

DRAFT
Substantive Compliance for
Clean Water Act Section 404 and Rivers and Harbors Act

1. Introduction.

The purpose of this document is to record the Corps' evaluation and findings regarding this project pursuant to Section 404 of the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA).

The following actions are covered by this document:

- a. Placement of 2000 cubic yards of fine substrate along the shoreline of Seward Park.

The information contained in this document reflects the findings of the project record. Specific sources of information include the following:

- a. Draft Seward Park demonstration restoration project, Environmental Assessment April, 2001.
- b. Biological Assessment Seward Park demonstration restoration project, Environmental Assessment April, 2001.
- c. Seward Park Rehabilitation Study: Juvenile Salmonid Use of Shoreline Habitats in Seward Park, King County, Washington Fiscal Year 2000 Planning Assistance to the States Report Paron and Nelson 2001
- d. Piaskowski, R. M. and Tabor, R. A. 2001. Nocturnal habitat use by juvenile chinook salmon in nearshore areas of southern Lake Washington, a preliminary investigation, 2000. U.S. Fish and Wildlife Service, Western Washington Office, Division of Fisheries and Watershed Assessment Lacey, Washington.
- e. 404(b)(1) Evaluation (see below)
- f. Public Interest Review (see below)

The structure of this document contains the substantive compliance issues from the Clean Water Act 404(b)(1) Guidelines [40 CFR §230.12(a)] and the Regulatory Programs of the Corps of Engineers [33 CFR §320.4(a)].

2.0 Project Background.

In 1997, the reconnaissance of the Lake Washington Basin Restoration Study was initiated at the request of Seattle and King County. The Lake Washington Basin Restoration Study is evaluating two water-related issues in the greater Lake Washington Basin, which includes Lake Sammamish, Lake Washington, and the Cedar River. These issues are: 1) improved salmonid migration and survival at the Hiram A. Chittenden Locks through water conservation and the modification of facilities, and 2) the creation of specific habitat improvements throughout the

basin for fish and wildlife. The listing of Puget Sound Chinook as a threatened species under the endangered species act has strengthened the need for specific habitat projects in the basin.

In 1999, the City of Seattle Parks Department began a Planning Assistance to the States (PAS) study with the US Army Corps of Engineers (Corps) under Section 22 Program of the 1974 Water Resources Development Act. The overall purpose of the Seward Park Rehabilitation Study was to identify potential areas and conceptual rehabilitation techniques that could be used along the shoreline of Seward Park to provide enhanced habitat for juvenile and adult salmonids. Based on the engineering analysis and the information gained from the field surveys, the Corps recommended several strategies for future rehabilitation of Seward Park shoreline. One of them included rehabilitating the nearshore area by placing a layer of sand and gravel over the selected portions of the shoreline that are now covered with angular rock.

Much of the Lake Washington shoreline in King County and the surrounding areas have been altered as a result of urbanization. With modification, the natural processes (both physical and biological) of beaches have also been altered. Extensive shoreline armoring and other development practices often results in the removal of the entire natural supralittoral zone and upland vegetation, with an accompanying loss of input of sediments, terrestrial organic matter and important prey resources (insects) for salmonids and other fishes utilizing the nearshore. Although scientists and resource managers have expressed concern regarding the impacts of alterations to nearshore processes and functions, there have been no quantitative studies linking alterations to changes in biotic communities. Furthermore, data on the timing, distribution and habitat utilization of juvenile salmon in nearshore environments is extremely limited. The fact that chinook salmon juveniles depend upon littoral areas for feeding, refuge and migration, highlights our need to determine the impacts of shoreline modifications.

In 2001, the Lake Washington Basin Restoration Study using information from the PAS study designed this experimental substrate modification project to improved rearing habitat for juvenile salmonids in Lake Washington. The proposed project study will improve our understanding of nearshore ecosystems by filling existing data gaps and enhance collaboration between various entities. Information gained from this project will be used on future Lake Washington Ecosystem Restoration GI projects throughout the basin.

