Research Project Work Plan

for

CLIMATE CHANGE IMPACT ON COASTAL RIVER ESTUARIES IN OREGON

SPR-719

Submitted by

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for

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1.0 Identification

1.1 Organizations Sponsoring Research

Oregon Department of Transportation (ODOT)
Research Unit
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Federal Highway Administration (FHWA)
Washington, D.C. 20590

1.2 Principal Investigator(s)

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1.3 Technical Advisory Committee (TAC) Members

Kami Ellingson, U.S. Forest Service
Barbara Ellis-Sugai, U.S. Forest Service
Matthew Mabey, ODOT Research
Steve Gisler, ODOT Region 2
Rob Piehl, U.S. Forest Service
Dan Bottom, NOAA
Marjorie Lifsey, ODOT Sustainability Program
Jerry Wolcott, ODOT Region 2

1.4 Friends of the Committee (if any)

Vivian Payne, ODOT Region 2

1.5 Project Coordinator

Matthew A. Mabey

1.6 Project Champion

Gail Achterman, Oregon Transportation Commission Chair

2.0 Problem Statement

U.S. Route 101 and other ODOT highways traverse numerous estuaries along Oregon's coast. These roadways affect, and in turn are affected by, changes in the function of the estuary caused by both the presence of the roadway as well as changes in sea level. Likewise, future climatic changes may also affect the function of both the roadways and the estuaries. A great deal of money and effort continues to be focused on restoring estuaries to their more natural function. To validate present methods, develop improved future methods, and to adapt to changing future conditions it is important to monitor conditions in the estuaries and along the roadways.

2.1 Background and Significance of Work

3.0 Objectives of the Study

It is proposed that ODOT monitor the physical processes, habitat, biota, and the roadway features of the Salmon River Estuary to better understand the effects of changes to ODOT's facilities and various restoration efforts as well as sea level rise and climate change. The proposed data will be targeted to form the foundation for ODOT's efforts to maintain the function of the coastal roadway system and to fulfill our obligation as environmental stewards. The Salmon Estuary has been selected from the many estuaries crossed by ODOT highways because of the existence of past monitoring and changes that are already planned for the highway.
The Objective of this research is to improve our understanding of the interactions of ODOT's facilities with estuary system. Specifically the intent is to gather data to verify that changes in ODOT's facilities and in the estuary produce the expected results or give new understanding to what really happened.

3.1 Benefits

By monitoring conditions and changes in the Salmon River Estuary we will better understand ho the roadway/estuary system functions and how it responds to changes of all kinds (restoration, climate, sea level, construction). With this understanding ODOT will be

better able to protect, maintain, improve, and construct these roadways. Our ability to do this while protecting the environment and enhancing ecosystem function will also be improved. Agriculture in the estuaries will benefit as well. In general we will be able to make more informed responses to current and future changes to fulfill our agency mission.

4.0 Implementation

It is anticipated that the data from this monitoring will inform and guide on-going construction and maintenance where highways cross estuaries up and down Oregon's coast. This result should come about through changes to design manuals and guides. Likewise the results may influence changes to maintenance practices in response to what is learned. It is also possible that what is learned about changes occurring along the cost will influence planning and transportation improvement projects.

5.0 Research Tasks

The main focus of the monitoring proposed for this research project is the hydrology of the estuary around the highway. Conceptually this project will monitor flow and stage at a number of locations influenced by and, in turn, influencing the highway and related structures. Additional physical parameters such as water temperature and water salinity will also be monitored at those sites. Settlement, aggradation, degradation, channel migration and avulsion are also intertwined with the hydrology. Therefore elevation data will be collected in and around the highway and monitoring sites to track changes due to those phenomena. A baseline data set of airborne lidar elevations has already been collected by the U.S. Forest Service. Participation in a future repeat collection of lidar data is also a possibility, but not currently programmed.
Monitoring biological parameters such as vegetation, invertebrates, fish use and movement, fish diets, consumption rate and growth is only incorporated as a tentative task. It is anticipated that other agencies, or others in ODOT, will conduct complimentary biological monitoring. Baseline information now exists and this information can be supplemented in the future should the need arise.

Task #1: Install water monitoring equipment.
Instrumentation for monitoring water levels and water quality will be installed in the Salmon River Estuary around U.S. Route 101.
Elevation profiles will also be collected in the estuary.
Time Frame: Summer 2011
Responsible Party: ODOT
Cost: $65,000
Deliverable: Installed instrumentation collecting data for the monitoring.
TAC Decision/Action: None

Task #2: Collect data from water monitoring equipment and monitor elevations.
Over a period of 10 years data will be collected regarding the water levels and water quality in the estuary around US Route 101.
Repeated elevation profiles will also be collected periodically.

Time Frame: 2011 to 2020
Responsible Party: ODOT
Cost: $191,000
Deliverable: Water level and water quality data for the Salmon River Estuary around U.S. Route 101.
TAC Decision/Action: None

Task #3 : Produce 5-year report

The data from the first five years of the project will be tabulated and summarized. The report might potentially include recommendations for additional monitoring activities.

Time Frame: The report will be completed by October 1, 2016
Responsible Party: ODOT
Cost: $1,000
Deliverable: A summary report
TAC Decision/Action: Review of the report and comments regarding recommendations for supplemental monitoring.

Task #4: Refurbish equipment

After five years in a brackish water environment, much of the equipment will need to be refurbished or replaced. Additionally, there may be additional information that is desired or new technology available.

