



September 5, 2014
Project No. 3-915-17568-A

Grays Harbor County
100 West Broadway, Suite 31
Montesano, WA 98563-3614

Attention: Kevin Varness

Subject: Kersh-Wishkah Floodwall Project Design Basis
Grays Harbor County, Washington

Dear Kevin:

1.0 INTRODUCTION

AMEC Environment & Infrastructure, Inc. (AMEC), is assisting Grays Harbor County in design and permitting for flood control measures recommended to reduce flooding along the portion of Wishkah Road from milepost 2.2 to 2.7. The solution will be to construct a floodwall with integrated tide gates to collectively serve as a flood barrier between the Wishkah River and Wishkah Road. This memorandum lays out the project goals, background, and other considerations that will serve as the basis for design of the flood reduction measures.

1.1 Background

Severe damage and major financial losses have resulted from recurring floods in the Chehalis River Basin. Following particularly devastating floods in 2007, both state and local government agencies have recognized the need to coordinate the study, analysis, and implementation of flood control measures throughout the Chehalis River Basin. As a result, the Washington State Legislature created the Chehalis Basin Flood Control Authority (Flood Authority) in 2008. The Flood Authority comprises representatives from Lewis, Thurston, and Grays Harbor Counties; the cities of Chehalis, Centralia, Montesano, and Aberdeen; the Confederated Tribes of the Chehalis Reservation; and the towns of Pe Ell and Bucoda. The state has allocated millions of dollars to the Flood Authority, and the Kersh-Wishkah Floodwall project is funded entirely through this source. The Flood Authority hosts a web page for each of the funded projects. The web page for this project can be accessed at https://www.ezview.wa.gov/site/alias__1747/34386/DesktopDefault.aspx.

The project site is located north of the City of Aberdeen, Washington, between Wishkah Road and the Wishkah River. A section of Wishkah Road approximately 2,700 feet long, between milepost 2.2 and 2.7, has flooded repeatedly during high river and/or high tide levels. When the road floods to a depth that poses a public safety risk, Grays Harbor County closes the road. Because a similar low-lying and

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flood-prone stretch of Wishkah Road exists farther to the north, there are times when approximately 86 homes between these two sections of Wishkah Road are inaccessible to emergency vehicles. This periodic lack of access for emergency responders is the primary concern that the floodwall project along this stretch of Wishkah Road will address.

1.2 Purpose and Objective

The objective of this project is to design a floodwall and obtain the necessary construction permits so that the wall can be built to prevent flooding of Wishkah Road for the purpose of keeping the road open during high water events. With the flood protection structure in place, the road would be open to all normal traffic, providing unimpeded travel for emergency vehicles.

The floodwall's primary purpose is to serve as a flood barrier between the Wishkah River and Wishkah Road. Tide-gated outlets will need to be established in the floodwall to provide drainage pathways to the river. These tide gates would automatically close when the water level in the river gets too high. Water currently discharges from west to east through seven culverts under Wishkah Road in the project site. The tide-gated outlets will allow the water to flow to the river any time that the water level in the river is lower than the water level on the road side of the floodwall.

1.3 Project Scope

The scope of this project is to design the floodwall, necessary drainage features, and habitat improvements and to obtain permits to get the project to shovel-ready status. The current project scope includes the following phases:

- Property acquisition,
- Data acquisition,
- Permitting,
- Design, and
- Project Management.

Two parcels exist between the road and the river and need to be acquired by Grays Harbor County for the project to proceed into the permitting and construction phases.

Data acquisition tasks include field work needed to identify and inventory wetlands, watercourses, fish, cultural artifacts, and historic structures. Permits will be required at the local, state, and federal level. The Grays Harbor County pre-application permit process identified the following required permitting documents:

- Joint Aquatic Resources Permit Application (JARPA) form,
- State Environmental Policy Act (SEPA) environmental checklist,
- Information to support a variance permit in accordance with Washington Administrative Code (WAC) 173-27-170 and Grays Harbor County Code 18.06.040,
- Special study regarding bull trout critical habitat, and
- Special study regarding wetlands.

Additional state and federal approvals that will be needed were identified in the previous phase of the project. We do not expect that requirements of the National Environmental Policy Act (NEPA) apply. Designs will be made available to Grays Harbor County for review at the 30%, 60%, and 90% levels before being finalized. Periodic updates will be made available to the Flood Authority. The updates, designs, and other documents submitted to the Flood Authority are typically made publicly available through the project web page hosted by the Flood Authority.