3.0 Project Need.

The Lake Washington watershed drains 607 square miles and may be the most productive salmon system in the Pacific Northwest. However, the chinook populations within the basin have been dramatically declining in recent years. In March 1999 the National Marine Fisheries Service (NMFS) listed Puget Sound Chinook salmon as threatened under ESA. Seattle's Lake Washington shoreline clearly is not pristine habitat. A recent survey of the City's shorelines demonstrates a high degree of development that has eliminated or altered most shallow water shoreline habitat. It is generally presumed that shallow shoreline habitat is preferred habitat and that most juvenile chinook generally use the lake shoreline for rearing and passage from late winter through early summer. Therefore, the development of Lake Washington's shoreline most likely has substantially altered juvenile chinook rearing habitat and may be a factor for the decline of chinook throughout the basin.

The Corps and the City of Seattle theorize that they can improve the nearshore habitat for juvenile chinook salmon by placing a layer of sand/gravel substrate over the present substrate. This is based on the work done by Piaskowski and Tabor (2000) which found evidence in southern Lake Washington that juvenile chinook prefer a sand/gravel substrate and avoidance towards larger substrate (cobble/boulder). Since the current substrate along Seward Park consists mainly of quarry spalls that have washed out into the nearshore habitat creating an "armored" substrate, the addition of a sand substrate will provide a habitat more suitable for juvenile chinook rearing.

This project would be a demonstration project under the Lake Washington Ecosystem Restoration GI. Information gained from this project will be used on future restoration projects throughout the basin. While the physical changes to littoral zone habitats resulting from shoreline development are clear, we lack information linking these alterations to changes in the growth and survival of juvenile salmon. Because of the large amount of uncertainty that still exists in understanding the responses of juvenile salmon to shoreline to habitat changes, this project will be carefully monitored. Environmental monitoring will be completed pre and post construction by US Fish and Wildlife Service and the Washington Department of Fish and Wildlife.

4.0 Project Purpose.

The purpose of this project was to design a substrate modification experiment that would provide information on how to improve shoreline rearing habitat for juvenile chinook along the nearshore of Lake Washington. Ultimately the purpose of this project will be to help restore Lake Washington salmon runs.

5.0 Availability Of Less Environmentally Damaging Practicable Alternatives to Meet the Project Purpose.

The Corps evaluated the alternatives using a wide range of criteria including those specified in the the CWA and RHA. The criteria were used to screen and evaluate the different alternative plans and to measure each plan's contribution to the National Economic Development (NED), Environmental Quality (EQ), Regional Development (RD), and Other Social Effects (OSE) of the Water Resources Council's Principles and Guidelines. A full evaluation of this issue is included in the Environmental Assessment. The alternatives evaluated for this project were as follows:

- a. **Alternative 1 (No Action).** Under No Action, the Corps would leave the nearshore habitat in its present condition. This alternative would not improve the marginal to poor quality of the shoreline habitat for salmonids. However, there would be no temporary construction impacts associated with this alternative.
- b. **Alternative 2 (Substrate Removal Alternative)** Under this alternative the Corps would remove the quarry spall substrate. This would be accomplished using

hydraulic excavators to pull out the larger substrate leaving the behind a sand/silt substrate.

- c. **Alternative 3 (Preferred Alternative- Substrate Supplement).** This alternative consisted of placing a 1-foot-thick layer of large and small gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects.

The selection and location of this alternative was based on the following criteria:

- The project will have adequate monitoring to ensure success of project features, particularly in regard to chinook salmon.
- The proposed work is compatible with other ongoing environmental restoration, recovery, and monitoring efforts by federal, state, and local agencies.
- Public health, safety, and well being will be protected.
- Analyses of benefits and costs were conducted in accordance with Corps regulations and must ensure that any plan is complete, efficient, safe, and economically cost effective in terms of current prices.
- Input from the local sponsor(s), resource agencies, and project staff will be incorporated into plan selection and design.
- The with-project condition will not significantly impact recreational navigation.
- The project will not interfere significantly with public visitation and enjoyment of the park.
- The project will not interfere with state and tribal fish management authorities.

Based on the aforementioned criteria, the eastside of Seward Park was selected. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. The dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot (plus or minus about ½ foot).

