Rockaway/Nedonna Beach Dune Management Study

NEDONNA BEACH FOREDUNE GRADING PLAN

Oregon Department of Land Conservation and Development

NEDONNA BEACH

FOREDUNE GRADING PLAN

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June, 1986

PREFACE

This report provides detailed recommendations for managing the foredune at Nedonna Beach, Oregon to maintain views and to improve protection from flooding. This report is one part of a three-part study. Other parts of the study include a Technical Report, which analyzes beach, dune and nearshore processes in the area and a Management Plan which recommends controls on other uses and activities which can affect dune stability. The plan will be implemented by Tillamook County and the City of Rockaway Beach through their comprehensive plans and zoning ordinances.

The report was prepared by Wilbur Ternyik, an expert on sand dune stabilization, with assistance from Robert Cortright, Coastal Policy Specialist with Oregon's Department of Land Conservation and Development, and other study team members including Roger Redfern, an Engineering Geologist, and Fred Glick of Fred Glick and Associates (FGA), a Landscape Architect of Portland. Ms. Kathy Schutt of FGA prepared the plan's illustrations.

The author and the study team also gratefully acknowledge the input of the following individuals who reviewed and commented on drafts of this plan and other parts of the study:

Debra Brooker, Tillamook County Coastal Planner
Helen Koopman, Property Owner
Jackylyn Prokopovich, Property Owner
Dr. Karl Nordstrom, Rutgers University
Ken Bierly, Division of State Lands
Peter Bond, Parks and Recreation
James Good, Oregon State University
Frank Reckendorf, Soil Conservation Service

TABLE OF CONTENTS

INTRODUCTION

This plan provides detailed recommendations for grading and stabilizing the foredune at Nedonna Beach, Oregon. This plan was prepared to demonstrate how state planning requirements for grading of developed foredune areas should be applied. The Nedonna-Rockaway Beach area was selected because of the extent of problems there and the interest of the property owners and elected officials in doing a plan. The plan and its recommendations are intended as a model for other areas with similar problems.

The foredune at Nedonna Beach is presently high enough in front of most houses to qualify for grading under Statewide Planning Goal 18 (Beaches and Dunes) (i.e., the dune is more than four feet above the 100-year flood elevation). Grading is being done to restore ocean and beach views from oceanfront homes whose views have been blocked by dune accretion. Proper placement and stabilization of the graded sand will also repair and strengthen the foredune, improving its function as a buffer to ocean flooding for the entire area.

The protective capability of the foredune should only be considered as a temporary feature. The foredune's protective ability for wave erosion lies in its width, height, and slope, and to a very limited extent, the vegetative cover. Although the vegetative cover is an integral part of the ability of the dune to grow in height and width by sand accumulation, once the foredune is attacked by waves, the foreslope vegetative cover will sluff off. The main protective ability lies in the foredune's width and height. It will take tides and storm waves some uncertain amount of time to remove the bulk of the foredune. This would allow landowners behind the new foredune some time to install riprap or other structural measures if erosion is very serious. Historical data shows that past storms have caused as much as 100-150 feet of erosion retreat on foredunes without structural protection, particularly where rip currents develop. Therefore, the width question at present can only be answered as the wider the better, because there is more sand bulk to be eroded. The sand bulk question is also relevant to increased sand supply to the sand budget along any given reach of the ocean. In other words, if enough sand is present then the foreshore and nearshore areas can be flattened, bars formed and wave energy dissipated. The other aspect of dune width of importance is that a wider foredune would increase the likelihood of percolation of wave uprush, thus diminishing the power and volume of water which would overtop the dune.

While the recommendations in this report are specific to Nedonna Beach, the recommended grading and stabilization techniques may be applicable to other developed foredunes. Readers should also consider the following:

- This plan is based on a careful evaluation of the sand system for the entire Rockaway-Nedonna shoreline;

OBJECTIVES AND EXPECTED RESULTS

The overall purpose of this grading plan is to allow crest grading as part of a total program that will strengthen the foredune. The plan will be carried out by:

- Creating a uniform crest at no lower than 26' (NGVD). This will involve building up low spots (through a combination of filling and/or planting or fertilizing) and limited grading of crest areas.

- Widening the foredune in most areas by:

  (1) Placing excess graded sand from the foredune crest onto the foreslope.

  (2) Smoothing the foreslope and fertilizing and planting european beachgrass in poorly vegetated areas to enhance even accretion of sand on the foreslope.

- promoting a new foredune from approximately Western Street to the Nehalem River south jetty to provide a more continuous foredune throughout this stretch of shoreline.

Specific problems for individual areas are described in the subarea descriptions which follow. The specifications section describes how corrective actions should be undertaken. These recommendations should be followed unless the subarea recommendations indicate otherwise.

The timing of each management measure is important because of the potential for grading to reactivate sand movement which would destabilize the foredune. Management measures generally should be done during the dormant season for beachgrass (between October and March). They should be done in the following order:

Year 1:

Foredune crest grading should be done in qualified areas (i.e., where foredune crest is more than 4 feet above the 100-year flood elevation).

As indicated in the specifications, graded sand should be used to fill low spots on adjacent lots. Portions of the crest that are currently below the base flood elevation should, at a minimum, be filled to the base flood elevation. Crests that are between the base flood elevation and the 4 feet level, should also be filled. However, these areas may instead be replanted with european beachgrass or fertilized if there is an adequate stand of grass.

The result will be a low (4-5 foot) open sand ridge up to 45-50 feet wide immediately in front of the present foredune. The sand fence may fill at different rates and high winter storm waves might erode a portion of the dune. (This should not seriously affect the foredune, especially if promptly repaired.)

Sand captured by the sand fences would otherwise have accumulated on the foredune or blown behind the foredune or beyond the jetties. Consequently, there may be a slight reduction in the rate of sand accretion on the existing foredune. However, sand will accrete at normal rates once the fences have filled until stabilizing vegetation becomes well established. If beachgrass is planted in place of sand fences, the grass should be spreading and begin to accrete sand.

End of Year 2:

Vegetation on graded areas should be substantially recovered or established. Overall the crest should have more and thicker vegetation coverage than prior to grading. Depending on the strength of winter winds the crest may begin to receive some new sand accretion although most new material should be trapped in sand fences or on the foreslope (in ungraded areas).

After grading, reshaped foreslope areas will temporarily have a reduced ability to trap windblown sand. This will increase sand accumulation slightly on ungraded crests. (Prompt replanting or fertilizing of european beachgrass will reduce this effect.)

Sand fenced areas will have been planted with european beachgrass. In its first six months the new beachgrass will capture only a little sand. Six to twelve months after planting the grass should be well established enough to capture sand at a rate equal to other areas.

End of Year 3:

Vegetation on graded crests should be fully recovered, and the entire crest should be well vegetated. Mowing may temporarily reduce height of the grass, but when done during the summer season and properly fertilized, it should grow back thicker. Crest areas should be receiving only small amounts of sand accretion.

Foreslopes reshaped during the previous year should have well-established vegetation that is trapping most of the sand.

Vegetation in sand fenced areas should also be well established except in isolated pockets of erosion (which should be in various states of repair depending on how recently they occurred). The "new" foredune should be trapping most of the windblown sand. The sand-fenced dune should grow at a rate of 18 inches to 24 inches per year.

SUBAREA ANALYSES

SUBAREA ANALYSIS AND RECOMMENDATIONS

Subarea A: South Jetty Subarea

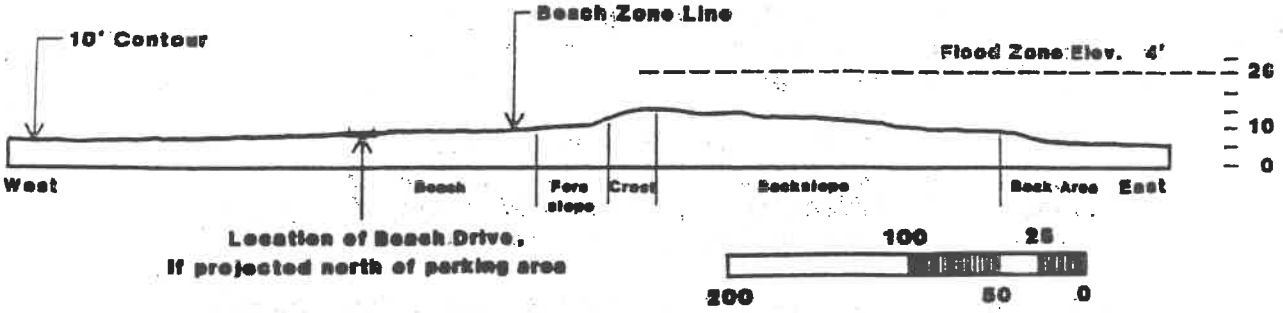


Figure 1: Generalized Cross Section of Subarea A

Setting

The foredune in this subarea is noticeably different in form and location from the foredune in other subareas. The foredune is quite narrow and curves back at a northeasterly direction from the jetty parking lot to the jetty. The orientation of the foredune is probably the result of wave action and a rip current in this area prior to jetty reconstruction. The beach in the triangular embayment between the jetty and the foredune is largely unvegetated but appears to be accumulating sand since jetty rehabilitation in 1981 (see figure 2). Aerial photographs show that the beach is wider and flatter than in earlier years and that several hummocks have developed. Because of the orientation of the foredune and the absence of stabilizing vegetation on the beach it appears that sand is being blown across the beach to the jetty and into the Nehalem River.