1.4 Project Schedule

The current project scope entailing design and permits is scheduled to be completed by the end of April, 2015. In the fall of 2014, the state legislature may allocate funding for the construction phase of the project, which could be made available as soon as July 2015.

2.0 EXISTING DATA

The project site is located within a floodplain and an area of fine-grained soils. The site is also subject to high rainfall, a marine climate, and tidal influence and is zoned for low-density rural residential and agricultural uses. Individual sources of data are referenced within the Alternatives Analysis and the studies listed below.

2.1 Alternatives Analysis

The Analysis of Alternatives was performed by AMEC in the previous phase of the project. During that process, a geotechnical investigation was performed, and included as an appendix to the report, that concluded that the soils at the site are subject to ongoing settling. Therefore adding significant fill to either raise the road or construct a levee would not be a viable long-term option. AMEC recommended

constructing a floodwall in order to provide the needed protection without adding significant weight, thereby minimizing the chance that the wall will exacerbate or accelerate the settlement of the soils.

2.2 Studies

At this phase of the project, completed studies or inventories include:

- Topographic Survey,
- Cultural Resources Assessment,
- Aquatic Resources Inventory,
- Phase I Environmental Site Assessment (ESA) for 3022 Wishkah Road,
- Phase I & Phase II ESA for 3134 Wishkah Road,
- Appraisals for 3022 and 3134 Wishkah Road,
- Wetlands and Streams Critical Areas Report, and
- Flood Modeling and Statistical Analysis.

The Topographic Survey was completed by Berglund, Schmidt, and Associates as a sub-consultant to AMEC. The Cultural Resources Assessment summarizes the steps taken to investigate the potential for cultural or historic resources to be impacted by this project. No significant findings were made. The Aquatic Resources Inventory identified the presence of salmonids west of Wishkah Road where ungated culverts pass under it. The Phase I study at 3022 Wishkah Road identified no signs of contamination. The Phase I study at 3134 Wishkah Road identified contamination concerns. The Phase II study there identified two small areas of lead-contaminated soils. The Wetland and Streams Critical Areas Report delineated the extent of wetlands and rated them. This information is necessary for the permitting process.

The work completed during the Alternatives Analysis phase of the project revealed that the Federal Emergency Management Agency (FEMA) has not completed a detailed study of the Wishkah River floodplain upstream of the city limits of Aberdeen, which is about 0.8 mile downstream of the project site. The site is subject to flooding from both riverine and tidal sources, which makes the necessary analysis much more complicated than if the site was influenced by high water from only one of these sources. Analysis of river flow and flood scenarios was recently completed by Coast and Harbor Engineering (CHE), a division of Hatch Mott MacDonald, as a sub consultant to AMEC, and is presented in Appendix A. The Flood Modeling and Statistical Analysis report determined the high water level that has a 1% chance of happening in a particular year. This water height will be considered when designing the elevation of the top of the proposed floodwall.

3.0 DESIGN ELEMENTS

This section outlines key project elements and design criteria that must be addressed.

3.1 Project Design Life

Russ Esses, County Engineer for Grays Harbor County, requested that the project have a design life of 100 years. It is not common for the design life of a floodwall to be greater than 50 years. It is conceivable that a design life less than 100 years may have to be considered if the amount of available funding falls short of what is needed to construct the project with the desired design life. This tradeoff between budget and design life will be finalized at the 60% design level, when specific floodwall materials will be evaluated, along with their costs. Regardless of the duration used for the project design life, Grays Harbor County will need to accept the responsibility for future maintenance, operation, and replacement costs. Russ Esses has also indicated that the project should be designed to minimize maintenance and operation costs, and that required maintenance and operation should require no specialized knowledge or training to perform, since Grays Harbor County intends to use available County Public Works staff to carry out these tasks.

3.2 Floodwall

The floodwall alternative was selected over options that required fill because it offers the least potential for settlement over time compared to the other options. Still, concerns remain that the wall could settle in some places over time even though the floodwall will not add a significant amount of new loading to the site's supersaturated soils. Portions of the wall will likely contact bedrock and thus would not be subject to settlement. The wall system to be selected must be able to handle the design high water elevation and consider the potential for both rising sea levels and settlement of the soils. The corrosivity of the soil must be estimated in order to forecast the useful design life of the materials being considered, if the materials are subject to corrosion. As identified in the Alternatives Analysis, it doesn't make sense to make the top of the floodwall any higher than 16 feet NAVD which is the height of the road crest just south of the proposed southern end of the floodwall. At the 30% Design level, we chose to set the top of floodwall elevation one foot above the modeled 1% chance high water event, which puts it at elevation 15.4 feet NAVD at the downstream end and 15.9 feet NAVD at the upstream end of the floodwall.