Time Frame: June 2016
Responsible Party: ODOT
Cost: $40,000
Deliverable: New, refurbished, or enhanced instrumentation for monitoring.
TAC Decision/Action: None

Task #5: Repeat elevation measurements.

This is a tentative task. Conceptually, a collaborative repeat of the airborne lidar elevation data might be collected.

Time Frame: Summer 2018 or 2019
Responsible Party: To be determined.
Cost: Not budgeted at this time.
Deliverable: To be determined.
TAC Decision/Action: The TAC would be instrumental in making the decision to collect actually pursue this task.

Task #6: Repeat biologic assays of marshes.

Baseline information existed at the beginning of this project. Repeats of a variety of biological information might be useful, especially if significant changes are made to the structure of U.S. Route 101. It is hoped that others, either outside or inside ODOT, will pursue this type of information. If not, it may be desirable to collect this information.

Time Frame: As dictated by circumstances.
Responsible Party: To be determined.
Cost: Not budgeted at this time.
Deliverable: To be determined.
TAC Decision/Action: [What action, if any, the Technical Advisory Committee will take, concerning the deliverable]

Task #7: Produce 10-year report

A comprehensive report summarizing and analyzing the data collected over the first ten years of the project will be compiled. The report will also making recommendations regarding continued monitoring and data collection. The implications of what was observed for maintaining and modernizing Oregon's highway system where it interacts with estuaries and the ocean should be clearly articulated.

Time Frame: April 2021
Responsible Party: ODOT
Cost: $8,000
Deliverable: A comprehensive report summarizing and analyzing the data collected over the 10 years of the project.
TAC Decision/Action: Review of the 10-year report and a recommendation regarding continued monitoring.

Task	Responsible Party(ies)	Cost
Task #1: Install water monitoring equipment Instrumentation for monitoring water levels and water quality will be installed in the Salmon River Estuary around U.S. Route 101. Elevation profiles will also be collected in the estuary. *Time Frame:* Summer 2011 *Deliverable:* Installed instrumentation for collecting data for the monitoring project *TAC Decision/Action:* None	ODOT	$65,000
Task #2: Collect data from water monitoring equipment and monitor elevations Over a period of 10 years data will be collected regarding the water levels and water quality in the Salmon River estuary around U.S. Route 101. Repeated elevation profiles will also be collected. *Time Frame:* 2011 to 2020 *Deliverable:* Water level and water quality data for the Salmon River Estuary around U.S. Route 101. *TAC Decision/Action:* None	ODOT	$191,000
Task #3: Produce 5-year report The data from the first five years of the project will be tabulated and summarized. The report might potentially include recommendations for additional monitoring activities. *Time Frame:* October 2016 *Deliverable:* A summary report *TAC Decision/Action:* Review of the report and comments regarding	ODOT	$1,000

recommendations for supplemental monitoring. *Task #4:* Refurbish equipment After five years of in a brackish water environment, much of the equipment will need to be refurbished or replaced. Additionally, there may be additional information that is desired or new technology available. *Time Frame:* June 2016 *Deliverable:* New, refurbished, or enhanced instrumentation for monitoring *TAC Decision/Action:* None	ODOT	$40,000
Task #5: Repeat lidar measurements This is a tentative task. Conceptually, a collaborative repeat of the airborne lidar elevation data might be collected. *Time Frame:* Summer 2018 or 2019 *Deliverable:* To be determined *TAC Decision/Action:* The TAC would be instrumental in making the decision to actually pursue this task	To be determined	Not budgeted
Task #6: Repeat biologic assays of marshes *Time Frame:* As dictated by circumstances *Deliverable:* To be determined *TAC Decision/Action:* The TAC would be instrumental in making the decision to actually pursue this task	To be determined	Not budgeted
Task #7: Produce 10-year report A comprehensive report summarizing and analyzing the data collected over the first ten years of the project will be compiled. The report will also making recommendations regarding continued monitoring and data collection. The implications of what was observed for maintaining and modernizing Oregon's highway system where it interacts with estuaries and the ocean should be clearly articulated. *Time Frame:* April 2020 *Deliverable:* A comprehensive report summarizing and analyzing the data collected over the 10 years of the project *TAC Decision/Action:* Review of the 10-year report and a recommendation regarding continued monitoring	ODOT	$8,000

6.0 Time Schedule

It is the intent that this project monitor the hydrology and of the Salmon River Estuary for a minimum of 10 years. Duration of monitoring can be easily extended, or shortened, as determined by circumstances.

Project Tasks	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020
Task 1: Install water monitoring equipment Deliverable: None										
Task 2: Collect data from water monitoring equipment and monitor elevations Deliverable: None										
Task 3: Produce 5-year report Deliverable: A report summarizing the data collected						*				
Task 4: Refurbish equipment Deliverable: None					*					
Task 5: Repeat Lidar Deliverable:										
Task 6: Repeat biologic assays of marshes Deliverable:										
Task 7: Produce 10-year report Deliverable: A comprehensive report summarizing and analyzing the data collected										*

*Deliverables

7.0 Budget Estimate

An itemized budget for the project is included here, showing expenditures for each item by fiscal year and in total. The total cost is estimated at $305,000. This amount budgets for some replacement and rehabilitation of equipment over the course of the project.

	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	Total
Personnel	$15,000	$7,000	$20,000	$20,000	$21,000	$22,000	$22,000	$23,000	$23,000	$25,000	$27,000	$225,000
Travel												
Services and Supplies												
Capital Equipment		$40,000				$40,000						$80,000
Total Project Costs												$305,000