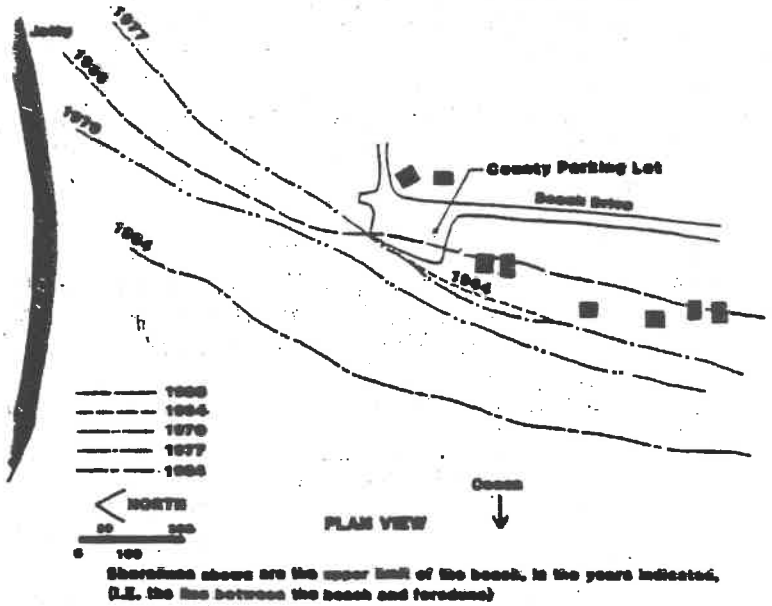
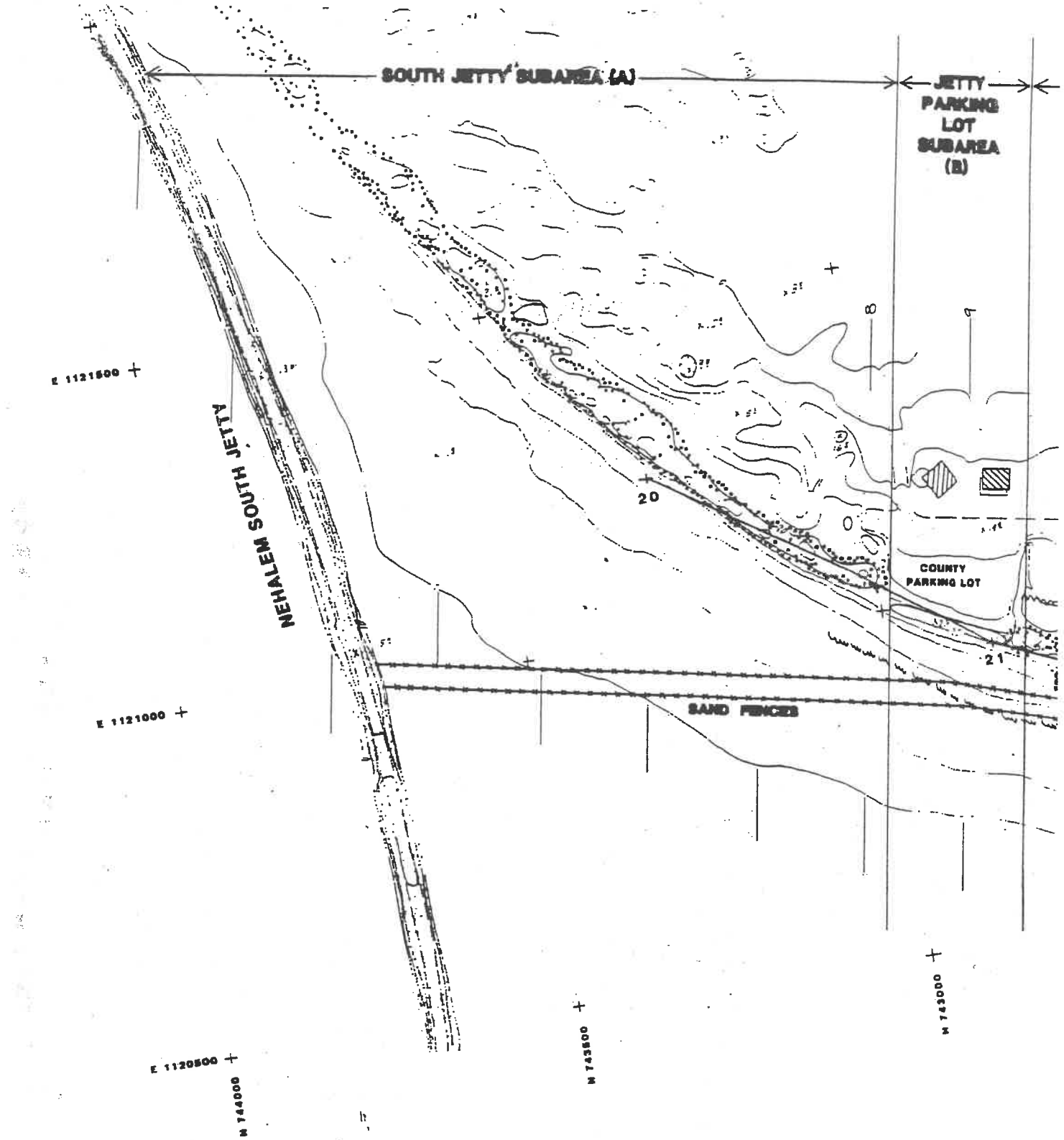


Figure 2: Shoreline Changes South of Nehalem South Jetty



GRADING PLAN

SCALE IN FEET

0 50 100 200 300 500

NORTH

LEGEND

- NEWLY FORMING SEAWARD EDGE OF DUNE VEGETATION
- TOE OF BACKSLOPE
- BEACH ZONE LINE
- SAND FENCE
- ESTIMATED BUILDING SETBACK LINE
- AVERAGE CREST OF EXISTING FOREDUNE
- NATURAL & MAN-MADE LOW POINTS (TO BE FILLED)
- AVAILABLE ADJACENT FILL AREAS & DIRECTION OF GRADING

Subarea B: Jetty Parking Lot Subarea

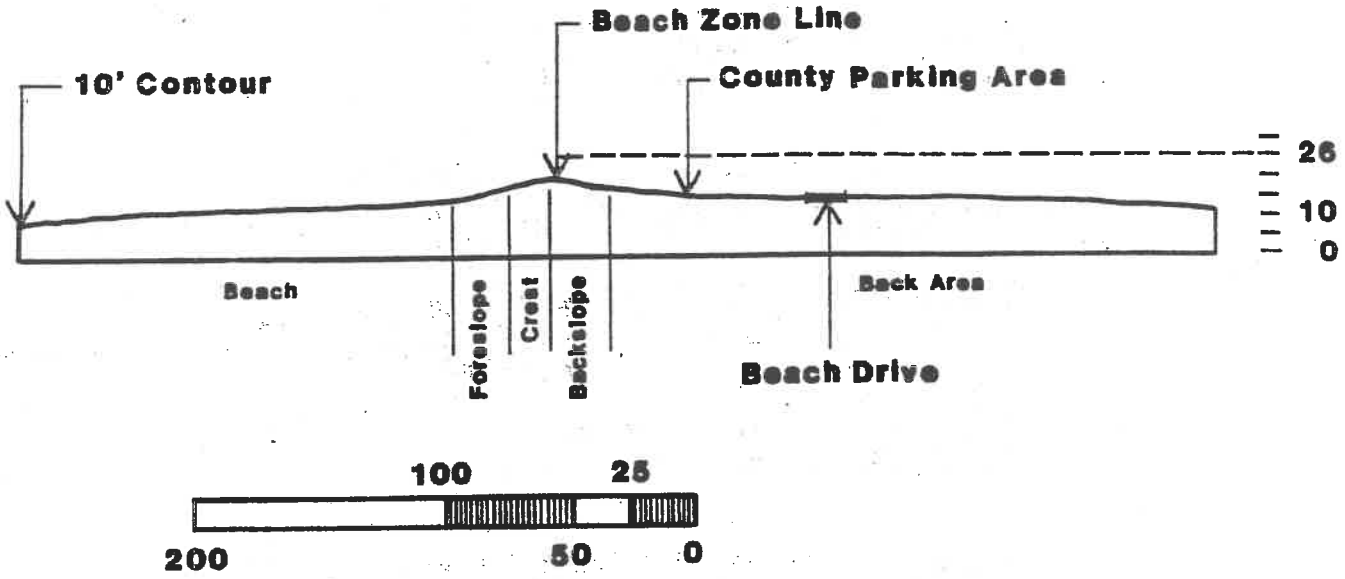
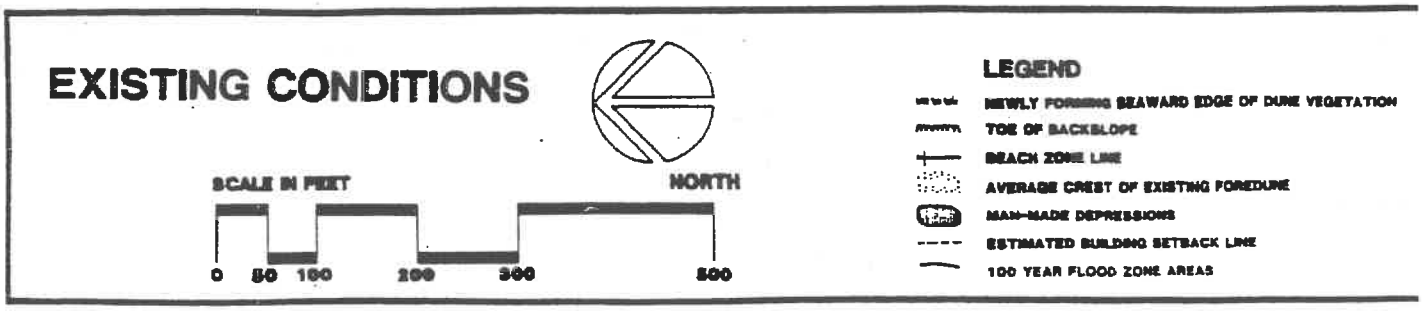


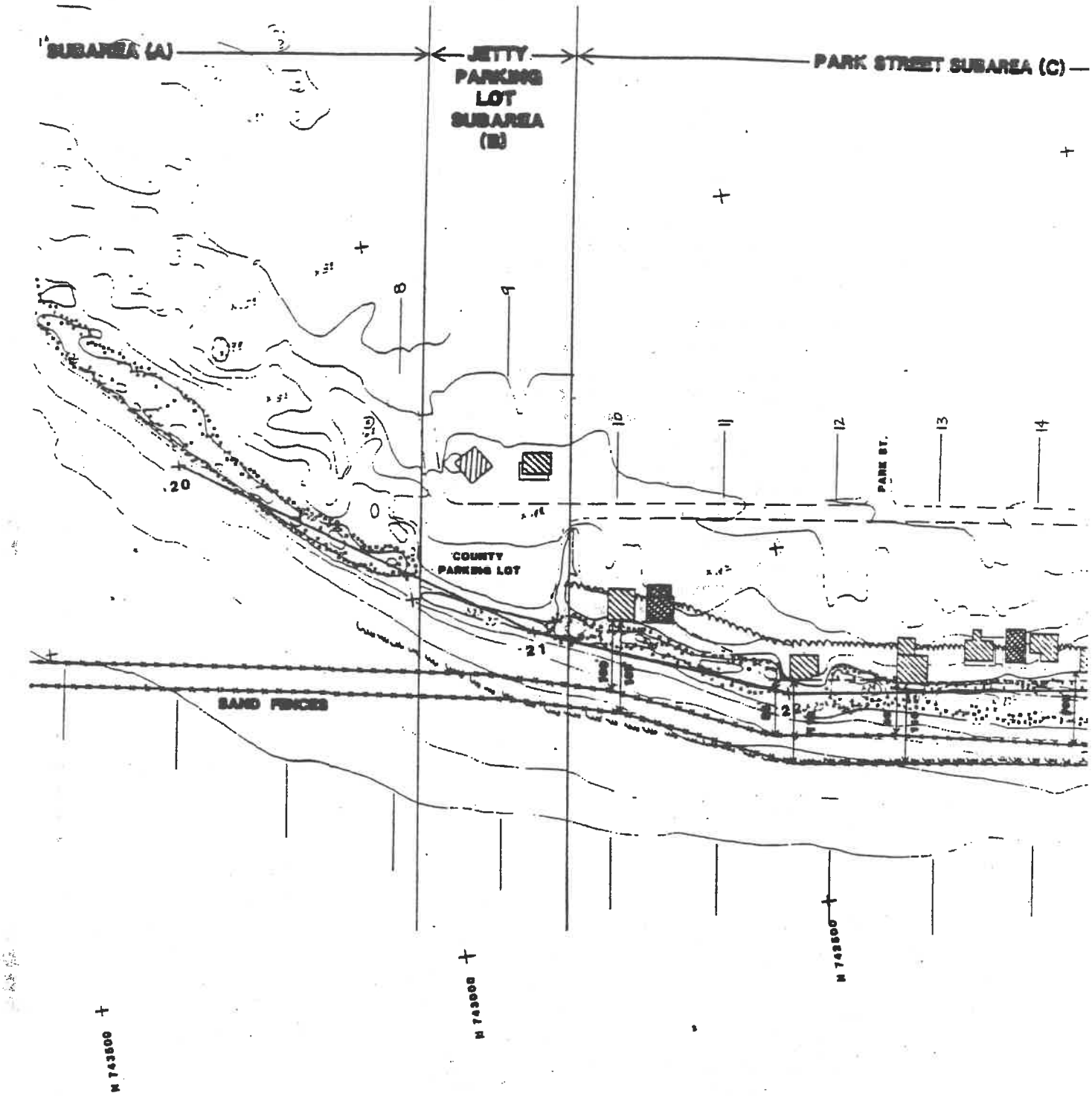
Figure 3: Generalized Cross-Section of Subarea B

