroad right-of-way and seven acres are located between the railroad and U.S. Highway 101. The two acre portion adjacent to the estuary has two structures on it; the remaining area contains two dwellings and a storage building which is used for a commercial cascara bark buying operation.

Because of its location adjacent to Nehalem Bay and the lack of existing development on site, the two acre portion is suitable for a small out-bay aquaculture facility. However, as the previous discussion has pointed out, only a small portion of an out-bay aquaculture facility is water-dependent. Therefore, it is inappropriate to designate an entire site for only water-dependent use where out-bay aquaculture is the only identified suitable water-dependent use. (Aquaculture and boat building are uses considered by the property owner). The small size of the site makes it unsuitable for upland support facilities in conjunction with a marina. Furthermore, the aquatic portion of the site is unsuitable for a marina because it is not adequately protected from the effects of waves and currents. The Water-Related Industrial zone which has been applied to this property provides for water-dependent and water-related uses as a "permitted outright" use, but also allows nonwater-related industrial uses as a Conditional Use.

The remaining seven acres contains two existing dwellings, and is separated from the estuary by the railroad right-of-way. This area also contains sections with moderate slopes. These factors make this portion unsuitable for water-dependent development. Therefore, this area has been designated for General Commercial use.

Area 4.

This area, Paradise Cove, consists of approximately 13 acres that is bisected by the railroad right-of-way. Approximately 1.5 acres is located on the Nehalem Bay side of the railroad right-of-way and the remaining 11.5 acres is located between the railroad and U.S. Highway 101.

The 1.5 acre portion adjacent to the Bay includes moorage facilities, a restaurant and a recreation vehicle/trailer park. Given the extent of existing development and the lack of vacant land in this area, it is considered unsuitable for water-dependent use. The primary use of the area adjacent to the Bay is for tourist oriented facilities that take advantage of the waterfront location. Therefore, the area has been designated Water-Related Commercial.

The majority of the 11.5 acre area located between the railroad and U.S. Highway 101 is a ravine which runs parallel to the railroad tracks. Several small creeks run through this ravine. At the eastern edge of the ravine is a steep slope which leads up to Highway 101. The only flat section of this 11.5 acre parcel is a 2-3 acre area on the south end of the property which contains a dwelling and a marina services building. This area is separated from the estuary by the 1.5 acre developed property west of the railroad tracks. Redevelopment of this site for a condominium/motel has been proposed.

This 11.5 acre parcel is considered unsuitable for water-dependent development due to topographic constraints (i.e. steep slopes) and to the isolation of the existing flat area from the estuary. The 11.5 acre portion has been designated General Commercial to accommodate the proposed condominium project.

Coastal Shoreland Uses requirement Number 3 states that "local governments shall determine whether there are any existing, developed commercial/industrial waterfront areas which are suitable for redevelopment which are not designated as especially suited for water dependent uses. Plans shall be prepared for these areas which allow for a mix of water dependent, water related, and water oriented nondependent uses and shall provide for public access to the shoreline." Wheeler's four waterfront areas, Area 1-4, were reviewed to determine whether any of the areas were "developed commercial/industrial waterfront areas which are suitable for redevelopment which are not designated as especially suited for water dependent uses." Wheeler has two waterfront areas that are developed as mixed use commercial areas. These are Area 2 and the portion of Area 4 that is located north of the railroad right-of-way. Redevelopment plans for these two areas are not required because the present mix of land-uses meets the City's objective of providing for water oriented tourist facilities in these areas.

Even though the City is not preparing a redevelopment plan for either Area 2, or a portion of Area 4, the objectives of Coastal Shoreland Use requirement 3 is met. The City's water-related commercial zone (the zoning for Area 2, northern portion of Area 4) provides for a variety of water-dependent and water related uses. The Zoning Ordinance, Section 11.110 Shoreland & Estuarine Development Standards, requires that development in shoreland areas provide "waterfront access for the public such as walkways, trails and landscaped areas will be provided, whenever possible and where consistent with public safety."

Existing public access to Nehalem Bay is limited. There are no existing public rights-of-way, streets, or easements that abut Nehalem Bay that could potentially provide public access. There is one public access point, a boat ramp located in Area 2. There are limited opportunities for expanded public access, that is strictly public access, because of the existing land use pattern and the location of the railroad right-of-way. Therefore the City is relying primarily on proposed new private development to provide for additional public access to Nehalem Bay. The Zoning, Ordinance Section 11.110 Shoreland & Estuarine Development Standards requires that new development in shoreland areas provide "waterfront access for the public such as walkways, trails and landscaped areas will be provided, whenever possible and where consistent with public safety".

Buildable Land

The Wheeler city limits include 220 acres of land. This total is broken down, by land-use, as follows:

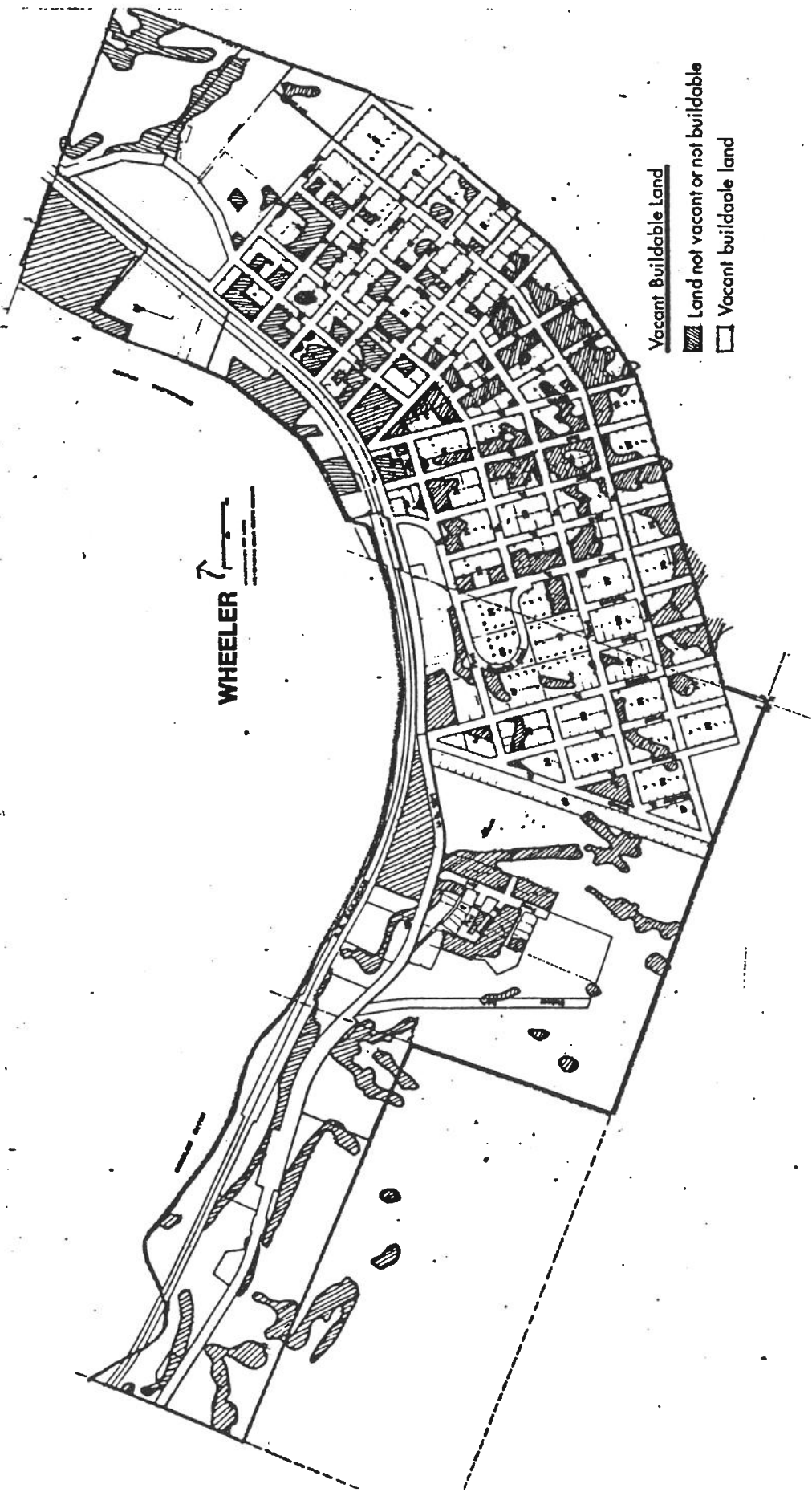
CITY LAND USE

<u>USE</u>	<u>ACRES</u>	<u>PERCENT</u>
Residential	20	9
Commercial	6	3
Public/Semi Public	2	1
Streets/Railroad	54	25
Vacant	138	63
TOTAL	220	—

The area inside the Wheeler urban growth boundary, but outside the Wheeler city limits, includes 79 acres of land. This total is broken down, by land-use, as follows:



URBANIZING AREA LAND-USE

<u>USE</u>	<u>ACRES</u>	<u>PERCENT</u>
Commercial	1	1
Vacant	78	99
TOTAL	79	100



WHEELER

Vacant Buildable Land

-  Land not vacant or not buildable
-  Vacant buildable land

The vacant land inside the urban growth boundary can be characterized as follows:

VACANT LAND

<u>WITHIN CITY LIMITS</u>	ACRES
General Commercial	11.0
Water Related Commercial	1.0
Industrial	5.6
Residential	<u>141.0</u>
TOTAL VACANT BUILDABLE LANDS IN CITY	158.6
 <u>URBANIZING AREA</u>	
Residential	<u>33.7</u>
TOTAL VACANT BUILDABLE LANDS IN UGB	192.3

Land requirements to accommodate projected residential growth

1.	Population projection 2020	475
2.	Population 1996 (Est.)	375
3.	Population increase	100
4.	Household size (1997)	1.6
	234 occupied / 375	
5.	Additional DU needed in 2020	62
6.	Vacancy rate 5.5%	3
7.	Total DU needed	65
8.	Housing mix, multiple units in 14 structures	52
	22% multi-unit	
	78% single family units	
9.	Land requirements	8 acres
10.	Total residential land requirements	8 acres
	1.75 acres multiple dwellings	
	6.25 acres single family dwellings"	

The urban growth boundary contains 175 acres of vacant land that has been designated for residential use. This is substantially larger than the projected need of approximately 8 acres.

The urban growth boundary contains 12 acres of vacant commercial land. Only .63 acres of this is in the Central Business District. However, this may meet the 20 year need since there are opportunities for rehabilitation and expansion of occupied commercial properties.

There is 5.6 acres of vacant Industrial land. This is adequate to handle the 20 year need.

Conclusion: No additionally zoned residential, commercial, or industrial land is needed to meet the 20 year need. No expansion of the Urban Growth Boundary is needed.

Industrial and commercial land use designations have been established in the Plan on the basis of (1) existing use of the land or water areas, (2) historical land and water use or zoning patterns, (3) proximity to the bay, rail lines and U.S. Highway 101, (4) probable future demand for waterfront land, (5) compatibility with residential development or environmentally sensitive areas such as salt marshes, and (6) ability of the City and the North Tillamook County Sanitary Authority to provide key public utilities. Each of these factors are discussed below. Reasons for location of industrial and commercial activity have been included on Page 3 and 4 of this report.

1. Both water-related commercial sites in the Plan are committed to development because of existing uses. The westernmost water-related commercial area (WRC) is the site of an existing sport boating and marina facility as well as a restaurant and recreation vehicle park. The remaining portion of the site is zoned General Commercial (GC) to accommodate an approved condominium development. The WRC area in the central part of the City contains a restaurant, marina and motel. It is part of the downtown area, and its upgrading is expected to continue. Shoreline industrial activity has declined significantly in this century due to the decline of salmon fishing and timber production. The two designated industrial sites are anticipated to provide for future industrial needs. There are two sites designated for industrial use. The more northerly site, adjacent to the proposed Bott's Marsh Marina Development, will provide for a mixture of land-use, many of them associated with the Marina development. Water-dependent and water-related uses are priority uses in this zone, but nonwater related industrial uses are permitted on a conditional use basis. The other site, northern portion of Kahr's property, is available to provide for a variety of industrial uses, with a priority given to water-dependent and water-related uses.

Although it is anticipated that these sites will be needed for future development, they are zoned primarily on the basis of suitability, inasmuch as they are committed to urban development.

2. Most of the IND and WDD areas have been historically zoned as such. The industrial sites supported sawmills and canneries in the early part of the century. Some industrial zoning has been eliminated because of its conflict with the estuary.
3. The industrial and commercial sites are all adjacent to U.S. Highway 101, the Southern Pacific Railroad and the Nehalem River.
4. There are no projections available on the number of acres needed for commercial and industrial development in the Nehalem Bay area. However, tourism has been identified as a major development opportunity for Wheeler. The WRC, GC and IND zones provide areas where the City can accommodate a variety of tourist oriented activities that take advantage of Wheeler's location adjacent to Nehalem Bay.
5. All WRC, WDD and IND sites are separated from residential areas by U.S. Highway 101. Major salt marshes are not included in these designations, the plan provides estuary and shoreland development policies and standards to protect environmentally sensitive areas.
6. Key public facilities are to be provided by the City (water) and the North Tillamook County Sanitary Authority (sewer). Adequate capacity must be available prior to approval of new uses. (See Public Facilities Policies, Page 13). Capacities for each system are discussed on Pages 60 and 61 of this report. It should be noted that it is difficult to project water and sewer usage of commercial and industrial development. For example, a shrimp processing plant uses several thousand gallons of water per hour, while a saw mill or loading dock uses very little. It is the intention of the City to evaluate all proposed uses for their impact on public services. The NTCSA system is being studied at this time for expansion. The City water system has sufficient capacity for moderate growth. All future commercial or industrial uses must meet State environmental standards, and it is the intention of the City to coordinate its activities with the DEQ. (See page 6 of the Plan).

The Wheeler Urban Growth Boundary (UGB) is based on five broad factors as set forth by the State Urbanization Goal:

1. There is a demonstrated need to accommodate long range population growth requirements consistent with other goals. There are 216 acres of vacant land in the Boundary. 52.5 acres are considered unbuildable due to steep slopes, public ownership, natural area classifications and future street requirements. The 1977 Land Use survey (see page 2) showed that 50 percent of the land within the City is vacant. This is due to, among other things, the practice of owners placing their homes on larger lot sizes than required, or owners holding onto large lots for retirement purposes.

If 40 acres are deleted from the total UGB for this purpose, the total buildable lands is estimated to be 123.5 acres, compared with a projected need of 90.1 acres. A surplus of 33.4 acres remains, which is considered a reasonable margin.

2. Providing a need for housing employment opportunities and livability. As mentioned above, the land allotted will provide a parcel size sufficient for a moderately-sized subdivision or mobile home area, which is not the case at present. The commercial and industrial areas are committed and/or suitable for development, and could provide employment opportunities not presently available. Wheeler is providing a livable environment through the development of a strong Comprehensive Plan and Zoning Ordinance, and protection of the unparalleled views of the Nehalem River and Coast Range. Large amounts of open space and recreation opportunities surround the City.
- 3.- Orderly and economic provision of public facilities and services. Water and sewer service can be easily extended to the UGB area to the South of the existing City. Since the area to the North and East is primarily wetlands and other resource lands, the next most logical extension of services is to the South. Sufficient capacity is available to service these areas.
- 4.- Maximum efficiency of land uses within and on the fringes of the existing urban area. The steep slopes on which Wheeler is built prevent intensive use of the land. Densities planned and anticipated are the maximum that should be permitted given the topography. Multi-family dwellings and planned developments are permitted in both the R-1 and R-2 zones. Clustering is encouraged to promote efficient extension of utilities. The allowance of mobile homes in the R-2 zone provides an intensive and efficient use of land not previously allowed, and is immediately adjacent to the existing City limits. A slope density guideline is provided in the Plan to prevent over development of steep slopes; engineering geology studies may be required where appropriate. Surrounding forest lands and the estuary are development constraints which severely limit the City's choices of future urban expansion, and the areas included in the UGB are the only non-resource, privately owned lands with logical reach of existing services.
- 5.- Consideration of environmental, energy, economic and social consequences. As mentioned, the City of Wheeler is in an enviable location, surrounded by forest lands and water areas. The intent of the Plan policies is to preserve the character of the community. No departure from this goal is intended for the UGB area. The expansion of the City is planned to provide for social and economic opportunities, as stated, including alternative housing types, planned developments, recreation facilities such as marinas, and commercial and industrial development.

NATURAL FEATURES ELEMENT SUMMARY

Including the studies of geologic, hydrologic, and topographic features:

Reference Maps:

Geology

Contours/Slope

Forest Land

Flood Plain

Buildable Lands Survey

Statewide Goals of Primary Importance:

Goal 3 -- Agriculture

Goal 4 - Forestry

Goal 5 - Natural Resources (Wetlands, watersheds, etc.)

Goal 6 - Water and Land Resources Quality

Goal 7 - Areas Subject to Natural Disasters and Hazards

Goal 10 - Housing

Goal 11 - Public Facilities and Services

Goal 12 - Transportation

Goal 14 - Urbanization

Goal 16 - Estuarine Resources

Goal 17 - Shorelands

Geology

The geology of Wheeler is described in the report Environmental Geology of the Coastal Region of Tillamook and Clatsop Counties, Oregon Department of Geology and Mineral Industries, 1972.

There are two major geologic units in the planning area: tide-flats, and Oligocene and Miocene sedimentary rocks (Map Section). Within the planning area there are also minor, isolated outcroppings of basaltic (volcanic) intrusions.

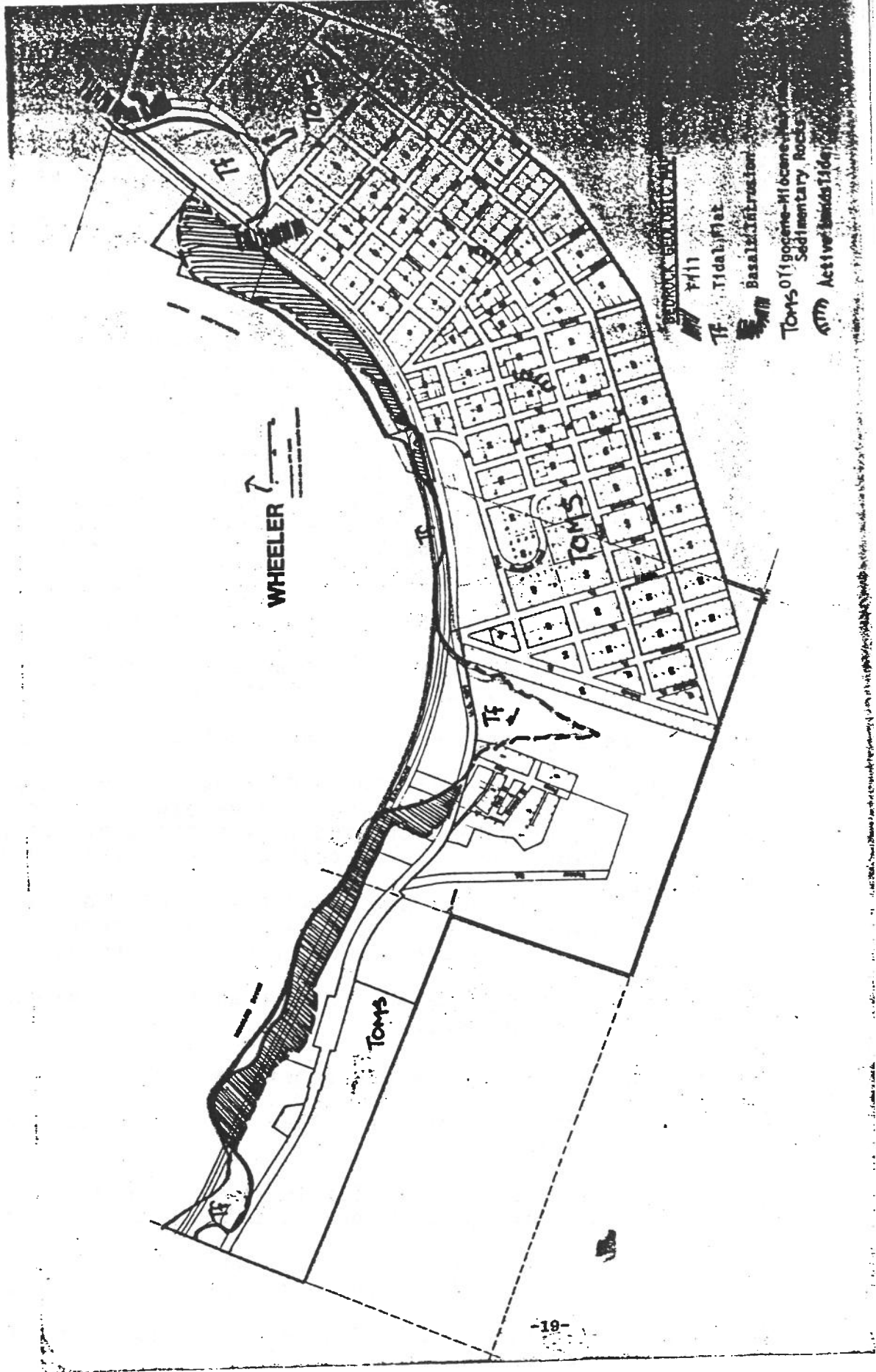
Oligocene and Miocene marine sedimentary rocks are the most extensive in the planning area. The terms "Oligocene" and "Miocene" indicate that the formation is 12-38 million years old. The unit consists of siltstones, and to a lesser extent, sandstone and claystone all consolidated in a shallow-water marine environment.

These originally flat-lying sedimentary rocks were elevated and tilted between 2 and 12 million years ago in conjunction with uplift and folding of the easterly Coast Range. For the Wheeler area Ross, (1978) concluded that the dip of bedrock ranges from 7° to 27°. (Dip refers to the angle of inclination of the bed measured from horizontal). The direction of dip varies from southwest to north with the predominate dip direction west. (See Map Section).

The Oligocene and Miocene unit is notorious for soil creep, and potential for rapid landslide movement. In the case of the study area, the entire upland region lies within a larger inactive landslide area (Schlicker, 1972 and Ross, 1978). The area of this ancient landslide roughly corresponds with the uppermost slopes and ridge above Wheeler. Geologists have estimated that the major movement in this landslide occurred several hundred or even several thousand years ago. In fact, based on criteria that an "active" landslide area is a one of continuous or periodic major ground movement over the past 100 years, there are no active landslide areas in the Wheeler study area. (Schlicker, 1972 and Ross, 1978)

Nevertheless, renewed movement and slope stability problems are a distinct possibility, especially if improper development practices are utilized. (Ross, 1978) The Ross study identified existing developed sites of very recent movements of a small scale. (Map Section).

-
1. Very slow, downslope creep of soil



Although generalizations can be stated for planning purposes, site investigation by a qualified engineer or geologist are often appropriate. The Ross study includes a set of recommendations for use in development of potentially unstable areas. The Ross recommendations emphasizes site-specific geologic investigations whenever appropriate. The Ross recommendations are as follows:

RECOMMENDATIONS

1. Chapter 70 (Excavation and Grading) of the Uniform Building Code (1976 edition) should be applied to all development within the study area.
2. In addition to when required by Chapter 70 of the Uniform Building Code, favorable site-specific investigations (conducted by qualified geotechnical experts at the developers expense) should be prerequisites for the issuance of building, excavation, or fill permits in properties containing the following:
 - A. Areas on slopes of 10% or more steepness (Plate 2);
 - B. Any other area deemed necessary by the building inspector (or other appropriate official).
3. Some suggested development practices:
 - A. Structures should be designed in such a way to preserve natural slopes and vegetative cover as much as possible; Cut-and-fill methods of lot preparation should be discouraged in hillside areas;
 - B. Access roads and driveways should follow natural slopes (i.e. follow contours) as much as possible to minimize need for grading and cuts;
 - C. No development should be allowed to block stream drainage ways.
4. Suggested development densities:
 - A. Average slope less than 10% - 4 units per acre maximum;
 - B. Average slope = 10% to 24% - 2 units per acre maximum with favorable site-specific study;
 - C. Average slope of 25% or more - 1 unit per acre maximum with favorable site specific study.

The above densities could be increased or decreased, dependent upon results of site investigations, nature of the development, utilization of special design techniques to avoid geologic hazards present, etc.

An understanding of factors which influence the potential for massive land slippage can help prevent improper and inadvertent development practices. The following table presents a summary of general findings:

MAJOR VARIABLES WHICH INFLUENCE LANDSLIDE POTENTIAL

Natural Factors

Summary of Variables

type bedrock geology	Wheeler is dominated by a marine sedimentary rock that is one of the least resistant geologic units
type of soils	Mainly Astoria silt loam (on 20-40% slopes) and Hembre silt loam (on 40%-60% slopes) See Soils
depth to bedrock	Varies in study area. Most Astoria silt loam is 40-72" and a typical Hembre silt loam profile is 40-50". Erosion or other cause for shallow soils may indicate problems.
orientation of bedding	Tilted sedimentary beds often dip in Wheeler area in the same direction as slope, indicating potential hazard.
slope	Generally steeper slopes are more prone to hazards. Slopes in the study area vary in upland areas mainly from 20%-60%. See slope and topographical information.
hydrological conditions	Water can act as a lubricant between bedding planes. Disruption of water cycle usually increases erosion, soil saturation, runoff rate and slide potential.

Development Practices

Impact of Change

removal of vegetation

Widespread removal of vegetation increases impact of precipitation upon land, and will often increase erosion, soil saturation and slope instability.

cut-and-fill practices

Used for road construction or lot preparation the practice can reduce support above the cut or add weight of the fill (and structure) on the slope below the cut.

density levels

Different levels of development can exceed engineering capacity depending on local conditions and development pattern.

disruption of natural drainage patterns

Impervious materials, such as roads and buildings, increases total runoff and can alter drainage patterns.

Soils

Information about soils in the Wheeler planning area is available at a generalized level (1:20,000 in the Soil Survey; Tillamook Area, Oregon; Soil Conservation Services, USDA; 1964). A more detailed survey for Tillamook County is in progress (4": 1 mile).

Generalized soils information is adequate for general planning purposes, and for 1978 represents the best data available about land capability. The information groups soil characteristics into units called "associations". Generalized soils information is adequate for comprehensive land-use planning because it permits general conclusions about engineering and land capability on a regional basis. Generalized soils information is not adequate for site developments or technical answers about agriculture and other resource management practices. Detailed soils information should be added to the background report and comprehensive plan when they become available.

The location of various soil associations is found in this report.

The Coquille silt loam soil is alluvial deposit emanating from breakdown of basalt and sandstone in the interior uplands. The soil occurs on nearly level areas where deposition by main streams occur. In the Wheeler planning area, S.C.S. soils mapping shows Coquille silt loam to be developed on the portion of the tidal flat within the embayment at the north end of town.

Another soil, tidal flat, is found in the Bay where barren, nearly flat areas of mud are periodically covered by tidal water.

Hembre and Astoria silt loam soils occupy the moderately steep to rugged slopes (to 60%) in the planning area. The soils, usually 50 or more inches in depth, are derived from weathered sedimentary rock. Capability of the soil for such uses as dwellings, excavations and streets depends largely on slope. As slope increases the rate of runoff and degree of erosion hazard is magnified. A relatively high rate of soil creep and potential for landslide has been documented. (See Geology)

Soils in the Wheeler planning area are strongly correlated with the upland geologic type (Oligocene-Miocene sedimentary) or else are of mixed geologic composition resulting from flood-plain deposition. For each of the geologic units described in the geology section, certain soils are often found as can be seen by comparing general soils and geology maps for the planning area.

Based on behavioral characteristics of a typical soils profile, soil scientists have rated each soil for its potential uses and limitations. The following chart summarizes the engineering limitations of various soils for possible development uses:

SOIL LIMITATIONS FOR URBAN USES

	Co Coquille	Tf Tidal Flats	Hembre 3-30% Slopes	Hembre 30+% Slopes	Astoria 12-20% Slopes	Astoria 20+% Slopes
Roads and Streets	Severe	Severe	Moderate to Severe	Severe	Slight-moderate	Severe
Excavations and Embankments	Severe	Severe	Moderate to Severe	Severe	Moderate	Severe
Dwellings without Basements	Severe	Severe	Moderate to Severe	Severe	Severe	Severe
Septic Tanks	Severe	Severe	Moderate to Severe	Severe	Moderate to Severe	Severe
Sanitary Land Fills	Severe	Severe	Severe	Severe	Severe	Severe
Recreation	Severe	Severe	Moderate	Severe	Slight-Severe	Severe

Source: The preceding table established for representative soils types from soils data by the USDA - SCS. General limitations are categorized as slight, moderate, and severe.

The following definitions of "severe" and "moderate" ratings are used by the S.C.S. (1972):

"Severe soil limitation is the rating given soils that have one or more properties unfavorable for the rated use, such as steep slopes, bedrock near the surface, flooding hazard, high shrink-swell potential, a seasonal high water table, or low bearing strength. This degree of limitation generally requires major soil reclamation, special design, or intensive maintenance. Some of these soils, however, can be improved by reducing or removing the soil feature that limits use, but in most situations it is difficult and costly to alter the soil or to design a structure so as to compensate for a severe degree of limitation."

"Moderate soil limitation is the rating given soils that have properties moderately favorable for the rated use. This degree of limitation can be overcome or modified by special planning, design, or maintenance. During some part of the year the performance of the structure or other planned use is somewhat less desirable than for soils rated slight. Some soils rated moderate require treatment such as artificial drainage, runoff control to reduce erosion, extended sewage absorption fields, extra excavation, or some modification of certain features through manipulation of the soil. For these soils, modification is needed for those construction plans generally used for soils of slight limitation. Modification may include special foundations, extra reinforcement of structures, sump pumps, and the like."

The next chart presents overall suitability of soils for agriculture and forest production. Agriculture classes range from Class I - VII; subclass W denotes wetness as the major agricultural limitation and subclass e represents erosion as the major limitation:

SOIL SUITABILITY FOR AGRICULTURE AND WOODLAND

TYPE	AGRICULTURE CLASS AND SUBCLASS	FOREST SITE INDEX FOR DOUGLAS FIR
Coquille	IVW	NA
Tidal Flats	VIIIW	NA
Astoria, 12-20%	IVe	165-190
20 - 40%	VIe	165-190
40--60%	VIIe	165-190

Slopes

USGS 20' contour maps are available for the planning area. Together, with generalized interpretation of the slope, a map helps to define the topography.

Slope is a major factor in orderly land-use planning for future uses for the community. Generalized interpretation of slopes reveals that most of the land area is gently to steeply sloped. Slope area which exceeds 12% slope is unlikely to be suited or needed to accommodate commercial, industrial, public or recreational developments. Slope area in excess of 25% slope is unlikely to be suited for residential development.

The generalized slope map is for comprehensive planning purposes and is not adequate for site planning. The slope map can be generally used, and suggests potential hazard and buildable area. For detailed or site-specific use of slope information the following formula is presented:

$$S = \frac{.0023 \times I \times L}{A}$$

where: .0023 = conversion factor of square feet to acres;

I = contour interval;

L = total length of the contour lines within the subject parcel;

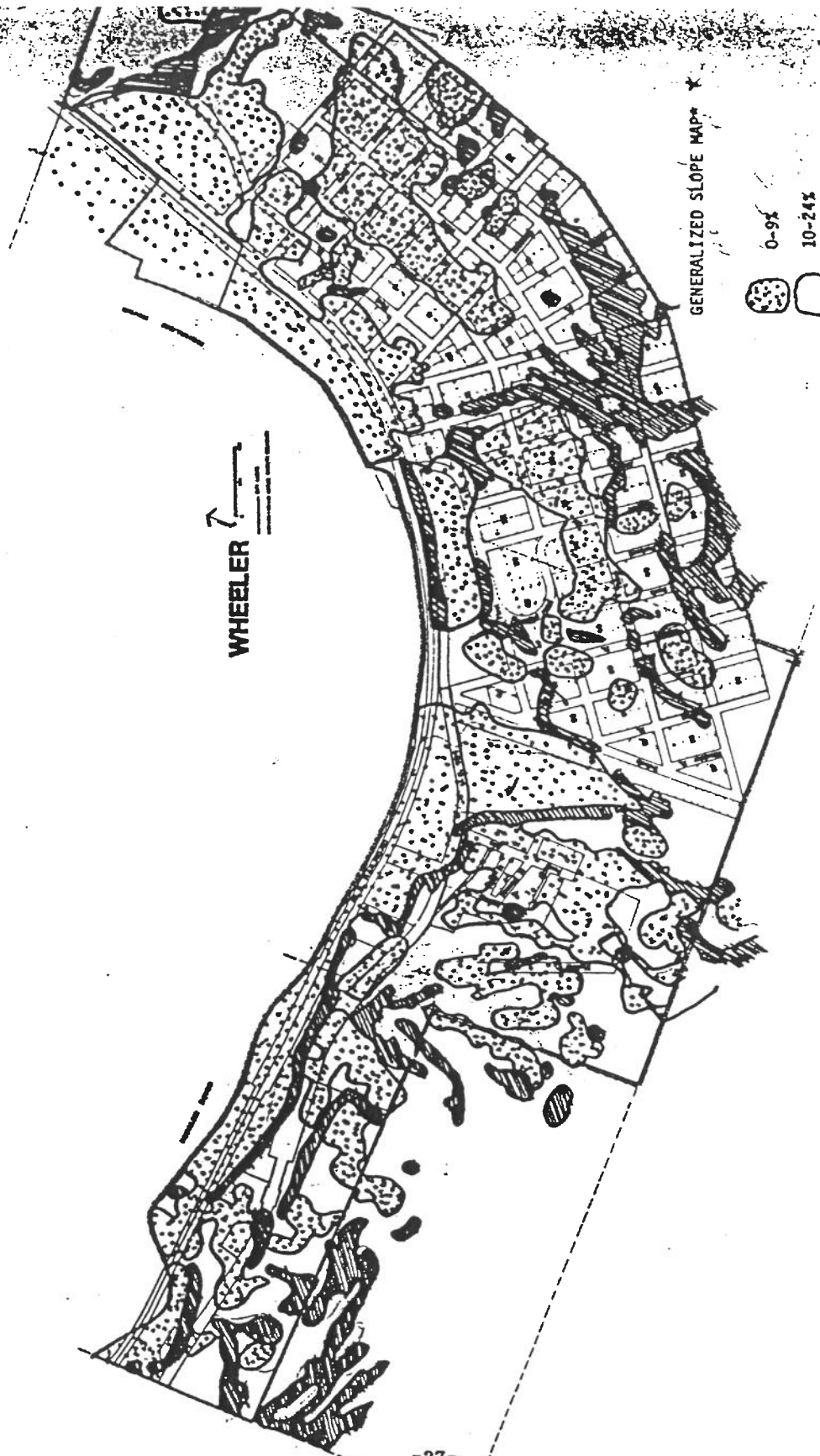
A = area in acres available

S = average slope

"L" can be determined by tracing each contour line with a planimeter and converting to feet.