3.3 Drainage

Seven culverts currently exist underneath Wishkah Road, and some of the outlets are open, while others are fitted with a tide gate. New tide gates will be designed to allow water to drain through the floodwall from the road side toward the river but not allow water to pass back through the floodwall from the river to the road. As part of the permit review process, it is possible that regulatory agencies will determine that it would be necessary to provide fish passage through some of the floodwall openings

into the watercourses on the protected side of the floodwall, even if the habitat value is marginal. If so, tide gates would be designed to remain open most of the time to promote fish passage and allow flow through the floodwall from the river to the road, but the gates would close automatically during high water to prevent floodwater from passing to the protected side of the floodwall. When properly sized, either type would provide suitable drainage capacity in the long term. The elevation of the tide gate inverts and size of each opening should be designed to consider not only the existing road culvert configurations, but also the potential for ongoing settlement of the road and the culverts.

3.4 Removal of Structures and Fill

Once constructed, the floodwall will restrict access east of the wall toward the river. Two parcels exist in this area, each with a dwelling. As the project has been conceived and funded, these two parcels will need to be acquired to remove people and their property from the floodplain. The structures and associated fill and appurtenances will be removed prior to constructing the floodwall, though the timing of the work will be up to the contractor.

3.5 Remediation

AMEC completed Phase I ESAs on both parcels east of Wishkah Road. Since potential contamination was identified during the Phase I ESA on the northern of the two parcels, a Phase II ESA was completed to quantify the extent and level of contamination present. Two areas of lead-contaminated soils were identified on that property. Grays Harbor County indicated that they have qualified and experienced personnel on staff who will clean up the site. AMEC support for design and oversight of the needed remediation tasks is not within our current scope of work.

3.6 Restoration

The project will include removal of structures, fill, contaminated soils, and non-native vegetation from the area east of Wishkah Road. The topography and vegetation on the site will be restored similar to what is present in the adjacent undisturbed wetland floodplain areas. Depending on what conditions are required in the permits, fish habitat improvements may be needed to compensate for impacts to fish habitat or passage that would arise from installation of the floodwall and tide gates.

4.0 DESIGN PROCESS

This section lays out procedures and processes that will be followed in preparing the project design.

4.1 Design Team

The disciplines required to accomplish both the design and permitting tasks include civil engineering, hydraulic engineering, coastal modeling, cultural resources, wetland biology, fish biology, geotechnical engineering, landscape architecture and structural engineering. Specific identified roles are as follows:

- Project Manager – Ryan Bartelheimer, PE
- Engineer of Record – Ryan Bartelheimer, PE
- Geotechnical Lead – James Dransfield, PE
- Structural Lead – San-lih Lok, PE
- Technical Reviewer – Jack Mowreader, PE
- Permitting Lead – Tad Schwager
- Hydraulic Modeling Lead – Vladimir Shepsis, PE (Coast & Harbor Engineers)
- Surveyor of Record – Mike Schmidt (Berglund, Schmidt & Associates)
- Project Manager for Client – Kevin Varness (Grays Harbor County)

The best available information will be used to develop the design, and the various discipline leads will have input into the design decisions. Design decisions will also be reviewed by the Permitting Lead to determine their effect on obtaining permits for the project. Every effort will be made to locate the floodwall alignment outside of the delineated wetland, knowing that the entire wall will be within the wetland or its buffer. Mitigation of the impacts to wetlands, wetland buffers, and fish passage will be proposed to be met with the removal of fill and structures east of Wishkah Road.

4.2 Deliverables

Designs will be submitted for client review at 30%, 60%, and 90% before being finalized. Permit applications will be submitted using the 60% design plans after the properties east of Wishkah Road have been acquired by Grays Harbor County. Designs will be delivered to Grays Harbor County in both PDF and AutoCAD format. Units and language will be English. Full-size drawings will be formatted for engineering size D layouts.

Grays Harbor County has requested that Washington Department of Transportation (WSDOT) standards and specifications be used for this project, which is typical for the County's public works projects.

Permit documents will be prepared using the permit forms available from the regulatory agencies.

Constructability reviews are not planned due to the relatively low risk of the project. If the project gets more complex or non-standard materials or methods are considered, a constructability review may be recommended.

5.0 DESIGN CONSIDERATIONS

Since Wishkah Road has settled significantly since it was raised in the 1980s and because AMEC's geotechnical investigation revealed that the subsurface soils are supersaturated, the design must account for the potential for the wall to settle over time where it will not rest on the underlying undulating bedrock. As such, the design will make provisions to raise the wall at a future date, provide deep support to bedrock, or make the wall high enough that settlement will not affect its future performance.