Setting

The foredune at the jetty parking lot has been seriously damaged by the vehicle traffic and foot traffic across the dune. As a result, the foredune is noticeably lower and narrower than the adjacent Park Street subarea. (The foredune at the jetty parking lot averages 20 feet in elevation and 60 feet in width vs. 25 feet and 115 feet respectively for Park Street.) Traffic across the foredune has also destroyed and prevented spread of beachgrass. Cover is non-existent on the backslope, while the crest has 40% cover and the foreslope has 0-20% cover. The lack of vegetation has resulted in sand accumulations in the parking lot which have been periodically bulldozed back over the foredune.

Access at this location is needed for emergency vehicles to conduct search and rescue at the south jetty. The parking lot is also the only public access north of the Manhattan Beach Wayside with off-street parking.





GRADING PLAN

SCALE IN FEET

0 50 100 200 300 500

NORTH

LEGEND

- NEWLY FORMED SEAWARD EDGE OF DUNE VEGETATION
- TOE OF BACKSLOPE
- BEACH ZONE LINE
- SAND FENCE
- ESTIMATED BUILDING SETBACK LINE
- AVERAGE CREST OF EXISTING FOREDUNE
- NATURAL & MAN-MADE LOW POINTS ITO BE FILLED
- AVAILABLE ADJACENT FILL AREAS & DIRECTION OF GRADING

Subarea C: Park Street Subarea

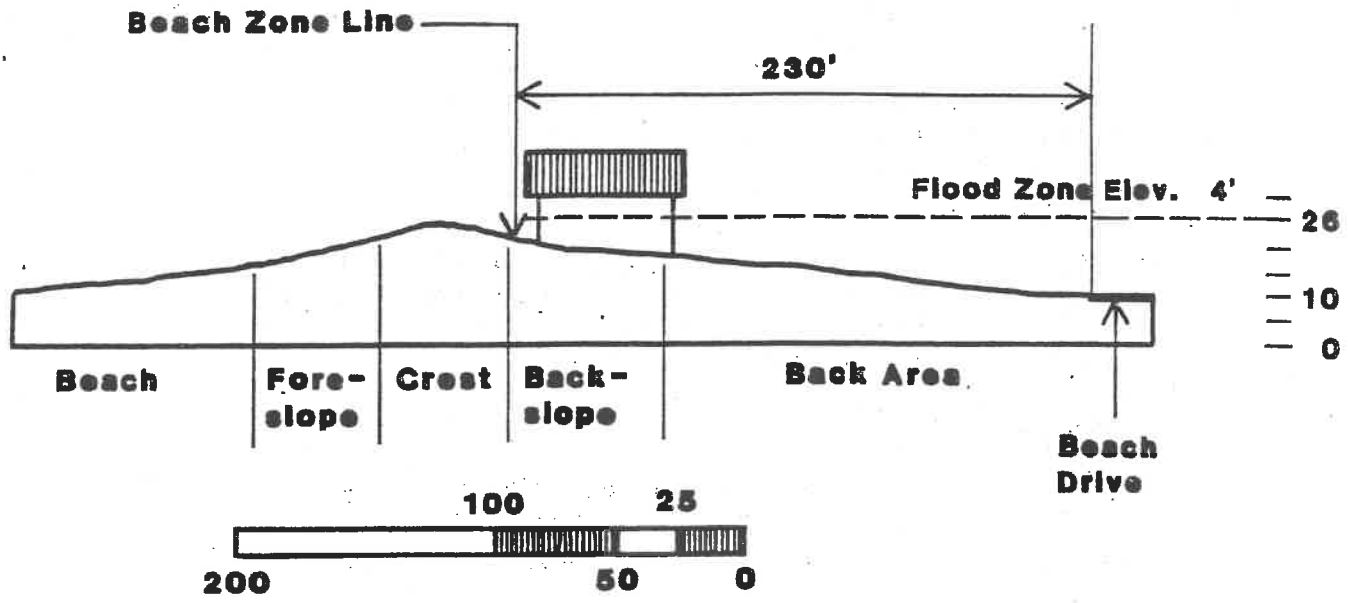
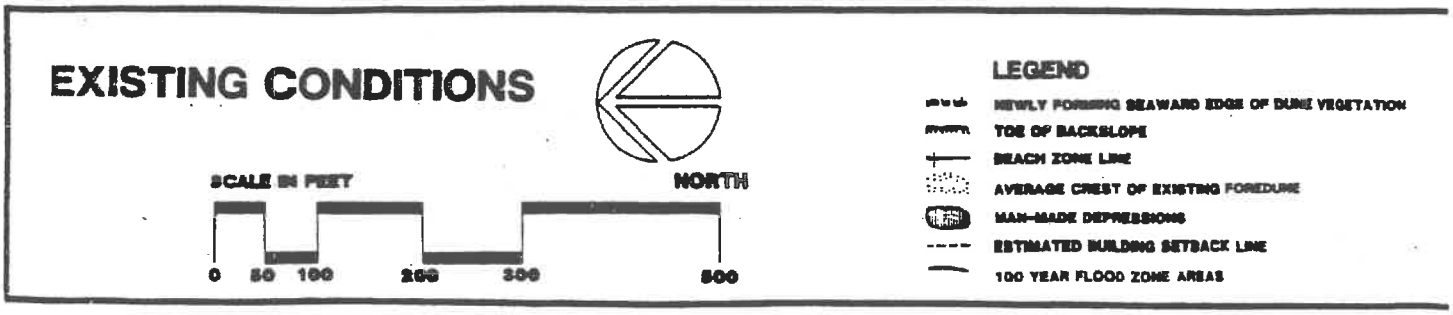


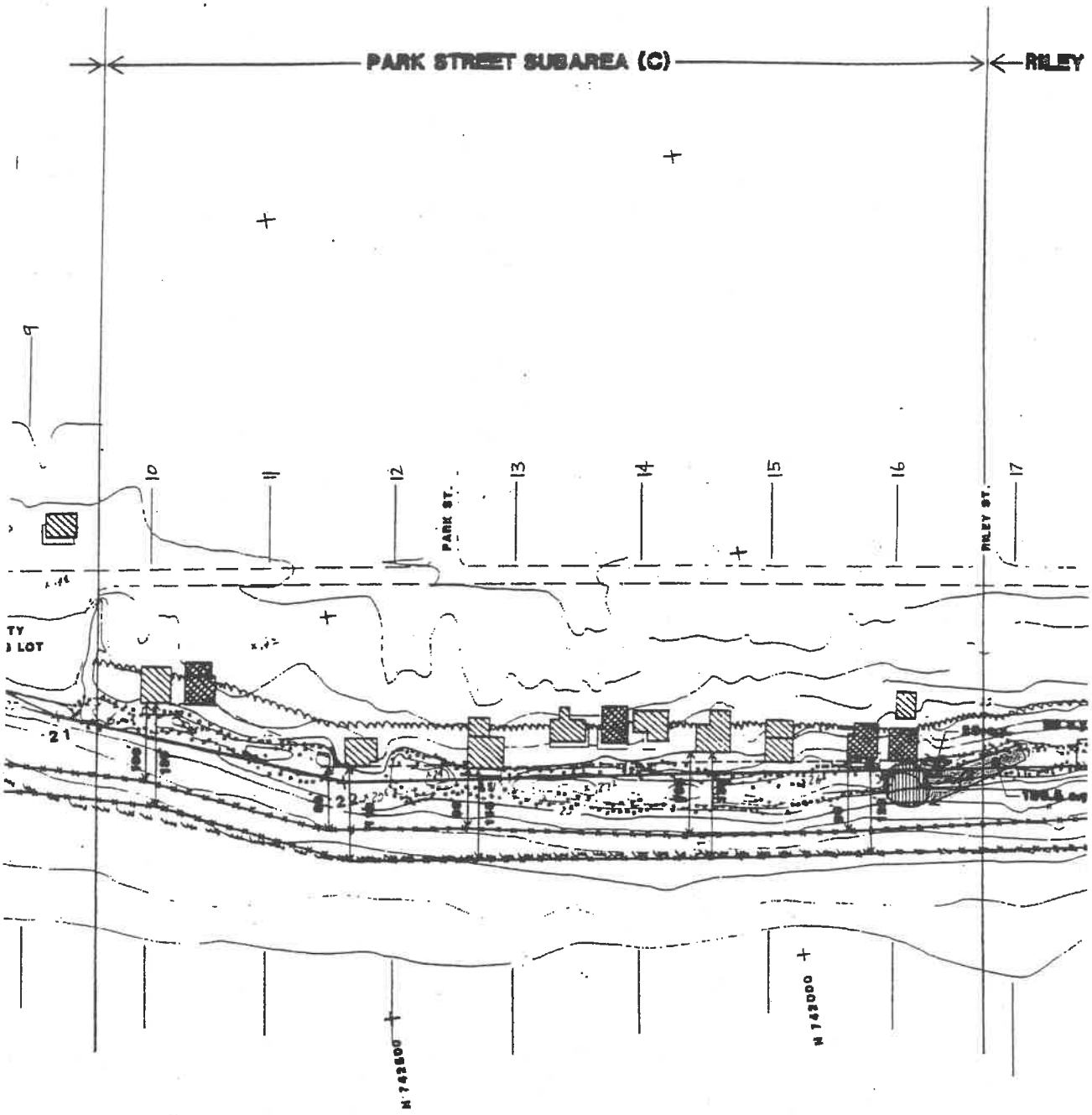
Figure 4: Generalized Cross-Section of Subarea C

Setting

This portion of the foredune has been developed with homes. The foredune itself is low (24-26 feet) and narrow (averaging 115-120 feet in width). The foredune is poorly to moderately vegetated. Cover in backslope areas is 100% but crest areas are about 40-60%, and some graded lots have no cover. The foredune is narrowest and least well vegetated on the north and gradually widens and is better vegetated towards the south.