"A" can be measured directly (one acre = 43,560 square feet) and should not include areas steeper than allowable for the proposed density of the development. For example, in a proposed development of 4 units per acre, those areas with slopes of 25% or more should be subtracted from the total area to give "A" which is the area available for the proposed development.

The average slope, "S", can then be used to determine the number of units permitted on the parcel.



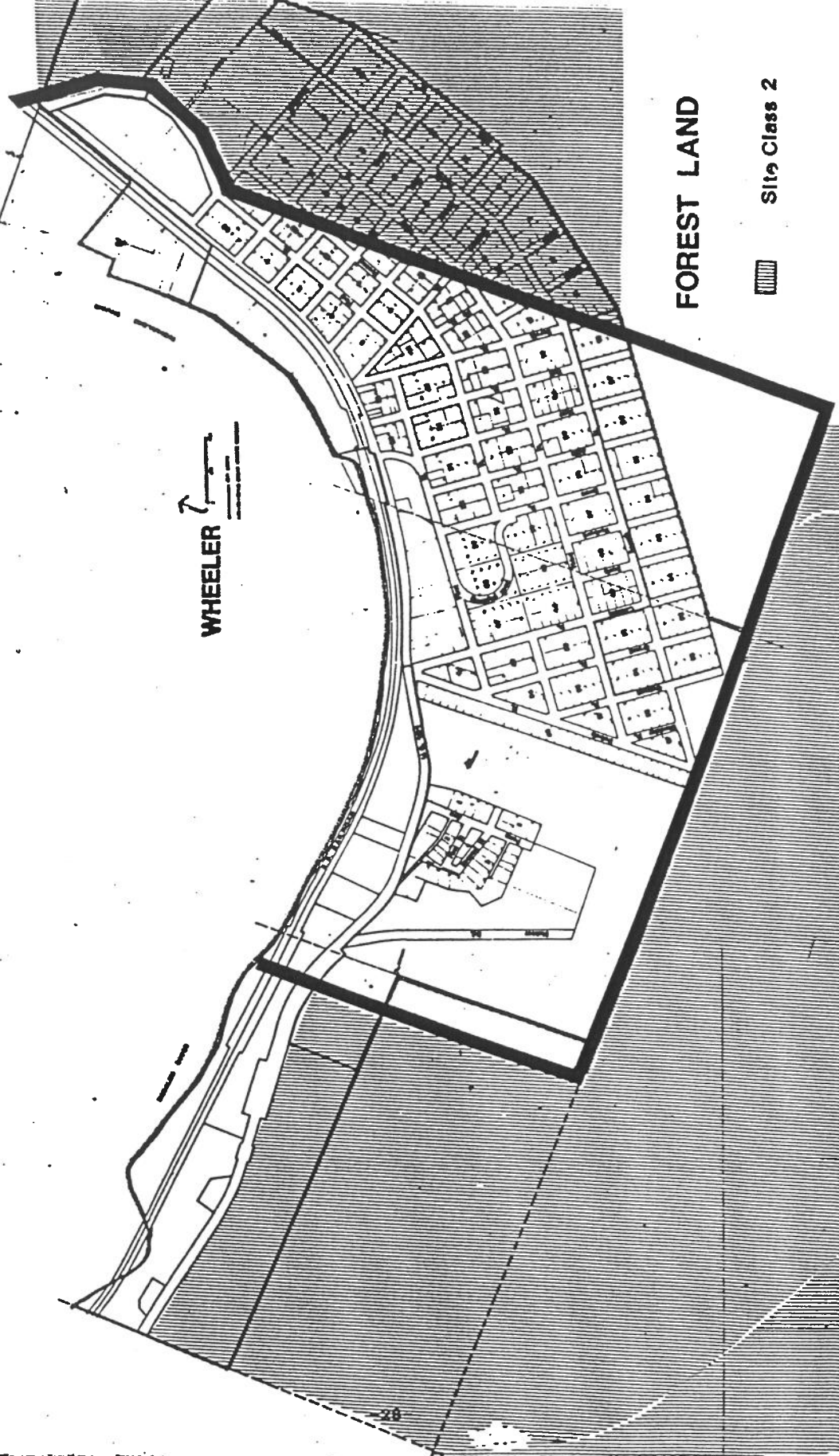
GENERALIZED SLOPE MAP*

- 0-9%
- 10-24%
- 25%+

WHEELER

*Detailed slope map is available at Wheeler City Hall

Map of Forest Land, Site Class 2, showing Wheeler and surrounding areas.

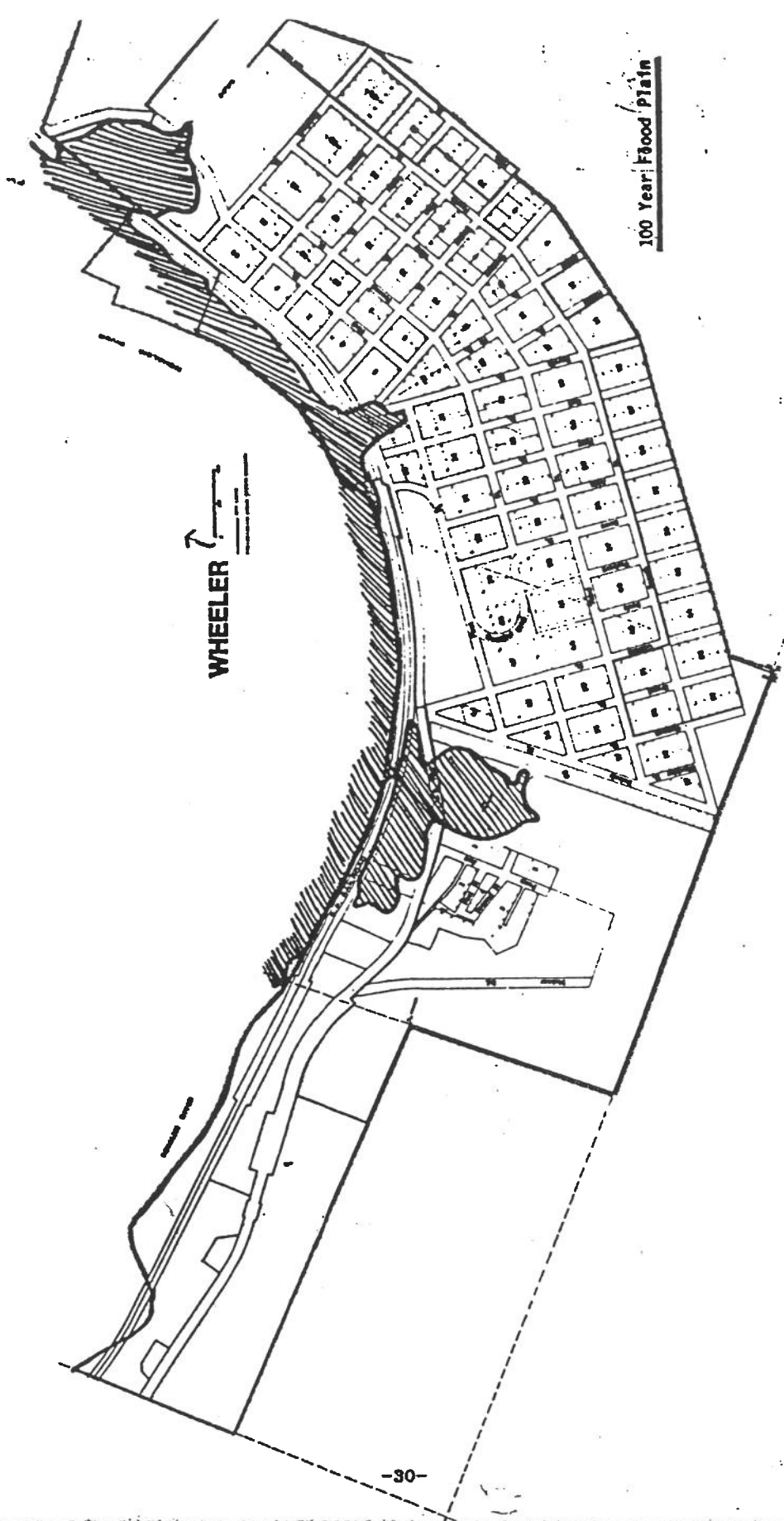


WHEELER

FOREST LAND



Site Class 2



100 Year Flood Plain

WHEELER

Within the planning area, there are approximately 40 acres of soil which is classified as I - IV capability, based on estimates from general soils mapping. There are no major Class I, II or III soils within the planning area.

The Oregon Department of Revenue has determined site conditions on much of western Oregon's forest lands. These designations are based on a 40 acre minimum unit classification. Even though site variations exist within 40 acre unit the revenue designation can serve as the unit average. Revenue site classes are divided into eight divisions whereas, standard site classifications include five divisions for douglas fir. The universal cubic foot site classes are divided into seven productivity classifications of which four can be related to douglas fir. Tillamook County has converted revenue site classes to standard site classes and cubic foot site classes as follows:

<u>REVENUE DESIGNATION</u>	<u>STANDARD SITE CLASS</u>	<u>CUBIC FOOT SITE CLASS</u>
	I +	1
FA	I	2
FB	II, II +	2
FC	II -, III +	3
FD	III	3
FE	III -, IV +	3.4
FF	IV, IV -	4.5
FG	V	5

The map titled Forest Suitability illustrates the forest suitability of land within and adjacent to the Wheeler urban growth boundary.

The Nehalem Watershed

The Nehalem watershed an area of 845 square miles, is a valuable resource to the community, the county and the state. Both quantity and quality of water are important in maintaining the wide range of beneficial uses of the river system. The following table illustrates beneficial uses of river water that are identified by the Oregon Department of Environmental Quality (DEQ).

Wheeler utilizes surface water supplies as a drinking water source. The City is currently participating with the Nehalem Bay Regional Water Board to establish and maintain a regional water system in order to expand water source and storage for the City.

Beneficial Uses of Oregon's Waters

1. Public Domestic H2O Supply
2. Private Domestic H2O Supply
3. Industrial Domestic H2O Supply
4. Irrigation
5. Livestock Watering
6. Resident Fish and Aquatic Life
7. Anadromous Fish Passage
8. Salmonoid Fish Rearing
9. Salmonoid Fish Spawning
10. Wildlife and Hunting
11. Fishing
12. Boating
13. Water Contact Recreation
14. Aesthetic Quality
15. Hydro Power
16. Commercial Navigation and Transportation

The level of water flow varies dramatically according to precipitation and saturation of soils. During the winter months flows exceed an average of 4,000 c.f.s. (cubic feet per second). Summer flows often decline below 150 c.f.s. by late summer (September). The desirable minimum flow to maintain fish life, in contract, is 200 c.f.s.¹

For protection of beneficial uses, including fish life, the state has established minimum stream flows. These levels help to prevent navigable waters from complete diversion or drying up, and are also bare minimums for dilution and flushing of water contaminants. When flows drop below the following levels, water rights for diversions can be legally voided until minimum flow returns to less serious levels.

NEHALEM RIVER

MINIMUM PERENNIAL STREAM FLOWS (c.f.s.)²

	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>
<u>Nehalem River</u>	200	270	270	270	270	270	270	200	150	100	100	100

(To be maintained from the confluence of Cook Creek -- S4; Sec. 35; T3N, R9W -- to the mouth of the Nehalem River)

Water quality is a complex interaction involving variables of temperature, flows, dissolved gases, suspended sediments and biologic organisms such as bacteria. The quality of water has been monitored by the Oregon Department of Environmental Quality on a regular basis, including six stations between the mouth and the city of Nehalem.

1. Source: State Water Policy Review Board (formerly State Water Resources Board) November, 1971
2. Source: State Water Policy Review Board (formerly State Water Resources Board), North Coast Basin Water Policy Statement, 1973.

In August of 1978, DEQ published a report titled Oregon's Statewide Assessment of Nonpoint Source Problems, based on historical records and professional and local input. The study is the first step in addressing nonpoint water quality problems, and will eventually lead to detailed studies of pollution sources and appropriate management technology.

Based on available information it appears that the most severe problems of water quality in the study area include sedimentation, water temperature, and high counts of fecal coliform bacteria. While the data is not sufficient to link problems with causes, it appears that the origination of major pollutants are mainly from "nonpoint" sources, such as agriculture, silviculture, forest practices, urban runoff, mining, construction, and septic systems. In the Nehalem Basin, forest practices are suspected to be a major contributor to water quality problems, particularly as they impact water temperature and sediment loads. The high counts of fecal bacteria are suspected to be related to agricultural runoff and failing septic systems.

A summary of the results of the 1978 DEQ report are as follows for the Nehalem watershed:

SUMMARY OF POLLUTION INDICATORS, NEHALEM RIVER

Pollution Indicator	Description of Problem Areas	Impact of Pollution
1. Excessive Debris	North Fork-moderate South Fork-moderate Mainstream-none indicated	Can physically de-grade stream channel. Most commonly impacted uses are boating and fish passage.
2. Sedimentation	North Fork-moderate South Fork-moderate Nehalem Bay-severe	Impacts water supplies, irrigation, fish habitat, recreation and aesthetics.
3. Elevated water temperatures	Severe	Interferes with aquatic life, especially rearing of salmonids, supply of oxygen, and prevalence of fish diseases.
4. Nuisance Aquatic Plant Growth	None indicated	Impacts water supply, fish rearing and recreation.
5. Stream Bank Erosion	None indicated, except small severe stretch near Hamlet ³	Impacts water supply and fish habitat.
6. Coliform Bacteria	Severe	Impacts most beneficial uses.

HYDROLOGIC FEATURES

Introduction

Hydrologic system simply means to correctly understand the natural hydrologic (water) system. One must analyze components of a holistic system - the Nehalem watershed. The following sections discuss: basic drainage characteristics, climate, tides, mixing characteristics in the estuary, flooding, groundwater, surface water quality, water diversion rights, navigation, and domestic watershed.

Basic Drainage Characteristics

The City of Wheeler is located on a hillside alongside the upper portion of the Nehalem Bay, from approximately Bay mile 4.0 to Bay mile 5.1. Runoff from the immediate planning area is directly into the Bay. Because of the generally steep slopes and impermeable soils, runoff is relatively high and groundwater recharge is low. (More information concerning existing drainage facilities is included in the Facility Analysis section).

The Nehalem watershed drains an area of 845 square miles. Major tributaries include Gallagher Slough, to the north of the planning area. (The Gallagher Slough area and the area upstream along the Mohler side of the river is mainly floodplain and in agriculture use). Approximately three river miles upstream is the North Fork Nehalem tributary.

Climate

The Wheeler area has a typical marine climate. With the prevailing air flow from the west, most air masses arrive on the coast after several days' travel over the Ocean. Their temperatures, at least in the lower levels, have become very near that of the water and their moisture content has approached the saturation point. Between late October and early April, most major storms occur. At this time, the land masses cool much more rapidly than the adjacent Pacific Ocean. Incoming air masses, once they reach land, are cooled both by their passage over the colder land surface and by the lifting as they move eastward up the slopes of the Coast Range. These cooling processes cause large quantities of moisture to be condensed, making very substantial contributions to the precipitation totals of these fall, winter, and early spring storms.

As there are no regularly-maintained weather recording stations in the study area, data must be interpreted from the Tillamook and Seaside stations.

Approximately 70 percent of the annual total rain falls during the five months of November through March. Practically all precipitation in the study area, even in the coldest months, occurs as rain. Snow usually melts immediately and rarely lasts more than a few days.

COMPARISON: CLIMATIC
CONDITIONS OF SEASIDE & TILLAMOOK, ORE.

	<u>Seaside</u>	<u>Tillamook</u>
Yearly precipitation (mean)	77.37"	89.33"
Number of days with precipitation of .1" or more (mean)	135 days	137 days
Number of days with maximum temper- ature of 90 degrees or above (mean) .	1 day	1 day
Number of days with minimum temper- ature of 32 degrees or below (mean) .	37 days	51 days

Source: U. S. Department of Commerce, Environmental Sciences Service Administration (renamed National Oceanic and Atmospheric Administration), "Climatological Summary".

Winds

Prevailing winds are from the southwest during the winter months, due to low pressure systems with counter-clockwise air circulation moving out from the Gulf of Alaska. High pressure cells further south of the Gulf of Alaska predominate during summer months.

Tides

Tidal effects on the Nehalem River extend upstream from the study area as far as Roy Creek (approximately eight miles). Tides exhibit typical West Coast patterns of unequal heights (higher high water and lower high water).

The difference between high tide and low tide decreases with distance upriver from the Bay mouth. Also, the time of high and low water lags behind that of the peak at the mouth of the Bay, with the lag increasing as one moves upstream. For example, short-term observations have been made at Nehalem and Brighton: (refer to the following page)

NEHALEM TIDE LEVELS

<u>Nehalem River</u>	<u>Range (feet)</u>		<u>Mean Tide Level (feet)</u>
	<u>Mean</u>	<u>Diurnal</u>	
Brighton.....	5.9	7.8	4.1
Nehalem.....	5.6	7.2	3.7

* * * *

Mean Range: Difference between Mean High Water (MHW) and Mean Lower Low Water (MLLW).

Diurnal (Daily) Range: Difference between Mean Higher High Water (MHHW) and Mean Lower Low Water (MLLW).

Mean Tide Level: (Half Tide Level) Plane midway between Mean Low Water (MLW) and Mean High Water (MHW)

Source: U. S. Department of Commerce, U. S. Coast and Geodetic Survey, Tide Tables, 1974.

According to predictions, high tide adjacent to the City of Nehalem occurs 26 minutes later and is approximately seven inches lower than high tide at Brighton. Low tide is one hour and two minutes later and is approximately four inches higher than Brighton's low tide. These predictions incorporate seasonal changes, but may not be accurate during unusual conditions such as floods and ocean storms.

Mixing Characteristics

Good information specifically about mixing of fresh water and salt water in the estuary is not readily available at the present time. In general, salinity and nutrient mixture is highly variable depending, for example, on the distance of the site from the Bay. Another factor affecting salinity is seasonal changes in volume of water. Fresh water, of course, dilutes salt water; and, in addition, the volume of fresh water can influence the manner in which salt water and fresh water will mix. In general, high volume runoff such as winter and spring months can result in a "two-layered system", where fresh water overrides salt water. Low volume flows, by contrast, tend to be dominated to a greater degree by the energies of tidal action, giving rise to more concentrated mixing of waters.

Runoff Yield and Sedimentation

The average annual yield of the entire Nehalem Basin is 2,148,000 acre-feet.¹ Approximately 80 percent of water-yield increase occurred during the October-to-March season.²

The annual sediment load in Nehalem Basin has not been studied in detail. It has been estimated that 116,000 tons of sediment is carried by the river system from forest practices alone.³ Historically, abnormally high sediment loads in the river have been due to the extensive Tillamook burn.

Urban development, especially if insensitively accomplished, also increases runoff and usually erosion and sedimentation rates.

The incidence of high sediment yield has significance mainly in the Bay area, affecting marsh expansion and shoaling (depth) of river channels.

Source:

1. Oregon Coastal Conservation and Development Commission, Freshwater Resources of the Oregon Coastal Zone, Dec., 1974, pp. 11, 14, & 16.
2. Rothacher, Jack, Increases in Water Yield Following Clear-Cut Logging in the Pacific Northwest, April, 1970, pp. 653.
3. Army Corps of Engineers, pp. C-44.

Flooding

Frequent flooding of the Nehalem Bay lowlands occurs mainly in the winter months during periods of high runoff; however, high tides driven inland by storm conditions produce the most severe flooding. At present, much of these low-lying areas are in agricultural use. The flood-prone flat areas have the capacity to absorb much of the floodwaters without incurring significant damage. Seasonal flooding is a local fact of life.

The "floodway" is the unobstructed portion of the floodplain required to carry the deep and fast-moving water runoff. The "flood fringe" is the area beyond the floodway where floodwaters are usually shallow and slow. The floodway and flood fringe together comprise the "floodplain".

Major flood protection in the Nehalem Basin depends on floodplain zoning, the prerogative of Tillamook County. Tillamook County and the cities of Nehalem and Wheeler have adopted floodplain zoning, consistent with the Federal Insurance Administration (HUD) requirements. The floodplain area is mapped (see Map section).

Groundwater

The availability of groundwater in the Wheeler study area is generally poor. Within the study area, yields from drilled wells have not yet produced adequate volume for domestic use.

One of the major factors influencing groundwater recharge and availability is the associated bedrock geology (see Geology report). For the area immediately adjacent to the city, the basic rock strata is a sedimentary deposit of a fine-grained composition which restricts free flow and holding capacity. Breakdown of this bedrock usually produces soil types which also tend to be fine-grained. Relatively little infiltration and buildup of groundwater combined with generally steep slopes produces rapid and high volume surface runoff.

Aside from the foregoing geologic limitations upon groundwater recharge, it should be noted that a probable factor affecting supply and quality of groundwater could be proximity to underground saltwater. If saltwater is partially blocking the available area for freshwater recharge, it could be the extraction of groundwater that might eventually result in intrusion of a saltwater ledge. This possibility deserves careful investigation prior to development of any wells for domestic water supply.

Groundwater quality is also a potential problem in the study area. Quality can vary but is generally poor because the major geologic aspect has been backfilling by alluvium (water deposited sediments). Water derived from this alluvium will typically contain dissolved salts, iron or organic material.

A study of engineering suitability of utilizing a groundwater source as a future supply for the city, concluded that the city must pursue other "available options for development of existing surface sources..."¹

1. Source: Groundwater Feasibility Study, H.G.E., July 1978, page 9.

Water Diversion Rights

From the drainage basin, the largest concentration of water diversion rights is in the following areas: Nehalem Bay, lower North Fork and Foley Creek. The following table summarizes diversion rights:

TOTAL WATER RIGHTS*

(In Cubic Feet Per Second)

Consumptive		62.5 c.f.s.
Domestic	8.1 c.f.s.	
Municipal	13.5 "	
Irrigation	24.6 "	
Industrial	16.3 "	
TOTAL	65.5 c.f.s.	
Nonconsumptive		32.5 c.f.s.
Power	3.1 c.f.s.	
Recreation	.8 "	
Wildlife	.2 "	
Fish	28.4 "	
TOTAL	32.5 c.f.s.	
Total (Consumptive & Nonconsumptive)		95.0 c.f.s.

SURFACE WATER RIGHTS BY RIVERMILE*

<u>Rivermile</u>		<u>Rights (c.f.s.)</u>
	Mouth of Nehalem Bay	95.043
	Misc. & Bay - 19.75	
0.0	Above Bay	75.293
2.7	At North Fork	70.093
	North Fork - 26.231	
7.5	At Foley Creek	41.912
	Foley Creek - 1.84	
22.2	At Salmonberry River	38.437
46.9	At Fishhawk Creek	31.107
90.8	At Rock Creek	12.210
113		.48

*Source: State Water Policy Review Board (Formerly, State Water Resources Board), November, 1971.

Navigation

"Nehalem Bay was once a bustling port of commerce, bringing in supplies for the community and hauling out processed fish and lumber. That was 50 years ago. Today, Nehalem Bay is a flooded sandbox, too shallow to allow big boats to enter and navigate, with a sandbar at the mouth of the River that challenges even the best of oceangoing fishermen."²

Prior to improvement, the River maintained bar depth from 12 to 14 feet at Mean Lower Low Water.³ Under original conditions, the entrance channel was 400 to 600 feet in width and was subject to great changes in position and direction, as well as depth. It shifted at intervals throughout a distance of more than a mile along the beach, and varied in direction from south-east to north-of-east with reported controlling depths on the bar of from 10 to 20 feet at high tide.⁴

Source: Nehalem Wetlands Review, p. C-47 through C-50.

2. Jacoby, Fred, The North Coast Times Eagle, "What Happened to Nehalem Bay?", Vol. 5, No. 11, Thursday, July 17, 1975.
3. Port of Nehalem, Nehalem Bay and River, Oregon: Restoration of Navigation Facilities, Bar Entrance, Wheeler, Oregon, 1962.
4. U. S. Army Corps of Engineers, Annual Report-Chief of Engineers, 1915.

As of March, 1913, \$82,000 had already been expended on initial construction of the South Jetty by local authorities. The Army Corps of Engineers took over work on the South Jetty in August of 1913. The South Jetty was completed on December 31, 1915, and the North Jetty was finished on October 15, 1918.¹

The completion of the South Jetty stabilized the position of the channel across the bar. The survey of June 30, 1916 showed a least depth of 12 feet at Mean Lower Low Water across the bar in a well-defined channel about 200-feet wide. The controlling depth between the jetties was 18 feet.²

In a 1929 report, the controlling depth on the Bay and bar was only eight feet at Mean Lower Low Water. No commerce on the Bay had occurred during the years 1924-1928. All of the lumber manufactured on the Nehalem River was shipped by rail, there being insufficient depth of water on the bar for the usual type of lumber carriers.³

During the middle thirties, independent logging operators in the Nehalem Basin constructed log rafts for water shipments to Columbia River log markets in the vicinity of Astoria, Oregon. The attempt to restore navigation failed, due to inadequate bar depths. Several log rafts were lost at sea while crossing the Nehalem bar.⁴

Except for one dredging project on the bar in 1933, the Corps has not conducted further work. When the logging and fishing industries left Nehalem and Wheeler, the Corps lost any economic justification for continued interest in the jetties.

In 1946, navigation was reported to be hazardous for any ocean-going vessel, even under the most favorable conditions. Sinking of both jetties had allowed shoaling to occur on the bar and in the entrance. Not only had the channel shoaled, but its position was said to shift continually. At high tide, considerable water flowed into and out of the Bay over the end of the spit north of the North Jetty, partially bypassing the present entrance and nullifying to some extent the effect of the controlling works.⁵

1. Jacoby, Fred, The North Coast Times Eagle, "What Happened to Nehalem Bay?", Vol. 5, No. 11, Thursday, July 17, 1975.

2. U. S. Army Corps of Engineers, Annual Report-Chief of Engineers, 1919.

3. U. S. Army Corps of Engineers, Annual Report-Chief of Engineers, 1929.

4. Port of Nehalem, Nehalem Bay and River, Oregon: Restoration of Navigation Facilities, Bar Entrance, 1962, pages 32-33.

5. Unpublished Report of U. S. Army Corps of Engineers, District Engineer, 1946.

Today, navigational use of the entrance channel is recreational. The bar is about 1,000 feet offshore and frequently shoals to two or three feet at Mean Lower Low Water. Waves break over the entire stretch from the bar to the ends of the jetties under all but the smoothest ocean conditions. The entrance to Nehalem Bay is only eight miles from Tillamook Bay, and a major improvement to the entrance cannot be justified on the basis of transportation savings.

ESTUARINE PLANNING

The Estuarine Resource Goal requires that the Land Conservation and Development Commission classify Oregon's estuaries to specify the most intensive levels of development or alteration to be allowed within each estuary. On October 7, 1977, the Land Conservation and Development Commission adopted an Administrative Rule classifying Oregon's estuaries. The classification system consists of four classes: 1.) the natural estuaries, 2.) conservation estuaries, 3.) shallow-draft development estuaries, and 4.) deep-draft development estuaries.

The intent of the classification system adopted is to:

1. Specify the most intensive level of development or alteration allowable within each estuary;
2. Direct the kinds of management units appropriate and allowable within each estuary;
3. Affect the extent of detail required and items inventoried for each estuary;
4. Affect the issuance of conditions attached to permits by State and Federal agencies;
5. Provide guidance for the disposal of State and Federal public works funds, and;
6. Indirectly affect decisions concerning private investments in and around estuaries.

Nehalem Bay was the only one of the twenty-two major estuaries not classified. Rather the rule states:

"Nehalem Bay is not classified at this time. The uses in and around Nehalem Bay should be consistent with the conservation classification, but Nehalem Bay historically has had jetties which are still authorized, but not maintained. A maintained entrance to the bay may be justified to provide for appropriate recreational and fishing use within the bay. The classification for Nehalem Bay estuary shall be developed with affected local jurisdictions in the Comprehensive Plan process."

When Tillamook County amends the Nehalem Bay Estuary Plan, for periodic review or other purposes, Wheeler will include appropriate portions of the Nehalem Bay Estuary Plan in its Comprehensive Plan and Zoning Ordinance.

Wheeler adopts the Tillamook County estuarine management unit description for estuarine management units within the Wheeler urban growth boundaries by reference.

RESTORATION AND MITIGATION

The Estuarine Resources Goal, Implementation Requirement (7), states that "state and federal agencies shall assist local government in identifying areas for restoration. Restoration is appropriate in areas where activities have adversely affected some aspect of the estuarine system, and where it would contribute to a greater achievement of the objective of this goal. Appropriate sites include areas of heavy erosion or sedimentation or degraded fish and wildlife habitat, anadromous fish spawning areas, abandoned diked estuarine marsh areas, and areas where water quality restricts the use of estuarine waters for fish and shellfish harvest and production, or for human recreation".

The Coastal Shoreland Goal, Implementation Requirement (4) states: "Local government, with assistance from state and federal agencies, shall identify coastal shoreland areas which may be used to fulfill the mitigation requirement of the Estuarine Resources Goal. These areas shall be protected from new uses and activities which would prevent their ultimate restoration or addition to the estuarine ecosystem".

Tillamook County has prepared an analysis of the restoration and mitigation needs in Nehalem Bay. The analysis contains four elements: an analysis of historic alterations of the estuary; the need for mitigation sites based on the amount of estuarine development proposed; sites where restoration of the estuary is appropriate; and sites that could serve as mitigation for estuarine alterations.

The following are the portions of that analysis that are pertinent to the City of Wheeler.

Historical Analysis

For analysis purposes the Nehalem Bay Estuary was divided into three segments. Wheeler is located in Segment 2, which extends from Fishery's Point upstream to the Highway 101 Bridge.

The majority of the alterations within Segment 2 are located along the Wheeler waterfront. At least 19 fills totalling 9.08 acres of submerged land and 4.72 acres of submersible land have been placed along the Wheeler waterfront. The majority of this fill material was placed in conjunction with the construction of the old Lewis Shingle Mill on the north end of the City of Wheeler. Development of the Lewis Shingle Mill involved the filling of 5.33 acres of submerged land and 3.04 acres of submersible land. Many of the old pilings which line the Wheeler waterfront were historically used to tie up rafts of logs which were processed at the Lewis Mill. Segment 2 also contains piling, bulkheads, floats and access ramps in conjunction with two commercial marinas; the Paradise Cove Marina and Dart's Marina. Other alterations within this segment have occurred in conjunction with the construction of U.S. Highway 101 and the Southern Pacific Railroad. Fill and piles for railroad bridges were placed across the entrance to the Fishery Point Cove and a smaller cove to the east. Fill in conjunction with Highway 101 has restricted tidal influence within a 4.2 acre marsh immediately north of the City of Wheeler, and has contributed to the elimination of tidal influence within a 4.5 acre area immediately east of the junction of Highway 101 and Highway 53.

Alteration of intertidal marshes by diking or other agricultural improvements is limited to three locations within Segment 2. Two of these historically diked marshes, a 24.3 acre area immediately west of the junction of Highway

101 and Highway 53, and a 9.9 acre area at the tip of Dean's Point, have reverted to intertidal marsh and are included within the Nehalem Estuary planning boundary. Another 38.3 acre area of former intertidal marsh is located west of Dean's Point where Alder Creek enters the Nehalem Estuary. Currently, this site contains approximately 15.3 acres of diked freshwater marsh and 23 acres of pastureland.

Navigational structures within Segment 2 are limited to scattered individual piling, and the remnants of a former pile dike which extended between the tip of Dean's Point and Lazarus Island.

Sedimentation within Segment 2 is indicated by the high rate of progradation of the West Island and Dean Point salt marsh. Eilers (1975) estimated that the West Island and Dean Point salt marsh have been prograding at a rate of .5 to 1.5 meters per year. One of the two major shoals in the Nehalem Estuary, the Fishery Point Shoal, is located within Segment 2. The shoal location and extent and estimates of initial and maintenance dredging necessary for shoal removal are discussed in the Tillamook County Plan. Historically, "scalping" of this shoal has been conducted by commercial fishermen and the Port of Nehalem, but the quantity of material removed is unknown.

Mitigation Needs.

Mitigation needs were estimated by calculating the total acreage of intertidal area within each estuary which is included within an Estuary Conservation 2 (EC2) or Estuary Development (ED) management unit. An acreage figure was obtained for each of five intertidal habitat classes through planimetric measurements of the Oregon Department of Fish and Wildlife Habitat Maps for each estuary and/or 1978 aerial photographs. The habitat map prepared as part of the Goal 16 exception for Nehalem Estuary Management Unit 13 ED was also used to calculate acreages of intertidal habitat.