The floodwall must also be designed to withstand the anticipated high water levels, along with the potential for sea level to rise over the lifespan of the project. The Flood Modeling and Statistical Analysis Report by CHE recommended that, for design purposes, the potential sea level rise over the presumed 100-year life of the project be set at a minimum of six inches.

Within the geotechnical report completed in the previous phase of the project, subsidence over a 20-year timeline for areas with no additional filling is anticipated to be on the order of 0.5 to 1 foot. The predicted effects of sea level rise are much less than the predicted effects of the settlement of soils, but both should be considered when designing the top elevation of the proposed floodwall.

Grays Harbor County has indicated that the project elements will need to be able to operate autonomously, require very little maintenance, and require no specialized training or knowledge to operate and maintain. Since the tide gates likely represent the only moving parts on the floodwall, they must be able to function automatically and require very little maintenance over their design lifespan.

Project engineers must consider the potential for corrosion or other forms of degradation, such as impacts by automobiles, of the floodwall components over the lifespan of the project. The floodwall materials must be designed to be functional over the intended design life. The target is 100 years, but this will be revisited if the construction cost of project is too high.

We have been told that there will be limited ability to increase funding for the construction phase of this project over the \$2.6 million that the state legislature has earmarked, which was based on a preliminary estimate completed by Mr. Esses prior to the Alternatives Analysis phase of the project. AMEC's most recent cost estimate for construction of this project was \$4.73 million, which was sent to Grays Harbor County and the Flood Authority on March 11, 2014. Every effort will be made to meet all of the project constraints. However, in the event that the estimated construction costs exceed the available funding,

the design team may recommend a lesser design lifespan in order to reduce the project cost and thereby improve the likelihood that the project will be funded for construction.

6.0 OTHER DESIGN CONSIDERATIONS

6.1 Materials

Materials will be recommended based on the potential for corrosion and other forms of damage. The floodwall and tide gate may contain dissimilar metals, which would require galvanic protection and/or isolation of differing materials. The designer will need to consider the rigidity of the tide gates and the potential distortion of the floodwall openings over time to ensure a tight seal between the tide gates and headwalls over the design lifespan of the project.

The designer will select materials for the floodwall and the tide gates to meet the design objectives for the project without taking undue risks by using unproven technology or materials that may not be suitable for this project in the long run. Materials will be selected based on cost, availability, durability, traffic considerations, construction methods, construction timeline, risks, and general suitability for this project.

6.2 Operation and Maintenance

The tide gates will be able to function automatically, but will need to be inspected periodically to ensure that they continue to function properly. Depending on the design chosen, periodic maintenance and adjustments may be necessary to maintain the desired functions and to be confident that the systems will function properly in a high water event.

Periodic inspections of the wall are also recommended. Maintenance of the wall will generally not be needed unless inspections identify damage due to corrosion, vehicles, catastrophic floods, tsunamis, earthquakes, or settlement.

6.3 Environment and Safety

Environmental considerations will be addressed through federal, state, and local permits and approvals. Generally the permitting process will involve permits related to the presence of wetlands and water courses, and project activities such as earthwork and disturbance of vegetation.

During construction, proper worker safety protection must be employed. We anticipate that the work will be staged from the northbound lane of Wishkah Road. Traffic control will be required to alternate traffic in the southbound lane and provide for safe construction ingress and egress. During the design process, every effort will be made to consider ways to make the project inherently safer and less risky to construct.

7.0 ENVIRONMENTAL MONITORING

Baseline monitoring has been performed to determine the presence of fish in the project area, including in the watercourses immediately west of Wishkah Road. The wetland report documents the physical boundaries of wetlands in the project area and identifies the extent to which properly functioning wetland conditions exist there.

Limited monitoring will be needed during the construction phase of the project to ensure that permit conditions are met and to minimize the risk that construction activities will harm the environment. The project will require temporary diversions of the watercourses that cross the proposed floodwall. Provisions must be made to remove fish, and other aquatic life that are present, from the work area, and barriers must be placed so that they remain excluded from areas where they could be harmed. During construction, permitting agencies will require regular monitoring of water quality conditions in the vicinity and biological monitoring to ensure that aquatic life remains protected.

Post-construction monitoring may be necessary in the wetland restoration areas, if included within conditions in the approved permits.

8.0 APPENDICES

1. Kersh-Wishkah Flood Wall Project Flood Modeling and Statistical Analysis
2. Wetlands and Streams Critical Areas Report