The condition of the foredune is a result of previous erosion, grading and house construction. The four existing homes north of Park Street are all located on the forward portion of the crest. This has required grading to keep the houses from being inundated with sand. The house immediately north of the end of Park Street is lower than the crest of the foredune on adjacent lands.





GRADING PLAN

SCALE IN FEET

0 50 100 200 300 500

NORTH

LEGEND

- NEWLY FORMING SEAWARD EDGE OF DUNE VEGETATION
- TOE OF BACKSLOPE
- BEACH ZONE LINE
- SAND FENCE
- ESTIMATED BUILDING SETBACK LINE
- AVERAGE CREST OF EXISTING FOREDUNE
- NATURAL & MAN-MADE LOW POINTS (TO BE FILLED)
- AVAILABLE ADJACENT FILL AREAS & DIRECTION OF GRADING

Subarea D: Riley Street Subarea

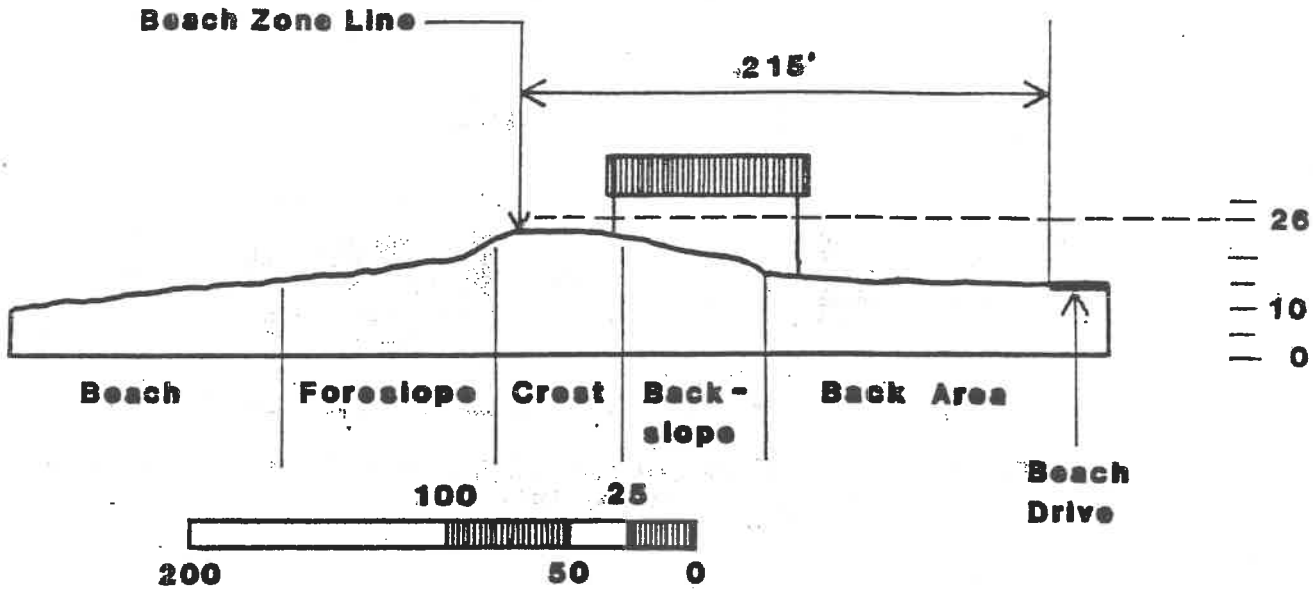


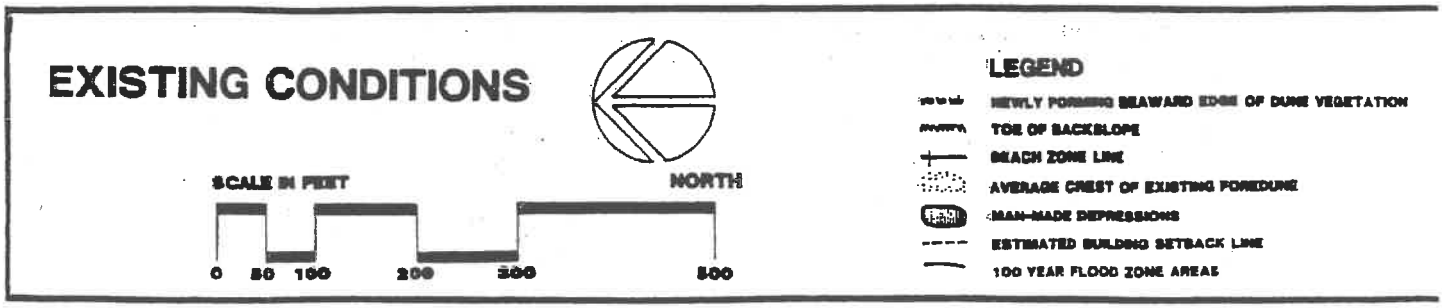
Figure 5: Generalized Cross-Section of Subarea D

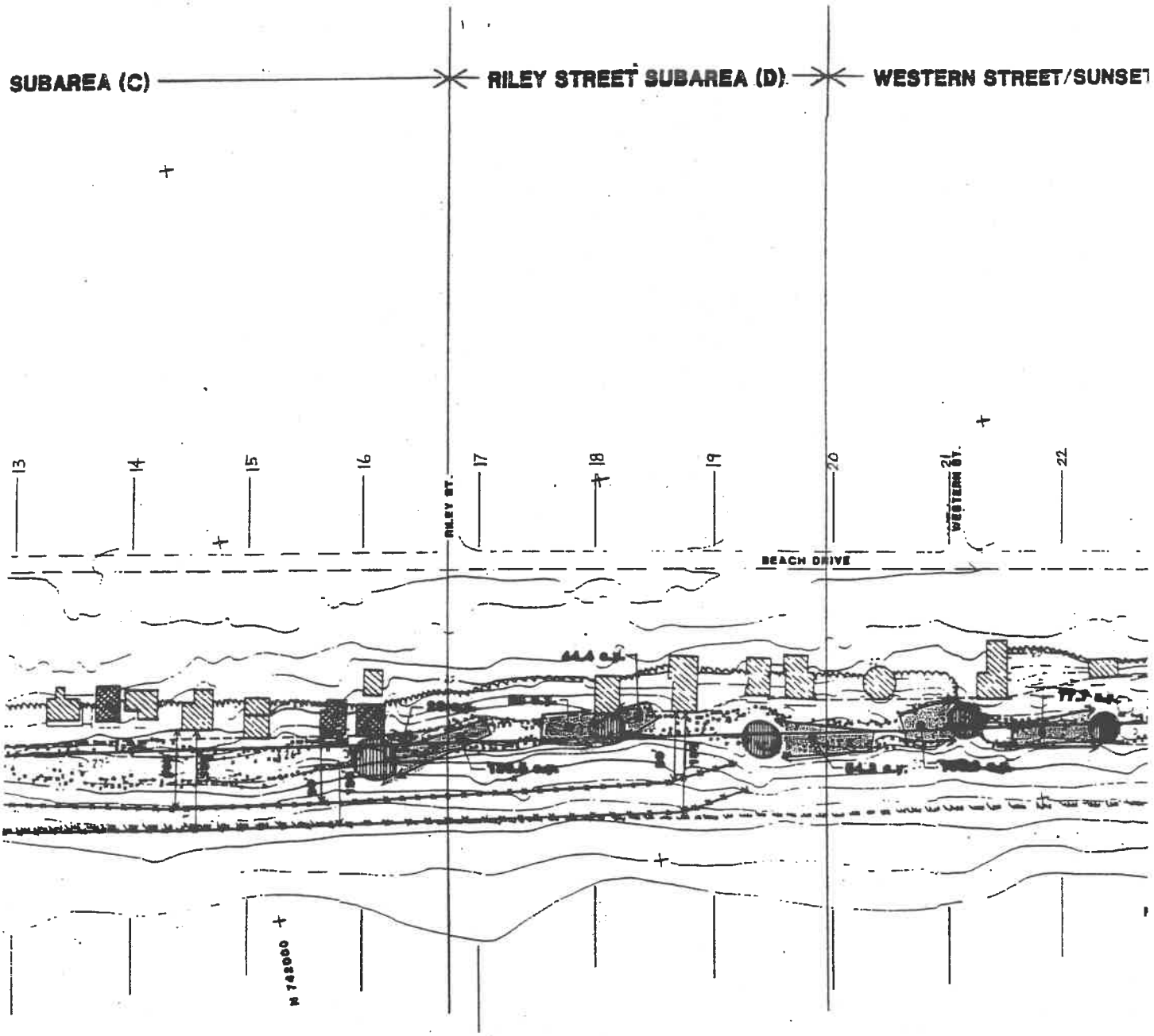
Setting

The foredune in this subarea is very similar to the Park Street subarea (Subarea C) with the following differences:

- The foreslope is noticeably wider (75-80 feet vs. 50-60 feet) and has slightly less beachgrass cover.
- The crest has been recently graded (i.e., within the last two years) in front of several houses in this area. The crest is at approximately 24.5 feet, or 1.5 feet below the approved grading elevation.
- The portion of the foreslope immediately forward of the crest is steeper than the subarea to the north, though both areas are characterized by hummocky foreslopes.

Like the Park Street subarea, Riley Street experienced substantial erosion during winter storms in 1977-78. Figures 6 and 7 illustrate the extent of erosion that occurred. Rip-Rap is now covered by the foredune which has grown seaward of its 1977 location. This seven-year episode of retreat and advance illustrates the dynamic forces at work in foredune areas.