The need for mitigation sites exists only in Nehalem and Tillamook estuaries, which have been classified as "Shallow Draft Development". In Conservation and Natural estuaries (Netarts, Sandlake, Nestucca, Neskowin Creek and Sutton Creek), ED management units have not been applied and EC2 management units have been limited to subtidal areas. It should be noted that the analysis of mitigation needs for Nehalem Estuary present a "worst possible case" estimate of mitigation needs by assuming that every intertidal area within each EC2 and ED zone will be developed in a manner which will require mitigation. Given the limitations placed on dredging and fill within intertidal areas by state and federal permit requirements, and by the standards for dredging and fill in the Tillamook County Zoning Ordinance, such an eventuality is unlikely to occur.

A total of 88.0 acres of intertidal area are included within EC2 or ED zones in Nehalem Estuary. This total includes approximately 22.5 acres of intertidal shore; 22.8 acres of intertidal beach bar; 5.2 acres of intertidal flat; 10.9 acres of intertidal aquatic bed; and 23.2 acres of intertidal marsh. The distribution of these intertidal habitat classes within each EC2 and ED management unit is listed in the chart below.

<u>Management Unit</u>	<u>Acreage and Habitat Class of Intertidal Area</u>
1EC1	16.9 acres intertidal beach bar 2.7 acres intertidal aquatic bed 1.7 acres intertidal shore
3ED	1.6 acres intertidal aquatic bed 1.4 acres intertidal shore

<u>Management Unit</u>	<u>Acreage and Habitat Class of Intertidal Area</u>
10ED	2.3 acres intertidal aquatic bed 0.9 acres intertidal marsh 8.1 acres intertidal shore
12ED	4.0 acres intertidal aquatic bed 1.3 acres intertidal marsh 8.7 acres intertidal shore
13ED 1,2	3.2 acres intertidal flat 21.0 acres intertidal marsh
22EC2	5.9 acres intertidal beach bar 2.0 acres intertidal flat 6.0 acres intertidal shore 0.3 acres intertidal aquatic bed

1. A Goal 16 exception for this management unit is included in the Goal 2 element of the Tillamook County Comprehensive Plan.
2. The McCoy Marsh, a tidally influenced freshwater marsh, has been included in the total of intertidal marsh acreage at this site.

Restoration Sites

Ten restoration sites have been identified within Nehalem Estuary. Five of these sites (5,6,7,9 and 10) are banklines along the upper reaches of the estuary (primarily along the North and South Forks of the Nehalem River) which could benefit from establishment of additional riparian vegetation. Site 1, which runs along the interior length of Nehalem Spit, is an area which experiences wind and wave erosion. The beneficial impacts which could result from the establishment of additional riparian vegetation include:

1. Shading of aquatic areas and reduction of increases in water temperatures which could be detrimental to aquatic life;
2. Reduction of streambank erosion (or wind and wave erosion) along Nehalem Spit; and
3. Reduction of sedimentation in adjacent aquatic areas.

Site 2 marks the location of a 5.8-acre diked area containing mostly freshwater marsh species although one saltwater species has been noted. The area is subject to seasonal tidal influence through breaches in the dikes which surround it. Restoration would consist of removing larger portions of these dikes. Adjacent to this area to the south is another marsh area partially surrounded by dikes. This area, known as Botts Marsh, is not suitable for restoration because of plans for a marina to be located there (see Botts Marsh exception).

Site 3 contains the remnants of an old pile dike which once extended between Dean Point and Lazarus Island. Removal of the remnants of this pile dike could enhance water flows between Dean Point and West Island and possibly reduce the rate of sedimentation in this region of the estuary.

Site 8 is an approximately 164 acre forested freshwater wetland which has been suggested by the Oregon Department of Fish and Wildlife as a site for waterfowl habitat enhancement. The value of this area to waterfowl could be increased by excavating shallow ponds within the area.

Mitigation Sites

The six mitigation sites which have been identified within Nehalem Estuary are discussed below. Sites 1, 2 and 3 are discussed in more detail in the Natural Resources of Botts Marsh, Nehalem Bay, a report prepared as part of the Goal 16 exception for Botts Marsh (Nehalem Estuary Management Unit 13ED) contained in the Goal 2 element of the Tillamook County Comprehensive Plan. Any future use of the sites listed below as mitigation sites must meet with the approval of the landowner and any affected incorporated cities.

SITE 1

Classification - Priority

Discussion - A 10-acre area of diked intertidal marsh at the tip of Dean Point (see Natural Resources of Botts Marsh Nehalem Bay, p.9).

SITE 2

Classification - Priority

Discussion - An approximately 4.2-acre degraded intertidal salt marsh on the northern end of the City of Wheeler (See Natural Resources of Botts Marsh, Nehalem Bay, p. 10).

SITE 3

Classification - Priority

Discussion - A 5.8 acre area which contains mostly freshwater wetlands. This site is subject to seasonal tidal influence and has been included within the Nehalem Estuary Planning Boundary.

SITE 4

Classification - Priority

Discussion - An approximately 38.3 acre area which contains approximately 15.3 acres of diked freshwater wetland on the eastern end of the property, and 23 acres of pasture on either side of Alder Creek. Existing tidegates on either side of Alder Creek could be removed and the pasture regraded to a lower elevation to create additional intertidal marsh. Breaching of the dikes in the eastern part of the area would also create additional marsh, but would result in the loss of the existing freshwater marsh, which is, in itself, a valuable habitat. This site could serve as a mitigation for the development proposed in Nehalem Management Unit 4 ED (Thomas Marsh) or 13 ED (Botts Marsh).

SITE 5

Classification - Inventory

Discussion - Small Island is an approximately 24.6 acre forested island with several small fringing salt marshes. Creation of additional intertidal marsh at this site would be possible if parts of the island were regraded to lower elevations. This site could not provide in-kind mitigation for the the habitats lost due to development in 4 ED or 13 ED, since the low salinities within this area would result in the creation of marsh types which are different from the ones at these development sites.

SITE 6

Classification - Inventory

Discussion - Site 6 contains a strip of land on either side of a small tidal channel. Creation of intertidal marsh adjacent to this tidal channel would be possible if the land adjacent to the channel were regraded to lower elevations. The acreage of marsh created would vary, depending upon the length and width of the regraded area. The area adjacent to the tidal channel is a forested freshwater wetland. This site could not provide in-kind mitigation for the habitats lost to development in 4 ED or 13 ED.

Within the Wheeler Urban Growth Boundary there are no identified restoration sites. There is one mitigation site, Site 2.

The Estuarine Resources Goal, Implementation Requirement (5) states that "local government and state and federal agencies shall develop comprehensive programs, including specific sites and procedures for disposal and stockpiling of dredged material. These programs shall encourage the disposal of dredge material in uplands or ocean waters and shall permit disposal in estuarine waters only where such disposal will clearly be consistent with the objectives of this Goal and state and federal law. Dredge material shall not be disposed in inter-tidal or tidal marsh estuarine areas unless part of an approved fill project ..." To meet this requirement, Tillamook County prepared and adopted the study, Tillamook/Nehalem Dredged Material Disposal Plan.

This study divided Nehalem Bay into three segments. Within each segment, the anticipated dredging needs, to the year 2000, and potential dredge material disposal sites were identified. Wheeler is located in Segment 2. The following is the pertinent material, taken from the study, Tillamook/Nehalem Dredge Material Disposal Plan, for Nehalem Bay Segment 2.

Dredging Needs

° Maintenance of Existing Projects

There is one existing maintenance project in Segment 2, at Dart's Marine in Wheeler. Because of shoaling inside the marina area, Dart's will require maintenance dredging of approximately 1,400 c.y.

° Construction of New Projects

If a navigation channel were to be maintained in Nehalem Bay, a major shoal would require dredging in Segment 2. The Fishery Point Shoal, located at Bay Mile 3.0, extends approximately 6,000 linear feet and would require the removal of 115,560 c.y. to attain a Mean Lower Low Water (MLLW) depth of 12 feet (2 foot overdredge). From the estimates of deposition rates in this area over the past five years, it is calculated that future maintenance dredging requirements would be about 5,400 c.y. per year.

New construction at Paradise Cove includes the expansion of the existing marina facilities, requiring the removal of 11,000 c.y. of material. The Scovell Industrial Park proposed development includes a channel north of Wheeler for commercial and recreational craft. This channel with docking areas, etc., would require the dredging of about 150,000 c.y. of material at construction. Maintenance has been estimated at approximately 1,500 c.y. per year.

SEGMENT 2 DREDGING NEEDS

Project	Quantity		
	Construction	Maintenance	20-Year Total
Dart's Marina		250 c.y.	5,000 c.y.
Navigation Channel-Fishery Point Shoal	115,560	5,400 c.y.	223,600 c.y.
Paradise Cove	11,000	200 c.y.	15,000 c.y.
Scovell Industrial Site	150,000	1,500 c.y.	180,000 c.y.
TOTAL DREDGING NEEDS			433,600 c.y.

DISPOSAL OPTIONS

• Ocean Disposal

Ocean disposal becomes less likely as one moves further from the mouth of bay. However, if a channel was maintained in Nehalem Bay in the future, and local disposal sites were not available, ocean disposal could be an option. Presently, there is not a hopper dredge available that could navigate the entrance jetties alignment. A specific ocean disposal site would have to be authorized prior to any ocean disposal activity. Authorization would be contingent upon the study of possible sites and alternatives by the Corps of Engineers and EPA. Sediment materials found in this segment are presently acceptable for ocean disposal.

Ocean disposal from the beach front may be a viable option for the Fishery Point dredging. Beachfront disposal of clean materials must be further explored with state parks personnel.

• Land Disposal

Land disposal sites that have been identified in Segment 2 are listed below.

SEGMENT 2 LAND DISPOSAL OPTIONS PRESENTLY ACCEPTABLE

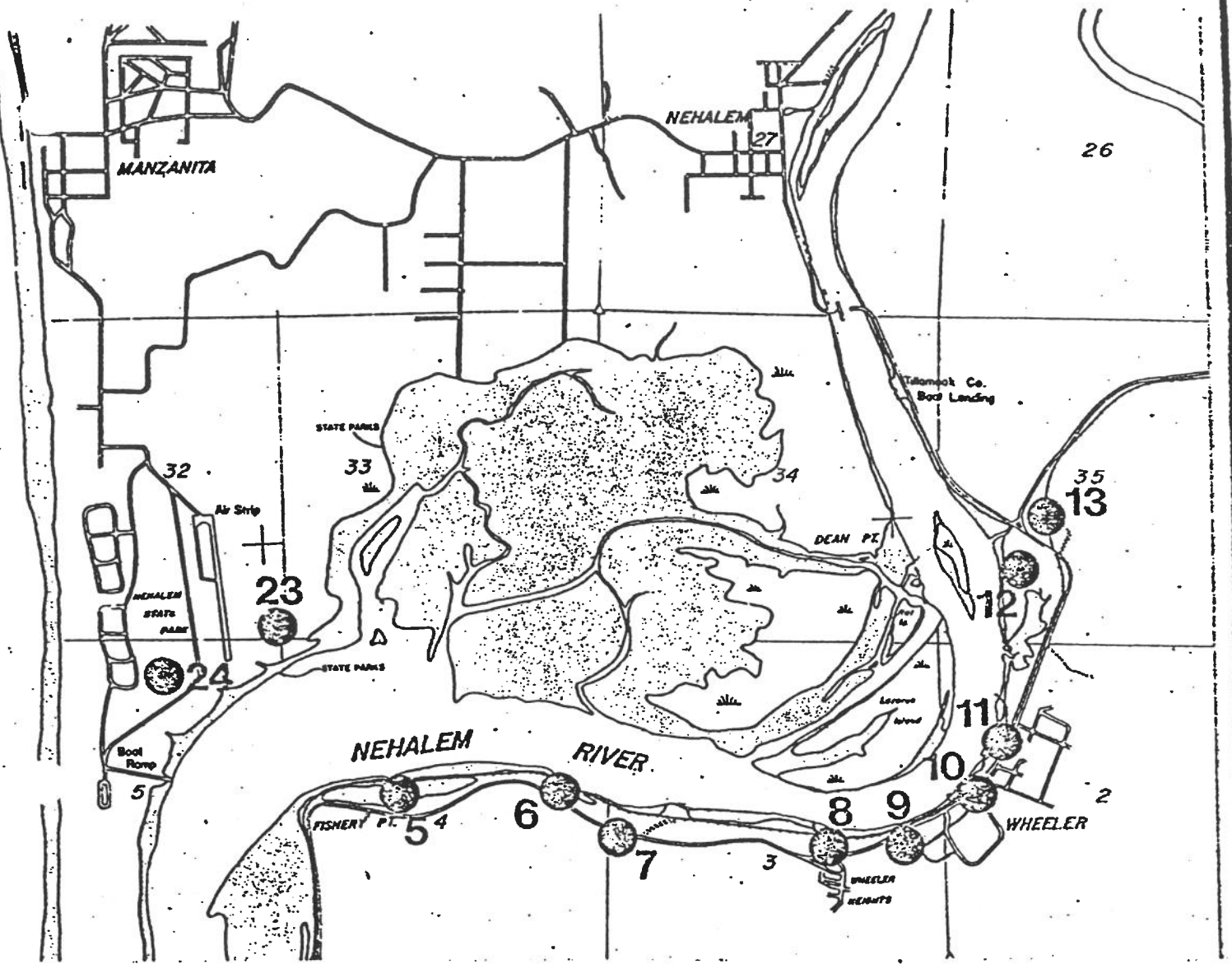
<u>Site No.</u>	<u>Approximate Capacity</u>
7	60,000 c.y.
9	11,000 c.y.
11	12,400 c.y.
13	43,000 c.y.
23	629,000 c.y.
24	<u>510,000 c.y.</u>
TOTAL	1,265,400 c.y.

PRESENTLY UNACCEPTABLE

<u>Site No.</u>	<u>Approximate Capacity</u>
5	338,000 c.y.
6	58,000 c.y.
8	20,000 c.y.
10	1,800 c.y.
12	<u>220,000 c.y.</u>
TOTAL	637,000 c.y.

TOTAL CAPACITY ALL POTENTIAL SITES 1,902,400 c.y.

Following are discussions about each potential disposal site. Aerial photo illustrations are available that depict actual site locations and dimensions.



Nehalem Bay Segment 2

SITE 5

Site Description

Location: Immediately northeast of Fishery Point, between Highway 101 and railroad tracks

Size: 15 acres

Capacity: 338,000 c.y. at 14' depth

Physical Characteristics: Tideflat area bordered by natural slopes and railroad berm. Small drainage enters from south. Causeway with railroad crossing connects site with open bay.

Biological Characteristics: Tideflat and saltmarsh (Thomas Marsh) area. Saltmarshes functioning as part of estuarine system. Shorebird and fishery use. Good riparian habitat on south border.

Comprehensive Plan/Zoning: EC1, superimposed by FH

Ownership: T2N, R10W, Sec 4(C) T.L. 200, 300

Engineering Considerations

Method of Dredging and Filling: Pipeline dredge

Site Preparation: Design diking to maintain existing drainage way and to avoid filling against railroad embankment.

Design Criteria: Outfall to main channel. Berms to be constructed with dredged materials.

Future Use Constraints: Possible load limitations given existing tideflat soils.

Environmental Considerations

Disposal activity on this site would require compliance with state and federal laws, particularly:

- a) a determination that the 404(b)(1) guidelines of the Federal Water Pollution Control Act have been met;
- b) findings that Goal 16 overall requirements for dredge, fill or other reduction or degradation of estuarine natural values have been met, or an exception to this Goal 16 requirement;
- c) mitigation for loss of estuarine habitat (unless otherwise determined by D.S.L.).

Economic Considerations

Site would be good disposal area for dredging of Fishery Point Shoal. Owner has requested disposal use of site, for a planned future development of the site.

Other Considerations

Potential environmental impacts as assessed by the resource agencies indicate that future approval of the site would be difficult (resource values are considered high). Mitigation would not be required for small acreage in southeast portion of site.

RESERVE site because of its size and proximity to Fishery Point Shoal (site is not "priority" because it is not presently acceptable).

Site Description

Location: West of Paradise Cove Marina, between Highway 101 and railroad tracks

Area: 3 acres

Capacity: 58,000 c.y. at 12' depth

Physical Characteristics: Tideflat area bordered by steep slopes and railroad dike. Causeway directly connects site to bay. Minor drainage enters from south.

Biological Characteristics: Tideflats and saltmarsh throughout the area, functioning as part of estuarine system. Shorebird and fishery use. Good riparian habitat on south border.

Comprehensive Plan/Zoning: Tillamook County - EC1 and SFW-20, superimposed by SH and FH; City of Wheeler - GC, superimposed by FHO

Ownership: T2N, R10W, Sec. 4D, T.L. 100

Engineering Considerations

Method of Dredging and Filling: Pipeline dredge

Site Preparation: Design diking to maintain existing drainage way and to avoid filling directly against railroad embankment.

Design Criteria: Outfall to main channel.

Future Use Constraints: Possible load limitations because of tideflat soils.

Environmental Considerations

Disposal activity on this site would require compliance with state and federal laws, particularly:

- a) a determination that the 404(b)(1) guidelines of the Federal Water Pollution Control Act have been met;
- b) findings that Goal 16 overall requirements for dredge, fill or other reduction or degradation of estuarine natural values have been met, or an exception to this Goal 16 requirement;
- c) an exception to Goal 16 requirements for Conservation management units;
- d) mitigation for loss of estuarine habitat (unless otherwise determined by D.S.L.).

Economic Considerations

This is the closest potential disposal site to the eastern portion of Fishery Point Shoal. Owner has requested disposal of materials on site, to allow for a planned future development of the site.

Other Considerations

The potential impacts to the estuarine environment as assessed by the resource agencies indicate that future approval of site would be difficult (resource values considered high).

Site Description

Location: South and west of Paradise Cove, on south side of Highway 101

Size: 3.8 acres

Capacity: 60,000 c.y. at 10' depth

Physical Characteristics: A deep depression, bordered by steep slopes on three sides and the highway berm on the north. Local drainage runs through the middle of the site.

Biological Characteristics: Thickly vegetated with firs, cedars, alder and an understory of blackberry, ferns, and various flowering plants. Wildlife includes small mammal and upland bird use.

Comprehensive Plan/Zoning: R-2

Ownership: T2N, R10W, Sec. 4(D) T.L. 100

Engineering Considerations

Method of Dredging and Filling: Pipeline dredge or truck dumped.

Site Preparation: Extensive clearing required, existing drainage way must be maintained and diking must be designed to avoid filling directly against highway embankments.

Design Criteria: Pipeline use would require booster equipment and unusual dewatering methods because of dimension limitations. Site design could be expensive.

Future Use Constraints: None

Environmental Considerations

Disposal use would temporarily displace wildlife and vegetation. Site could be replanted after proper de-salinization of materials (3 - 5 years). May cause an aesthetic impact for Highway 101 travelers until revegetation is accomplished.

Economic Considerations

Difficult site to reach with pipeline equipment (boosters, etc., required). Best used for rehandled materials, to be trucked in. However, site would still be costly to use.

Other Considerations

Dredged material disposal on this site must comply with the requirements of the Tillamook County zoning ordinance.

UNSUITABLE site because of engineering problems, potential high costs of dredged material disposal and access problems.

SITE 8

Site Description

Location: West end of City of Wheeler, below Wheeler Heights

Size: 2.6 acres
Capacity: 20,000 c.y. at 5' depth

Physical Characteristics: Tidally influenced shoreland area, subject to flooding. Bordered by Highway 101 berm and railroad dike.

Biological Characteristics: Saltmarsh with riparian vegetation on west side. Functioning part of estuary.

Comprehensive Plan/Zoning: N, superimposed by FHO
Ownership: T2N, R10W, Sec. 3 T.L. 1300

Engineering Considerations

Method of Dredging and Filling: Small pipeline (?) or truck dumped

Site Preparation: Design diking to protect existing drainage way and the highway embankment.

Design Criteria: Pipeline use would require fast dewatering because of limited site size. Special cell development may be required.

Future Use Constraints: None

Environmental Considerations

Disposal activity on this site would require compliance with state and federal laws, particularly:

- a) a determination that the 404(b)(1) guidelines of the Federal Water Pollution Control Act have been met;
- b) findings that the Goal 16 overall requirements of dredge, fill or other reduction or degradation of estuarine natural values have been met, or an exception to this Goal 16 requirement;
- c) an exception to Goal 16 requirements for Natural management units;
- d) mitigation for loss of estuarine habitat (unless otherwise determined by D.S.L.).

Economic Considerations

If used for disposal, site would become waterfront developable land, a limited resource in Wheeler.

Other Considerations

Property owner has requested fill for site.

SITE 9

Site Description

Location: Immediately east and below Wheeler Heights, in City of Wheeler.

Size: 1.8 acres

Capacity: 11,000 c.y. at 4' depth

Physical Characteristics: Flat area bordered by slopes to west and highway berm to north. Old road remains along east side.

Biological Characteristics: Thickly vegetated with alders and brambles. Small mammal and perching bird habitat.

Comprehensive Plan/Zoning: R-1, superimposed by FHO

Ownership: T2N, R10W, Sec. 3 T.L. 900

Engineering Considerations

Method of Dredging and Filling: Pipeline or truck dumped

Site Preparation: Extensive clearing required. Design diking to protect existing drainage way and highway embankment.

Design Criteria: Outfall to main channel, not to local creek. Pipeline disposal may require special dewatering features..

Future Use Constraints: None

Environmental Considerations

Use for disposal would eliminate alder grove, displacing wildlife uses. Impact would be temporary, and not significant. Stream to east would require appropriate buffer zone (Class I salmonid stream).

Economic Considerations

Disposal use could make site more attractive for development purposes. Site size will require high unit cost for disposal if pipeline equipment is used.

Other Considerations

Property owner has requested fill.

Dredged material disposal at this site must comply with the requirements of the Wheeler zoning ordinance.

INVENTORY site because of small size and potential high cost of dredged material disposal.

SITE 10

Site Description

Location: Waterfront at Dart's Marina in the City of Wheeler

Size: 10' x 500'

Capacity: 1,800 c.y. at 10' depth

Physical Characteristics: Presently the waterward bankline of the marina facilities; concrete bulkhead exists as east border.

Biological Characteristics: Ten foot wide, 1,800 long strip of tideflat.

Comprehensive Plan/Zoning: ED, superimposed by FHO

Ownership: Dart's Marina

Engineering Considerations

Method of Dredging and Filling: Clamshell dredge

Site Preparation: Construct seawall with area for disposal behind wall.

Design Criteria: No revegetation required. Construct seawall to fit needs of marina. Flood protection design required.

Future Use Constraints: None

Environmental Considerations

Site not presently acceptable for disposal. Disposal of materials would cause loss of limited area of tideflat, created because of shoaling in area. Impacts would be to area influenced by marina activity and are not expected to be significant. Environmental evaluation should take place in fill permit process.

Economic Considerations

Disposal of materials could be tied into planned development of marina waterfront, benefitting both efforts. If timing were appropriate, this site would be most logical for disposal of marina dredged materials.

Other Considerations

As a dredged material disposal site this is not presently acceptable. However, if presented as a marina development and fill project, site may receive favorable review.

INVENTORY site for possible use as a DMD site for any future marina development project.

SITE 11

Site Description

Location: North of Dart's Marina, west of Highway 101 in north part of the City of Wheeler UGB.

Size: 2.2 acres

Capacity: 12,400 c.y. at 3.5' depth. Stockpile use most appropriate.

Physical Characteristics: Old mill location, presently vacant and subject to occasional flooding.

Biological Characteristics: Minimal wildlife use. Vegetation sparse.

Comprehensive Plan/Zoning: WRC and IND

Ownership: T2N, R10W, Sec. 2(BC) T.L. 4700, 4800

Engineering Considerations

Method of Dredging and Filling: Truck dumped or barge offloaded

Site Preparation: Protect slough and wetland from fill

Design Criteria: Berms can be constructed with de-watered dredged materials. Sloughing into waterway must be prevented

Future Use Constraints: None

Environmental Considerations

Disposal materials must not be allowed to slough into waterway. Small wetland in northeast corner should be protected from materials.

Economic Considerations

Use of site for stockpiling will limit future development potentials of site. Site is a water-front, developable parcel, and a limited resource in area. Disposal of dredged material on the site must comply with the requirements of the Wheeler City zoning ordinance.

RESERVE site for interim use as a DMD site prior to site development.

12a Comprehensive Plan designation - UNACCEPTABLE
 Resource agency evaluation - PRESENTLY UNACCEPTABLE
 12b Comprehensive Plan designation - RESERVE DMD SITE
 Resource agency evaluation - PRESENTLY UNACCEPTABLE

Site Description

Location: immediately south of junction of Highway 53 and Highway 101

Size: 12a - 4.4 acres; 12b - 9.6 acres

Capacity: 12a - 69,140 c.y. at 10' depth; 12b - 150,860 c.y. at 10' depth

Physical Characteristics: Intertidal area, subject to regular flooding and debris log deposition. Local drainage enters from east. Bordered by berms to west and north and highway berm to east.

Biological Characteristics: Functioning saltmarsh over much of site. Freshwater marsh exists in northern portion. Waterfowl and shorebird use. Some small mammal use.

Comprehensive Plan/Zoning: ED, EC₁, superimposed by FH

Ownership: T3N, R10W, Sec. 35 T.L. 200,400'

Engineering Considerations

Method of Dredging and Filling: Pipeline dredge; truck dumping or barge offloading

Site Preparation: Extensive debris removal required prior to fill placement in northern portion of area.

Design Criteria: Outfall to main channel. Toe-dikes may be beneficial along highway berm to regulate saturation.

Future Use Constraints: Possible load limits on filled area because of existing soils.

Environmental Considerations

Disposal of dredged material in this site would require compliance with state and federal laws, particularly:

- a) a determination that the 404(b)(1) guidelines of the Federal Water Pollution Control Act have been met;
- b) findings that Goal 16 overall requirements for dredge, fill or other reduction or degradation of estuarine natural values have been met, or an exception to this Goal 16 requirement;
- c) mitigation for loss of estuarine habitat (unless otherwise determined by D.S.L.).

Economic Considerations

If used for disposal of dredged materials, site could be used for waterfront development, a limited resource in area. Site is presently being proposed for industrial development. Owner has requested dredged material for site.

Other Considerations

Site 12a is designated as a priority mitigation site. A Goal 16 exception is being taken for 12b to justify the ED designation for a proposed moorage and dock development planned for commercial and recreational use. The dredging requirements for the moorage and dock development could be disposed of on Site 12b.

RESERVE site (12b) because of relationship to the projected marina development.

SITE 13

Site Description

Location: Immediately east of the junction of Highway 53 and Highway 101

Size: 4.5 acres

Capacity: 43,000 c.y. at 6' depth

Physical Characteristics: Low, bottom land subject to seasonal flooding. Drainage enters from east. Highway berms to north, west and south.

Biological Characteristics: Presently pastureland with various grasses, scotch broom and brambles. Small mammal and perching bird use, though not significant.

Comprehensive Plan/Zoning: LM, superimposed by SH and FH

Ownership: T3N, R10W, Sec. 35 T.L. 202

Engineering Considerations

Method of Dredging and Filling: Spoils placed by truck dumping, possible pipeline disposal.

Site Preparation: Topsoil removal may be appropriate for post-disposal mixing.

Design Criteria: Berms should be placed to protect highway berms until materials are dewatered and settled. Outfall to main channel.

Future Use Constraints: None

Environmental Considerations

Disposal use would temporarily displace limited wildlife and vegetation. Some impacts to local aesthetics, particularly relative to Highway 101 travel. However, both wildlife and aesthetic impacts are considered short term and nominal.

Economic Considerations

Disposal materials may make site more attractive for possible development, though the site lies outside the proposed urban growth boundaries. Agricultural use could be enhanced if soils are properly mixed (material would raise land above seasonal flooding).

Other Considerations

This site was considered as both a dredged material disposal site and a mitigation site (see Mitigation/Restoration Plan). Because DMD sites 14a and 15a are available for disposal of material from the Dean Point Shoal, and because of the need for a mitigation site in this area, this site has been designated as a Reserve Mitigation site.

Dredged material disposal on this site must comply with the requirements of the Tillamook County zoning ordinance. A Tillamook County Development Permit is required prior to dredged material disposal on this site.

SITE 23

Site Description

Location: Nehalem Spit State Park, immediately east of Nehalem
airstrip.
Size: 65 acres
Capacity: 629,000 c.y. at 6' depth
Physical Characteristics: Recently stabilized sand dunes and hummocks.
Biological Characteristics: Shorepine/scotch broom mix of vegetation. Various
perching birds and small mammals use site.
Comprehensive Plan/Zoning: RM, superimposed by SH
Ownership: State of Oregon

Engineering Considerations

Method of Dredging and Filling: Fill by pipeline dredge or truck dumping.
Site Preparation: Design diking to avoid interfering with airstrip
operations. Clean and grade prior to disposal.
Design Criteria: Design fill to avoid interfering with airstrip
operations. Replant with existing vegetation
materials. Maximize aesthetic potentials of site
by topographic control.
Future Use Constraints: None

Environmental Considerations

Disposal use would temporarily displace wildlife.
Vegetation would re-establish in 2 - 4 years, with
wildlife resources returning concurrently. Some
aesthetic impacts would occur, though short term.

Economic Considerations

Site could be used for part of the Fishery Point
Shoal dredging. This site is one of only three
local sites that is presently acceptable for
disposal use. However, state parks is currently
not in favor of receiving disposal materials.

Other Considerations

Parks division anticipates adverse impacts to
recreational uses of site if used for disposal.
Critical area to resolve use conflicts.

The State Parks Master Plan for Nehalem
Bay Park designates Site 23 as primary
protection. Dredge material disposal
would not be compatible with the desig-
nation. State Parks and Tillamook County
are attempting to resolve this conflict
through the planning process.

Dredged material disposal on this site must comply with
the zoning requirements of the Tillamook County
zoning ordinance.

PRIORITY site because of size and proximity to Fishery
Point Shoal.

SITE 24

Site Description

Location: Nehalem Spit State Park,
Immediately east of Nehalem State Park campground,
west of main access road.

Size: 53 acres

Capacity: 510,000 c.y. at 6' depth

Physical Characteristics: Recently stabilized sand dunes, with hummocks.

Biological Characteristics: Shorepine/scotch broom vegetation mix. Various perching bird and small mammal habitat.

Comprehensive Plan/Zoning: RM superimposed by SH

Ownership: State of Oregon

Engineering Considerations

Method of Dredging and Filling: Fill by pipeline dredge or truck dumping.

Site Preparation: Land clearing and grading. Maintain existing drainage ways.

Design Criteria: Disposal must be designed to coordinate with park planning and uses. Minimize aesthetic impacts. Revegetate immediately, as high winds present a local problem.

Future Use Constraints: None

Environmental Considerations

Temporary displacement of wildlife. Vegetation would re-establish in 2 - 4 years. Possible aesthetic impact to park area, though mitigative measures such as berms and buffers could be used.

Economic Considerations

Large size of site makes it advantageous for Fishery Point Shoal dredging (large quantities pumped via large equipment).

Other Considerations

Presently considered unacceptable for use by state parks. This site is the only existing major disposal site that can be reached from the Fishery Point Shoal without booster equipment on a pipeline. Park management is concerned about adverse impacts to recreational uses in area, both short term and long term.

During the state park master planning effort, full consideration shall be given to the use of this site as a dredged material disposal site. Future use of this site shall be subject to the approval of the Oregon Department of Transportation.

Dredged material disposal on this site must comply with the requirements of the Tillamook County zoning ordinance.

SUMMARY AND CONCLUSION

The only identified existing dredging project for this segment, Dart's Marina, could be disposed of at Site #10. This site is immediately adjacent to the dredging area, and is part of the owners overall marina improvement plan. State and federal agencies recommend that Site #10 be proposed as a fill project (for review purposes) and could be tied to the dredging project.

Future navigation channel development would depend on the dredging of the Fishery Point Shoal. At construction this would produce approximately 320,000 c.y. of material, and a total of about 620,000 c.y. over the 20-year period. The disposal sites closest to the shoal, Sites #5 and #6, could take 396,000 c.y. of material. However, neither is acceptable at this time. Sites #23 and #24, on the north end of Nehalem Spit, could take about 1,139,000 c.y. Site #24 has been identified as a reserve site because it is unacceptable to the State Parks Division. To compensate, Site #23 has been expanded from 16 acres to 65 acres and is designated priority. The use of this site may be acceptable to State Parks providing that aesthetic impacts are minimized through proper design. The Parks Department intends to develop a master plan for Nehalem State Park during the 1981-82 biennium. Dredged disposal site use should be incorporated into that planning effort to insure proper design and recreation or wildlife enhancement efforts on the site. Impacts could be limited to short term. Dredged Material Disposal policy 9 commits Tillamook County to coordinate with the O.D.O.T. on future use of dredged material disposal sites within state parks.

Booster pumps could be used to get the material to the beachfront for beach nourishment, or pump the material to more southern portions of the spit.

The Paradise Cove dredging (15,000 c.y. total) could be trucked to Site #7 or #9. Site #8 could use material to make the site more developable, but existing state and federal guidelines won't permit its use. The Scovell Industrial Park will require 150,000 c.y. dredging at construction. Site #12 is immediately adjacent to this area, and could handle the full yardage. Disposal material would improve the land for development purposes, and would also provide good back-up land for the marina development. However, Site #12 is not presently acceptable because it is part of the estuarine system. If Site #12 cannot be used, then the material will have to be trucked off the site, substantially raising the costs of local development.

Wheeler Dredge Material Disposal Sites

Four of the inventoried sites are located within the Wheeler Urban Growth Boundary. Site 8 was found to be unacceptable because it is a salt marsh with bordering riparian vegetation. Site 10 is unacceptable as just a dredge material disposal site, however filling of this site in conjunction with a marina proposal may be acceptable. Site 9 was designated as an inventory site because its usefulness may be limited by its small size and the potential high cost of dredge material disposal. Site 11 was designated as a reserve site for interim use as a dredge material disposal site prior to the site's development. No Priority dredge material disposal sites were identified.