Findings. The results of feasibility planning indicate that only one alternative, the substrate supplement, met the requirements of economic, engineering, and environmental feasibility while responding to the planning criteria and the sponsor's and community's needs to the greatest extent possible.

6.0 Significant Degradation, Either Individually or Cumulatively, To the Aquatic Environment

a. Impacts on Ecosystem Function.

Potential impacts to aquatic resources were considered during the design of the proposed work, and steps have been taken to minimize construction impacts. According to surveys completed in 2000, the timing of the preferred alternative would occur when very few fish are present. However, implementing this alternative is may have temporary effects on some fish. Substrate

modification may result in a temporary degradation of the water quality, increasing turbidity, possible lowering of dissolved oxygen and the potential displacement of fish species. These effects would be limited to the immediate substrate modification sites. Should fish species coincidentally be present in the substrate removal area, it is highly likely that these fish would remove themselves from the area immediately upon commencement of the substrate addition. This removal would be temporary in nature and fish could re-enter the area once operations ceased and suspended sediments settled. Suspended sediments are not expected to remain in the water column for very long (approximately ten minutes in midwater areas) and dissolved oxygen should return to original levels with that same timeframe (Truitt, 1986a; 1986b).

The presence of a barge would temporarily shade the water column under the barge. The barge may also would create wakes and disturb the water column under the boats, as well as generate loud noises. The effects of wakes are felt to a depth of about 5 feet; beyond this depth, the wake energy is significantly attenuate. Fish in the vicinity of the area are in water up to 172 feet in depth; the slight disturbance near the surface is not expected to disturb most fish, other than cause them to avoid the wake by moving deeper into the water. All effects are temporary and would be concluded within 1-2 days.

Implementing the preferred alternative will have adverse effects on invertebrate species within the immediate dredging location and minimum effects on invertebrates at the disposal sites. Placement of addition substrate has the potential to bury immobile invertebrates if greater than 10 cm of material is deposited. Otherwise, mobile invertebrates are expected to dig out of 10 cm or less of material.

Substrate modification is likely to be of minor consequence since the biological effect of episodic inputs has been found generally to be temporary (Tsui and McCart 1981). Rapid recovery often results.

Changing the substrate from the quarry spalls to a sandy/gravel substrate could increase the production of chironomid larvae (M. Koehler personal communication). This is especially important to chinook since pilot study work done in 1999 indicates that chinook mainly prey upon chironomids before June.

In several areas along the shoreline, quarry spalls have washed out into the nearshore habitat creating an "armored" substrate. Substrate is important because it has potential use as cover, spawning, and feeding habitat for juvenile salmonids. The quarry spalls lack any habitat quality for salmon but may provide good ambush habitat for several species of sculpins that prey upon juvenile salmon. Spalding (1998) indicated a change in sediment composition could cause a change in meiofauna density and that bulkheads could adversely affect benthic organisms in freshwater lakes. Another potential problem of the quarry spalls may be that it eliminates any potential sockeye spawning since it is too large to use for spawning. Piaskowski and Tabor (2001) documented that chinook appear to have a preference for a sand/gravel substrate and an avoidance for cobble or boulder substrate. The addition of the projects substrate is likely to be an substantial increase in the quality of habitat for juvenile chinook.

b. *Impacts on Recreational, Aesthetic and Economic Values.*

Impacts related to recreation and aesthetics are considered minimal. Construction activities will not adversely impact the economy of the area. The project is not expected to prevent people from visiting Seward Park.

Findings. The Corps has determined that there would be no significant adverse impacts to aquatic ecosystem functions and values. It is expected that some aquatic ecosystem functions and values will temporarily degrade during construction. However, it is expected that these functions and values will return when operations are completed.

7.0 Appropriate and Practicable Measures To Minimize Potential Harm to the Aquatic Ecosystem

a. Impact Avoidance Measures.

The preferred alternative would occur when very few fish are present and before nesting season of bald eagles.

b. Impact Minimization Measures.