GRADING PLAN

NORTH

SCALE IN FEET

0 50 100 200 300 500

LEGEND

- NEWLY FORMED SEAWARD EDGE OF DUNE VEGETATION
- TOE OF BACKSLOPE
- BEACH ZONE LINE
- SAND FENCE
- ESTIMATED BUILDING SETBACK LINE
- AVERAGE CREST OF EXISTING FOREDUNE
- NATURAL & MAN-MADE LOW POINTS ITO BE FILLED
- AVAILABLE ADJACENT FILL AREAS & DIRECTION OF GRADING

Subarea E: Western Street - Sunset Street

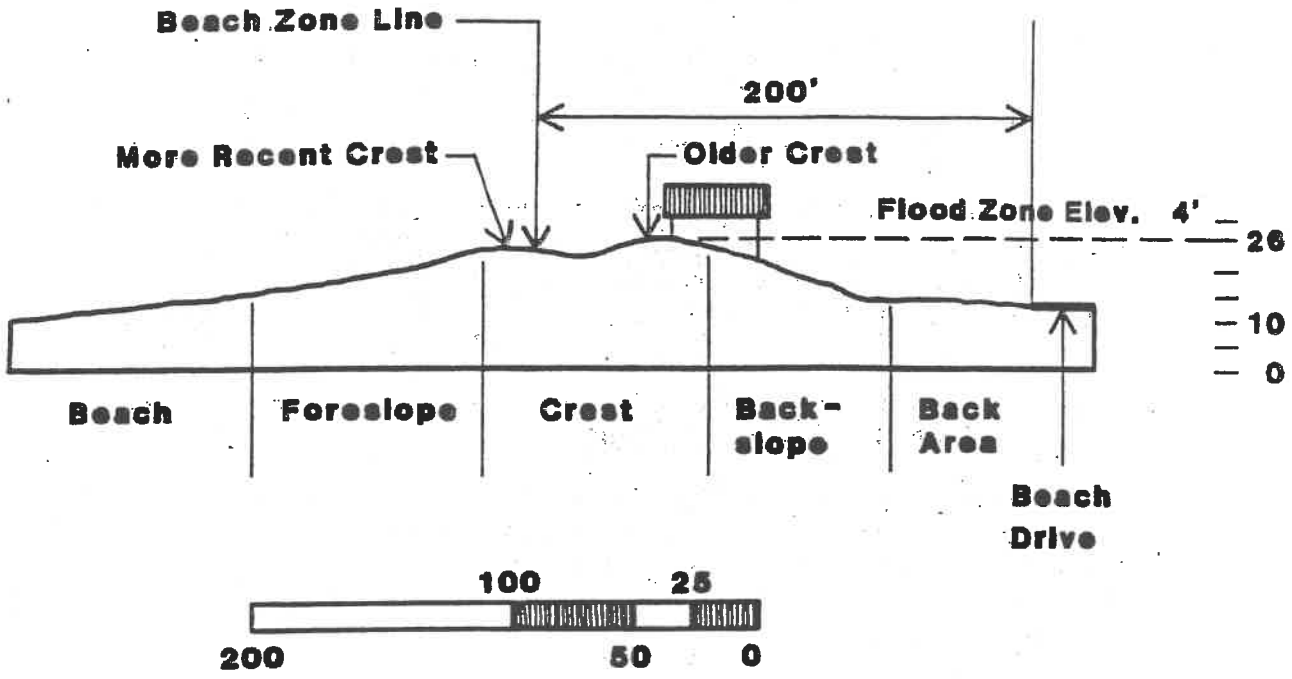
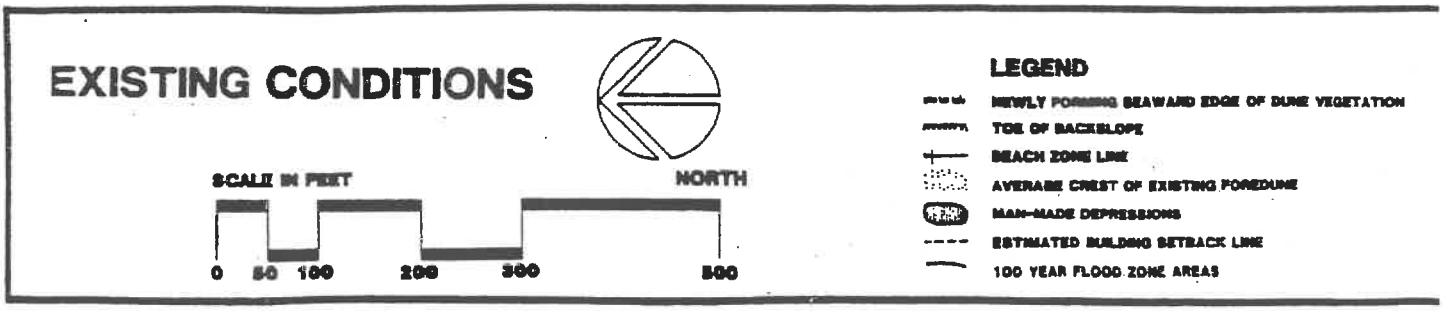


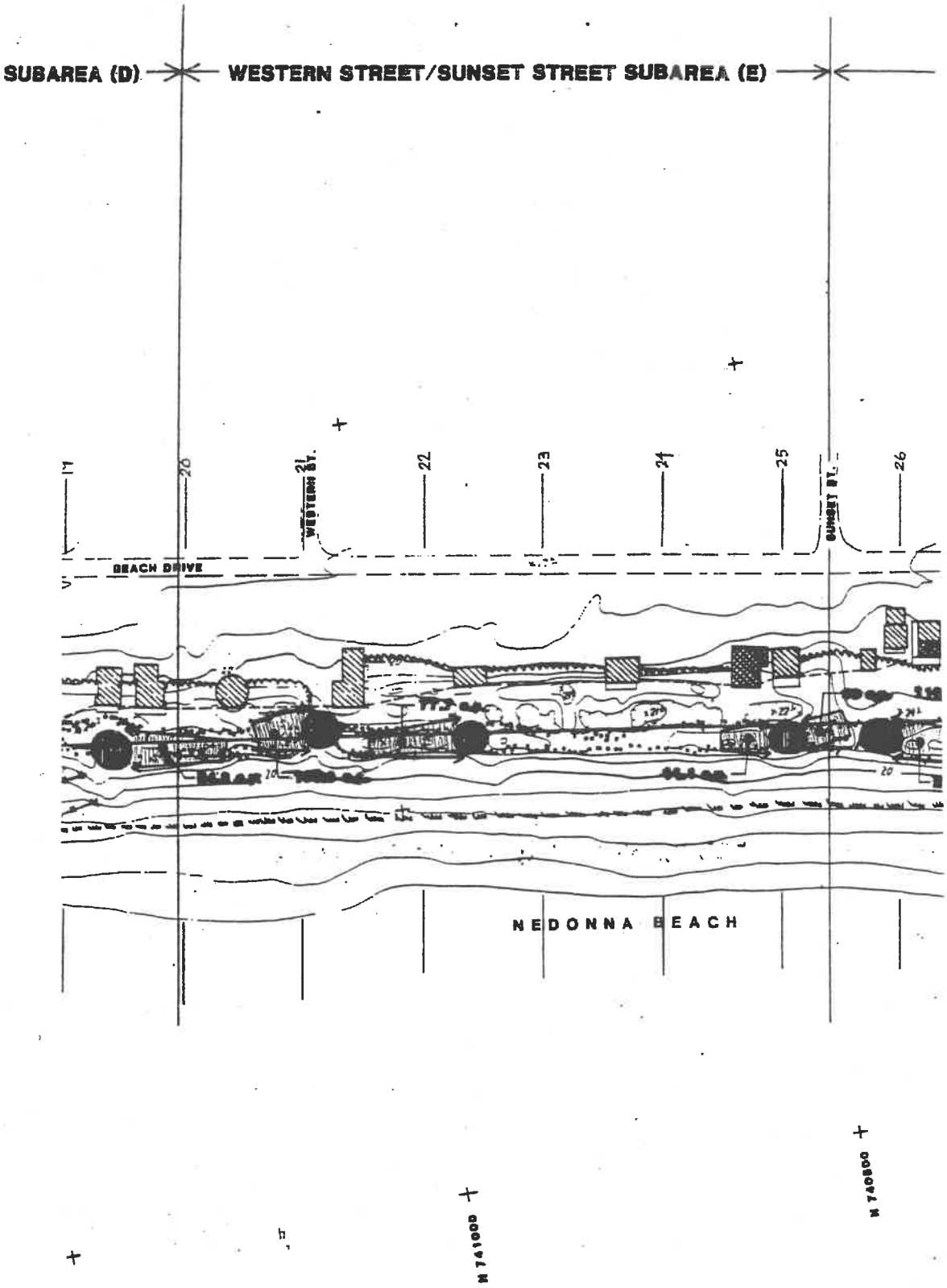
Figure 8: Generalized Cross-Section of Subarea E

Setting

The foredune in this subarea is wider, taller and better vegetated than those to the north. The crest averages 50 feet in width and height varies from 25 to 30 feet. In this subarea, the foredune is progressively wider and better vegetated to the south.

The foredune in this subarea is in better condition than the Riley Street subarea because homes are set back slightly further, there has been less alteration of the foredune, and no ocean erosion has occurred recently. Actually the homes are located on the crest of an older foredune. There is a slight trough in front of this older foredune and an apparent, though poorly formed, crest and foreslope in front of the trough. (See generalized cross section -- Figure 8.)





GRADING PLAN

SCALE IN FEET

0 50 100 200 300 500

NORTH

LEGEND

- RIDGE FORMING SEAWARD EDGE OF DUNE VEGETATION
- TOE OF BACKSLOPE
- BEACH ZONE LINE
- SAND FENCE
- ESTIMATED BUILDING SETBACK LINE
- AVERAGE CREST OF EXISTING FOREDUNE
- NATURAL & MAN-MADE LOW POINTS (TO BE FILLED)
- AVAILABLE ADJACENT FILL AREAS & DIRECTION OF GRADING