COASTAL SHORELANDS

The objective of Goal 17, Coastal Shorelands, is:

"To conserve, protect, where appropriate develop, and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water dependent uses, economic resources and recreation and aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters; and to reduce the hazard to human life and property, and the adverse effects upon water quality and fish and wildlife habitat, resulting from the use and enjoyment of Oregon's coastal shoreland."

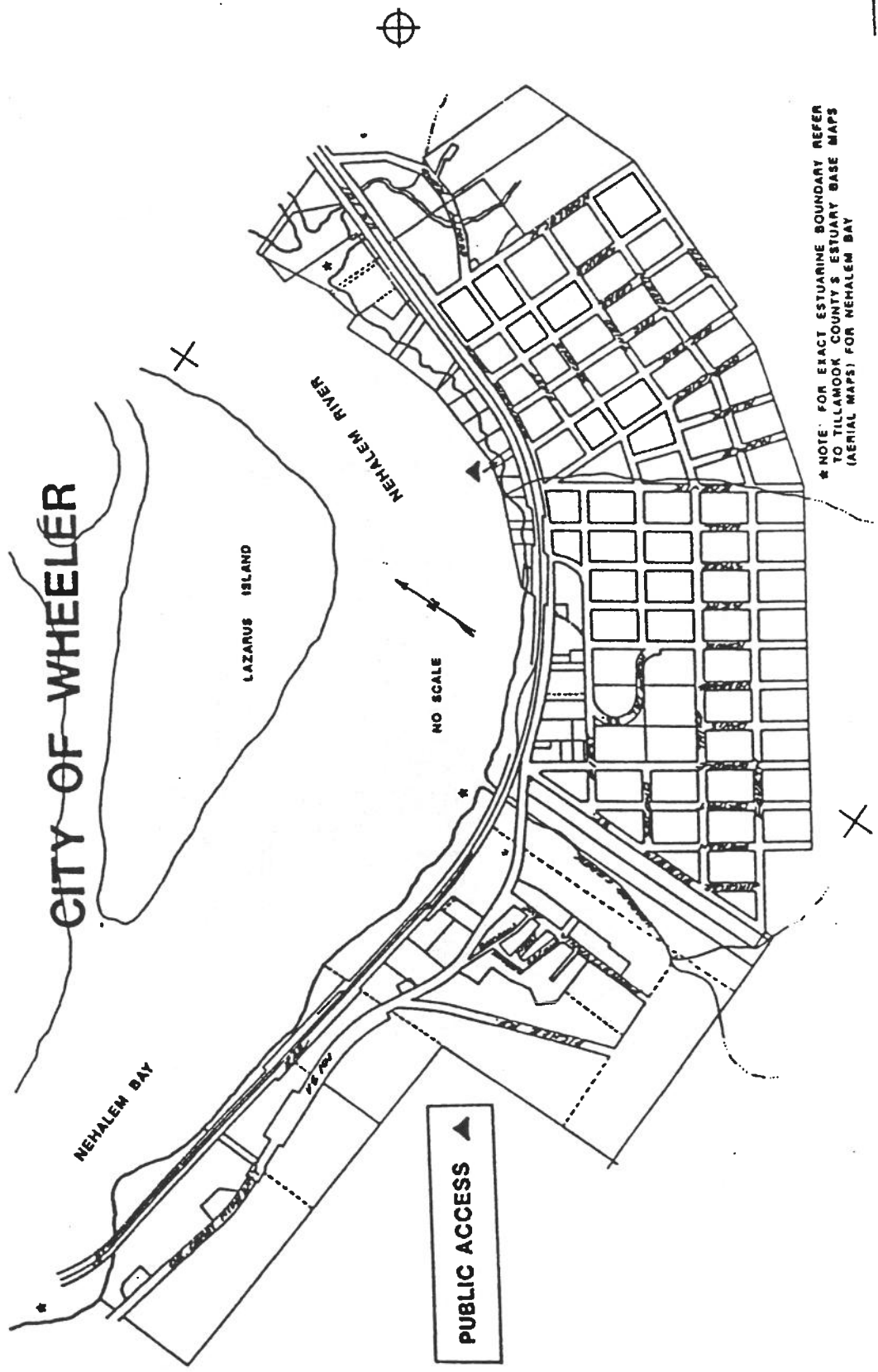
To accomplish this objective, Wheeler is required to develop a program for coastal shorelands based on two sets of requirements: the identification of a coastal shoreland boundary and the regulation of uses and activities in certain areas. To provide data for the identification of a coastal shoreland boundary, Goal 17 requires that an inventory of geologic and hydrologic hazards, fish and wildlife habitat, water-dependent uses, economic resources, recreational uses and aesthetic resources be conducted within a "coastal planning area", which is defined as:

"All lands west of the Oregon Coast Highway as described in ORS366.235; and all lands within an area defined by a line measured horizontally;:

- (a) 1000 feet from the shoreline of estuaries, and
- (b) 500 feet from the shoreline of coastal lakes."

This inventory of features within the "coastal shorelands planning area" is used to establish the extent of coastal shorelands. Goal 17 requires that the extent of identified shorelands shall include at least:

- "(1) Areas subject to ocean flooding and lands within 100 feet of the ocean shore or within 50 feet of an estuary or coastal lake;
- (2) Adjacent areas of geologic instability; where the geologic instability is related to or will impact a coastal water body;
- (3) Natural or man-made riparian resources, especially vegetation necessary to stabilize the shoreline and to maintain water quality and temperature necessary for the maintenance of fish habitat and spawning areas:



CITY OF WHEELER

NEHALEM BAY

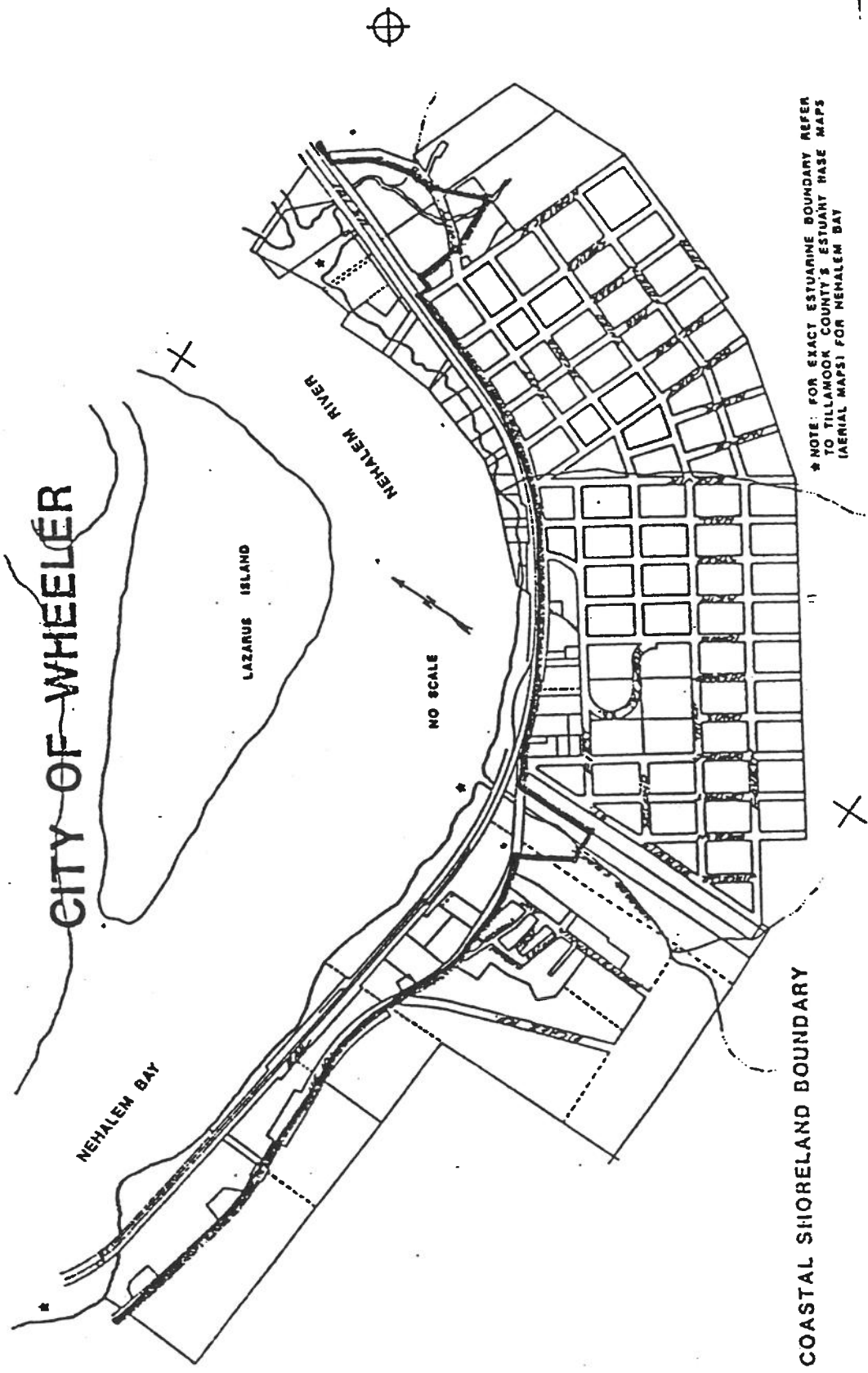
LAZARUS ISLAND

NEHALEM RIVER

NO SCALE

PUBLIC ACCESS ▲

* NOTE: FOR EXACT ESTUARINE BOUNDARY REFER TO TILLAMOOK COUNTY'S ESTUARY BASE MAPS (AERIAL MAPS) FOR NEHALEM BAY



* NOTE: FOR EXACT ESTUARINE BOUNDARY REFER TO TILLAMOOK COUNTY'S ESTUARY BASE MAPS (AERIAL MAPS) FOR NEHALEM BAY

COASTAL SHORELAND BOUNDARY

- (4) Areas of significant shoreland and wetland biological habitats; whose habitat quality is primarily derived from or related to the association with coastal water areas;
- (5) Areas necessary for water dependent and water related uses, including areas of recreational importance which utilize coastal water or riparian resources, areas appropriate for navigation and port facilities, dredge material disposal and mitigation sites, and areas having characteristics suitable for aquaculture;
- (6) Areas of exceptional aesthetic or scenic quality, where the quality is primarily derived from or related to the association with coastal water areas; and
- (7) Coastal headlands."

Goal 17 also establishes the following specific use requirements for the following areas within coastal shorelands (only those applicable to urban areas are included):

- (1) Major marshes, significant wildlife habitat, coastal headlands, and exceptional aesthetic resources identified in the Comprehensive Plan shall be protected. Uses in these areas shall be consistent with protection of natural values. Such uses may include propagation and selective harvesting of forest products consistent with the Oregon Forest Practices Act, grazing, harvesting wild crops, and low-intensity, water-dependent recreation.
- (2) Shorelands in urban and urbanizable areas especially suited for water-dependent uses shall be protected for water-dependent recreational, commercial and industrial uses.

Some factors which contribute to this special suitability are:

- (a) deep water close to shore with supporting land transport facilities suitable for ship and barge facilities;
- (b) potential for aquaculture;
- (c) protected areas subject to scour which would require little dredging for use as marinas; and
- (d) potential for recreational utilization of coastal water or riparian resources.

Other uses which may be permitted in these areas are temporary uses which involve minimal capital investment and no permanent structures, or a use in conjunction with and incidental to a water dependent use.

- (3) Local governments shall determine whether there are any existing developed commercial/industrial waterfront areas which are suitable for redevelopment which are not designated as especially suited for water dependent uses. Plans shall be prepared for these areas which allow for a mix of water-dependent water-related, and water oriented non dependent uses and shall provide for public access to the shoreline."

In addition to the Comprehensive Plan requirements for coastal shoreland boundary identification and coastal shoreland use and activity regulations, Goal 17 also establishes six implementation requirements dealing with the following areas or features within coastal shorelands:

- (1) Forested Lands. Implementation Requirement I requires the Oregon Department of Forestry to recognize the unique and special values of coastal shorelands, and to develop (in conjunction with other State and Federal agencies) forest management practices and policies which protect and maintain these special shoreland values and forest uses.
- (2) Mitigation and Dredged Material Disposal Sites. Implementation Requirements 2 and 3 require that coastal shoreland areas which may be used to fulfill the mitigation requirement of the Estuarine Resources Goal (Goal 16) or coastal shoreland areas which are identified as dredged material disposal sites be protected from new uses and activities which would prevent their ultimate use for mitigation or dredged material disposal.
- (3) Riparian Vegetation. Implementation Requirement 4 requires that riparian vegetation be maintained, and, where appropriate, restored and enhanced where consistent with water-dependent uses. A City of Wheeler Waterfront Revitalization Plan may be prepared for these areas which allows for a mix of water-dependent uses and shall provide for public access to the shoreline.
- (4) Structural Shoreline Stabilization. Implementation Requirement 5 establishes a preference for land use management practices and non-structural solutions over structural solutions be designed to minimize adverse impacts on water currents and erosion and accretion patterns.

- (5) Public Access. Implementation Requirement 6 states that the City, in coordination with the Parks and Recreation Division shall develop and implement a program to provide increased public access. Existing public ownerships, rights-of-way, and similar public easements in coastal shorelands which provide access to or along coastal waters shall be retained or replaced if sold, exchanged, or transferred. Rights-of-way may be vacated to permit redevelopment of shoreland areas provided public access across the affected site is retained.

The coastal shoreland boundary for Wheeler was established through an inventory of all areas within the "coastal shoreland planning area" defined by Goal 17. The purpose of this inventory was to determine the location of the features which are required by Goal 17 to be included within the coastal shorelands. The following is a description of how these features were identified.

Areas subject to ocean flooding and lands within 100 feet of the oceanshore or within 50 feet of an estuary or a coastal lake. The extent of this area was defined as those areas within the 100 year flood boundary as established by the HUD Flood Insurance Study for Wheeler. For areas adjacent to Nehalem Bay that are not subject to flooding, a 50 foot boundary from the estuary was used. There are no coastal lakes in Wheeler.

Adjacent areas of geologic instability, where the geologic instability is related to or will impact a coastal water body. The report titled "A Field Investigation of Geologic Hazards in Wheeler, Oregon" prepared by Martin Ross was used to determine if any such areas existed in Wheeler. No adjacent areas of geologic hazard were identified in this report.

The existance of riparian vegetation was established as the result of a field investigation. Two areas of riparian vegetation were identified. The first was along Vosberg Creek. The Tillamook County Comprehensive Plan has identified streams with a channel width of less than 15 feet to have a low potential for streambank erosion (Vosberg Creek's channel is less than 15 feet in width). Both the Oregon Department of Fish and Wildlife and the Soil Conservation Service considered a riparian zone of 15 feet on either side of a stream of Vosberg Creek's size to be adequate to reduce streambank erosion.

The Oregon Department of Fish and Wildlife also considered a 15 foot wide riparian zone to be sufficient to maintain water quality and temperature necessary for the maintenance of fish habitat. Therefore, the City established a 15 foot riparian zone on either side of Vosberg Creek. The second area with riparian vegetation is located adjacent to the 4.2 acre estuarine area located east of Highway 101, at the north end of the City. The riparian vegetation is located between the estuary and a road that borders it. The width of the riparian zone varies from 10 feet to 25 feet.

Areas of significant shoreland and wetland biological habitat were separated into two categories, "major marshes" and "significant wildlife habitat". Three information sources were used to determine the possible location of these resources in Wheeler:

- a. Oregon Department of Fish and Wildlife Map of Special Wildlife Habitat in Tillamook County, prepared by Doug Taylor, O.D.F.W. Wildlife Biologist, for the Tillamook County Planning Department, February, 1981;
- b. U.S. Fish and Wildlife Service Natural Wetland Inventory Map, U.S. Department of the Interior, Fish and Wildlife Service; and
- c. Oregon Natural Areas, Data Summary for Tillamook County, a report prepared by the Oregon Nature Conservancy for the Department of Land Conservation and Development.

No major marshes were identified. Significant wildlife habitat was defined to include habitat for: rare, threatened, or endangered animals or plant species; band-tailed pigeons, and big game animals. (Only major big game habitat was considered). No such areas were identified in Wheeler.

The Tillamook County Estuary Plan finds the no portions of the Wheeler waterfront are identified as especially suited for water dependent development, although all of the Wheeler waterfront is designated to provide for a mixture of water-dependent, water-related and non-water dependent, non-water related uses. (See discussion under Waterfront areas.) There is an aquaculture facility located on Vosberg Creek, east of Highway 101. The 4.2 acre estuarine area east of U.S. Highway 101, at the northern end of the City, has been designated as a mitigation site. The Nehalem Bay Dredged Material Disposal Plan identified no priority dredge material disposal sites in Wheeler.

No areas of exceptional aesthetic or scenic quality were identified.

There are no coastal headlands in Wheeler.

In establishing its shoreland area the City defined a broader area than that which resulted from applying the criteria of the Statewide Planning Goals. U.S. Highway 101 forms a logical coastal shoreland boundary for the City because it separates the portion of Wheeler adjacent to Nehalem Bay from the remainder of the City. Therefore, Wheeler has defined its coastal shoreland area as that portion of the City west of Highway 101. Two areas east of U.S. Highway 101 are also included in the coastal shoreland area: the riparian vegetation adjacent to the 4.2 acre estuarine area at the north end of the City and the 100-year floodplain and riparian vegetation associated with Vosberg Creek. A map of the Coastal Shoreland Boundary is contained in the Comprehensive Plan.

The City intends to develop a Waterfront Revitalization Plan for the area that extends along the entire waterfront between the Nehalem River and Highway 101 and includes the commercial lands on the other side of Highway 101. The project adopted by the Planning Commission is to be a primary goal for the City's endeavors to stimulate the local economy. The project seeks to promote a mix of industrial, commercial, residential, and recreational activities along the Wheeler Waterfront. Refer to the economy section of the Comprehensive Plan for goals and policy information. The Nehalem Bay Fishery has been a traditional component of the local job market which terminated with the close of commercial fishing in the Bay in 1956. Sport fishing provides the community's residents with income. The Nehalem Estuary's waters have served as a sport fishery and wildlife habitat. The City's businesses market trade and lodging services to the recreational fishing fleet and tourism visitors. The Nehalem Estuary contributes to this economy by serving as a nursery, feeding and resting area for numerous resident and migratory fish and wildlife.

In fact, it is the estuary's uniqueness as an environmental habitat which contributes to an important source of income, tourism, and recreational fishing. The unique specialized habitat of the Nehalem Estuary's water generates an area rich in plant, animal, and scenic diversity. Local merchants sell a variety of goods and services to tourists, sightseers, and fishermen who seek the Nehalem Estuary's waters for pleasure and recreation. To gauge the land use needs around and on the Nehalem Estuary, the Revitalization Plan will include examination of a Waterfront Vision, land use development standards, detailed biological and land-use master plan inventories of the City and County Estuarine areas and adjacent shorelands. These inventories will contribute materially to the evolution of the master plan designations to be presented in the Waterfront Revitalization Plan.

AIR QUALITY

In 1974, the Environmental Protection Agency (EPA) issued air quality regulations under the 1970 version of the Clean Air Act (P.L. 91-604) for the prevention of significant deterioration of air quality (PSD). These regulations established a scheme for protecting areas with air quality cleaner than the national ambient air quality standards (NAAQS). EPA's prevention of significant deterioration regulatory scheme was further modified by 1977 amendments to the Clean Air Act (P.L. 95-95).

Under existing EPA regulations, "clean areas" of the nation can be designated under one of three "classes". Specified numerical "ambient increments" of net air pollution increases are permitted under each class up to a level considered to be significant for that area. Class I increments permit only insignificant air quality deterioration; Class II increments allow for the greatest amount of deterioration, but in no case beyond the national air quality standards.

Under the Federal regulations, all areas of the state are automatically classified as Class II areas, except for mandatory Class I areas and "non-attainment" areas. The area classification scheme is administered and enforced through a preconstruction and premodification permit program for specific types of stationary air pollution sources. No such air pollution sources could begin construction or modification unless EPA and DEQ have found that the source's emissions will not exceed the numerical "increments" for the applicable class, and that the source would use the best available air pollution control technology.

Under this classification scheme, Wheeler is a Class II area. According to DEQ's Handbook for Environmental Quality Elements of Oregon Local Comprehensive Plans, the Wheeler airshed has 100% of its Class II TSP and SO₂ "increments" still available to it. This implies that some air quality deterioration, through industrial development, could take place without exceeding national air quality standards. There is presently no industrial development in Wheeler, the plan makes provision for some new industrial uses. Because of the limited area designated in the comprehensive plan for industrial use. It is not anticipated that a Class II PSD increments for the area will be "used up". Thus it has been determined that Wheeler's Comprehensive Plan does not appear to conflict with Class II PSD air quality standards.

Using the method contained in DEQ's Handbook, a calculation was made to determine whether there is a violation of the carbon monoxide air quality standard.

Within the Wheeler area, only Highway 101 carries substantial amounts of traffic. The Department of Transportation's Traffic Volume Tables for 1978, indicates that between 2950-3850 vehicles per day use the highway in the vicinity of Wheeler. This is well below the volume of traffic necessary to generate an excess of carbon monoxide levels. Thus it has been determined that the needs within the Wheeler Comprehensive Plan area do not cause existing or future violations of 8-hour carbon monoxide standards.

Noise Pollution.

Large trucks on U.S. Highway 101 cause most of the noise problems in Wheeler, particularly when braking or accelerating. Boats on the Nehalem River have the potential to cause noise problems, but they are regulated (as are trucks and all other sources) by the standards of the Department of Environmental Quality. The noise-sensitive uses in the City, residences and hospital/clinic, are located on the hillside and are generally separated from the river and U.S. 101.

When new industrial uses are located in the City, they will be subject to Department of Environmental Quality standards. Both industrial zones are situated along the waterfront, and should be compatible with existing development in Wheeler. The DEQ office in Tillamook is capable of advising the City on noise pollution matters.

NATURAL RESOURCES ELEMENT SUMMARY

Including the study of mineral and aggregate resources, scenic resources, cultural and historic sites, vegetation, fish and wildlife areas, natural areas, and open space resources:

Reference Maps:

Geographic Features

Existing Land Use

Buildable Lands

Statewide Goals of Primary Importance:

Goal 5 - Natural Resources

Goal 16 - Estuarine Resources

Goal 17 - Shoreland Resources

Natural Resources

Mineral, Aggregate and Energy Resources

The planning area does not include identified or known commercial sources of mineral, aggregate or energy resources. Deposits of sand and gravel do occur upstream in channels and bars. The nearest major gravel removal operation, at present, is on the South Fork. This and other potential working operations can have an impact in the planning area. Sand, gravel and crushed rock are essential ingredients for cement, concrete, road foundations and other community developments. These operations can affect water quality.

Fish and Wildlife Areas

Considering the relatively small size of the Wheeler planning area, there is an impressive diversity of plant habitat types and, in turn, fish and wildlife species. Many of the fish and wildlife species in the area thrive best with a range of plant habitat types for various animal needs or for different stages of the animal's life.

Changes in plant life seems to inevitably effect fish, wildlife and man. These changes occur naturally and are an ongoing process, but sometimes man through lack of foresight, adversely affects fish and wildlife by inadvertently destroying fish and wildlife areas.

One of the best means of promoting fish and wildlife resources is to monitor and defend plant habitat diversity and health. Plant habitat is the single best indicator of the environment's capacity for fish and wildlife.

There are five major types of plant habitat in the planning area. The location of these habitats are found on maps in the Nehalem Wetlands Reviews, Army Corps of Engineers, 1977. The following chart provides a general summary of important characteristics of each habitat type.

PLANT HABITATS IN THE CITY OF WHEELER PLANNING AREA

HABITAT TYPE	RANKING LEAST TO MOST	DISTRIBUTION	VULNERABILITY	PRODUCTIVE VALUE	SPECIAL CONCERNS
Urban	1		low		
Douglas Fir Blackberry Forest	2	nonurban upland areas	moderate	moderate	
Estuarine and Sub- merged Land	3	Approximately one mile of river area	Sensitive to filling levies, pollutants, etc.	high	Scarcity and productivity
Riparian	4	Thin band of dense growth along portions of the river and creeks (Vosburg, Jarvis, and Zimmerman)	Sensitive to clearing and erosion	high	Flood and erosion center; wild-life habitat cover; scenic quality
Salt Marsh	5	Area north of town	Sensitive to filling, levies pollutants, etc.	highest	Scarcity and productivity

The most socially significant habitats in the planning area are the estuarine, riparian and salt-marsh types.

Because of the overall scarcity of estuarine areas (including salt marsh) in the state, the resources of the estuary habitat have been clearly recognized as being of significance at the local, state and national levels. The Nehalem estuary habitat represents the seventh-largest estuary in total size and in total tideland area (out of seventeen major Oregon estuaries). The following table summarizes the amount of estuarine area, by subtype, for the Oregon Coast, Tillamook County, and the Nehalem River:

ESTUARINE AREA BY SUBTYPE

REGION	OPEN WATERS/ SUBMERGED LANDS	TIDELANDS/ SUBMERSIBLE LANDS	EELGRASS	SALT MARSH
Oregon Coast	94,346	44,567	5,019	18,424
Tillamook County	6,722	6,791	2,400	3,000
Nehalem Estuary	1,231	1,078	50	330
Wheeler Planning Area	Substantial	Substantial	0	Limited

In 1973, the Nehalem River was estimated to have an anadromous spawning population as follows:

- | | |
|-----------------------------|--------|
| (1) Spring Chinook Salmon | - |
| (2) Fall Chinook Salmon | 4,000 |
| (3) Coho Salmon | 21,840 |
| (4) Chum Salmon | 200 |
| (5) Winter Steelhead Trout | 11,000 |
| (6) Summer Steelhead Trout | - |
| (7) Sea-Run Cutthroat Trout | 8,000 |

Fish and shellfish regularly taken from the estuary include perch, sculpin, crabs and softshelled clams.

The bay has a large population of waterfowl during the fall and winter, including Black brant during March and April. Salt pans on the northeast edge of the estuary are particularly important as watering areas for approximately one thousand band-tailed pigeons. The Oregon Fish and Wildlife Commission data indicate the estuary supports the Whistling swan, 6 species of geese, 24 species of ducks, 22 shorebird species, and 47 other species of aquatic birds. The Oregon Fish and Wildlife Commission estimated the 1970 hunter-use of the area as 1,875 hunter days for waterfowl, and 900 hunter days for Band-tailed pigeon. Marine mammals using the estuary include the hair and fur seals and the sea lion.

More complete information on types of fish and wildlife and their native habitats is available from a variety of sources, including the Oregon Department of Fish and Wildlife.

Cultural and Historic Sites

Within the planning area there are no identified structures of state or national recognition or importance, with the exception that the State has recognized the historical significance of Highway 101 and the railroad.¹

The history of the region is helpful in understanding trends within the study area. Prior to the early white settlements in the later half of the 19th century, the Nehalem Bay area was home for relatively small, indigenous populations of Indians. The Indians tended to move from a permanent encampment (Kilamox Town on Cronin Point, located southwest of the study area), to other temporary camps (such as on the Nehalem Spit and to scattered sites at Wheeler and Dean's Point).¹

Early contacts between Spanish and English explorers and the Indians of Nehalem Bay have been confirmed. In 1806, Lewis and Clark reported about 1,000 Indians in the region. The largest village at the time was at Cronin Point; however, early settlers (1850's) reported that the village had been deserted. The Cronin Point village site was eventually eroded by the river (1930).

-
1. Should such resources be discovered, grant programs for archaeological and historical preservation are available from State and Federal agencies. State antiquities laws prohibit the destruction of certain archaeological sites, such as Indian burials, and discovery of archaeological sites should be reported to the State Highway Division, Parks and Recreation Division.

The first white settlers arrived from Astoria by boat in 1850. More homesteaders continued to filter into the Bay area. Most were farmers who cleared the dense underbrush from the river's edge. The early community of the 1800's attracted mainly residents from Finland, Lithuania and Russia.

The first school was established in 1879, in Upper Town, upstream from Nehalem. In July, 1887, a small steamship navigated the bar for the first time. In the fall, another ship attempted a crossing but struck bottom and withdrew. The first exports, salmon and dairy products, occurred in 1889.

By the 1890's Nehalem, across the river, began to emerge as the community center for the Bay area. Ship travel and waterfront activity continued to improve despite dangerous bar conditions. A large dock extended outward from the existing waterfront area toward Small Island, the scene of a logging operation and general store. Timber production is still for a local market. Chinese and Japanese people are brought to the area and employed in local canneries from the 1890's into the 1920's.

In 1909, the Port of Nehalem organized to improve bar conditions. A local tax was levied and bonds were floated to match federal dollars for a jetty. The jetty construction project was not completed until 1916.

In 1899, Nehalem incorporated, signalling two decades of intensive growth. Because of the primary importance of the river as a transportation route, the orientation of the business activity was towards the waterfront. It was not until 1908 that the log decking which served as the main street in town was replaced by fill and a road. The permanent population reached around 400 in the city. The Indian population had mostly disappeared, a victim of European diseases.

The completion of a railroad between Portland and Tillamook (1911) and initiation of the coastal highway over Neahkahnie (1925) reduced the need and importance of water-borne commerce. A shift in focus from Nehalem to Wheeler and Brighton occurs as businesses take advantage of improved transportation modes.

Wheeler incorporated in 1913, and the city replaced Nehalem as the economic center for the Bay area. Many Nehalem businesses relocated to be near the lumber mill that turned out 150,000 board feet of lumber per day.

The E. G. Wish Cannery, at Upper Nehalem, closed, but commercial fishermen formed a cooperative "Sunset Fish House" at Wheeler in 1922. Another fish processing center also was established in the area, and both operated until 1956, when the Bay was closed to commercial fishing.

By 1925 commerce over the bar ceased, due to shoaling. Reportedly bar conditions were even more dangerous as a result of a jetty project completed in 1916. The Port of Nehalem began negotiations with the Federal Government for jetty maintenance that lead to removal of over 12,000 cubic yards of sand in 1932-33. The first of the Tillamook Burn destroyed much of the coastal forests in 1933 and resulted in increased flooding (November) and sedimentation in the bay.

Commercial fishing was banned in the Bay in 1956 and the remaining cheese factories in the area were consolidated in 1960 at Tillamook. The timber industry, of course, suffered a setback from the Tillamook Burn.

After the Nehalem and Wheeler boom periods, the local economic base was gradually altered to recreational fishing, tourism, and retirement-type housing.

Scenic Resources

Development and planning in the downtown waterfront area - and, for that matter, in the largely natural setting which surrounds the city - must be sensitively accomplished if the community is to protect identified scenic qualities.

Within the planning area different types of landscapes are found, including "community center", "forested", "river", and "salt marsh". Each of these landscapes poses a different and important visual experience.

In part, the attractiveness of the planning area can be attributed to the variety of landscapes. Of particular significance, however, are landscapes in the planning area which are coastal oriented. Natural landscape types such as the river, the bay and marshes are community resources.

The river meanders near the base of the city and spreads into an embayment. The view to north, west and south is open and unobstructed for a mile and more. From many locations within the city, the view is panoramic, an impression of coastal beauty that can be intensified by solar aspect, such as early morning or late evening light. West Island, Lazarus Island, Nehalem Bay tidelands, and the southern tip of Dean's Point are prominent features in views from the planning area.

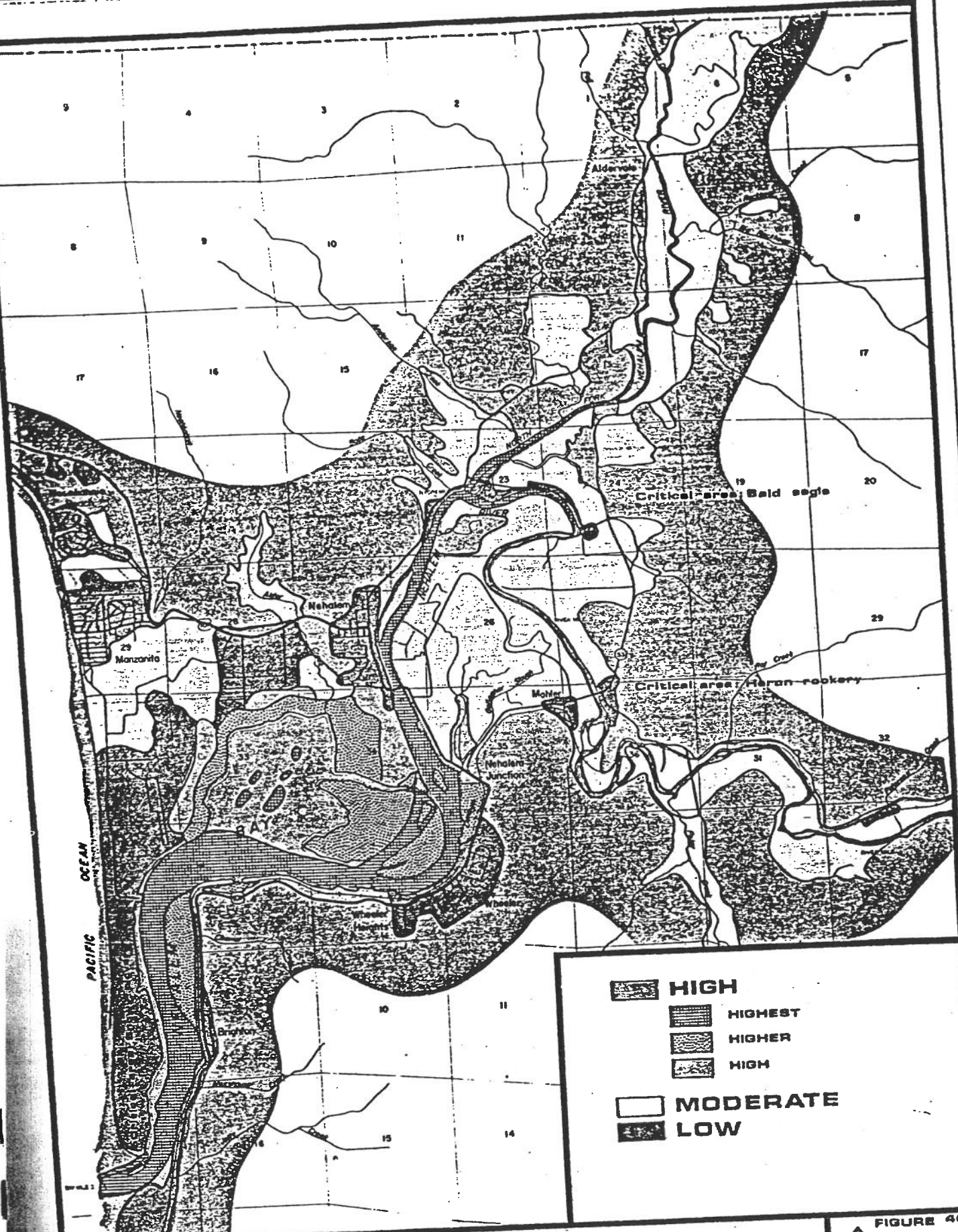
A view can be broken down: foreground, middleground, and background. Typical middleground features in the view from Wheeler include the waterfront, open river and Lazarus Island, with more distant features in the background.

