

North Jetty Coastline Evolution and Shoreline Engineering, Grays Harbor, Washington

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INTRODUCTION

This study was initiated by the Port of Grays Harbor and the City of Ocean Shores, WA to address ongoing shoreline erosion processes, and sedimentation at the Grays Harbor Federal Navigation Channel. The North Jetty at the entrance to Grays Harbor Estuary, WA was constructed at the beginning of last century (1907) and resulted in major regional changes to the coastline. During the first 40 years post-construction of the jetty, approximately ten miles of sandy beach shoreline, two miles wide north of the jetty, was created by natural sediment transport processes. The accreted land was the base for the creation of the City of Ocean Shores. Since that time the shoreline has been periodically altered by extreme erosion events.

BACKGROUND

Shoreline protection measures and modifications to the North Jetty have been periodically conducted. Significant rehabilitation or modification of the North Jetty has been conducted with a frequency of approximately 25-30 years since its initial construction. After extended periods of no jetty rehabilitation, several shoreline protection projects were required and were constructed on the shoreline at Ocean Shores, north of the North Jetty. Unique rock structures (built 1996) and filled geotextile structures (built 1997 and 2015) have provided short term stabilization solutions. An emergency rock revetment was constructed by the U.S. Army Corps of Engineers (USACE) in the winter of 2015-2016.

Numerous detailed studies have been conducted over the past fifty years to characterize physical process of this region, including specifically at Ocean Shores. Work has included studies by USACE (1974, 2003, 2014), U.S. Geological Survey (USGS), and Washington State Department of Ecology (DOE). These studies included field data collection, analysis, and numerical and physical modeling.

APPROACH

A correlation between the integrity of the North Jetty and the shoreline stability to the north of the jetty along the City of Ocean Shores coastline was determined. The correlation is based on review and analysis of previous data and studies, new field data developed by USACE and DOE, and results of numerical modeling. Using available information, including field data, an empirical relationship between the length of functional (rehabilitated) jetty and shoreline stability was established. It was found that deterioration of the jetty results in shoreline erosion, while rehabilitation of the jetty results with shoreline stability and/or accretion. The empirical relationship was

developed between shoreline condition and jetty deterioration (effective length). A new design approach, based on this relationship, was developed for shoreline erosion protection. The new method considers selected rehabilitation of the North Jetty in key areas to the design grades, instead of placement of any structure on the sandy beach shoreline or major rehabilitation of the jetty. Further, this approach was validated with analysis and numerical modeling. The economic and environmental benefits of this approach are significant. It was estimated that effort for selected rehabilitation of the jetty is significantly less than that for protection of several miles of shoreline. This engineering solution was developed with the aim to continue to maintain the shoreline without placement of rock on the beach or other designated habitat areas, and reducing the amount of sediment to the USACE Navigation Channel. The North Jetty Technical Committee (comprised of local, state, and federal agencies), which was created to assess risk to infrastructure, shoreline processes, and risk to navigation, has approved the new design approach. A request was given to state congress for authorization of the budget.



Figure 1 - Grays Harbor North Jetty on the Pacific Ocean

REFERENCES

- USACE (1974): Design Memorandum: North Jetty Rehabilitation. Grays Harbor and Chehalis River, Washington
- USACE (2003): North Jetty Performance, and Entrance Channel Maintenance, Grays Harbor Washington.
- ERDC/CHIL TR-03-12.
- USACE (2014): Grays Harbor, Washington Navigation Improvement Project General Investigation Feasibility Study