Subarea F: Lake St.- Beach St. Subarea

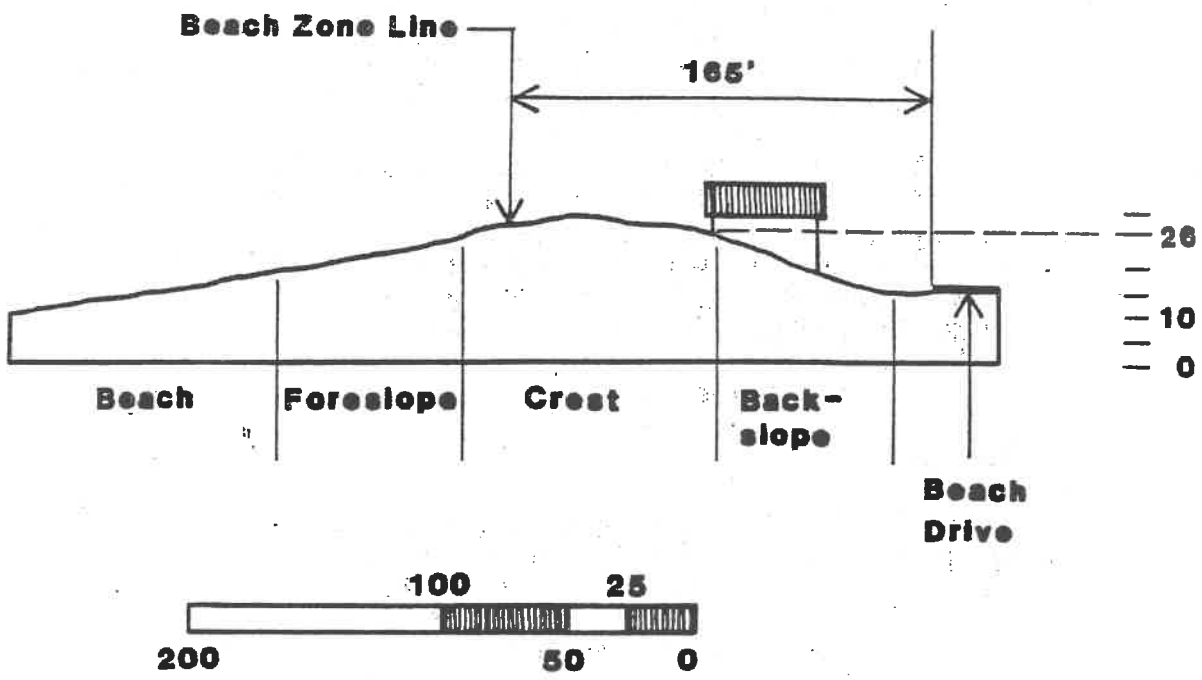


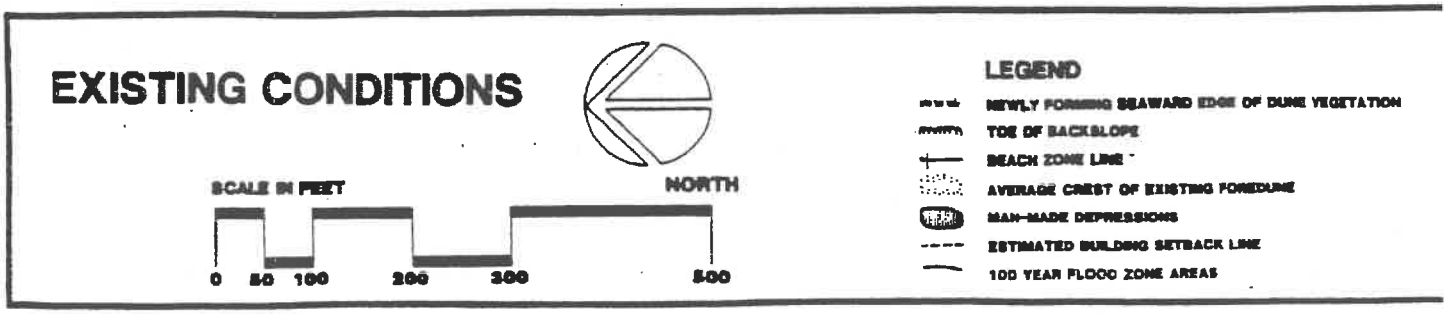
Figure 9: Generalized Cross-Section of Subarea F

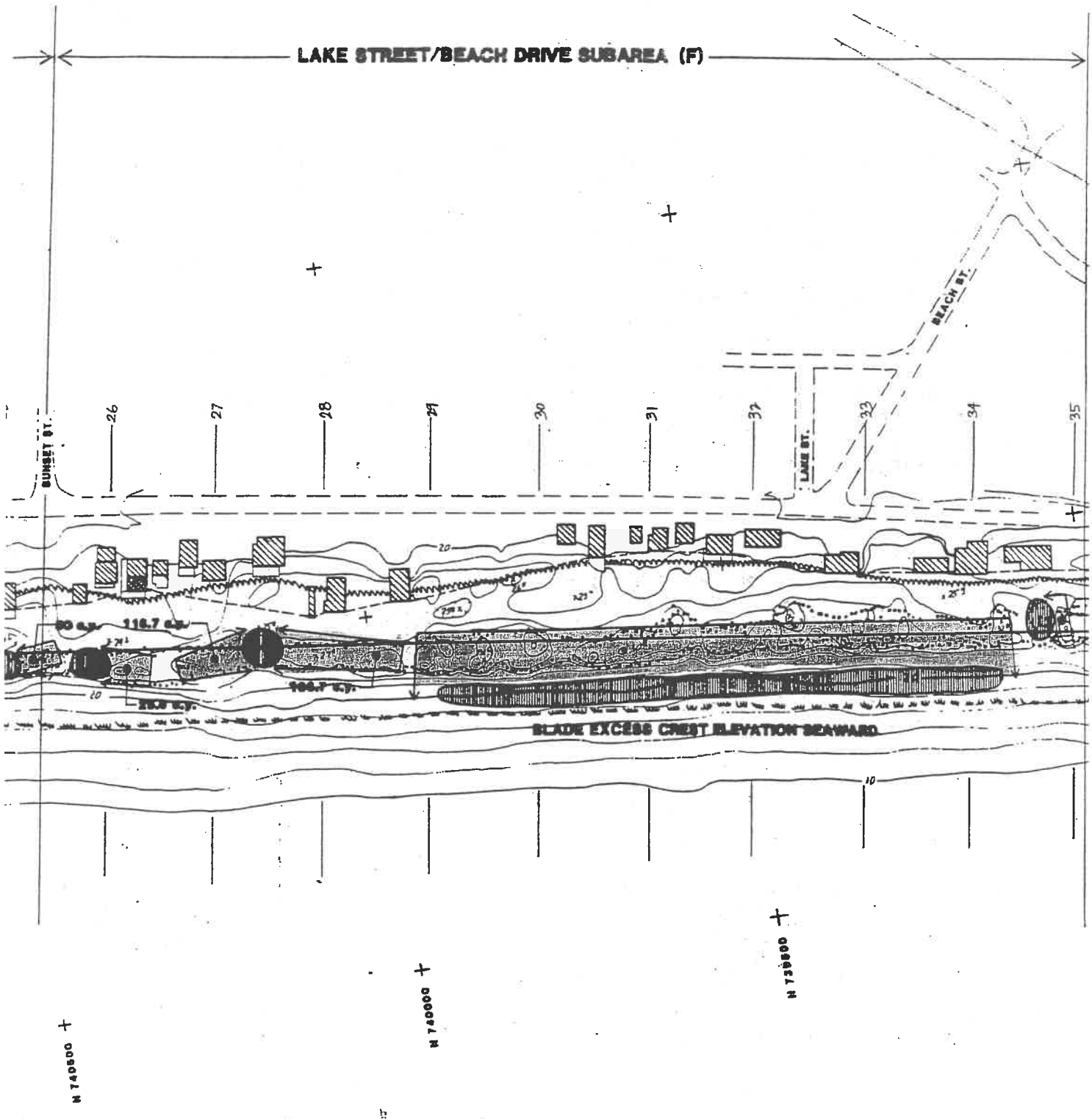
Setting

This stretch of the foredune is consistently higher, wider and better vegetated than the areas to the south. All of the homes in this area are located 25-100 feet landward of the crest. Most are located on an older foredune just west of Beach Drive. These are generally the older oceanfront homes in this subarea. They were apparently built before the present foredune accreted to its current height.

The backslope in this subarea is well vegetated. There is a complete cover of european beachgrass, with a mix of secondary vegetation including some small shorepine. There are also several noticeable depressions in the foreslope.

The crest in this area is wide (100-125 feet), well-vegetated, with an even low-relief characterized by flat areas and numerous low hummocks. The crest on many of the lots has been graded or mowed but the entire area appears to be at or above the recommended crest elevation and the vegetation is in very good condition.





GRADING PLAN

SCALE IN FEET

NORTH

0 50 100 200 300 500

LEGEND

NEWLY FORMING SEAWARD SIDE OF DUNE VEGETATION

TOE OF BACKSLOPE

BEACH ZONE LINE

SAND FENCE

ESTIMATED BUILDING SETBACK LINE

AVERAGE CREST OF EXISTING FOREDUNE

NATURAL & MAN-MADE LOW POINTS (TO BE FILLED)

AVAILABLE ADJACENT FILL AREAS & DIRECTION OF GRADING

5. All areas planted should be fertilized with coarse particle ammonium sulfate commercial fertilizer (21-0-0), applied at a rate of 42 pounds of available nitrogen per acre (one pound per 1000 square feet). (Elephant Brand or its equivalent is recommended because grains are large enough to avoid being blown by wind.) Fertilizer should be applied when the wind is calm and the rain is steady; irrigation may be substituted for rain. The fertilizer should be applied at the time directed by the contracting officer or the authorized representative.

TABLE 1: Transplants Needed With Varied Spacing Requirements

Transplant Type	Spacing	1,000 sq. ft.	one acre
Beachgrass - 3 culms per hill	12"x12"	3,004	130,680
Beachgrass - 3 culms per hill	18"x18"	1,335	58,080
Beachgrass - 3 culms per hill	24"x24"	751	32,670
Beachgrass - 3 culms per hill	30"x30"	480	20,880
Beachgrass - 5 culms per hill	12"x12"	5,006	217,800
Woody species - 1 transparent per hill	3'x3'	111	5,840
Woody species - 1 transparent per hill	6'x6'	28	1,210
Woody species - 1 transparent per hill	8'x8'	16	680
Woody species - 1 transparent per hill	12"x12"	7	302

Note - A word of caution: Always order 3% more to offset heavy planting.

Inspection:

1. Inspections should be made by the contracting officer or his authorized representative. A representative cross section of not less than 5% of the planted areas should be inspected to ensure compliance with the contract requirements.

2. Nonconformance with any specifications classifies a plant hill as unsatisfactorily planted. A tolerance of 5% or 5 unsatisfactory plant hills per 100 is satisfactory. However, any amount over 5% should be applied as an equal percentage reduction of the acreage planted (payments being made on the basis of net acreage). When the deficiencies are 10% or over, the contractor should be expected to take steps to correct them.

Timing:

Planting is recommended between November 15 and April 10. Plantings occurring this time of the year will be most successful because of the abundant rainfall and natural growth pattern of european beachgrass. Beachgrass can be planted at other times of the year, however, additional measures are necessary to assure planting success such as irrigation and fertilization. Usually, it is preferable to delay planting to the November to April season noted above and temporarily stabilize the area by placing rye grass straw (1 inches-2 inches) covered loosely with sand to prevent blow-outs.

Storage:

Plants should be kept in water immediately prior to planting to maintain moisture and proper temperature.

Planting:

Should be done at night or when temperature is below 60 degrees farenheit. Plants should be watered after planting and fertilizing.

Crest Grading:

Limited grading of sand from crest areas above the 26 foot elevation is allowed by this plan. These specifications should be followed carefully to minimize damage to dune vegetation and to stability of the foredune. If done improperly, grading can destroy stabilizing vegetation, cause unwanted sand accretion on adjacent lots and homes, and substantially increase potential for ocean flood damage.