Retention and enhancement of scenic quality can most directly be achieved by planning and development within the city planning area. The following items are a partial list of possible scenic quality programs for the planning area:

1. In conjunction with planning for natural hazard areas, vegetation should be conserved on identified hillside hazard zones, a guideline that bears scenic, watershed and natural areas significance.
2. Where possible, retain trees in their natural state between U. S. Highway 101 and the waterfront, possibly by a tree cutting or zoning ordinance calling for public review of proposals to alter vegetation.
3. Appropriate building height and setback requirements to protect community view of the waterline and beyond.
4. Prevent, where possible, the proliferation of single purpose docks throughout the planning area. Promote public access, instead, where appropriate.
5. Consider architectural standards or a review process for commercial and industrial development with highway and/or water frontage.
6. Land-use planning should encourage the efficient use of partly developed shoreland areas, existing fill sites, and recognized growth areas. Identification should be made of areas recognized for undisturbed and natural retention, including basis for identification and priority for retention (see example matrix).

Coast Hiking and Bike Trails: The Oregon Coast Hiking Trail, which begins at the Columbia River, follows the Nehalem Bay spit south to its tip. At that point, a ferry from the Jetty Fishery Marina will carry hikers across the mouth of the river to the mainland. The trail continues south to its end at Cape Meares. The Oregon Coast Bike Trail also bypasses the City. The trail follows U.S. Highway 101 from the north to its junction with Highway 53, eventually connecting with the Miami-Foley Creek Road. The trail rejoins U.S. Highway 101 south of Garibaldi.

A hiking trail could be established along Zimmerman Creek and the south boundary of the City, possibly terminating at Paradise Cove. Since most of the length would be on private land, agreements or easements would have to be obtained.



	HIGH
	HIGHEST
	HIGHER
	HIGH
	MODERATE
	LOW

NEHALEM WETLANDS REVIEW
HABITAT VALUES

FIGURE 46

SCALE 1" = 1 MILE

EXAMPLE:

MATRIX FOR A PROGRAM TO RETAIN NATURAL, SCENIC AND OTHER RESOURCES

SITE DESCRIPTION	PRIORITY	RATIONALE
1. Steep bank along the S. E. waterfront (Gamble to Hospital Road waterfront)	1. High	1. Site not buildable
2. Marsh area at north end of city, east of highway 101	1. High	2. Significant habitat, severe building limitations
3. Lowland flood area between 101 and the River west of the city limits	2. Medium	2. Some building limitations; habitat and scenic significance; not currently needed to accommodate waterfront uses
4. Conifer forest between Highway 101 and the river northwest of the westernmost city limits	3. Low	3. Significant support habitat for the estuary and scenic value

Priority:

- High - Requires a major plan amendment for development
- Medium - Requires a minor plan amendment and site plan analysis by developer
- Low - Requires no plan amendment and allows for normal processing. If a public hearing is otherwise required, review should be made of scenic and other resource significance.

GOAL #5 OPEN SPACE, SCENIC AND HISTORIC AREAS, AND NATURAL RESOURCES

The overall goal of Statewide Planning Goal #5, Open Space, Scenic and Historic Areas, and Natural Resources is: "To conserve open space and protect natural and scenic resources".

To achieve this goal, Wheeler is required to undertake an inventory of the following twelve types of resources:

- a. Land needed or desirable for open space;
- b. Mineral and aggregate resources;
- c. Energy sources;
- d. Fish and wildlife areas and habitats;
- e. Ecologically and scientifically significant natural areas, including desert areas;
- f. Outstanding scenic views and sites;
- g. Water areas, wetlands, watersheds and groundwater resources;
- h. Wilderness areas;
- i. Historic areas, sites, structures and objects;
- j. Cultural areas;
- k. Potential and approved Oregon Recreation trails;
- l. Potential and approved federal wild and scenic waterways and state scenic waterways.

These resources are to be inventoried as to their location, quality and quantity.

Upon completion of the resource inventory, a determination is to be made if there are conflicting non-open space uses for these resources or resource areas. Areas or sites for which no conflicting use has been identified are to be protected. Where conflicting uses have been determined to exist, the economic, social, environmental and energy consequences of the conflicting uses on the resource shall be determined.

Based on the inventory and the analysis of conflicting uses, the City is to develop a program that will:

- 1) insure open space;
- 2) protect scenic and historic areas and natural resources for future generations;
- 3) promote healthy and visually attractive environments in harmony with the natural landscape character.

Requirements of the Administrative Rule on Goal #5, OAR 660-15-00

An administrative rule clarifying the requirements of Statewide Planning Goal #5, Open Spaces, Scenic and Historic Areas, and Natural Resources was adopted by the Land Conservation and Development Commission in June of 1981. The administrative rule establishes a method to be used in applying Goal #5 to resource sites. This procedure addresses the following elements: what is and is not required to be included in the plan inventory; how to identify conflicting uses for resource sites and determine their impacts on those resource sites; and how to protect resource sites, depending on the degree to which conflicting uses are to be allowed or limited.

The following is an outline of the three-step procedure which the Administrative Rule establishes. The first step is data collection and an evaluation of the quality, quantity, and location of the resource sites identified. Based on the information collected, one of three decisions is made: the resource is determined not to be important enough to warrant inclusion in the inventory; or the available information is inadequate to determine the value of an identified resource (in this case, the City must include policy language in its Comprehensive Plan committing the City to the development of additional information on the resource and an evaluation of the resource within a specific period of time); or there is sufficient information on the resource sites' quality, quantity, and the resource site is important enough to include in the inventory.

The second step is the identification of conflicting non-open space uses for a given resource or resource site. If no conflicting uses are identified, the resource must be protected. If conflicting uses are identified, an evaluation of the environmental, social, economic and energy consequences of allowing the conflicting use is required. The level of information that the City must provide concerning possible conflicting uses should be adequate to explain why the City chose to protect, or not to protect, a given resource.

Relationship of Goal #5 to the Estuarine Resources Goal #16, and the Coastal Shoreland Goal #17.

Goal #5 lists twelve types of resources that are subject to inventory and possible protection. A number of these resources are also addressed by the Estuarine Resources Goal and the Coastal Shoreland Goal. Generally, the resource protection requirements of the Estuarine Resources Goal and the Coastal Shoreland Goal are more stringent than the requirements of the Open Space Goal.

Thus, when one of the twelve Goal #5 resources is located in either an estuarine or coastal shoreland area, the appropriate resource inventory and

and protection requirements of the Estuarine Resources Goal of the Coastal Shorelands Goal are applied. Therefore, these resources are not covered by this element of the Comprehensive Plan.

The following describes the scope of the Goal #5 inventory for each of the identified resources:

- 1) Open Space - all land and water areas
- 2) Mineral/Aggregate - all land and water areas
- 3) Energy Sources - all land and water areas
- 4) Fish/Wildlife Habitat - all land outside of the City's estuarine areas
- 5) Ecologically significant Natural Areas - all land outside the Coastal Shoreland planning area and estuarine areas.
- 6) Scientifically significant Natural Areas - all land areas
- 7) Outstanding Scenic Views - all lands outside of the Coastal Shoreland planning area and estuarine areas.
- 8) Watersheds - all land areas
- 9) Groundwater resources - all land areas
- 10) Wetlands - all lands outside of the Coastal Shoreland planning area and estuarine areas.
- 11) Historical/Archaeological Sites - all areas
- 12) Wilderness - all areas outside the Coastal Shoreland planning area
- 13) Oregon Recreation Trails - all land areas
- 14) Wild and Scenic Waterways - all land areas.

Methodology of the Open Space, Scenic and Historic Areas, and Natural Resources Inventory

The following procedure was used in undertaking the Wheeler Open Space Inventory and in the establishment of a program to protect identified open space sites resources:

- 1) Determination of the elements of each resource category to be inventoried. The completeness of each resource category to be verified with appropriate state agencies.
- 2) Selection of inventory sources.
- 3) Development of a preliminary resource list based on the inventory sources.
- 4) Evaluation of the elements on the preliminary resource list to determine whether their location, quality and quantity warrants inclusion in the Open Space Inventory. In general, an attempt was made to gather sufficient information on the resource at this time, rather than deferring the required decisions to a later date.

- 5) Establishment of the final inventory lists.
- 6) Determination of conflicting uses, if any, for the resources on the final inventory list. Where conflicting uses were identified, an evaluation of the environmental, social, energy and economic impact of allowing these conflicting uses was undertaken.
- 7) Development of a program to achieve the objectives of the Open Space Goal. This includes a determination of which resources to protect and the appropriate method of resource protection. Generally, where they were found to be adequate, existing state or federal programs and regulations were relied on to protect resources. Additional local protection was developed only for those resources for which existing regulation was found to be inadequate to meet the intent of the Goal.

The Goal defines open space to "consist of lands used for agriculture or forest uses and any land area that would, if preserved and continued in its present use:

- a) Conserve and enhance natural or scenic resources;
- b) Protect air or streams or water supply;
- c) Promote conservation of soils, wetlands, beaches or tidal marshes;
- d) Conserve landscaped areas such as public or private golf courses, that reduce air pollution and enhance the value of abutting or neighboring property;
- e) Enhance the value to the public or abutting or neighboring parks, forests, wildlife preserves, nature reservations or sanctuaries or other open space;
- f) Promote orderly urban development."

Using this definition, three types of open space can be identified. The first is general open space. This category consists of forest lands, agricultural lands and estuarine areas. Because the land inside the WheelerUGB is planned for urban development, the retention of forest and agricultural land for its open space values is not appropriate. Existing forested areas will provide open space values until they are converted to urban use. The open space values of the City's estuarine areas will be protected through the City's Estuarine Resource element. The second group of open space consists of site specific resources. This category includes parks, wildlife refuges and natural areas. The location, quality and quantity of these resources, as well as potential conflicting uses and the consequences of allowing conflicting uses, is discussed in the portion of the open space inventory dealing with a particular resource (e.g. natural areas or scenic sites). The final category is open space that is provided in conjunction with a specific

development, ususally residential. This type of open space can serve a number of purposes: the protection of areas of steep slope, geologic hazard, or flooding hazard; the buffering of conflicting land-uses; or the provision of areas for passive and active forms of recreation. The City has adopted Comprehensive Plan policies and a development Ordinance that encourages cluster development and the retention of open space in residential developments.

The Department of Geology and Mineral Industries list of removal permits was used as a source for identifying aggregate sites in Wheeler. None were identified.

There are no energy resource sites within Wheeler, e.g. hydro-electric sites, sites with potential for wind energy, or geothermal potential.

The "Fish and Wildlife Habitat Protection Plan for Tillamook County" prepared by the Oregon Department of Fish and Wildlife includes six wildlife habitat types: big game, upland game birds, water fowl, furbearers and hunted non-game wildlife, non-game wildlife and fish habitat.

The Department of Fish and Wildlife classifies big game range as either Major Big Game Range, Peripheral Big Game Range, or Excluded Range. (Big Game Range provides the habitat requirements for Roosevelt Elk, Black tail deer, Blak bear and cougar). Major Big Game Range is defined as that portion of the County which supports the majority of big game. In general, these lands are sparsely developed forest lands. They also provide the majority of big game recreational opportunity. Peripheral Big G ame Range is generally defined as the valley bottoms of the County's major river valleys. These lands support substantial big game populations and serve as a wintering areas for animals from Major Range areas in severe winters. Conflicts exist between big game and other uses, and these conflicts limit management options and recreational opportunities. The Peripheral Big Game Range areas were once of equal value with Major Big Game Range prior to their more intensive development. Excluded Range areas are developed areas, such as cities and urbanized portions of the County, that are only occasionally used by big game. Most of Wheeler is classed as Excluded Range. The periphery of the urban growth boundary area is classified as Peripheral Range. Because this area has been determined to be necessary for urban development, no special policies have been developed to protect Peripheral Big Game Range areas inside the urban growth boundary.

Two types of habitat have been determined to be important for upland birds: mineral springs for band-tail pigeons and riparian vegetation along streams. There

are no mineral springs in Wheeler. The City will develop a program to protect riparian vegetation along Vosburg Creek, Jarvis Creek and Zimmerman Creek.

Waterfowl habitat is covered by the Estuarine Resources element of the plan.

Non-game wildlife includes eagles, herons, ospreys and owls. There are no Northern Bald Eagle, Great Blue Heron, Osprey or Northern Spotted Owl nesting sites in Wheeler.

The habitat for furbearers and hunted non-game wildlife corresponds to that for big game species and upland birds.

Jarvis Creek and Zimmerman Creek support anadromous fish runs according to the Oregon Department of Fish and Wildlife. There are a number of factors that can lead to a loss of fish habitat or the deterioration of habitat quality. The most significant of these are: low stream flows, elevated stream temperatures, stream sedimentation, chemical or biological stream pollution, and the blockage of the stream through log or debris jams. Stream quality, and thus its value as fish habitat is affected by adjacent land uses. The major adjacent land use in Wheeler is residential. Residential uses can affect stream quality in a number of ways. The removal of riparian vegetation can result in elevated stream temperatures and increase the potential for streambank erosion. Improper land clearing practices can result in stream sedimentation. The City will develop a program to control the removal of riparian vegetation. The City's Development Code contains standards that seek to minimize erosion and sedimentation that results from land division and subdivision activities.

The report, Oregon Natural Areas, Tillamook County, prepared by the Oregon Natural Heritage Program for the Department of Land Conservation and Development listed no potential ecologically or scientifically significant natural areas in Wheeler.

The scenic resources of Wheeler and a program to protect them are discussed in the previous section titled, Scenic Resources.

There are no lakes in Wheeler. The Oregon Department of Fish and Wildlife identified no non-coastal freshwater wetlands in Wheeler. The City's water system contains two watersheds. The Vosburg Creek watershed contains approximately 200 acres and the Jarvis Creek watershed contains approximately 150 acres.

There are no wilderness areas in Wheeler.

There are no buildings or sites listed on the National Register of Historic Places or the State of Oregon Inventory of Historic Sites and Buildings.

There are no archaeological sites in Wheeler.

There are no approved Federal Wild and Scenic Waterways and State scenic waterways in Wheeler.

There are three bicycle routes that pass through Wheeler. One of these, the Oregon Coast Bicycle Route, has been officially designated by procedures established by ORS 390.950-091. The other two routes have not gone through the procedures established in Oregon Revised Statutes. The Oregon Coast Bicycle Route is part of the coastal bicycle touring route that extends from Mexico to Canada. It follows U.S. Highway 101 through Wheeler. The Northwest Oregon Loop Bicycle Route connects the Willamette Valley with the Oregon Coast. The portion through Tillamook County follows Highway 101. The Trans-America Bikeway connects the east and west coasts of the United States. The western terminus of the route is in Astoria. The route follows U.S. Highway 101 through Wheeler.

The Oregon Coast Trail will eventually be a 370 mile hiking trail along the coast from the Columbia River to the California border. The northern-most 64 mile segment from the Columbia River to Barview was dedicated in 1975. The Parks Division is planning the remaining segment of the trail through Tillamook County. In the Nehalem Bay area, the trail follows the beach south from Manzanita, crossing the Nehalem River by ferry at Nehalem State Park. The alternative route, not involving a ferry crossing, follows U.S. 101 from Manzanita through Nehalem and Wheeler and reconnecting with the trail at Jetty Fishery.

SOCIAL RESOURCES ELEMENT SUMMARY

Including studies of community facilities and services, population, economics, and housing.

Reference Maps:

- Existing Land Use
- Water Distribution System
- Sewerage Collection System
- Storm Drainage Collection System
- City Street and Railroad System
- Housing Conditions

Statewide Goals of Primary Importance:

- Goal 8 - Recreation
- Goal 11 - Public Facilities
- Goal 12 - Transportation
- Goal 13 - Energy
- Goal 14 - Urbanization

Economic Element

Detailed economic information for Wheeler is not available. Even if such data were available for smaller jurisdictions, the results would in most cases closely approximate conclusions that could be drawn for the overall county economy. The following discussion will focus on examination of available economic data and issues which are especially pertinent to the Nehalem Bay area: sectors of employment in the county, income statistics, and a description of the major economic opportunities for Nehalem Bay.

Employment

The following table summarizes employment characteristics for Tillamook County from 1972-1977. During this period total employment grew slightly, but the civilian population increased steadily. As a result there has been a substantial increase in unemployment figures. A high unemployment rate of 14.5% was registered in 1975 when an average of 1,130 persons were unemployed. Since 1975, the civilian labor force has not increased as rapidly as employment opportunities, with resulting improvement in the rate of unemployment since 1975 for the county as a whole.

TILLAMOOK COUNTY RESIDENT LABOR FORCE, UNEMPLOYMENT AND EMPLOYMENT 1972-77

	1972	1973	1974	1975	1976	1977
Civilian Labor Force	7,440	7,790	1,974	7,810	7,750	8,250
Unemployment	450	460	830	1,130	780	570
Percent of Labor Force	6.0	5.9	10.6	14.5	10.4	6.9
Total Employment	6,990	7,330	6,970	6,680	6,740	7,680

Source: State of Oregon, Department of Human Resources, Employment Division

Unemployment in the Tillamook region is a problem that is statistically more severe when compared with statewide data. During the same period, 1972-77, unemployment for the state varied from 6.8% to 9.5%.

Seasonality of work is also a significant feature of the local economy, and is a problem which again is more extreme than for the entire state. Each of the major economic sectors in the county, especially forestry, tourism and fishing, is subject to fluctuations in monthly employment rates. Consequently, for the period 1973-77, the average unemployment rate was 68% higher in the winter (December through January), than it was in the summer (July through September).

Income

Using income as a measure of economic well being, Tillamook County residents are not as prosperous as the state as a whole. Furthermore, available data indicate that the situation is getting worse. In 1965, per capita personal income in Tillamook County was 93% of the state average; in 1974 it was 85%. The County's position has also deteriorated with respect to neighboring counties; Clatsop, Lincoln and Yamhill. In 1965, Tillamook per capita was the second highest when compared with neighboring counties, but by 1974 it was last.

The following table confirms the problem of personal income. It shows that in 1975, 33% of state and 56% of Tillamook County households had incomes of less than \$8,000.00.

PERSONAL INCOME BY HOUSEHOLD FOR 1975

<u>Income Categories</u>	<u>Tillamook County</u>	<u>Oregon</u>
Less than \$8,000	55.8	32.9
\$8,000 - \$9,999	13.4	8.9
\$10,000 - \$14,999	23.8	24.5
\$15,000 - \$24,999	15.0	25.8
\$25,000 and over	3.6	7.9
TOTAL	100%	100%

Source: 1976 Buying Guide, Sales Management

The failure of personal income to advance as rapidly as inflation rates or to keep pace with personal income advances for other regions can be partly explained by other factors. First, available population information indicates a substantial influx of retired persons who have migrated into the county. Even more significantly, it appears that higher paying jobs (such as lumber and wood product manufacturing) are being replaced by generally lower paying jobs (trade and service sector).

Key Sectors of the Nehalem Bay Economy

For the county as a whole, the major economic sectors are: forest products, agriculture, recreation/tourism, and commercial fishing. (See Table II).

A cursory overview of forest products, agriculture and commercial fishing is sufficient for planning purposes of the city. These three industries are not dependent upon the planning area in terms of production or processing of raw materials. (See historical overview).¹ By contrast, emphasis should be given for planning purposes toward an understanding of the tourist/recreation industry, since in this case the city is in a position to influence the success of the tourist and recreation sector.

The tourist and recreation industry in Nehalem and in the county is typically of a low-intensity type. Since the 1960's it has been apparent that Tillamook County has one of the least developed recreation and tourist sectors on the Oregon Coast. In 1973, one study revealed that Tillamook County captured less dollars per tourist than any other coastal county in Oregon.

Despite the lack of developed facilities for tourist visitation, or perhaps because of the lack of development, recreationists and sightseers continue to visit in increasing numbers. In any case, the recreation/tourist industry appears to be the fastest growing sector of the economy. It is the only sector which has consistently shown steady increases, as reflected in retail sales indicators and information on visitor days.

For the Nehalem Bay area, considering the prospects for expansion in other economic sectors, it appears that the best prospect for economic improvement is based on tourism. One study of the county economic situation has concluded that the Nehalem Bay area has the greatest potential for cost-efficient exploitation of the tourist dollar. (Street, et al, 1978).

1. For the north county area as a whole, manufacturing activity is represented by: Chase Logging Company, Cook Creek Shake and Shingle, Mohler Sand and Gravel, Nehalem Bay Winery, Newberg and Scovell, Inc., and Sorensen Logging Company.

Source: Economic Technical Report for Tillamook County, Street, et al, 1978.

The question of how to capitalize upon the potential growth of the tourist industry is complicated. The following facts and issues are intended to serve as a basis for a description of the nature of recreation and tourism in the area.

- Visitors come to the Oregon Coast and Nehalem Bay area to engage in a variety of activities such as fishing, clamming, hunting, sightseeing, use of recreational vehicles, camping, photography and other activities.
- The tourist industry, as might be suspected, is highly seasonal. An indication of this cyclical activity is suggested by reviewing high and low retail employment figures. In 1977, for example, winter retail employment rates were less by 370 jobs compared to summer retail employment for the county. To a certain extent, however, the tourist economy is becoming less seasonal.
- Because of the type of activities which attract visitors to the Bay area, overexploitation or other damage to the natural resource base will reduce the attractiveness of the area for visitors. Therefore, maintenance of visual integrity, habitat diversity and water quality are more significant to the long-term economy than other goals based on the type of activities which attract visitors.
- Community projects which improve access to the waterfront are the most significant means of improving visitation and longer stops by tourists. This means that for local businesses the major community resource is the downtown waterfront stretch.
- The key economic land resource of Wheeler - the town waterfront land area - currently appears to be underutilized. Plans to improve public access to the waterfront and the question of what types of new developments would be beneficial to the long-term economy and area livability should be addressed by the local comprehensive plan.
- Tourism does create costs which are borne by the general public (these costs are called externalities by economists). These public costs include depletion of resources, traffic and parking congestion, expanded need for police protection, and higher demands for sewerage and water systems.
- Overnight accommodations for tourists include a number of motels in the Wheeler area and a planned recreational vehicle park. The Comprehensive Plan should address the issue of whether additional overnight facilities are desirable, and where these facilities should best be located.

Social Resources

The Oregon Statewide Outdoor Recreation Plan (SCORP), prepared by the State Parks Branch, projects a steady increase in outdoor recreation demand for the North Coast. However, it also states that there is an over-supply of recreation facilities for the County (Table 29). While the City recognizes that most major tourist activity will remain at facilities such as the Nehalem State Park, the City is providing locations in the downtown on the waterfront for water-related and commercial uses. Although Wheeler provides services to visitors, it is not a tourist destination, and will probably maintain this role in the future. Public access is generally to be required of all uses to be located on the river.

WHEELER ECONOMIC DEVELOPMENT ANALYSIS

THE WHEELER BUSINESS PLAN

Regional Economic Background

The economic background of Wheeler closely reflects Tillamook County's. The rural economy has been highly dependent on its natural resource base. The 1970's were years of growth for most industries, although recessions in 1970 and 1974-75 were felt by businesses and residents in Tillamook County. Continued growth late in the decade was driven by high inflation rates that encouraged consumer spending. When the inflationary demand was curtailed by Federal Reserve Policy in the early 1980's, Wheeler and Tillamook County entered a national economic downturn equal to the great depression. The county's lumber and wood products industry felt the downturn first, and was hardest hit by layoffs and plant production reduction. The County's seafood processing industry also experienced major employment losses due to diminished fish stocks and demand. The diminished fish stocks, foreign competition, and higher operating costs for producers and processors resulted in layoffs and closures.

Economic conditions improved from the mid-1980's into the early 1990's, but a transition in the nature of employment growth resulted in a shift away from employment in natural resource extraction and processing toward employment in retail trade and services. The transition was fueled, for the County and Wheeler, by increases in tourism and retiree visitation, and by the upgrading of processing facilities to reduce labor costs and sharpen competitive advantage. The county's net earnings in lumber and wood products remained relatively constant from 1988 to 1992, as did farm operations, food and kindred products, and commercial fishing. However, tourism hotels and lodging grew from 2.6 million in 1988 to 4.5 million in 1992.

GROWTH IN NET EARNINGS (MILLIONS) - TILLAMOOK COUNTY

Sector	Year				
	1988	1989	1990	1991	1992
Commercial	4.2	2.7	3.1	3.5	3.7
Fishing					
Lumber	11.4	11.1	11.2	12.5	14.1
Wood					
Products					
Agriculture	9.9	10.7	11.8	11.1	14.1
Food &					
Kindred					
Products					
Farm	8.6	7.9	11.0	9.9	9.4
Operations					
Tourism	2.6	3.7	3.5	4.0	4.5
Hotels &					
Lodging					

Source: Dept. of Economic Development

Wheeler anticipates capitalizing on growth in the tourism retail industry by upgrading its commercial district in the style of a waterfront community. Overall employment gains in non-manufacturing sectors has affected jobless rates in the County compared to the rest of the Northwest and the region. The tourism industry represents a niche market opportunity for small communities on the North Coast in Oregon.

Tourism Industry Outlooks

The most visited region in Oregon is the Portland Metro Area, which receives one quarter of the total person-visits to the state (25%) The Coastal region as a whole receives the second largest proportion of visitors (23%), concentrating in the Central Coast (10%).

The Willamette Valley receives nearly one fifth of the person-visits (17%), while the Southern region's share is slightly smaller (14%). The least visited regions are Central and Eastern, which receive, respectively, 7% and 6% of the total number of person-visits to Oregon.

Number of Person-visits to Oregon (in millions)

Region	Fall	Winter/Spring	Summer	Total
The Coast	2.15	2.71	2.88	7.74 (23%)
North Coast	.58	.72	.86	2.15 (6%)
Central Coast	1.06	1.22	1.18	3.46 (10%)
South Coast	.51	.77	.84	2.12 (6%)

(Oregon Visitor Profile, April 1995)

Tourism Needs Analysis

Commercial land use including the business district of downtown Wheeler continues to be rejuvenated to the current time. The successful commercial trend is towards capturing the tourism market and recreation industry, facilitated by downtown area appeal as a authentic waterfront community.

The land use and commercial success of the downtown continues to depend on a balance of shops, waterfront development, high amenity attractions, and regional recreation opportunities.

Further expansion of commercial uses in the downtown area is ultimately constrained by the amount of developable land.

Visitor Trip Purpose

Out-of-State Visitors

The great majority of out-of-state visitors are on a pleasure trip (76%), especially in the summer (85%). A much smaller group visit Oregon for a convention or meeting (10%), although the proportion of conventioners doubles in the winter/spring (22%). One visitor in twenty comes for business purposes (5%), and a slightly larger group combines business or convention with pleasure (7%).

The preferred activities among out-of-state visitors seem to be the tourist mainstays of eating and shopping--dining out (61%) and shopping (56%), in small towns (38%) and in metropolitan areas (30%). Other common activities include visiting friends and family (53%) and visiting attractions (50%), such as historical sites or museums (22%), Oregon Trail sites (14%), zoos (12%), aquariums (7%), science museums (10%), art museums (8%), and wineries (10%).

In-state visitors

The great majority of in-state visitors travel in Oregon on pleasure (89%). A small proportion combine pleasure with business or convention (4%). An even smaller group travels mainly for business purposes (2%) or mainly to attend a meeting or convention (2%).

Visiting attractions is another popular activity among in-state visitors (43%). One in five visits historical sites or museums (21%), while half as many visit zoos (11%). A smaller proportion visit science museums (8%), Oregon Trail Sites (7%), art museums (5%), or wineries (3%).

North Coast Visitor Profile

The North Coast is a destination for older people taking short, frequent trips for rest and relaxation. Visitors to the region have the highest average age (48 yrs.) and the highest proportion of people 55 years or older (36%). Although their trip length averages only 2.7 nights in the region, they have visited the North Coast 10 times on the average. They enjoy the same types of activities as overall visitors to the Coast. However, they seem to be somewhat less active and more likely to enjoy relaxing and sightseeing (47%).

Not surprisingly, due to its proximity to Washington, this region receives the highest proportion of visitors from that state (19%), though it also receives many visitors from California (12%). Among all coastal regions, the North Coast is visited by the smallest proportion of Oregon residents (24%).

Although summer is the busiest season, visitation is more evenly distributed throughout the year on the North Coast than in other Coastal Regions. Forty-one percent visit the North Coast in the summer, 31% in the fall, and 28% in the winter/spring.

The North Coast has visitors with the highest household income (\$54,300 on average) and the highest daily expenditures per person (\$62.00) on the Oregon Coast.

(Source: Oregon Visitor Profile, April, 1995)

TILLAMOOK COUNTY NONAGRICULTURAL WAGE AND SALARY EMPLOYMENT

TOTAL WAGE & SALARY EMPLOYMENT	1970	1971	1972	1973	1974	1975	1976	% OF CHANGE 70-76
ANNUAL AVERAGE NUMBER OF EM- PLOYEES	4380	4580	4700	4990	4880	4700	4970	13.5
TOTAL MANUFACTURING	1590	1650	1690	1750	1480	1120	1330	-16.0
FOOD PRODUCTS	250	270	290	280	300	290	290	16.0
LUMBER & WOOD PRODUCTS	1280	1330	1360	1420	1130	770	980	-23.4
OTHER MANUFACTURING	60	50	40	50	50	60	60	
TOTAL NON-MANUFACTURING	2790	2930	3010	3240	3400	3580	3640	30.5
CONTRACT CONSTRUCTION	70	90	120	170	150	110	120	71
TRANSPORTATION & UTILITIES	140	150	170	150	160	140	150	7
WHOLESALE & RE- TAIL TRADE	760	820	880	950	940	1040	1,090	43
FINANCE INSURANCE REAL ESTATE	130	130	130	130	150	140	140	8
SERVICE & MISC.	660	710	530	600	730	730	760	15
GOVERNMENT	1030	1030	1180	1240	1270	1420	1380	34

SOURCE: State of Oregon, Department of Human Resources, Employment Division

Housing

Introduction

Extensive publicity has been directed toward housing problems throughout Oregon and elsewhere, such as increasing costs, inadequate supply, low vacancy rates, substandard conditions, housing for the elderly, etc. A challenge facing communities throughout the United States is how to develop programs and policies to deal with these ever-increasing problems.

The first step in problem solving to meet the needs of the area's current residents, as well as to provide adequate housing for future residents, is gathering of information. In addition to the need for housing information from a practical point of view, an adequate data base is also necessary for satisfying the requirements of a Housing Assistance Plan, a Community Development Block Grant Application, and Goal #10 Housing of the Land Conservation and Development Commission.

Useful information is available from a variety of sources as a foundation for developing an effective housing plan. These sources include:

A Survey of the Housing Situation in Tillamook County,
Richard L. Ragatz, Inc., 1978.

A Survey of the Housing Situation in the City of Wheeler,
Wheeler City Council in cooperation with the Clatsop-
Tillamook Intergovernmental Council, 1977.

A Housing Stock Inventory for the City of Wheeler,
Clatsop-Tillamook Intergovernmental Council, 1977.

1970 U. S. Census for the City of Wheeler, United States
Department of Commerce, 1971.

Tillamook County Housing Assistance Plan, Clatsop-Tillamook
Intergovernmental Council, September, 1978.

Statistical Report

Housing Mix	#	<u>City</u>	<u>County</u>
		%	%
Single Family	114	69.1	84
Duplex	6	3.7	5.5
Multiple Family	40	24.2	5.5
Mobile Home	5	3	8.4
Other	0	0	2.1
Total Units	165	100%	100%

Source: CTIC Housing Stock Inventory, 1977.

About 30% of housing units in the city are duplex or multiple-family structure type. Approximately 1.78 acres are currently used for duplex and multiple-family units; .62 acres mobile home and 17.11 acres for single family (See Land Use).

1977 Housing Age

City

<u>Years</u>	<u>Number</u>	<u>Percent</u>
1-5	4	2.4
15-30	17	10.3
30+	144	87.3
<hr/>		
Total	165	100%

Source: CTIC Housing Stock Inventory, 1977

Inventory on the age of the city's housing stock indicates that a statistically large proportion (87%) of housing is more than 30 years old.

By comparison, 40% of all housing units in the county are more than 30 years old.

1977 Vacancy Rate

City

HUD
STANDARD

<u>Number</u>	<u>%</u>
9	5.5

5%

U.S. Department
of Housing and
Urban Development

Source: CTIC Housing Stock Inventory, 1977

The U. S. Department of Housing and Urban Development recommends an average vacancy rate of 5% to allow for mobility and a reasonable choice in housing. For the county, the vacancy rate is statistically low, in the range of 1 to 2%. Given the regional picture, evidence of higher vacancy rates in Wheeler may indicate that the housing market is depressed by high housing costs or by substandard housing conditions.

1977 Housing Conditions

	City	
	<u>Number</u>	<u>Percent</u>
Sound	99	60.
Moderate	58	35.
+ Dilapidated	8	5.
Total	165	100%

Source: CTIC Housing Stock Inventory, 1977.

To determine the condition of the housing units within the city, a visual field survey was conducted in September, 1977. This was accomplished by driving by each unit and evaluating its exterior condition. This assumes that exterior conditions are a valid indicator of the overall conditions and "soundness" of construction.

Primary factors considered for each unit included the condition of the foundation, roof, porch, steps and exterior walls. Of lesser importance were the condition of the doors, windows, chimney, guttering and paint. The house was examined and given an overall rating based on the following definitions. An attempt was made to ignore housing age, construction materials, or initial cost or design.

Sound - No visual defects or only minor defects which could be corrected by the homeowner during the course of regular maintenance.

Moderate- Basically sound structure in need of minor or major repairs which are more than is generally included in regular maintenance.

Dilapidated - A structure in such a state of disrepair that it is not economically feasible to rehabilitate.

The results of the survey indicate that within the city in 1977: 99 homes were rated as "sound", 58 homes were rated as "moderate", and 8 homes as "dilapidated".

Information for the city of Wheeler has been compared with other areas and shows that Wheeler has a relatively greater percentage of moderate and dilapidated units. This suggests that relatively rapid deterioration of housing stock is possible.

Housing Repair Needs

When asked about specific housing repair needs, survey respondents have indicated a range of items needing repair:

Housing Items in Need of Repair¹

<u>Item</u>	<u>City Respondents</u>		<u>County Respondents</u>	
	<u>NUMBER</u>	<u>PERCENT</u>	<u>NUMBER</u>	<u>PERCENT</u>
Insulation	20	33.9	405	27.9
Foundation	10	18.2	222	15.3
Plumbing	13	21.2	254	17.5
Electricity	4	6.9	216	14.9
Roof	12	20.4	363	25.0
Heating	5	10.5	184	12.7
Exterior Painting	-	-	525	36.1
Others	11	22	165	11.4
None	21	35.7	325	22.4

1. Source: Results from CTIC and City of Wheeler Housing Survey, September, 1977; and Ragatz Associates for Tillamook County, May, 1978, including returned questionnaires-- from Wheeler.

Housing Costs (County)

Monthly Income	Percent of Respondents Paying Over 25 Percent of Income for Housing
Less than \$200	89.9
\$200 to \$399	68.7
\$400 to \$599	58.3
\$600 to \$799	36.6
\$800 to \$999	36.1
\$1,000 to \$1,199	29.5
\$1,200 to \$1,599	19.4
\$1,600 to \$1,999	11.0
\$2,000 or more	14.3

Source: Ragatz, 1978 for Tillamook County

For Tillamook County as a whole, the Ragatz study disclosed that a relatively high percentage (31.1%) of respondents paid a theoretically excessive amount of their income for housing. The results for each income group are cited in the table above.

A comparison of income to housing costs indicates that a severe problem exists overall in the county. For the city of Wheeler, statistically the problem seems even more dramatic, especially with respect to household income figures. The following tables presents summarized data for monthly household costs and income.

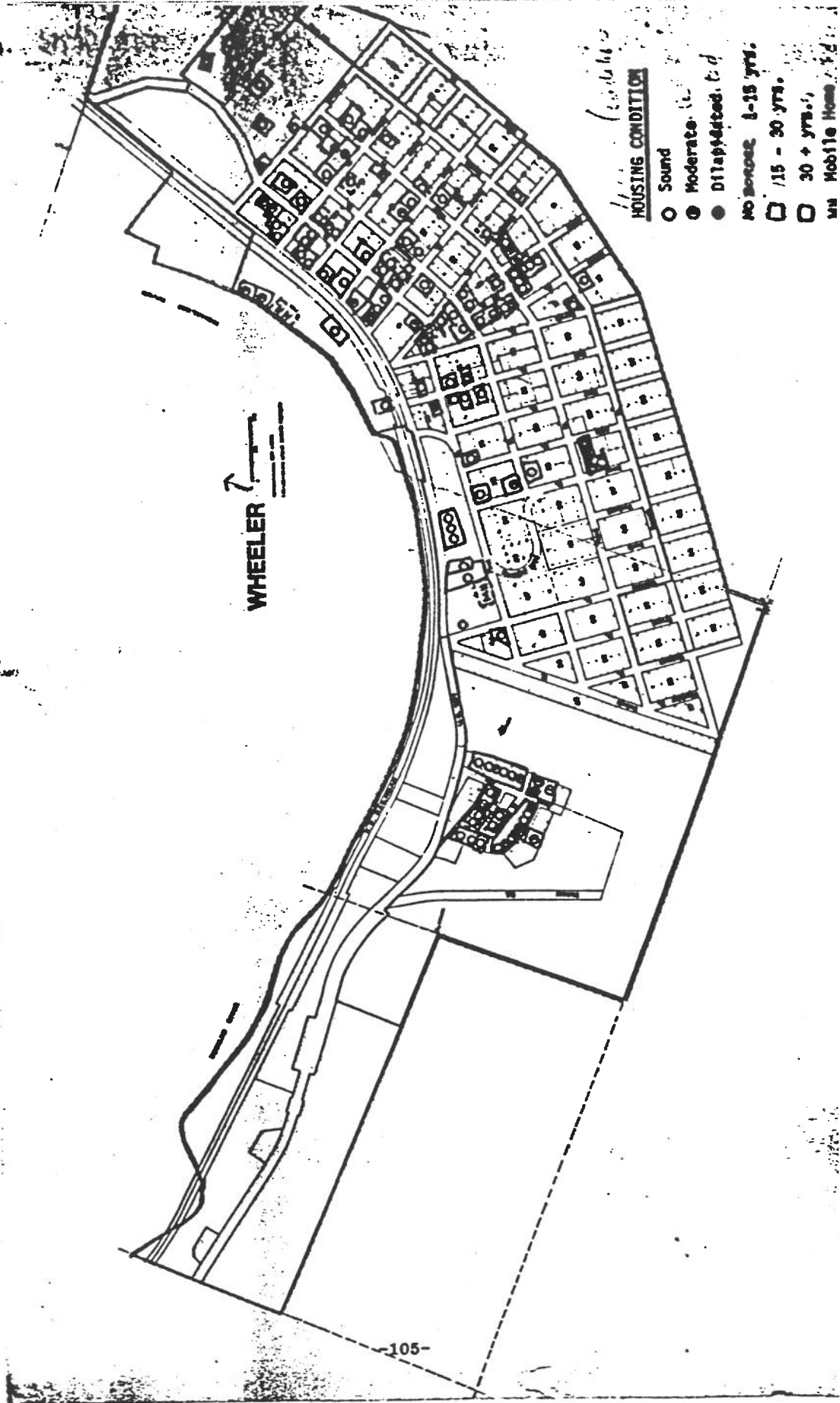
STUDY	SAMPLE SIZE	MONTHLY HOUSEHOLD INCOME						
		LESS THAN \$200	\$200- \$399	\$400- \$799	\$800- \$1,199	\$1,200- \$1,599	\$1,600- \$1,999	\$2,000- or more
Ragatz for county	1,453	1.8	6.2	23.8	29.5	16.7	9.8	12.1
Ragatz for Nehalem	47	4.3	6.5	32.6	23.9	15.2	8.7	8.5
Ragatz for Wheeler	21	0	4.8	38.1	28.5	14.3	4.8	9.6
Wheeler Council Survey	38							

(See Footnote 1. on the following page)

STUDY	SAMPLE SIZE	MONTHLY HOUSING COSTS			
		\$0-\$99	\$100-\$199	\$200-\$299	More than \$300
Ragatz for County	1,453	11.8	32.0	30.9	29.3
Ragatz for Nehalem	47	13.0	30.4	17.4	39.1
Ragatz for Wheeler	21	14.3	25.3	19.0	33.4
Wheeler Council Survey	51	33.2	38.7	17.6	7.8

Footnote 1: Data from the City 1977 Housing Survey are available by annual (versus monthly) household income. According to the survey, 45.8% of households have incomes less than \$10,000 annual; and 77.1% of households have incomes less than \$22,000 annual. These results are generally consistent with the Ragatz survey results.

Results of the city council study and the Ragatz survey for housing costs seem inconsistent. Differences in survey results might be accounted for by a number of explanations including: differences in survey techniques; low reliability of results for income/cost figures are common according to most experts in survey techniques; or housing costs may be understated by many respondents in the city council survey.



Summary of Housing Issues

1. Housing age results indicate that the total number of homes in the Wheeler area has historically remained relatively small, and in recent years has not increased dramatically. Several major factors have influenced growth in the area; these include employment and economic opportunities, topography, groundwater limitations, and sewerage and water facilities. Construction, operation and orderly expansion of public water and sewerage facilities should help to permit housing development.
2. Proper care and repair of existing housing resources is essential in maintaining or improving community housing conditions.
3. The incidence of need for home repairs is above average (see Housing Conditions and Housing Repair Needs) - a problem which is magnified by generally average or below average household incomes (see Housing Costs).
4. Loss of housing units through age or deterioration will occur (in the next twenty years), including decline in existing multiple-family dwelling units. Net loss of housing diversity can adversely affect housing costs for those directly displaced and for renters in remaining low-income housing units. The incidence of low-and fixed-incomes in the Wheeler area implies that housing assistance could be necessary, and that such assistance could encourage rehabilitation or redevelopment for the community.
5. If as a standard, 10% of homes more than 30 years old is taken annually from the available housing stock, 1.4 units will be lost per year, for a total of 28 units in 20 years.
6. Proposals for second-home, condominium development, and other seasonal units are an additional community planning issue. To what extent are they to be permitted in the urban service area?
7. Existing plan and zoning regulations generally permit multiple-family construction and mobile-home placement as conditional uses in many areas. Considering topographical features, expected housing demand, and existing housing trends, a change of housing mix to emphasize mobile-home and second-home family units is anticipated in the next twenty years. Development or rehabilitation of multiple-family units will generally be in the public interest, but will not necessarily be easy to achieve.

Provision of Adequate Land for Low & Moderate Income
Housing Types.

The land requirements to accommodate projected residential growth portion of the Background Report, page 10, indicates that Wheeler will need 176 dwelling units to accommodate its projected residential growth. The City's Zoning Ordinance provides for mobile homes as an outright use in its R-2 Residential Zone. The two areas zoned R-2 can accommodate a minimum of 80 mobile homes. Comparing the number of needed dwellings, 176, with the area available for mobile homes as an outright use, 80, indicates that 47.1% of Wheeler future housing needs could be accommodated by mobile homes. Such a high percentage indicates that Wheeler is providing adequate opportunities for low and moderate income housing types. In addition, the City's R-1 and R-2 Zones permit duplexes as an outright use. Multi-family structures are also permitted as a conditional use in the R-1 and R-2 Zones. Mobile homes are also permitted as Conditional Uses in the R-1 Zone.

Demographic Profile and Population

The table on the following page presents a profile of the county population by age and sex.

The most striking conclusion is that Tillamook County has more people aged 65 and over and less people of prime working and family rearing age than the state as a whole. For the Nehalem County Census District (CCD), this population makeup is more pronounced, since the 1970 census reported even large concentrations of older people and small concentrations of people in prime working age.

This is a significant feature since it implies two patterns an out-migration of young adults seeking education and employment opportunities and an influx of retired people.

Population Forecasts. Based on the discussion in the appendix concerning the variety of methods for projecting populations, it seems appropriate to compare several forecasts:

POPULATION FORECASTS GATHERED FROM OTHER SOURCES

SOURCE	FORECAST AREA	FORECAST					
		1977	1980	1988	1990	1998	2000
PSU and Tillamook County Planning (1978)	County	18,800	19,300	-	1,000	-	22,200
PSU & Tillamook County Planning (1978)	Nehalem Census District	1,960	2,065	-	2,455	-	2,815
PSU & CTIC Planning (1978)	City of Wheeler	236	303	-	348	-	405
HGE (1978)	City of Wheeler	293	-	450	-	600	-
2% Per Year Increase	City of Wheeler	293	305	354	370	442	460
			1990*	1996*	2000	2010	2020
1% Per Year Increase	City of Wheeler		335	375	390	430	475

(notes for table on next page)

POPULATION FORECASTS GATHERED
FROM OTHER SOURCES (continued)

- * 1990 Federal Census
- ** 1996 PSU Estimate

Based on a review of these population projections and other available information, the City determined that a population projection of 600 by the year 2000 was the most appropriate of the available projections.

The Portland State University population estimate for Wheeler as of July 1, 1985 was 350. The population estimate indicates that Wheeler is growing more slowly than the population projection of 600 persons by the year 2000. However, the City still believes a population projection of 600 persons by the year 2000 is reasonable.

The P.S.U. population analysis has no impact on the City's housing needs analysis since the City is growing at a slightly slower rate than projected in 1978. Therefore, the size of the Urban Growth Boundary is adequate. Further, the City's provision for low and moderate income housing types is adequate since it is based on a population of 6000 by the year 2000.

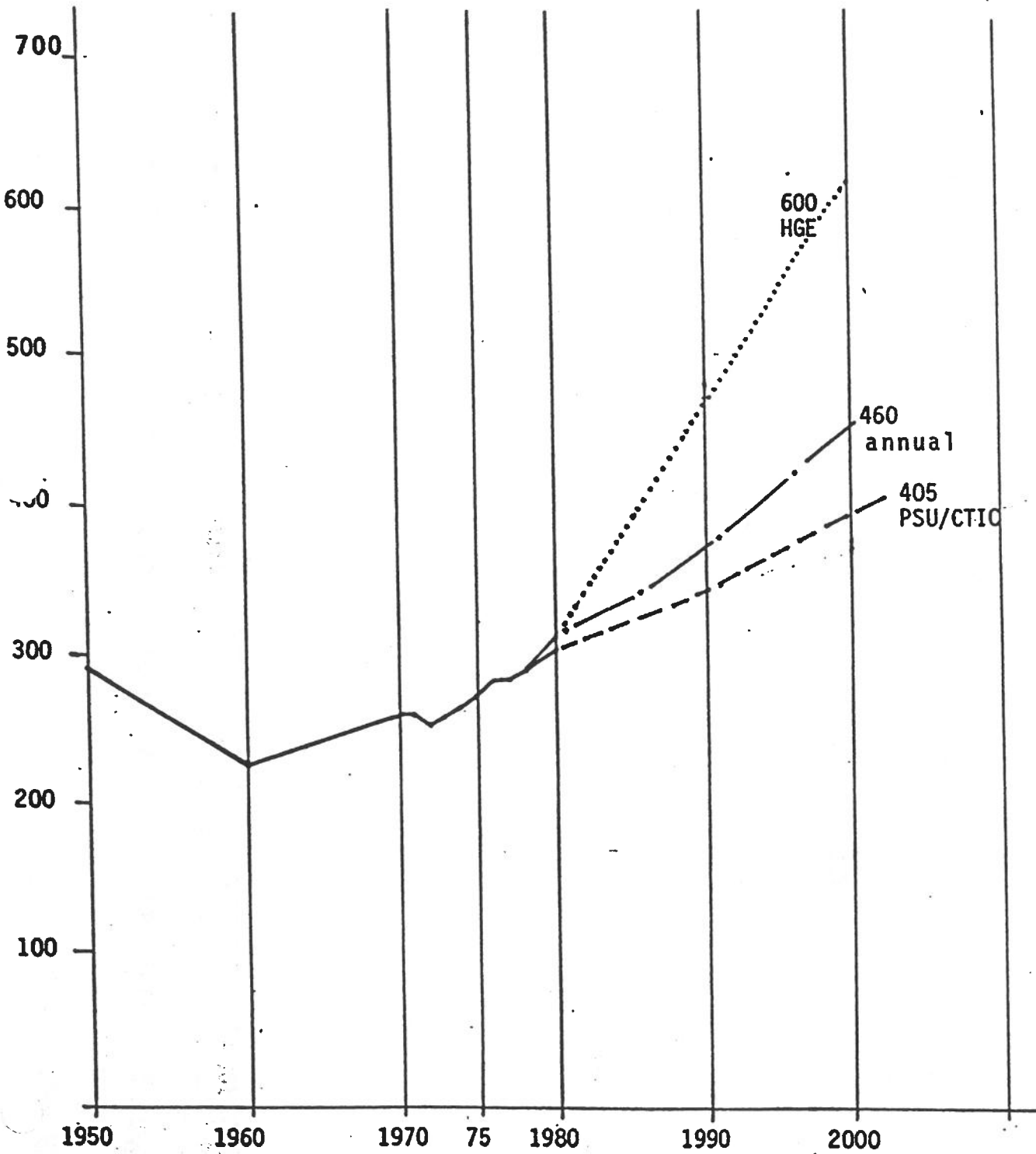
DISTRIBUTION OF POPULATION BY AGE AND SEX
OREGON AND TILLAMOOK COUNTY
FOR THE YEAR 1970

(PERCENTAGES)

AREA	14 & Under		15 - 24		25 - 44		45 - 64		65 & Over		Median Age	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Oregon	13.9	13.3	8.4	9.1	11.3	11.6	10.5	11.0	4.8	6.1	28.2	29.7
Tillamook County	13.9	13.4	7.3	7.1	10.4	10.6	11.6	12.4	6.5	6.8	32.3	33.9

SOURCE: Oregon Coastal Conservation and Development Commission, Economic Survey and Analysis of the Oregon Coastal Zone, November, 1974.

POPULATION ESTIMATES FOR WHEELER



POPULATION DATA: HISTORICAL TREND

	1950a	1960a	1970a	1971b	1972b	1973b	1974b	1975b
Oregon	1,521,341	1,768,687	2,091,385	2,143,010	2,185,270	2,224,900	2,268,000	2,299,000
Tillamook	18,606	18,995	17,930	17,830	18,400	18,200	18,450	18,500
Nehalem CCD	-	1,910	1,855	-	-	-	-	-
Manzanita	339	363	365	375	400	415	445	470
Nehalem	270	233	241	245	235	250	260	260
Wheeler	291	237	262	262	255	265	270	280

1976b 1977b

Oregon	-	-
Tillamook	18,800	18,800
Nehalem CCD	-	1,954
Manzanita	480	480
Nehalem	265	270
Wheeler	290	290

SOURCE: a. U. S. Census Data
 b. Estimates by the Center for Population Research and Census, Portland State University

SUMMARY OF POPULATION, HOUSING AND
INCOME CHARACTERISTICS, 1980 US CENSUS

POPULATION

The City's population was 237 in 1960, 262 in 1970 and 319 in 1980. The City's population grew by 10.5% between 1960 and 1970, and by 21.8% between 1970 and 1980.

Tillamook County's population between 1970 and 1980 grew by 17.4% and that of Oregon by 25.9%.

Wheeler's population as a percentage of the total Tillamook County population has been gradually increasing. In 1960, Wheeler's population was 1.2% of the total County population, in 1970 it was 1.4%, and in 1980 it was 1.5%

Among Tillamook County cities, Wheeler's growth rate was the third highest, between 1970 and 1980, the growth rate of Manzanita and Rockaway being higher.

AGE

The major trends affecting various age categories in Oregon between 1970 and 1980 were:

1. A substantial decrease in the percentage of the population under the age of 15 as a result of a decline in fertility rates. However, there were opposing trends within the under 15 age group. While the school age population (5-14) decreased, the number of preschool children increased. The increase in preschool age children is attributable to women of the "baby boom era" entering the reproductive years;
2. A very large increase in the 15-34 age group as the result of the aging of the baby boom generation;
3. A modest increase in the 45-64 age category due to the entry into this age group of person's born during the Great Depression; and
4. A slow but steady increase in the 65 and older age group as the result of increased longevity.

The changes in Wheeler's age structure are reflective of these general demographic changes, but are also divergent in some important ways.

The most important demographic change in Wheeler between 1970 and 1980 was the large increase in the population aged 65 and over and a substantial decrease in the population under the age of 25. As a result of these trends, Wheeler's median age is 53.8 years. Tillamook County's median age in 1980 was 34.2 and that for the State was 30.2 years. Among Tillamook County cities, Wheeler has the highest percentage of persons aged 65 and older, 37.7%; this figure is twice the County average of 15.8%. Conversely, Wheeler has the smallest percentage of persons, among Tillamook County cities, in the two youngest age cohorts, 0-14 and 15-24. Between 1970 and 1980, Wheeler's population in the 15-24 age group decreased by 31.6%, while the County's population in this age group was increased by 18.5%.

Wheeler's population, by age group, exhibited the following additional trends between 1970 and 1980:

- A 37.5% increase in the population aged 0-14. The County's population in this age group increased by 20%.
- A 21% decrease in the population aged 5-14. The County's population in this age group decreased by 19.9%.
- A 20% decrease in the population aged 18-24. The County's population in this age group increased by 41.6%.
- A 55% increase in the population aged 60 years and older. The County's population in this age group increased by 34.6%.
- The median age of females was 55.9 years; that of males was 50.7.

TABLE 1
POPULATION BY AGE GROUP, 1970 & 1980

	1970					1980				
	0-14	15-24	25-44	45-64	65+	0-14	15-24	25-44	45-64	65+
Wheeler	46	38	38	77	63	41	26	66	85	101

TABLE 2
PERCENTAGE OF TOTAL POPULATION
BY AGE GROUP, 1970 & 1980

	1970					1980				
	0-14	15-24	25-44	45-64	65+	0-14	15-24	25-44	45-64	65+
Wheeler	17.6	14.5	14.5	29.4	24.0	12.9	8.2	20.7	26.6	31.7
Tillamook Co.	27.2	14.4	21.0	24.0	13.4	21.0	14.4	26.0	22.8	15.8
OREGON	27.2	17.5	23.0	21.4	10.8	22.4	17.6	29.8	18.7	11.5

TABLE 3
PERCENTAGE CHANGE IN POPULATION
BY AGE GROUP, 1970, 1980

	TOTAL	0-14	15-24	25-44	45-64	65+
Wheeler	21.8	-10.9	-31.6	73.7	10.4	60.3
Tillamook Co.	17.4	-9.3	18.5	46.1	12.1	39.9
OREGON	25.9	3.5	26.7	63.4	9.5	33.7

RACE

In 1980, 1.9% of Wheeler's population was non-white. Persons of Spanish origin composed 3.1% of the total population. In comparison, 2.0% of Tillamook County's population is non-white and 1.0% is of Spanish origin. Wheeler has the highest percentage of persons of Spanish origin among cities in Tillamook County.

HOUSEHOLDS AND HOUSEHOLD SIZE

Between 1970 and 1980 the number of households in Wheeler increased from 110 to 154, a 40% increase. This was almost twice the rate of population growth.

Between 1970 and 1980, the average household size decreased from 2.38 to 2.07. Only Rockaway had a smaller household size in 1980 (2.05). During the same decade the average household size of Tillamook County decreased from 2.9 to 2.5 persons.

In 1980, 42.9% of Wheeler's households were one person households, 46.8% consisted of two or three persons, and 10.4% had four or more persons. For comparison, the breakdown for Tillamook County was: 24.6% one person households; 53.2% two or three person households; and 22.2% four or more persons. Among Tillamook County cities, Wheeler has the highest percentage of one person households and the lowest percentage of households with four or more persons.

HOUSING UNITS

The total number of housing units in Wheeler increased from 115 to 233 between 1970 and 1980, a 102.6% increase. Most of these additional units were the result of conversions, since the Census listed only nine new units built between 1970 and 1980. The number of occupied housing units increased by only 40% (from 110 to 154). The remainder of the increase consisted of 38 units classified as seasonal and 41 units classified as vacant. There were no units classified as seasonal in 1970.

The decade from 1970 to 1980 saw a sharp increase in the number of the City's housing units that were located in structures containing two or more units (duplexes and multi-family). In 1970, 86% of the City's housing stock was single-family residences and 14% were housing units consisting of two or more units. In 1980, only 59% of the City's housing stock was in single-family structures and 39% consisted of units containing two or more units. In 1980, among Tillamook County cities, Wheeler had the highest percentage of its housing stock in multi-family units.

The number of mobile homes increased from one to four between 1970 and 1980. The four units represented two percent of the occupied housing units. This is the lowest percentage in Tillamook County.

The City's occupied housing stock is old. The following is the percentage of the City's housing stock by year built: 1939 or earlier, 48%; 1940-49, 19%; 1950-59, 12%; 1960-69, 8%; 1970-80, 9%. By comparison, Tillamook County's 1980 occupied housing stock consisted of 28% built before 1939 and 27% built between 1970 and 1980.

HOUSING TENURE

The number of owner occupied housing units increased from 81 to 92 in 1980, a 13.6% increase. The number of renter occupied housing units increased from 29 in 1970 to 62 in 1980, a 113% increase. As a result of the large increase in renter occupied housing units, the percentage of the City's housing units that are owner occupied decreased from 73.6% in 1970 to 59.7% in 1980. For comparison, the percentage of occupied units that are owner occupied in Tillamook County decreased slightly from 72.5% to 70% during the decade.

Among Tillamook County cities, Tillamook and Rockaway had higher percentages of renter occupied units in 1980.

HOUSING COST

The median value of owner occupied housing in 1980 was \$41,000. The median value of owner occupied housing in Tillamook County was \$50,800. Among Tillamook County cities, Garibaldi and Rockaway had lower median owner occupied housing values.

The median rent in 1980 was \$181. The County median was \$180. Among Tillamook County cities, only Manzanita had a higher contract rent.

As Table 4 illustrates, the percentage of total income that homeowners spend on housing costs, decreases as income rises. Seventy-five percent of households with incomes of less than \$5,000 spend 25% or more of their income on housing costs. While all households earning more than \$20,000 spend less than 20% of their income on housing costs. As with homeowners, the percentage of total income that renters spend on housing costs decreases as income rises.

TABLE 4

OWNER OCCUPIED MONTHLY HOUSING COSTS, AS A PERCENTAGE OF INCOME BY NUMBER

<u>INCOME</u>	<u>Less than 20%</u>	<u>20-24%</u>	<u>25-34%</u>	<u>35+%</u>
Less than \$5,000	2	0	4	2
\$5,000-9,999	2	2	8	2
\$10,000-14,999	11	0	0	0
\$15,000-19,000	13	2	2	0
\$20,000 +	13	0	0	0

TABLE 5

RENT AS A PERCENTAGE OF HOUSEHOLD INCOME, BY NUMBER

<u>INCOME</u>	<u>Less than 20%</u>	<u>20-24%</u>	<u>25-34%</u>	<u>35+%</u>
Less than \$5,000	0	0	2	20
\$5,000-9,000	5	0	9	0
\$10,000-14,999	0	1	3	0
\$15,000-19,999	7	3	0	0
\$20,000 +	9	2	0	0

INCOME

The median household income in 1979 was \$11,500. Tillamook County's median income was \$14,266. The median household income in Oregon was \$16,781. The income of Wheeler's households is broken down as follows:

<u>INCOME</u>	<u>NUMBER</u>	<u>PERCENTAGE</u>
Less than \$5,000	37	24.0
\$5,000 - 9,000	34	22.1
\$10,000-14,999	20	13.0
\$15,000-19,999	30	19.5
\$20,000-24,999	13	8.4
\$25,000-34,999	12	7.8
\$35,000-49,999	3	1.9
\$50,000 +	5	3.2

The median family income in Wheeler, in 1979, was \$16,607. The median family income for Tillamook County was \$17,162 and for Oregon it was \$20,028. Wheeler's family income is broken down as follows:

<u>INCOME</u>	<u>NUMBER</u>	<u>PERCENTAGE</u>
Less than \$5,000	4	4.7
\$5,000 - 9,999	22	25.6
\$10,000-14,999	8	9.3
\$15,000-19,999	24	27.9
\$20,000-24,999	10	11.6
\$25,000-34,999	10	11.6
\$35,000-49,999	3	3.5
\$50,000 +	5	5.8

The reason that Wheeler's household income is so much lower than the County's, while the median family income is only slightly lower, is because of the large portion of Wheeler's population over the age of sixty-five. Persons over 65 tend to reside in non-family situations and have substantially less income than the population as a whole. In 1979, 14.8% of Wheeler's population was classified as having income below the Federal Poverty level. The percentage for Tillamook County was 10.1%. Among Tillamook County cities, only Rockaway and Garibaldi had higher rates of poverty.

Public Facilities Element

HGE Inc., in conjunction with the City of Wheeler, has prepared the public utilities element of the comprehensive plan. It forms a portion of the background report. The following is a summary:

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Water System

1. The city water system is adequate for present domestic demands but is deficient for fire protection. To improve system capacity, the most important capital investment is to install 5000 feet of 8" diameter line north along Third Street. This mainline (capacity to 2200 gallons per minute) can help to assure adequate fire flow to the existing developed area and can help to supply service for future development. A second priority for water capacity would be to provide 6" and 8" piping between Third Street and Highway 101, improving water pressure for the whole system. (page i, ii, 21, 22, and 23 of Preliminary Report by HGE Inc.)
2. The city has two water system impoundments, one each on Vosburg and Jarvis creeks. Positive bacteriological contamination in violation of State and Federal drinking standards has occasionally occurred in Jarvis Creek.

Seasonal turbidity can be expected within the existing system as a result of heavy rainfall and associated erosion. And turbidity (contamination by sediments) will be increased by vegetation removal or road building.

3. The overall physical capacity of the Vosburg Creek watershed is superior to the capacity of the Jarvis Creek watershed. Vosburg contains over 200 acres, produces a stream flow estimated to be in excess of 3000 GPM (gallons per minute) the year round. Water rights were negotiated with the State in 1976 for 1800 GPM, which is far beyond the projected demands of the year 2000.

The Jarvis Creek watershed contains over 150 acres, produces about 1800 GPM stream flow, and today provides only a small portion of the total system demand. Water rights were obtained in 1913 for 125 GPM. (page 1 and 3 of the Preliminary Report of HGE Inc.).

4. Should treatment facilities need to be improved to comply with State or Federal regulations, major improvements would be required to upgrade the Vosburg Creek water supply, including: land purchase for a new treatment plant, construction of a new treatment plan, and possible covering of the reservoir itself. (page 4, 5, 19, and 20).
5. The city should investigate the possibility of purchase or lease of a portion of the Vosburg watershed, presently owned by Publisher's Paper. Investigation and negotiation for land should consider the possibility of purchase designed to prevent turbidity and/or the possibility of purchase of the land area suitable for construction of a new treatment plant, should such a treatment plant become necessary. (see pages 19-20 of the Preliminary Report of HGE).
6. Currently there are two water connections existing outside incorporated city limits. By City ordinance, annexation is required for additional connections, and all cost and expenses incidental to the installation and extension of the water system are the responsibility of the developer.

Storm Drainage

1. Wheeler is divided into three drainage basins: Zimmerman Creek, Jarvis Creek and Vosburg Creek. The area is characterized by steep, unstable slopes and large runoff volumes. This situation can have certain adverse effects including: impact on local marshland areas and water quality of the river, potential for some storm-drainage flooding during severe rainstorms, and potential for a large amount of slope or soil erosion.

The city policy has been to construct and maintain drainage ways, as required, with city crews. The city policy shall be to avoid, where possible, the need for major public improvements, if necessary by requiring adequate storm-drainage facilities of new developments.

Sanitary Sewer Service

1. All existing sewerage facilities for the City of Wheeler, including two lift stations and the collection network, are operated and maintained by the North Tillamook County Sanitary Authority (NTCSA). Until recently, raw wastes were discharged into the Nehalem River at several points. Now wastes are collected and transported to a regional treatment facility. (page 32 of HGE Preliminary Report).

2. The sewage treatment plant consists of three stabilization lagoons with a capacity of approximately 4,500 population. It is estimated at the present time that approximately 40 to 50% of the treatment facility's capacity has been committed. Because of rapid growth in the area and high levels of groundwater infiltration, the system is reaching capacity sooner than anticipated. The Sanitary Authority has taken several steps to improve the system. On the advice of their consulting engineering firm, the north pump impellers have been increased in size by 20 percent. A new central pump has been purchased which will be installed in June.
3. The Authority has requested that the Department of Environmental Quality modify the permit to increase allowable discharge into the Nehalem River from .7 MGD to 1.3 MGD, while retaining a 30/30 winter and 15/15 summer effluent quality requirement. Recent tests done by the Health Division have shown a higher water quality than before, and Authority Officials are confident that the request will be granted. Other options considered include raising the height of the dikes around the lagoons to improve retention time of the effluent.
4. The City has been assured by the Authority that no new sewer connections will be refused within the City Limits, and that the increased capacity of the north lift station will increase the service capacity to the City substantially. A population of 8,193 is projected for the area by the NTCSA for the year 2000, and is consistent with those of the jurisdiction within the Authority's boundaries.
5. Under the NTCSA system, application for a building sewer permit is required prior to installation of a connection. Hookup to the system is limited to land within the NTCSA district boundary, subject to NTCSA connection standards. All cost and expenses incidental to the installation and connection of the building sewer are the responsibility of the developer.

Solid Waste

The Department of Environmental Quality has indicated that the existing solid waste disposal facilities in north Tillamook County are not in compliance with state law. The comprehensive plan should address this problem, and should make suggestions for an adequate solid waste plan.

The possibilities of continuing the present Manzanita site (or locating another suitable landfill site in the north county area) are remote.

Management of solid waste is regional, and a solution requires cooperation. The County has organized a committee to find management solutions. The most likely solution will probably be a combination of new recycling efforts and opening or expansion of a regional landfill.