Timing:

1. Grading should generally be done between November 1 and March 15. Beachgrass planted or fertilized subsequent to grading will grow best at this time of the year.

2. Grading may be done at other times of the year but is not encouraged. If grading is done between March 15 and November the foredune should be temporarily stabilized by discing of rye grass straw into the graded crest immediately after grading to prevent wind movement of sand.

3. Planting and fertilization of european beachgrass should be done in the following November-March season. Planting should be done directly into the ryegrass and spacing may be increased to 24 inch centers.

Conditions:

The crest area to be graded must be more than 4 feet above the 100-year flood elevation; in most of the Nedonna area this is the 26-foot elevation (MSL).

Equipment:

A bulldozer with size depending upon the extent of the area to be graded.

Method:

1. The area to be graded should be staked by a qualified individual in advance of grading, so that the operator knows the limits on the area and the depth of grading to occur (setting elevations is simplified by the fact that elevations were marked on most homes in a December 1985 survey by Handforth & Larson Engineers of Manzanita).

2. The management authority should be notified so that a representative can view the staked area, the grading operation, and the completed grading.

3. The bulldozer should get to the lots through the jetty parking lot and along the beach. The bulldozer should minimize crossing the foreslope.

Placement of Graded Sand:

1. The first priority for placement of graded sand is filling of low

In either case sand should simply be pushed onto the foreslope. Where a substantial amount of sand is placed on the foreslope it should be smoothed out to create an even slope. If only a small amount of sand is graded forward, the bulldozer should not attempt to smooth the sand forward on the foreslope.

Tapering:

If the crest of adjacent ungraded lots is more than 4-feet higher or lower than graded lots, the grading should taper the crest into these areas rather than leave a right angle cut at the lot line.

Minimum Area:

Grading should be done over several lots at a time to achieve a uniform crest height throughout. However, grading may be done on a lot-by-lot basis provided all other specifications are met.

Fertilizing:

Areas graded less than 3 feet should be promptly fertilized per the fertilization recommendations for beachgrass plantings. Fertilizer should be applied to graded sand placed on the crest and foreslope as well.

Planting Beachgrass:

Areas graded more than 3 feet in height should be replanted with european beachgrass at 18 inch spacing. Any graded crest area with less than 30% vegetative cover should also be replanted with european beachgrass.

Monitoring:

1. The management authority should inspect the site before and after grading to confirm that grading and other measures have been done in compliance with specifications here.

2. Permits for grading should be conditioned to require reestablishment of vegetation on all areas affected by grading or filling. The management authority should inspect the graded area periodically after grading and recommend remedial measures at those times. Failure to comply should provide for management authority authorization to reestablish vegetation at the permittee's expense.

Mowing Beachgrass:

Mowing of beachgrass is generally discouraged because, once cut, grass temporarily loses most of its ability to trap windblown sand. However, mowing can be an approrpiate management tool to maintain views across the crest or to promote even sand deposition on the foreslope.

General Requirements:

1. Mowing should be done between March and October.

2. Mowing should be done with a "weed-eater" type machine. Grass should be cut as evenly as possible levaing six to eight inches of grass remaining above ground.

3. Mowed areas should be fertilized immediately with 21-0-0 ammonium sulfate at a rate 2 1/2 pounds per 1000 square feet and watered.

Mowing for View Maintenance:

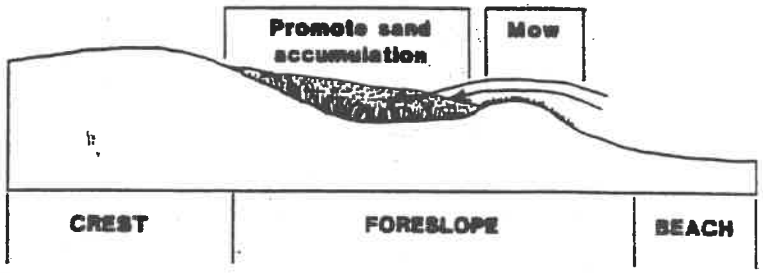
The foreslope should have at least 60% mature unmowed beachgrass cover to assure capture of accreting sand.

Mowing to Promote an Even Foreslope:

Mowing of foreslope vegetation is appropriate where the foreslope is accreting unevenly. Uneven accretion is usually indicated by a trough or a series of hummocks forward of the crest area. The high spots in the foreslope captured some accreting sand with the balance passing through to the crest. Mowing is recommended to allow sand to be captured in low spots to provide a smooth even angle to the foreslope. This technique should promote capture of sand on the foreslope reducing the need for future grading of the crest.

1. Foreslope mowing should only be done when low spots in the foreslope (which will remain unmowed) have at least 60% mature unmowed vegetation. Areas with less than 60% cover should be planted with european beachgrass at 18 inch spacing.

2. Mowed grass should be scattered in unmowed low-spots to promote capture of windblown sand.



Plant grasses on a 24" spacing, mow high area to allow sand to pass through and into low, unmowed area.

Figure 11: Recommendations for Beachgrass Mowing

Timing:

Fencing should be placed from November 15 to January 1 to maximize capture of wind blown sand. Fences may be placed at other times of the year but will fill more slowly.

Beachgrass Planting:

Once the sand fences have filled or substantially filled (i.e., within 6 inches of the top of the fence), beachgrass should be planted according to specifications for beachgrass planting following surface grading to provide an even surface for planting.

- The foreslope (i.e., in front of the seaward sand fence) to a width of approximately 35 feet should be planted at 18-inch centers.
- The crest (between the parallel sand fences) should be planted at 18-inch centers.
- The back portion from the shoreward sand fence approximately 24-feet should be planted on 18-inch centers.

Other:

1. Fences must be repaired if damaged by erosion or vandalism.
2. Signs should be placed at public access points to explain the purpose of sand fencing projects to encourage public cooperation.

Applicability to Other Areas:

The specifications recommended here were drawn up based on a detailed examination of the circumstances at Nedonna Beach. Nonetheless, many of the specifications in the plan can be applied to other developed foredune areas on the Oregon Coast.

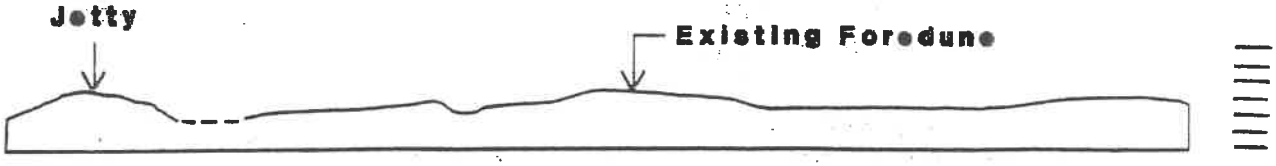
Specifications for foreslope shaping, beachgrass planting, secondary stabilization and accesses through sand fences are applicable to other areas where these measures are determined to be appropriate. Specifications for crest grading and sand fencing are transferable to other developed foredunes with the limitations noted below.

Crest Grading:

Statewide Planning Goal 18 (Beaches and Dunes) requires a complete foredune management plan when crest grading to maintain views is proposed under the Goal. Such grading can only be permitted in presently developed areas where the crest is more than 4 feet above the 100-year flood level. The crest grading recommendations in this plan can be applied to other areas using the specifications in this plan with one exception. This plan allows low spots in the crest to be filled in over-time by planting and fertilization of european beachgrass and allows, natural accretion to filling the gaps. However, the preferred technique is to fill in low spots with graded sand, immediately followed by planting and fertilization of beachgrass. Using beachgrass and natural accretion is appropriate in Nedonna Beach only because the foredune crest is presently at or above the 100-year flood elevation. In other foredune areas where portions of the crest are below the 100-year flood elevation, filling of low spots should be a condition of approval for crest grading.

Sand Fencing:

The specifications for sand fencing are generally applicable to other areas where a plan determines that a new or widened foredune is appropriate. The location of fencing in relation to the shoreline and the foredune should be based on a site-specific investigation. Closer spacing between parallel fences may be appropriate in some areas.



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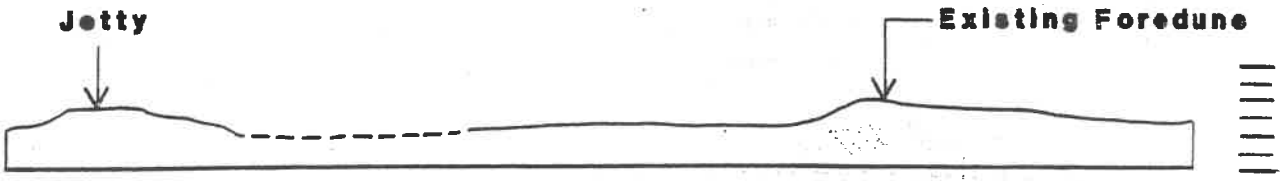

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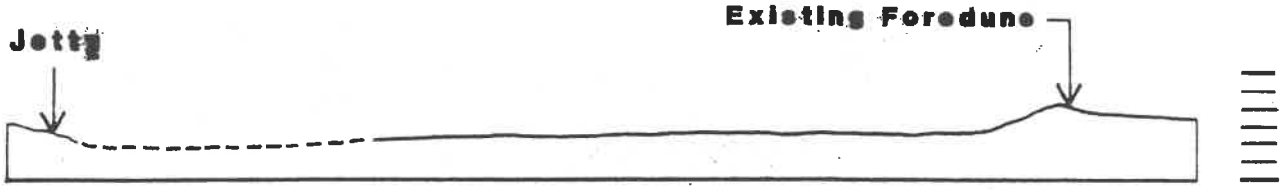

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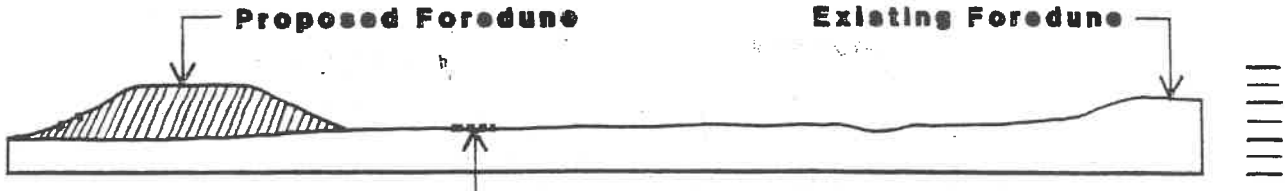