Schools

Children are bused to schools outside the planning area, either to elementary school in Nehalem or to junior and senior high school near Rockaway. The current enrollment at Nehalem is 203 pupils, well below capacity. The current enrollment at Rockaway is 462 pupils, which is near capacity. As the school district population increases, expansion of the school is possible.

Recreation and Open Space

There are statistical means to compute recreational needs. The following chart presents statistical data concerning recreation need for the existing and projected population:

Recreational Standards for Wheeler, In Acres

Recreation Activity	Standard Per 1000 Population	Standard Applied to Existing Population (300)	Standard Applied to High Forecast (600)
Playground	1.5	.45	1.05
Neighborhood Park	2.0	.6	1.40
Playfield	1.5	.45	1.05
Community Park	3.5	.75	2.45

Source: Planning and Design Criteria, Kopper

The recreation needs of visitors to the Wheeler area is discussed in the Economic Element, page 43.

Developed city park facilities do not exist currently and are needed. The city is in the process of developing a small waterfront park for community and public access to the river. About five acres of land, above the City Hall, has been dedicated by the County Court as a public park and can help to provide for future developed recreational activities.

Police and Fire Protection

Police protection is by Tillamook County and Oregon State Police. There is a city firehall and volunteer fire department, as well as mutual-aid agreements with other local fire departments. Equipment used by the city fire department includes: 2 pumpers - 1-500 GPM - 46 Chev. with 500 gallon tank and 1-750 GPM - 73 Ford L-800, with 750 gallon tank.

Insurance rating from the National Board of Fire Underwriters is Class Seven, which is relatively good. Some improvement in fire rating is possible if the water system is upgraded to provide improved fire flow (see Water System). The area presently served per hydrant is approximately 240,000 square feet, in excess of a suggested maximum of 160,000 square feet.

Health Services

The Rhinehart Memorial Hospital, located in Wheeler, provides ambulatory and other primary health care. Currently the hospital includes 22 short-term beds and 19 long-term beds. They are contemplating expansion of 20 long-term care beds (61 beds total). Economically, the hospital is a major employer in the north county area, and is a vital source of revenue in the city economy.

Energy

Home and business energy usage in Wheeler consists mainly of electricity provided by the Tillamook County Peoples Utility. Electrical power costs in Tillamook County are very low, at 1.28¢ per kilowatt hour (KWH). It is estimated that most homes and commercial uses in Wheeler are heated by electricity, (approximately 50%) with fuel oil (approximately 25%), and other energy sources making up the balance. Other sources of heating energy include bottled gas, wood, and solar energy. It is estimated that 15% of the homes in Wheeler are heated totally or in large part by cord wood. The other major form of energy usage in Wheeler is gasoline for automobiles.

Energy Forecast

Energy usage in the area is directly related to the growth of housing and tourist activity. The population projection estimates a doubling of total population by the end of the century. If energy conservation is instituted in the area, energy consumption can be expected to grow, but to fall somewhat short of double, depending on the amount of conservation and use of alternative energy sources.

Wind Energy*

Wind energy as a power source is attractive because it is continuously regenerated in the atmosphere under the influence of radiant energy from the sun. It is available everywhere and is not likely to have any detrimental effects on the environment. Wind is, however, uncertain and capricious in nature.

A wind mill extracts 59.3% of an airstream's energy. This is a theoretical maximum based on momentum and blade element theory. Modern windmills generally extract only 70% of the theoretical maximum.

*Source: Alternative Natural Energy Sources in Building Design, Davis and Schubert, Van Nostrand Reinhold Company, New York, 1974.

An annual mean wind speed of 6 miles per hour is required for successful operation of wind mill generators. The ability to harness the wind effectively, store it and release it continuously is also required. Wind records are available through the National Weather Bureau, Portland. Their records include areas of highest wind speed, direction of prevailing winds, measure of consistency and variability of year to year wind speed.

Wood Energy

Wood is a time-honored source of energy for heating, cooking, smoking, drying and other purposes. With proper precautions for fire safety, such as the use of insulated stovepipes, and the use of heat extractors or airtight wood stoves, a significant amount of energy in the home can be obtained with wood. It has been calculated that wood purchased at \$40 per cord (128 Cu. Ft.) is equivalent in cost with fuel oil and electricity selling for 40¢ per gallon and 3¢ per KWH, respectively. If wood is gathered by the user or obtained at a cheaper cost, it is more economical. Since wood is readily available in the Nehalem area and is a renewable resource, it presents a valuable energy component. As electricity and fossil fuels become more costly, wood will become more attractive.

Source: The Woodburner's Encyclopedia, Jay Shelton and others, Crossroads Press, Vermont, 1976.

Solar Energy

There is an average of 70 total hours per month of sunshine in January and 240 hours in July. To illustrate the ability of solar energy a calculation was made for latitude and sunny days and then compared to average electrical use for the city, taken from the previous section. It was found that more than enough solar energy is radiated in one year onto a surface the size of an average house roof (783 square feet) to equal the annual electricity energy use of the average house in Nehalem. Sample calculations are shown below:

Average electrical energy use

20,190 kwh/year x 3,413 BTU/kwh = 68,908,470 BTU/year

Annual solar radiation per square foot

88,000 BTU/year/square foot

Size of surface necessary to equal average use

68,908,470 BTU/year = 783 square feet

88,000 BTU / year / square foot

The technology is rapidly becoming available for the solar heating of water and room space. Many units are presently on the market for either purpose. Photovoltaic cells, which convert solar energy into electricity, are rapidly becoming more economic. Tax credits are presently available for the installation of solar collectors through the State of Oregon, and will soon be available from the Federal government.

TRANSPORTATION

Highway - Highway 101 is the major arterial in Wheeler. In 1978 the average daily traffic count was 3850 at the north City limits, 3450 at the south City limits and 2950 at Wheeler Heights. This represents a 5% annual increase from 1973. A permanent recorder control station is located at Rockaway. For this station traffic volumes are broken down by month. These traffic counts permit a closer analysis of the nature of traffic on Highway 101. It is assumed that traffic trends in Wheeler are similar to those observed in Rockaway. The seasonal nature of traffic is apparent. In 1978, the average daily volume in January was only 70% of the average daily volume for the year, while that for August was 154% of the total average for the year. However, a comparison with figures from 1970 shows traffic and by inference tourism, is becoming less seasonal. Between 1970-1978 traffic increased 55% in January, but only 33% in August. The average increase for all months was 38%. The figures also show that the number of out state travelers has almost doubled, from 5.3 to 9.1.

The State Transportation Goal (No.12) requires that transportation plans, "minimize adverse social, economic and environmental impacts and costs." Although the City may comment on the Highway Department's 6-year plan or impact statements of specific projects, there is no assurance that its concerns over these impacts will be heeded.

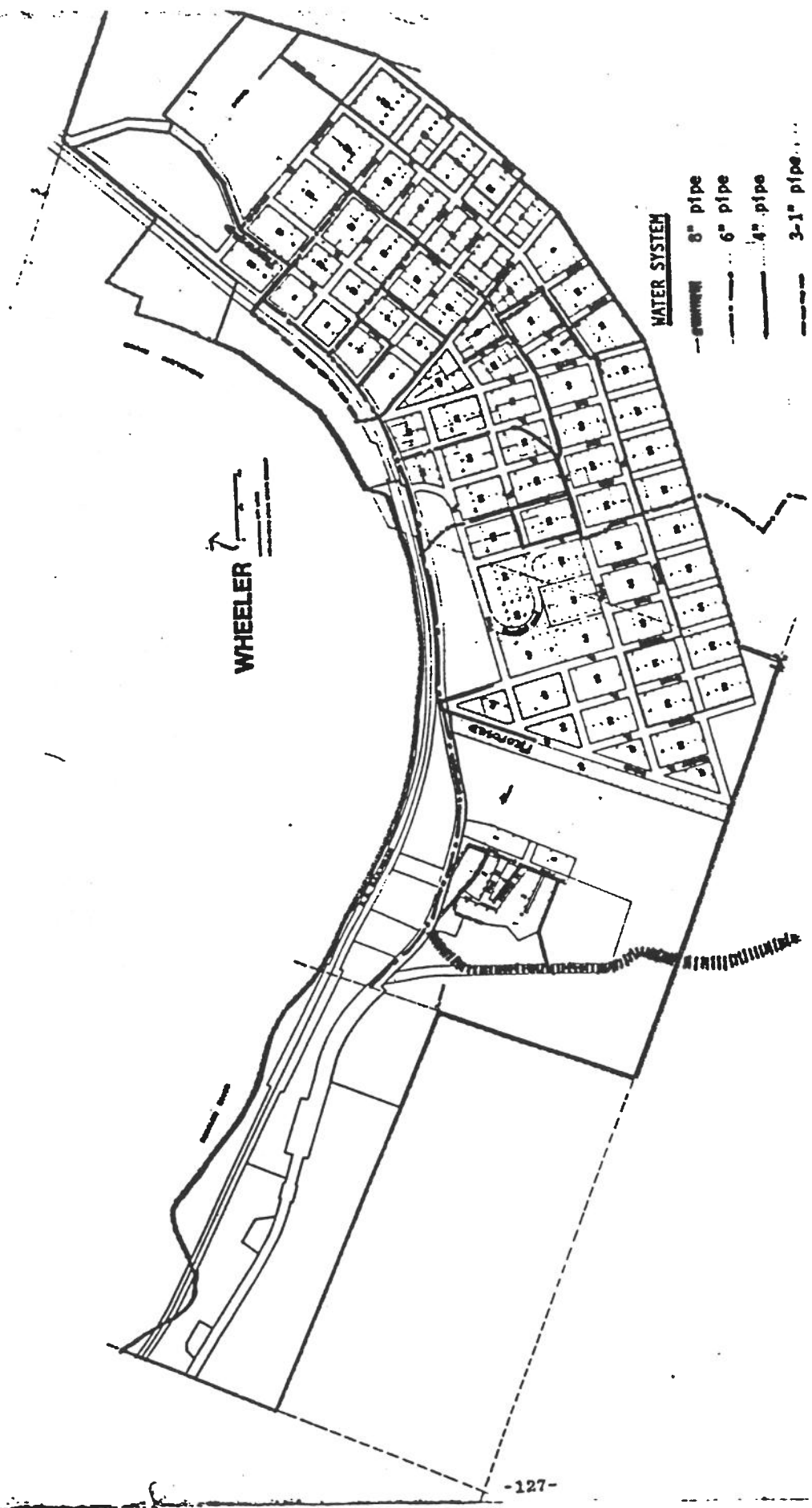
City Streets - The condition of City streets are shown on the map on Page . A number of questions on the 1977 community survey dealt with City streets. Fifty percent of those responding to the survey felt City streets needed improvement. This was the highest percentage for all services listed. In a separate question pertaining just to streets, 53.6% felt they required more maintenance, 12.2% felt they were too narrow and needed widening, 8.1% felt better street lighting should be provided, while 21% felt the streets were fine the way they were.

Bike - The coastal bicycle route follows Highway 101 through Wheeler.

Rail - The Southern Pacific Railroad maintains railroad tracks through Wheeler, but neither freight or passenger service is provided by the City.

Bus - A bus for senior citizens provides service to Tillamook two days a week.

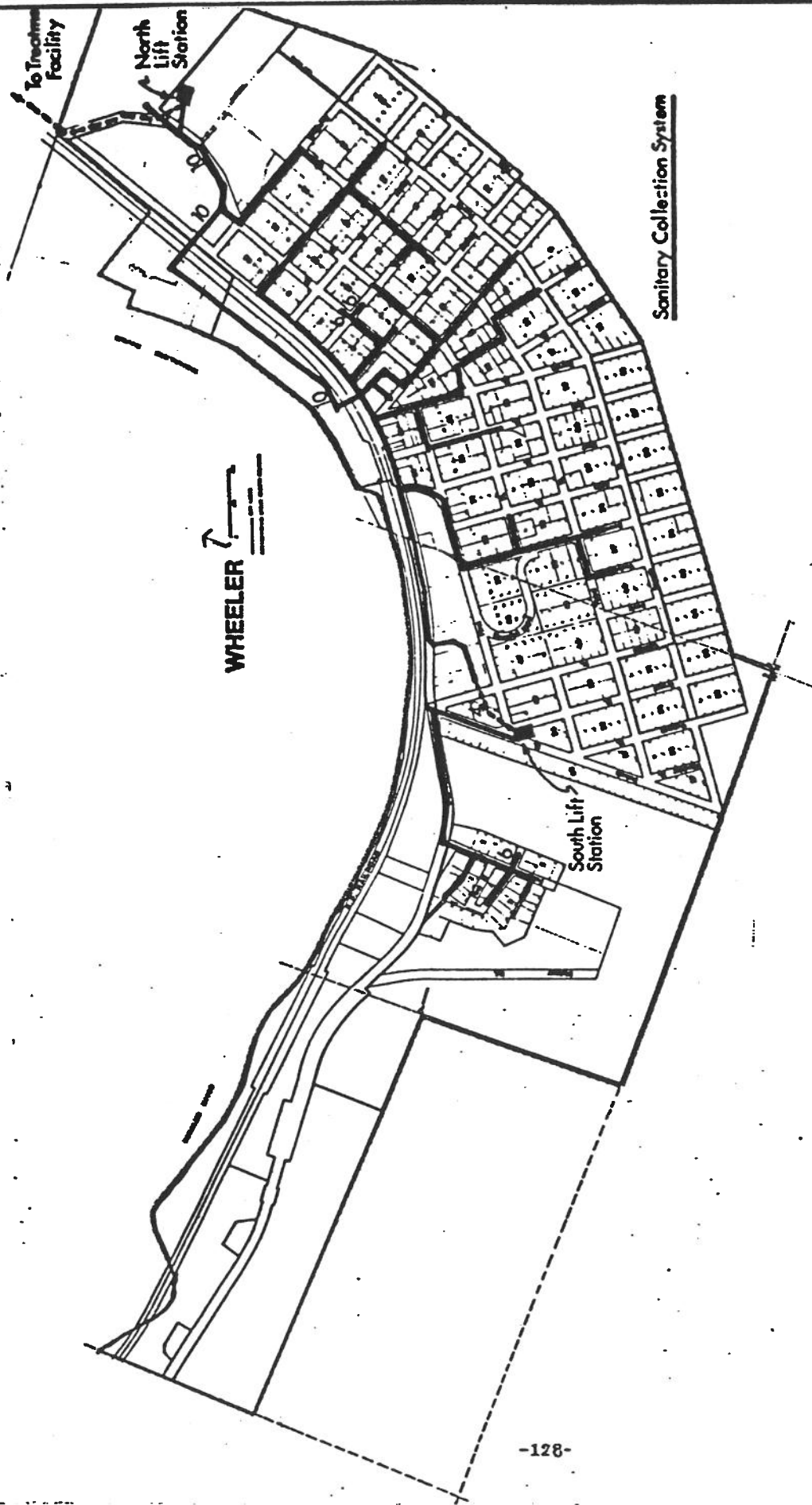
Major highway or railroad developments can have an important impact on small towns like Wheeler. In the short run, major activities such as highway realignment, construction of additional lanes or intersections, or railroad abandonment can cause disruption of business and loss of revenue. In the long run, they can either revitalize the community (as in the case of Cannon Beach) by eliminating unnecessary traffic, or they can divide the town and cut off cross-circulation, particularly to the waterfront. The possibility of rerouting the Oregon Coast Highway down the Miami-Foley Creek Road has been discussed in the past, and may in the future. The proposal to reroute U.S. 101 down the Nehalem Spit, with a bridge spanning the mouth of the river, was put forth in the 1960's; there is little likelihood of its becoming a reality. Minor improvements such as repaving or widening of lanes for bicycles without new right-of-way acquisition, generally have little impact on the City.



WATER SYSTEM

- 8" pipe
- 6" pipe
- 4" pipe
- 3-1" pipe

WHEELER ↗



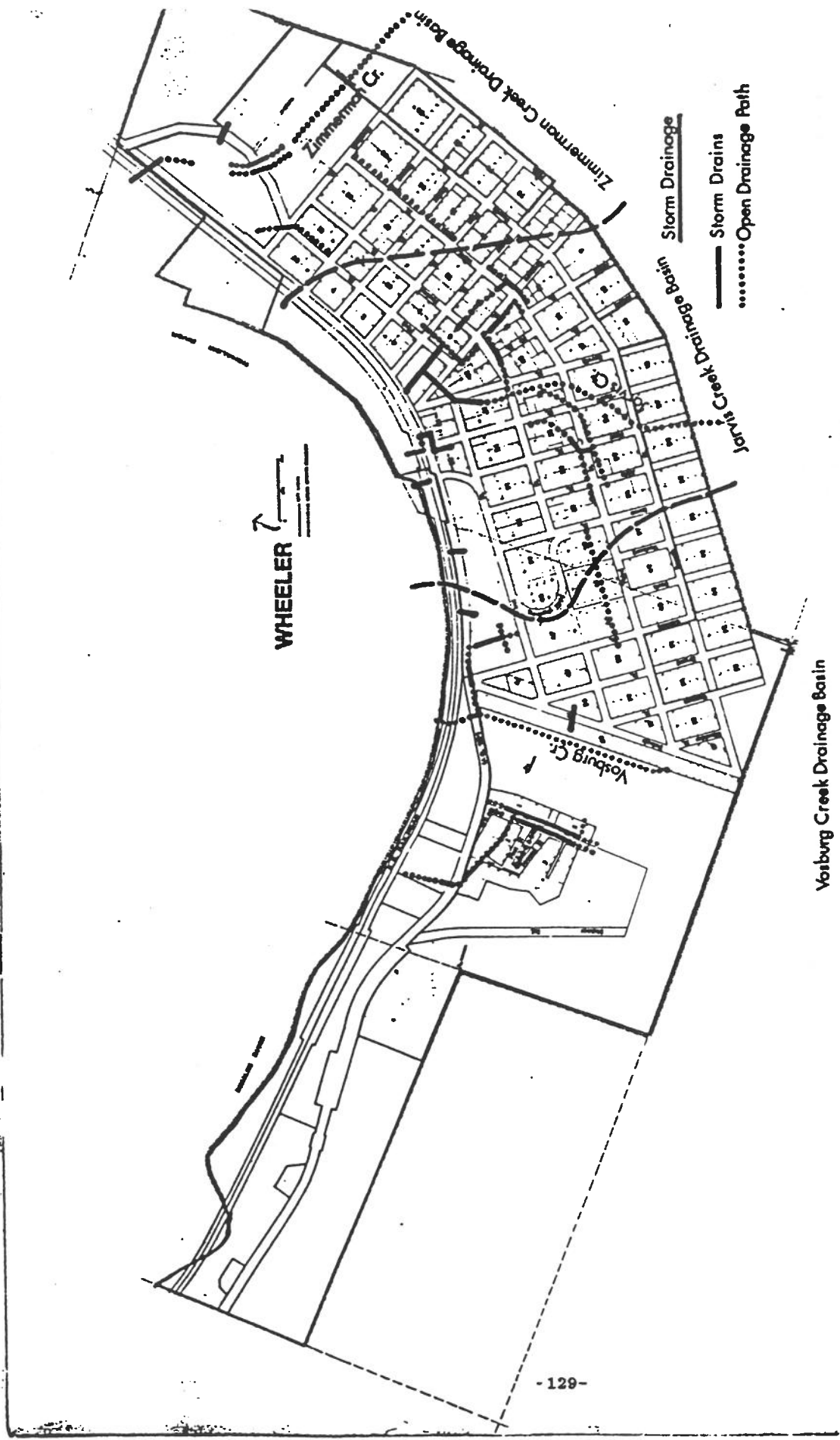
Sanitary Collection System

WHEELER

North Lift Station

South Lift Station

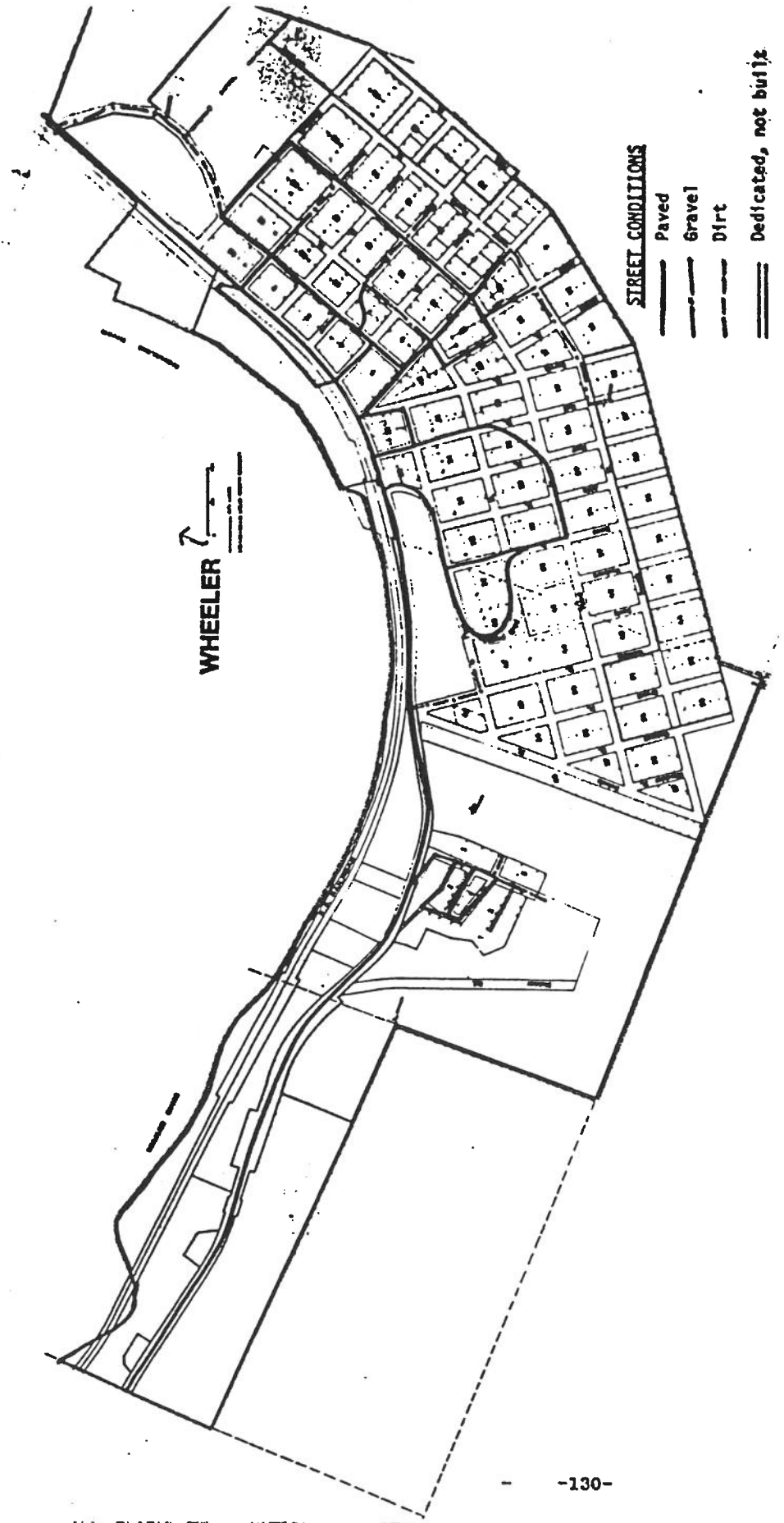
To Treatment Facility



- Storm Drainage Basin
- Storm Drains
- Open Drainage Path

WHEELER

Vosburg Creek Drainage Basin



APPENDIX 1

**A FIELD INVESTIGATION OF GEOLOGIC HAZARDS
IN WHEELER, OREGON**

July 5, 1978

**Prepared by
Martin E. Ross**

Geologist

P.O. Box 20

Cannon Beach, Oregon

97110

for

Clatsop-Tillamook Intergovernmental Council

A FIELD INVESTIGATION OF GEOLOGIC HAZARDS
IN WHEELER, OREGON

PURPOSE AND SCOPE OF INVESTIGATION

This study was undertaken by Martin Ross at the request of the Clatsop-Tillamook Intergovernmental Council (C.T.I.C.) to map the bedrock geology and areas of existing or potential slope stability problems within the urban services area of Wheeler, Oregon.

METHODS OF INVESTIGATION

The study area (Plate 1) was mapped between June 6 and June 8, 1978 by visual inspection and the pace-and-Bruntan compass method. Mapping was done at a scale of 1 inch = 400 feet on a topographic base map (contour interval = 20 feet) provided by C.T.I.C. A Thommen pocket altimeter calibrated to 20 foot intervals and accurate to \pm 30 feet was also used. The following aerial photographs provided by C.T.I.C. were also used: lower Nehalem photos 1-5, 1-7, 1-8, and 1-9, March 23, 1973, 1:24,000;(stereographic pairs); photo mosaic enlargements (1 inch = 400 feet and 1 inch = 800 feet) prepared from the above photographs by the U. S. Army Corps of Engineers:(July and November, 1976); 1:20,000 photo-mosaic prepared by USDA Soil Conservation Service in 1963 from 1953-54 photography.

The geologic contacts between map units on Plate 1 are based on topography augmented wherever possible by surface outcrops and exposures. In general, these contacts are within about \pm 40 feet of their positions shown as solid lines on Plate 1. The contacts

are shown as dashed lines in areas where conditions did not allow to above degree of accuracy.

The landslide classification scheme and stratigraphic nomenclature of Schlicker and others (1972) is used in this report.

ROCK UNITS MAPPED

Tertiary marine sedimentary rocks (Toms)

Nearly all of the bedrock beneath Wheeler consists of Oligocene (26-38 million years ago) to Miocene (12-26 million years ago) marine sedimentary rocks. The rocks consist of interbedded tuffaceous siltstones and claystones with subordinate amounts of shale and fine to very fine-grained sandstone. Observed bedding thicknesses range from 1 mm (thinly laminated) to over 100 cm (very thick-bedded). A light to dark gray, hard siltstone seems to be the predominant rock type in the area. Thin interbeds of laminated, gray siltstone, claystone, and tan to light brown claystone, and fine, yellow-brown sandstone are exposed in a cut behind the fire station (Figure 1). The siltstones and claystones at this locality are soft to moderately hard and fissured and the sandstone is hard but occurs in minor, thin beds.

These originally flat-lying sedimentary rocks were tilted and elevated during the uplift and folding of the Coast Range which occurred mostly between 2 and 12 million years ago (Baldwin, 1976). Bedding dips (i.e. tilt measured from horizontal) measured within the area range from 7° to 27° . Dip directions vary from southwest to north within the area (Plate 1).

Soils mapping done by the Soil Conservation Service (1964) covers most of Wheeler and shows Astoria silt loam (on 20-40% slopes) and Hembre silt loam (on 40-60% slopes) to be the dominant soil types developed on the Oligocene to Miocene sedimentary rocks. The S.C.S. soil interpretation sheets for these two soils are shown in Tables 1 and 2 respectively. Soil properties will be discussed in the section on geologic hazards.

Tidal flat deposits (tf)

Tidal flat deposits are restricted to low-lying areas along the Nehalem River and two small drainage ways, one at each end of Wheeler proper (Plate 1). Lesser amounts of flood-plain alluvium are also present in these two embayments but were not mapped separately. The tidal flat deposits consist mainly of fine sand and silty clay at the surface but may be underlain by thick deposits of fine-grained unconsolidated sediments (Schlicker, 1972). An oil and gas test well drilled on Nehalem Spit penetrated about 250 feet of these sediments (mostly clay and sand) (Schlicker, 1972). These deposits, if present, are probably only a few tens of feet thick at most within the two small drainage ways within Wheeler, but are likely much thicker between the Nehalem River and U.S. 101.

Most of the flat areas below U.S. 101 appear to be fill placed over tidal flat deposits but portions of these areas could be old flood plain deposits of the Nehalem River.

Soils mapping (S.C.S., 1964) shows Coquille silt loam to

be developed on the portion of the tidal flat within the embayment at the north end of town. Soil properties are shown in Table 3 and will be discussed in the section on geologic hazards.

Miocene basalt

Between about 9 and 16 million years ago, basalt magmas were intruded into the marine sedimentary rocks which now make up the Coast Range (Snively and others, 1973). The resultant intrusive bodies occur as dikes (cut across sedimentary beds) and sills (run parallel to sedimentary beds) within the Oligocene to Miocene sedimentary rocks. Several of these intrusions were noted within the study area (Plate 1). These bodies could not be mapped in their entirety because of limited exposures.

Fresh samples of the basalt are blue-black, and hard with weathered surfaces being reddish-brown. The rock typically exhibits fracturing and jointing (joints are fractures formed by contraction of the rock when it cooled originally).

GEOLOGIC HAZARDS

Flooding

The reader is referred to the 1976 flood study conducted by the Corps of Engineers for a delineation of flood zones within the study area. In addition to these flood zones, limited flooding is possible along the small drainage ways, such as Jarvis Creek, during periods of heavy rainfall. Because of the narrow-floored, steep-walled valleys, such flooding

probably would be restricted to narrow zones along the creeks.

In addition to creek and river flooding, the two low-lying tidal flat embayments at creek mouths are also subject to flooding by high ground water levels during the rainy season.

Two small reservoirs are located within the study area. One is formed behind a small concrete and earthen dam across Jarvis Creek near the 300 foot elevation (Plate 1). Several minor fractures are present in the concrete but one fracture near the center of the dam extends downward at least 5 or 6 feet below the crest of the dam. The reservoir above Wheeler Heights is contained within an asphalt-lined, rectangular pit excavated along a ridge crest and seems to be in good condition.

Landslide hazards

It has been estimated that approximately 70% of the upland area of Tillamook County has undergone some type of downslope movement (Schlicker and others, 1972). This movement has occurred as very slow, downslope creep of soil or as a variety of more rapid landslide types such as slumps, debris slides, and rock slides. The following landslide activity classification of Schlicker and others (1972) is used in this report: 1) active landslide- area within which ground movement has been continuous or periodic over about the past 100 years; 2) inactive landslide- slide which shows no evidence of movement within about the past 100 years; 3) old landslide topography- large areas in which postulated landslide movement may have occurred from several

hundred to several thousand years ago. Evidence for active
landsliding includes fresh, steep headscarps which are bare or
recently vegetated; cracked, hummocky ground; back-tilted
blocks of ground; tilted trees, disturbed human-made structures;
and sag ponds.

No large, active landslides were observed within the
study area. Evidence of very recent movements occur at
several localities along streets and are plotted on Plate 1.
The more extensive of these occurs along the curve in Hall
Street below the View of the West Motel. The main evidence
of movement at these localities are arcuate fractures and/or
depressions within the pavement, especially where steep slopes
occur below the street. Early stages of failure of a retaining
wall are shown in Figure 2. This wall is of inadequate design
and construction and the excavation is located too close to
the cabins (Figure 2).

The entire upland area lies within an inactive landslide
according to mapping done by Schlicker and others (1972), and
the results of my investigation support this. The moderately
hummocky topography upon which the town is built forms a portion
of the landslide mass with the eroded and vegetated headscarp
area represented by the steep slopes above town (Figures 3 and 4),
which lie outside the study area. It should be stressed that the
major movement(s) in this inactive landslide probably occurred
several hundred or even several thousand years ago. It should
not be concluded that this area is necessarily less stable than
other areas with, as yet, undisturbed slopes. The undeveloped,

forested slopes in the area seem to be stable under existing conditions. However, these areas will likely become increasingly susceptible to landsliding and erosion if unnecessarily steep or large or numerous excavations are made or if widespread removal of vegetation is done in the process of future development.

Extensive use of cut-and-fill methods of lot preparation generally reduce slope stability by removing support uphill from the cut and by the added weight of the fill placed on the slope below the cut. The total removal of vegetation by this method also increases the likelihood of erosion and sedimentation problems occurring unless proper preventative measures are taken. An example of this type of lot preparation is located in the vicinity of Second and Pine Streets (just barely visible in Figure 4). Examples of steep, unsupported cuts that have reduced the stability of the adjacent ground are shown in Figures 1 and 5. In general, the steeper the slope the greater is its sensitivity to development. This is especially true where sedimentary beds dip in the same direction that the slopes are facing (which is the case for most of Wheeler).

Examination of Tables 1 and 2 reveals that slope steepness is a critical factor effecting the desirability of the Astoria and Hembre soils for such uses as dwellings, shallow excavations, streets, and small commercial buildings. On slopes over 20 or 30% these soils have use ratings of "severe" in all of the above listed use categories (Tables 1 and 2). For slopes flatter than 30%, their ratings are "moderate to severe" for these uses.

The following definitions of "severe" and "moderate" ratings are used by the S.C.S. (1972):

"Severe" soil limitation is the rating given soils that have one or more properties unfavorable for the rated use, such as steep slopes, bedrock near the surface, flooding hazard, high shrink-swell potential, a seasonal high water table, or low bearing strength. This degree of limitation generally requires major soil reclamation, special design, or intensive maintenance. Some of these soils, however, can be improved by reducing or removing the soil feature that limits use, but in most situations it is difficult and costly to alter the soil or to design a structure so as to compensate for a severe degree of limitation."

"Moderate" soil limitation is the rating given soils that have properties moderately favorable for the rated use. This degree of limitation can be overcome or modified by special planning, design, or maintenance. During some part of the year the performance of the structure or other planned use is somewhat less desirable than for soils rated slight. Some soils rated moderate require treatment such as artificial drainage, runoff control to reduce erosion, extended sewage absorption fields, extra excavation, or some modification of certain features through manipulation of the soil. For these soils, modification is needed for those construction plans generally used for soils of slight limitation. Modification may include special foundations, extra reinforcement of structures, sump pumps, and the like."

It should also be noted that on slopes of 30% or more, these soils may be subject to rapid runoff and severe erosion (Tables 1 and 2).