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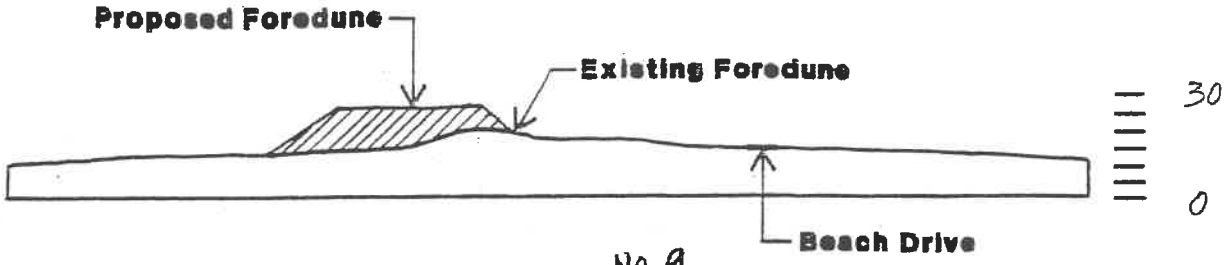
NEDONNA BEACH GRADING PLAN CROSS-SECTIONS



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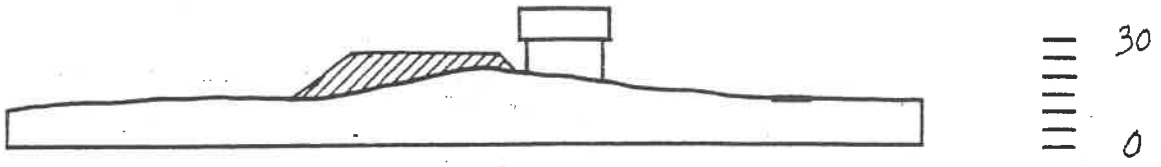

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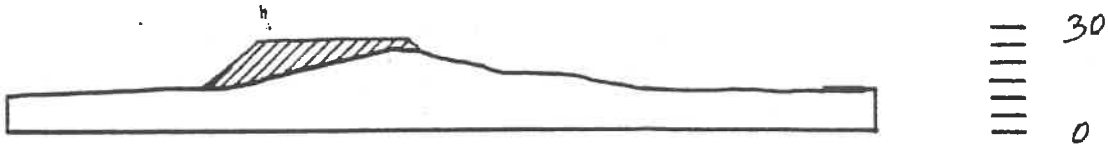

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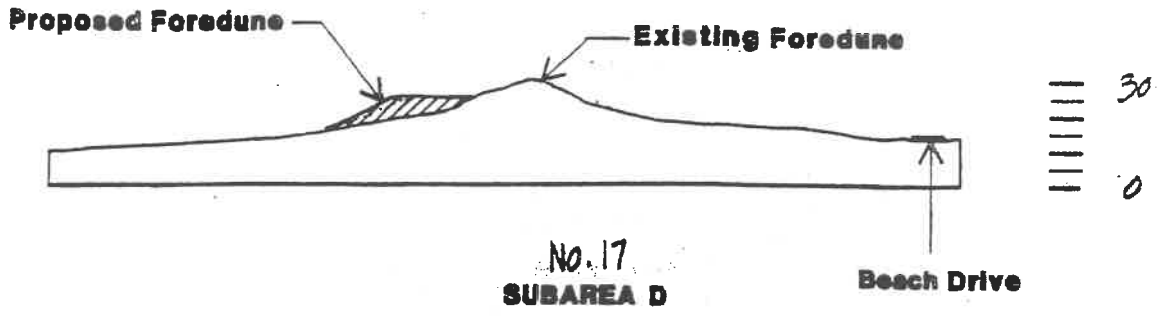

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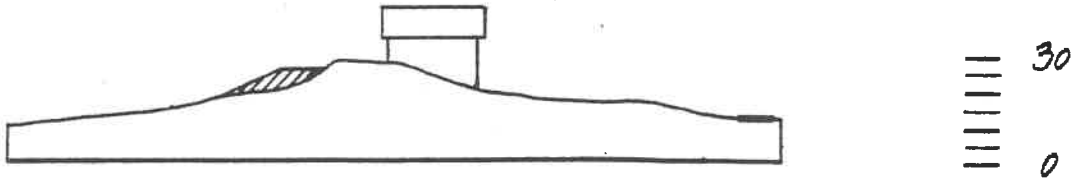

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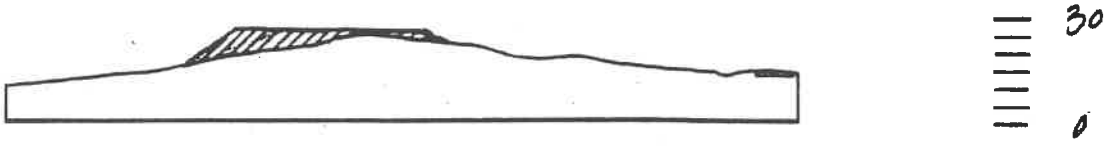

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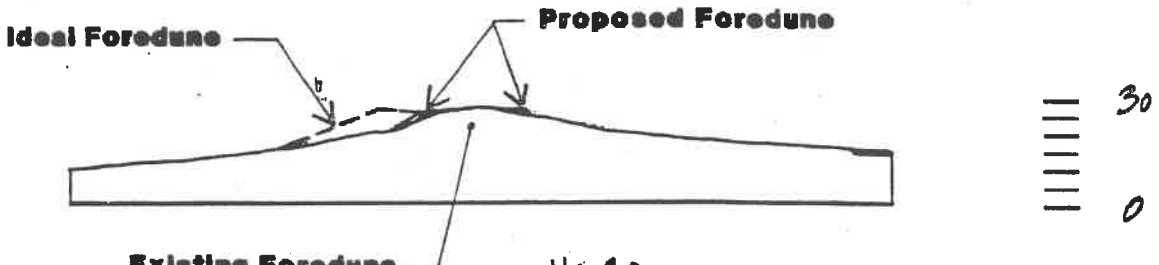

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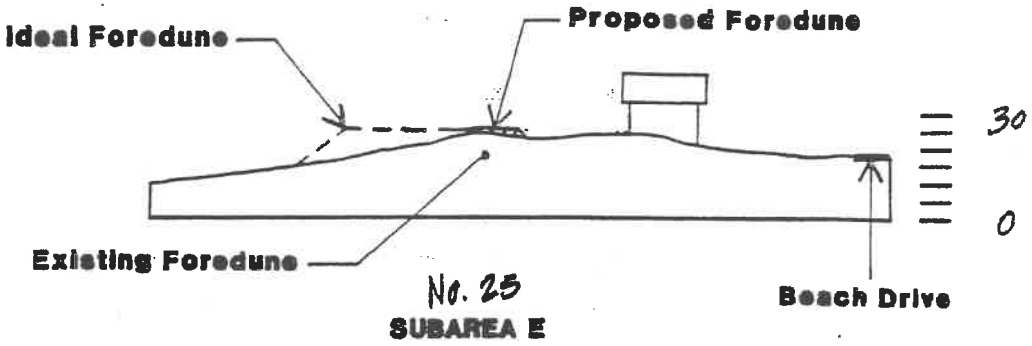

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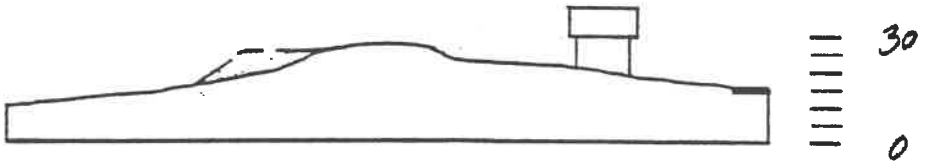

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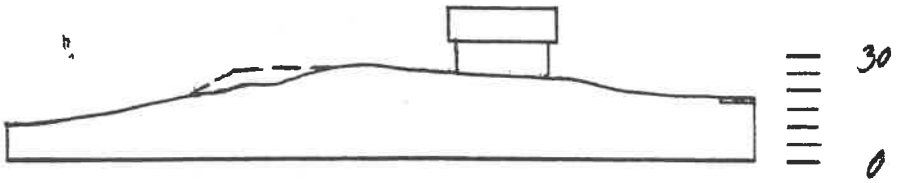

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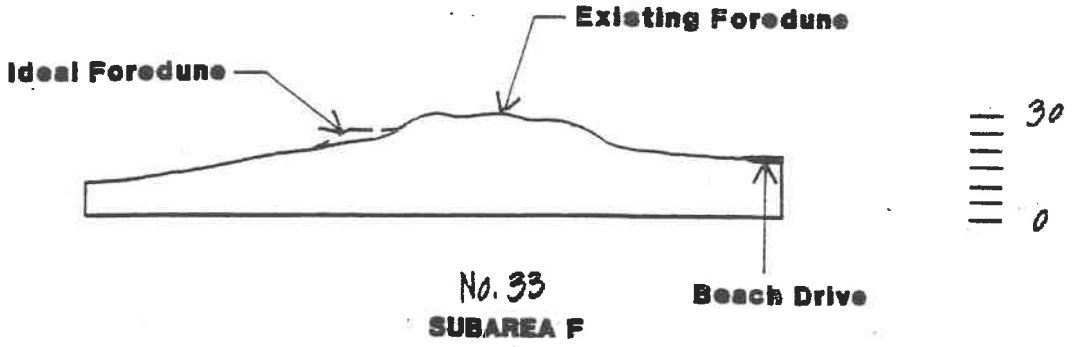

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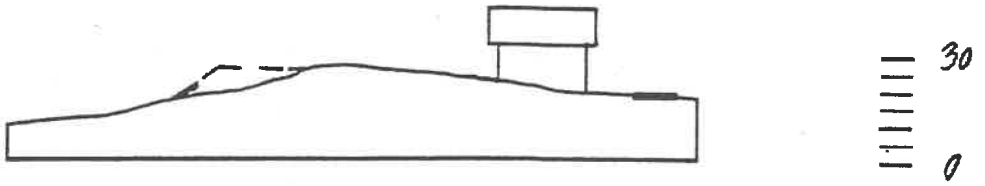

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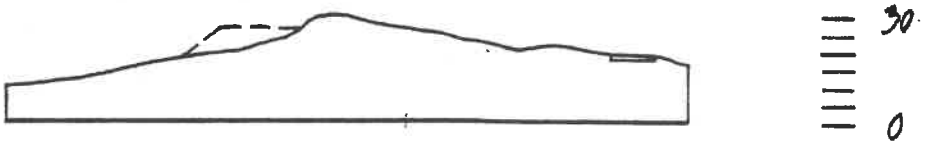

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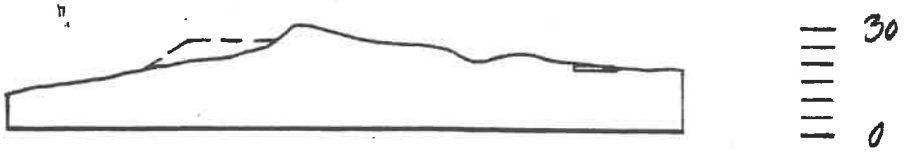

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