It can be stated in general, then, that the marine sedimentary rocks and associated soils forming the hillside areas of Wheeler, though relatively stable under existing conditions, have marked potential for future slope stability problems, especially if improper development practices are utilized. A slope map has been prepared from the topographic base map provided by C.T.I.C. to better depict the distribution and extent of slopes of various steepness within the study area.(Plate 2). This map should be useful for general planning purposes but is not of sufficient detail to adequately portray slopes on individual lots or groups of lots. Slopes of 25% or more ($90^{\circ}=100\%$) are considered to be "steep" slopes and, in general, have the greatest potential for slope stability problems. "Moderate" slopes range in steepness from 10 to 24% and tend to be more stable than steeper slopes but are not immune to landslide and erosion problems. "low" slopes are those less than 10% in steepness and are, in general, the most stable slopes. Other variables such as rock and soil type, depth to bedrock, orientation of bedding and other planes of weakness relative slope directions, and ground water conditions may locally control the stability of slopes more than steepness. With regard to slides involving bedrock, for example, a slope facing in the same or nearly same direction as the dip of underlying strata, will likely be less stable than an equally steep or even steeper slope facing opposite

the direction of bedding dip. Slide movements involving only soil are more closely related to slope steepness.

Compressible soils

Compressible soils are common in the tidal flats in the Nehalem Bay area (Schlicker and others, 1972; S.C.S., 1964). These soils include peat and organic soils which are extremely compressible and generally considered entirely unsuitable for supporting structural foundations or earth embankments (Schlicker and others, 1972). The soils properties of the Coquille series, present locally, are listed in Table 3. The high water table, poor drainage, probable existence of compressible soils, and flood potential makes tidal flat areas unfavorable for residential development.

RECOMMENDATIONS

1. Chapter 70 (Excavation and Grading) of the Uniform Building Code (1976 edition) should be applied to all development within the study area.
2. In addition to when required by Chapter 70 of the Uniform Building Code, favorable site-specific investigations (conducted by qualified geotechnical experts at the developers expense) should be prerequisites for the issuance of building, excavation, or fill permits in properties containing the following:
 - A. areas on slopes of 10% or more steepness (Plate 2);
 - B. areas lying within zones of flooding as delineated on the Army Corps of Engineers July 1976 Flood Insurance Rate Map; (includes possible areas with compressible soils);

C. any other area deemed necessary by the building inspector (or other appropriate official).

3. Some suggested development practices:

A. Structures should be designed in such a way to preserve natural slopes and vegetative cover as much as possible; Cut-and-fill methods of lot preparation should be discouraged in hillside areas;

B. Access roads and driveways should follow natural slopes (i.e. follow contours) as much as possible to minimize need for grading and cuts;

C. No development should be allowed to block stream drainage ways;

4. Suggested development densities: (see Appendix for method of calculating average slope):

A. Average slope less than 10% - .4 units per acre maximum; (see 2B and 2C above for site-specific study requirements).

B. Average slope = 10% to 24% - 2 units per acre maximum with favorable site-specific study.

C. Average slope of 25% or more - 1 unit per acre maximum with favorable site specific study.

The above densities could be increased or decreased, dependent upon results of site investigations, nature of the development, utilization of special design techniques to avoid geologic hazards present, etc.

5. The dam on Jarvis Creek should be inspected in more detail by a qualified engineer to better evaluate its safety.

REFERENCES CITED

- Baldwin, E. M., 1976, Geology of Oregon: Kendall/Hunt Publishing Co., Dubuque, Iowa, 147 p.
- Schlicker, H. G., Deacon, R. J., Beaulieu, J. D., and Olcott, G. W., 1972, Environmental geology of the coastal region of Tillamook and Clatsop Counties, Oregon: Bulletin 74, Oregon Dept. Geol. and Min. Ind., 164 p.
- Snavely, P. D., MacLeod, N. S., Wagner, H. C., 1973, Miocene tholeiitic basalts of coastal Oregon and Washington and their relations to coeval basalts of the Columbia Plateau: Geol. Soc. America Bull., v. 84, p. 387-424.
- Thurrow, C., Toner, W., and Erley, D., 1975, Performance controls for sensitive lands: a practical guide for local administrators, Parts 1 and 2: Report nos. 307 and 308, American Soc. of Planning Officials, 156 p.
- U.S. Army Corps of Engineers, July 1976, Flood Insurance Rate Map, Nehalem, Oregon, 1 inch=400 feet.
- U.S. Army Corps of Engineers, Nov. 1976, Flood plain information Nehalem River, Oregon: sheets NE-14-1/2 and NE-14-1/3.
- U.S.D.A. Soil Cons. Serv., 1964, Soil survey, Tillamook area, Oregon: U.S. Gov. Printing Office, series 1957, no. 18, 75 p.
- U.S.D.A Soil Cons. Serv., 1973, Soil interpretations for Oregon: sheets for Astoria, Coquille, and Hembre soils.
- U.S.D.A. Soil Cons. Serv., 1972, Guide for interpreting engineering uses of soils, 85 p.
- U. S. Dept. Housing and Urban Dev., Nov. 16, 1977, Flood insurance rate map, City of Wheeler, Oregon.

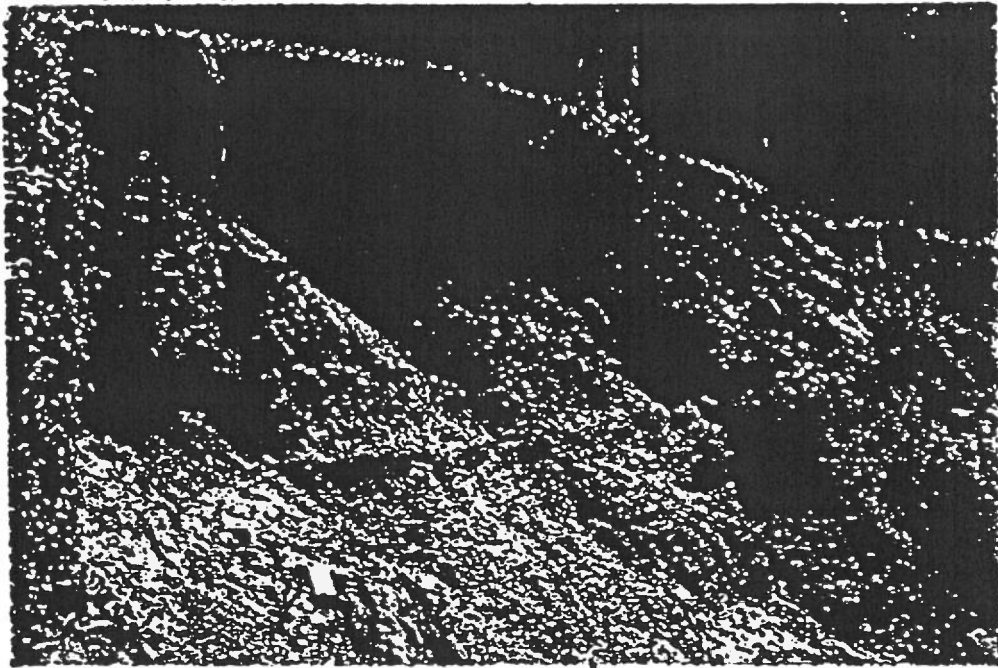


Figure 1. Thin-bedded Tertiary marine sedimentary rocks exposed in steep excavation behind the Wheeler fire station. Exposed rock types include siltstone, claystone, and a few thin beds of sandstone. Note the fissuring of the rocks, especially the longer, curved, open fissure that extends down from the top of the cut. Slight backward rotation has occurred on the block overlying this fissure. Evidence of disturbed bedding also occurs elsewhere along the face of this cut.



Figure 2. Wooden retaining wall adjacent cabins along First Street, south of Spruce Street. Note the distortion of the wall because of its inability to support the rock, soil, and cabins.

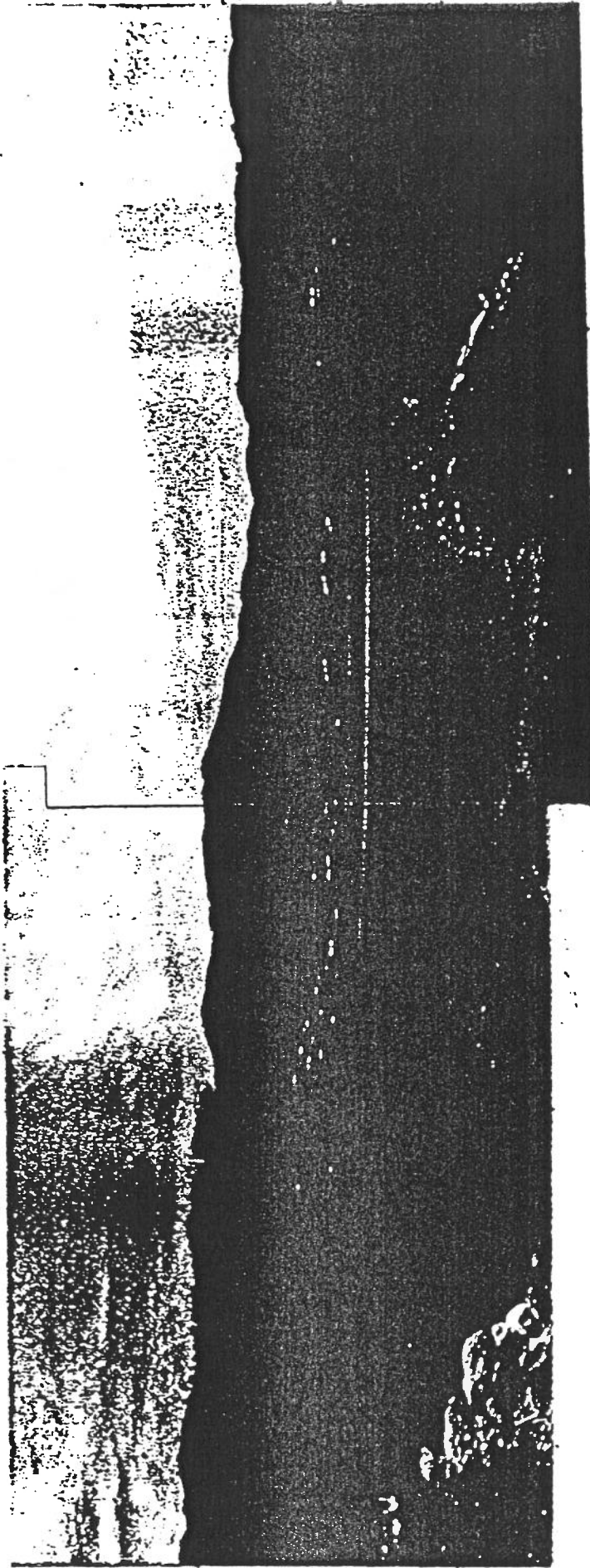


Figure 3. View looking south toward Wheeler from U.S. 101. Hehalem river and tidal flats in foreground. The eroded, vegetated headscarp of a large inactive landslide roughly coincides with the uppermost slopes above town and Wheeler lies on old landslide topography associated with ancient movements on this slide.



Figure 4. View looking south over Wheeler. The small area of exposed rock and soil near center of photo is the cut-and-fill site referred to in text. The entire upland area is underlain by Oligocene to Miocene marine sedimentary rocks. Sedimentary bedding at this vantage point dips 18° to 20° away from viewer. Bedding dip in area shown in photo is essentially to the viewer's right.

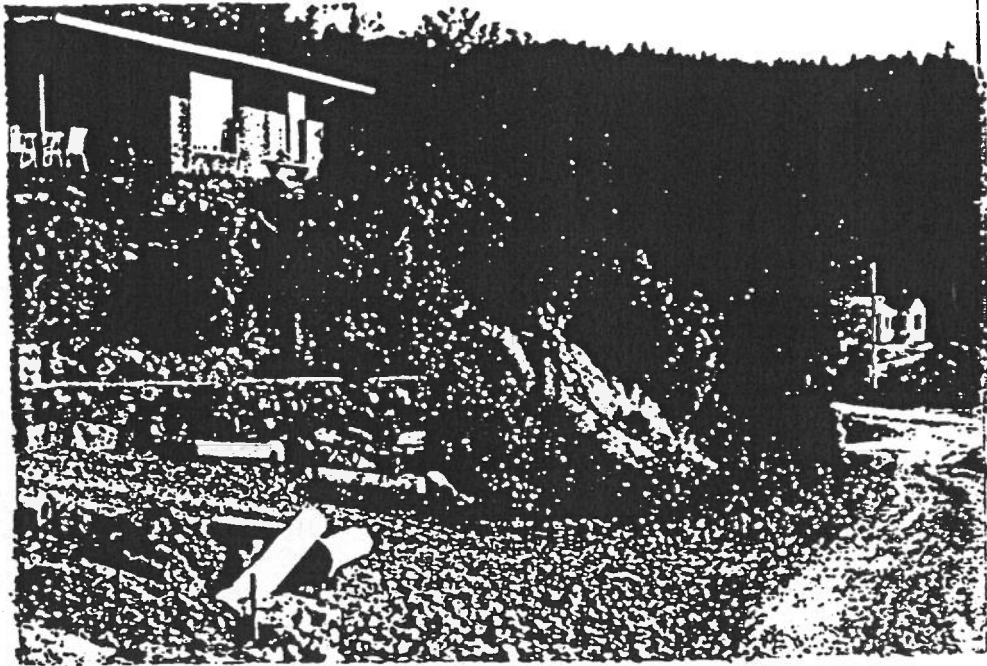


Figure 5. Road cut in soil and sedimentary rock below house along Second Street between Gregory and Pine Streets. Widespread use of excavations of this sort (steep, bare, unsupported) for streets and lots, would greatly increase the likelihood of landsliding and erosion in Wheeler.

DATE: May 22, 1973 CEO

HEMBRE

SERIES

SOILS:

1. Hembre silt loam, 3 to 30% slopes
2. Hembre silt loam, 30 to 60% slopes
3. Hembre silt loam, 60 to 90% slopes

The Hembre series consists of well drained silt loam over silty clay loam soils formed over basalt in the Coast Range. The soils have 3 to 90% slopes. The vegetation consists of Douglas-fir, hemlock, Sitka spruce, Western red cedar and sword fern. Elevations range from 200 to 2800 feet. The mean annual precipitation is 145 to 200 days.

Typically, the surface layer is dark reddish brown silt loam about 12 inches thick. The subsoil is reddish brown and dark reddish brown silty clay loam about 32 inches thick. It is underlain by basalt rock.

Permeability is moderate. Runoff is slow to medium on unit 1; and rapid on units 2 and 3. Erosion hazard is moderate on unit 1; high on unit 2; and very high on unit 3. Total available water holding capacity is 7 to 10 inches. Water supplying capacity is 22 to 24 inches.

These soils are used mainly for timber production. Other uses include pasture, recreation, wildlife and water supply. These soils occur in the North Pacific Coast Range and Valley Land Resource Area (MLRA A-1)

The Hembre series is a member of the fine-loamy, mixed, mesic family of Typic Haplumbrepts.

ESTIMATED SOIL PROPERTIES

DEPTH FROM SURFACE (in.)	CLASSIFICATION			COARSE FRACT. OVER 3 IN.	% OF MATERIAL PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX	PERMEABILITY (in/hr)	AVAIL. WATER CAP. (in/in)	SOIL REACTION (pH)	SHRINK SWELL POTENTIAL
	USDA TEXTURE	UNIFIED	AASHO		#4	#10	#40	#200						
0-12	Silt loam	CL-ML, ML	A-4	0-5%	95-100	90-95	80-95	60-85	25-35	5-10	0.6-2.0	.19-.21	4.5-5.5	Low
12-44	Silty clay loam	CL	A-4, A-6	0-15%	80-95	75-90	70-90	65-85	35-40	5-15	0.6-2.0	.16-.20	4.5-5.5	Low
>44	Basalt bedrock with a few fractures													
DEPTH (in.)	CONDUCTIVITY (mhos/cm)	CORROSIVITY		EROSION FACTORS K T	WIND EROD. GROUPS	FLOODING			HIGH WATER TABLE			HYDROLOGIC GROUP		
		STEEL	CONCRETE			FREQUENCY	DURATION	MONTHS	DEPTH (ft.)	KIND	MONTHS			
0-12	--	High	High	.32	3	none					> 6			
12-44	--	High	High	.28		CEMENTED PAN		BEDROCK			FROST ACTION			REMARKS
>44	--					DEPTH (in.)	HARDNESS	DEPTH (in.)	HARDNESS					
						--		40-50	Hard					
SANITARY FACILITIES AND COMMUNITY DEVELOPMENT						SOURCE MATERIAL AND WATER MANAGEMENT								
USE	SOIL	RATING	RESTRICTIVE FEATURES			USE	SOIL	RATING	RESTRICTIVE FEATURES					
SEPTIC TANK ABSORPTION FIELDS	1, 2, 3	Moderate to severe	Slope			ROADFILL	1, 2, 3	Fair to poor	Low strength, slope					
SEWAGE LAGOONS	1, 2, 3	Moderate to severe	Depth to bedrock, slope			SAND	1, 2, 3	Unsuited	Excessive fines					
SANITARY LANDFILL (TRENCH)	1, 2, 3	Severe	Depth to rock, slope			GRAVEL	1, 2, 3	Unsuited	Excessive fines					
SANITARY LANDFILL (AREA)	1, 2, 3	Slight to severe	Slope			TOPSOIL	1, 2, 3	Fair to poor	Slope					
DAILY COVER FOR LANDFILL	1, 2, 3	Fair to poor	Stones, slope			POND RESERVOIR AREA	1, 2, 3	Moderate to severe	Depth to rock, slope					
SHALLOW EXCAVATIONS	1, 2, 3	Moderate to severe	Depth to rock, slope			EMBANKMENTS DIKES AND LEVEES	1, 2, 3	Moderate to severe	Low strength, slope					
DWELLINGS WITHOUT BASEMENTS	1, 2, 3	Moderate to severe	Depth to rock, slope			DRAINAGE	1, 2, 3		Not needed					
DWELLINGS WITH BASEMENTS	1, 2, 3	Moderate to severe	Depth to rock, slope			IRRIGATION	1, 2, 3		Not needed					
SMALL COMMERCIAL BUILDINGS	1, 2, 3	Moderate to severe	Depth to rock, slope			TERRACES AND DIVERSIONS	1, 2, 3		Not needed					
LOCAL ROADS AND STREETS	1, 2, 3	Moderate to severe	Slope			GRASSED WATERWAYS	1, 2, 3		Not needed					

DATE: November 1973 RJK-FWC

COQUILLE SERIES

- SOILS: 1. Coquille peaty silt loam, 0-1% slopes
2. Coquille sandy loam, 0-1% slopes
3. Coquille silt loam, 0-1% slopes
4. Coquille and Brenner silt loams, 0-1% slopes

The Coquille series consists of very poorly drained very strongly acid soils that formed from sediments deposited in water subject to tidal fluctuations.

The soils are on level and depressional flood plains and stream deltas along coastal tidelands. Slopes are 0 to 1 percent. Elevations are from sea level or below to 10 feet. Where not cultivated, the vegetation is rushes, sedges, marsh grass, and tules. Average annual precipitation is 60 to 90 inches, average annual air temperature is 50 to 53 degrees F., and the frost-free period is 180 to 220 days.

Typically, the surface layer is very dark grayish-brown, mottled silt loam about 13 inches thick. The subsoil is dark grayish-brown, mottled silty clay loam about 27 inches thick. Very dark gray, massive, silty clay and clay, stratified with thin layers of peat, sandy, and loamy materials occur below 40 inches.

Permeability is slow. Runoff is slow to ponded on all Units. The erosion hazard is slight except where a river or stream can change channels. Effective rooting depth is limited to between 20 and 40 inches by the massive silty clay layer and by the seasonal water table. Available water holding capacity is 7.5 to 8.5 inches. The water supplying capacity is 23 to 25 inches. Workability is fair when not wet. The soils are subject to tidal overflow at high tide if not protected by dikes.

Coquille soils are used for pasture and forage crops, wildlife habitat, and recreation. These soils are along the Oregon Pacific Coast (MLRA-A1).

(Classification: Typic Fluvaquents; fine-silty, mixed, acid, mesic.)

ESTIMATED SOIL PROPERTIES

DEPTH FROM SURFACE (in.)	CLASSIFICATION			COARSE FRACT. OVER 3 IN.	% OF MATERIAL PASSING SIEVE				LIQUID LIMIT	PLAS-TICITY INDEX	PERMEA-BILITY (in/hr)	AVAIL. WATER CAP. (in/in)	SOIL REAC-TION (pH)	SHRINK SWELL POTEN-TIAL
	USDA TEXTURE	UNI-FIED	AASHO		#4	#10	#40	#200						
0-13	Silt loam	ML	A-4	0	100	100	90-100	70-90	30-35	5-10	6-2.0	.19-.21	4.5 - 5.0	Low
13-40	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	12-20	.2-.6	.19-.21	4.5 - 5.0	Moderate
40-60	Silty clay	CL or CH	A-7	0	100	100	95-100	90-95	45-55	25-35	.06-.2	.15-.17	4.5 - 5.0	Moderate

DEPTH (in.)	CONDUCTIVITY (mmhos/cm)	CORROSION		EROSION FACTORS K T	WIND EROD. GROUPS	FLOODING			HIGH WATER TABLE		HYDRO-LOGIC GROU P	
		STEEL	CONCRETE			FREQUENCY	DURATION	MONTHS	DEPTH (ft.)	KIND		MONTHS
						CEMENTED PAN	BEDROCK		FROST ACTION	REMARKS		
0-13	-	High	High	.28	3	Frequent	Long	Oct.-May	0-2	Apparent	Oct.-June	D
13-40	-	High	High	.40		DEPTH (in.)	HARDNESS	DEPTH (in.)	HARDNESS		Daily tidal flooding and permanent water table if not diked or drained.	
40-60	2.0-4.0	High	High	.28		-	-	> 60	-	-		

SANITARY FACILITIES AND COMMUNITY DEVELOPMENT				SOURCE MATERIAL AND WATER MANAGEMENT			
USE	SOIL	RATING	RESTRICTIVE FEATURES	USE	SOIL	RATING	RESTRICTIVE FEATURES
SEPTIC TANK ABSORPTION FIELDS	1,2,3,4	Severe	Wet, floods	ROADFILL	1,2,3,4	Poor	Wet
SEWAGE LAGOONS	1,2,3,4	Severe	Wet, floods	SAND	1,2,3,4	Unsuited	Excessive fines
SANITARY LANDFILL (TRENCH)	1,2,3,4	Severe	Wet, floods	GRAVEL	1,2,3,4	Unsuited	Excessive fines
SANITARY LANDFILL (AREA)	1,2,3,4	Severe	Wet, floods	TOPSOIL	1,2,3,4	Poor	Wet
DAILY COVER FOR LANDFILL	1,2,3,4	Poor	Wet	POND RESERVOIR AREA	1,2,3,4	Slight	Favorable
SHALLOW EXCAVATIONS	1,2,3,4	Severe	Wet, floods	EMBANKMENTS DIKES AND LEVEES	1,2,3,4	Moderate	Piping, low strength
DWELLINGS WITHOUT BASEMENTS	1,2,3,4	Severe	Wet, floods	DRAINAGE	1,2,3,4	Severe	Wet, floods, poor outlets
DWELLINGS WITH BASEMENTS	1,2,3,4	Severe	Wet, floods	IRRIGATION	1,2,3,4	Severe	Wet, floods
SMALL COMMERCIAL BUILDINGS	1,2,3,4	Severe	Wet, floods, corrosive	TERRACES AND DIVERSIONS	1,2,3,4		Not needed
LOCAL ROADS AND STREETS	1,2,3,4	Severe	Wet, floods	GRASSED WATERWAYS	1,2,3,4		Not needed

APPENDIX

Method for calculating average slope

The following formula (Thurrow and others, 1975) can be used in conjunction with a topographic map to determine the average slope within a given parcel of land:

$$S = \frac{.0023 \times I \times L}{A}$$

where: .0023 = conversion factor
of square feet to
acres;

I = contour interval;

L = total length of the
contour lines within
the subject parcel;

A = area in acres

"I" should appear on the map provided by the developer.

"L" can be determined by tracing each contour line with a planimeter and converting to feet.

"A" can be measured directly (one acre = 43,560 square feet) and should not include areas of parcel steeper than allowable for the proposed density of the development. For example, in a proposed development of 4 units per acre, those areas with slopes of 25% or more should be subtracted from the total area to give "A" which is the area available for the proposed development.

The average slope, "S", can then be used to determine the number of units permitted on the parcel.

The above report is respectfully submitted July 14, 1978 and represents the undersigned's opinions based on the investigation presented therein.

Martin Ross

Martin Ross, Ph.D.

Geologist
P.O. Box 20
Cannon Beach,
Oregon 97110

APPENDIX 2

COMMUNITY WATERSHED ZONE

- .010 Intent. The purpose of the Community Watershed Area Zone is to provide for implementation of a working relationship among federal and state agencies, land owners, local governments, and special districts which have programs, land, or responsibilities within domestic watershed areas. It is intended that watershed area zoning be applied only to land areas from which the quality of surface runoff affects downstream use by a state-licensed water system. Furthermore, it is intended that such zoning shall be applied by the county only at the request of special districts or cities which demonstrate a need, desire, and willingness to cooperate in planning for land use activities within their own community watersheds. The overall purpose of the community watershed zoning classification is two-fold: first, to provide a means for notification of affected local jurisdictions concerning significant activities within watershed areas; and, second, to assure that only those commercial management activities are permitted which are consistent with the adequate protection of water quality necessary for individual licensed water systems. Full commercial use of all community watershed areas is anticipated; on the other hand, land uses should not endanger the health of community residents, nor should watershed land uses inadvertently necessitate redevelopment of community water systems.
- .020 Permitted Principal Uses. In a community watershed zone area the following uses and their accessory uses are permitted outright, where consistent with state and federal requirements:
1. Stream bank and stream quality enhancement;
 2. Road maintenance of existing road surfaces which does not contribute to hydrologic problems in watershed tributaries;
 3. Tree planting;
 4. Pruning of trees;
 5. Pre-commercial thinning outside a buffer area of one chain (66 feet) in width on each side of streams. Such pre-commercial thinning shall not deplete standing timber below normal stocking levels and not exceed the removal of greater than one-half of standing conifer per acre.

6. Selective logging by lateral skyline yarding or helicopter outside a buffer area of one chain (66 feet) in width on each side of streams; such selective logging on at least a seven year cycle, each cycle designed to remove not more than one-third of the year's eligible standing timber supply per acre.
7. Low intensity recreational activity, not including developed picnic or camping facilities.

.030 Conditional Uses. The following uses are permitted in the community watershed zone area as conditional uses if the county Planning Commission determines, after a public hearing, that the use complies with applicable standards in Section .040.

1. Use of Environmental Protection Agency-approved herbicides, pesticides, and other man-made chemicals, which have been approved by independent scientific research to be non-carcinogenic, non-mutagenic, and non-teratogenic, for conifer release to induce forest growth;
2. Development and replacement of roads, bridges, culverts and utility rights of way;
3. Use of natural-source fertilizers which are free of active pathogenic bacteria;
4. Logging of forest not specifically permitted outright in Section .020.
5. Construction of such water impoundments, treatment facilities, and distribution lines as can be arranged for with the land owner;
6. Mining, quarrying or other extractive activity requiring State Department of Geology and Mineral Industry permit;
7. Livestock use under noncontinuous grazing patterns.

.040 Use Standards. The following standards when applicable shall apply within the community watershed area zone:

1. Chemical applications. Herbicides, pesticides, fertilizers and other artificial chemical applications shall be applied by hand application. No chemical applications shall be permitted within three chains (198 feet) of each side of streams with perennial flow, and no chemical applications shall be permitted within one chain width (66 feet) of streams with intermittent flows.

2. Use of Stream Buffers. Logs shall not be skidded across the stream, and shall not be skidded across the ground within 50 feet on each side of streams. Man-caused woody debris must not be allowed to enter the stream channel. Removal of stream debris and streambank vegetation, such as vegetation providing shade, shall be done only in cases where excessive erosion is occurring as a result of woody material. Use of equipment in streams shall be allowed only for the installation of crossing structures. Logging equipment shall be kept out of streams; roads shall be located, constructed and maintained so that sedimentation and accumulation of woody debris will not take place in stream channels. Specific plans for vegetation removal within 50 feet on each side of streams shall be prepared at developer's expense for public review, showing: stream grade; contour at a scale of 20 foot intervals, or more detailed. Such plans shall also indicate which trees are to be removed and which are to be retained, as well as any changes in existing grade greater than 10 percent.
3. Clearcut and Other Intensive Logging. All logging activities not permitted outright, including clearcut operations and selective cutting to remove in excess of one-third harvestable timber, shall be designed to prevent erosion. No conditionally permitted activities will be allowed between November 1 and March 31. Special installations (e.g. sediment traps, settlement ponds, etc.) will be utilized to keep sediment from reaching streams.

Monitoring of stream turbidity levels by the DEQ prior to, during and following logging activities may be required by the county when appropriate to determine stream changes. Results shall be reported to the county, to the affected city or special district, and to the State Health Department. The county may require that monitoring shall be conducted at developer's expense at regular intervals for up to one year or more.

4. Mineral, Quarrying and Aggregate Extraction. Mining shall be conducted in such a manner as to eliminate, as far as practical, any water quality impacts. Leaching of substances into ground and surface waters shall be prevented, and public health and safety shall be protected. All mining and other extractive activities shall demonstrate a major burden of proof in showing why other areas not involving domestic watershed areas are not available for meeting public need for mining material.

5. Notification and Local Public Involvement. All conditional uses outlined in Section .030 shall allow for public review. Applicants for conditional uses will make themselves available for other forms of local communications and cooperation, including:
- a) site investigations or field trips for the benefit of interested parties such as the County Planning Commission, the City Planning Commission, County Board of Commissioners, City Council members, or special district board members;
 - b) public information meetings and/or public hearings;
 - c) other public meetings as appropriate.
- Conditional uses provide for local approval, denial, or approval with conditions.
6. State and Federal Conditions. The Oregon Forest Practices Act, Department of Environmental Quality and other state and federal rules shall apply to domestic watershed areas, and provisions of such rules which are more stringent than the preceding local ordinance provision shall take precedence in determining land management.

BIBLIOGRAPHY

- "Census Data", U. S. Department of Commerce, Washington, 1974.
- "Clatsop-Tillamook Solid Waste Management Plan", UMA Nortec, Inc. Portland, June, 1974
- "Coastal Wetlands of Oregon", Oregon Coastal Conservation and Development Commission, January, 1975, page 190.
- "Descriptions and Information Sources for Oregon Estuaries", Oregon State University, Corvallis, May, 1974, page 294.
- "Environmental Geology of the Coastal Region of Tillamook and Clatsop Counties", Oregon Department of Geology and Mineral Industries, Portland, 1972, page 164.
- "Estuarine Resources of the Oregon Coast", Oregon Coastal Conservation and Development Commission, September, 1974, page 223.
- Hempel, Lamont C., "The Recreation Environment of Tillamook County", Western Interstate Commission for Higher Education and Tillamook County Planning Department, December, 1975, page 112.
- "Inventory of Development Pressures in the Coastal Zone", Oregon Coastal Conservation and Development Commission, February, 1975.
- "Manzanita, Oregon Comprehensive Plan", City of Manzanita and Clatsop-Tillamook Intergovernmental Council, (in process of being completed). Background Report and Plan text.
- Mostue, Brian A., "Nehalem Waterfront Restoration Project", HGE, Inc., and Brian Mostue Landscape Design, Portland, 1976, page 52.
- "Nehalem Wetlands Review", U. S. Army Engineer District, Portland, February, 1977.
- "Oregon Action Plan for Transportation 1979", Oregon Department of Transportation, October, 1978.
- "Oregon Natural Areas: Tillamook County Data Summary", Oregon Natural Heritage Program, Portland, March, 1977.
- "Oregon State Parks Systems Plan 1975-1981", Oregon Department of Transportation, Salem, November, 1975.
- "Population Estimates of Counties and Incorporated Cities", Center for Population Research and Census, Portland State University, 1971-1977, April, 1978.

BIBLIOGRAPHY

- "Postflood Report: November-December 1977 Floods in the Portland District", U. S. Army Corps of Engineers, August, 1978.
- "Public Utilities Position of the Comprehensive Land Use Plan", City of Wheeler, Preliminary Report, HGE.Inc., March 1979.
- Ragatz, Richard L., "A Survey of the Housing Situation in Tillamook County", Richard L. Ragatz Associates, Inc., Eugene, 1978, page 160.
- Rittenback, D. R., "Memorandum, Wheeler Housing Survey Final Tabulation", Clatsop-Tillamook Intergovernmental Council and City of Wheeler, 1977.
- Rittenback, D.R., "Memorandum, Wheeler Questionnaire Final Tabulation", Clatsop-Tillamook Intergovernmental Council and City of Wheeler, 1977
- Rittenback, D. R., "Table of Existing Land Use in the City of Wheeler By Acres By Assessor Plat", City of Wheeler and Clatsop-Tillamook Intergovernmental Council, 1977.
- Ross, Martin E., "A Field Investigation of Geologic Hazards in Wheeler", July, 1978.
- "Sewage Treatment Facilities and Interceptor Sewers", Willis F. Perley and Associates, Portland, November, 1966, page 59.
- "Soil Survey: Tillamook Area", U. S. Department of Agriculture, Soil Conservation Service, August, 1964.
- "Statewide Planning Goals and Guidelines", Land Conservation and Development Commission, January, 1975.
- Street, Bill et al, "Economic Technical Report for Tillamook County", Cannon Beach, 1978.
- "Tillamook County Soil Interpretations", commonly called OR-1 sheets, U. S. Department of Agriculture, Soil Conservation Service, date various.
- "Tillamook County Housing Assistance Plan", Clatsop-Tillamook Intergovernmental Council, September, 1978.
- "Traffic Volume Tables for 1977", Oregon Department of Transportation, Salem, July, 1978, page 242.