The Corps will take all steps during construction and monitoring of the project to minimize impacts to aquatic resources. The Corps will monitor water quality during and after construction to assure that any impacts to water quality will be temporary in nature and minimal in overall impact. The Corps will observe all construction windows to assure that impacts to migratory fish will be avoided or minimized. Specifically these best management practices (BMPs) will be implemented:

1. Riparian and wetland areas will be avoided as staging or refueling areas.
2. Equipment will be stored, serviced, and fueled away from aquatic habitats or other sensitive areas.
3. The project will use clean material to minimize the release of fines into the aquatic environment.
4. Excavation and transport equipment machinery will be limited in capacity, but sufficiently sized to complete required activities.
6. All garbage will be removed from the project site and disposed of properly; undisturbed vegetated buffer zones will be retained along the project to the greatest extent possible to reduce sedimentation rates, channel instability, and aquatic habitat impacts.

c. Compensatory Mitigation Measures.

The project is intended to be a restoration project therefore no additional compensatory mitigation will be required.

Findings. The Corps has determined that all appropriate and practicable measures have been taken to minimize potential harm.

8.0 Other Factors In the Public Interest.

- a. **Fish and Wildlife.** The Corps has coordinated with State and Federal agencies, as well as Native American Nations to assure careful consideration of fish and wildlife resources. The Corps has prepared a Biological Evaluation in accordance with the Endangered Species Act. The Corps will assure full compliance with the Endangered Species Act prior to project implementation.
- b. **Water Quality.** The Corps will coordinate the construction design with the Washington Department of Ecology and the US Environmental Protection Agency to assure compliance with State Water Quality Standards.
- c. **Historic and Cultural Resources.** The Corps will coordinate with the State Historic Preservation Office.
- d. **Activities Effecting Coastal Zones.** The Corps has determined that this project is consistent with the Coastal Zone Management Act.
- e. **Environmental Benefits.** The Corps and the City of Seattle theorize that they can improve the nearshore habitat for juvenile chinook salmon by placing a layer of sand/gravel substrate over the present substrate. This is based on the work done by Piaskowski and Tabor (2000) which found evidence in southern Lake Washington that juvenile chinook prefer a sand/gravel substrate and avoidance towards larger substrate (cobble/boulder). Since the current substrate along Seward Park consists mainly of quarry spalls that have washed out into the nearshore habitat creating an "armored" substrate, the addition of a sand substrate will provide a habitat more suitable for juvenile chinook rearing.
- f. **Navigation.** The proposed work would not obstruct navigable waters of the United States.

Findings. The Corps has determined that this project is within the public interest.

9.0 Conclusions. The Corps finds that this project complies with the substantive elements of Section 404 of the Clean Water Act and the Rivers and Harbors Act.

404(b)(1) Evaluation [40 CFR §230] and Evaluation for General Policies for the Evaluation of Permit Applications [33 CFR §320.4]

404(b)(1) Evaluation [40 CFR §230]

Potential Impacts on Physical and Chemical Characteristics (Subpart C)

1. Substrate [230.20]

The project consists of placing a 1-foot-thick layer of fine and coarse gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. Material would be placed from a barge with the dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot (plus or minus about ½ foot). The area proposed

for placement is approximately 1000 lineal feet along the east shore. The required quantity of sand, gravel, and cobbles is estimated at 1400 cy or approximately 2,000 tons. The west shore site would be divided into two areas, one for fine grained, sandy material and one coarse gravel and cobbles. The placement method will be one that has been used successfully in the past. This method consists of offloading material from a barge by conveyor. This placement method allows material to be placed accurately and efficiently.

Since the current substrate along Seward Park consists mainly of quarry spalls that have washed out into the nearshore habitat creating an "armored" substrate, the addition of a sand substrate will provide a habitat more suitable for juvenile chinook rearing.

Changing the substrate from the quarry spalls to a sandy/gravel substrate could increase the production of chironomid larvae (M. Koehler personal communication). This is especially important to chinook since pilot study work done in 1999 indicates that chinook mainly prey upon chironomids before June.

2. Suspended Particulate/Turbidity [230.21]

Under this alternative substrate modification operations will degrade water quality on a very localized and temporary basis, not over the long term nor lake-wide. Turbidity from an individual construction activity would not represent a permanent sediment source and would not produce conditions of chronic exposure, but it could be acute. However, given the relatively small quantities of sediment typically suspended, the short duration of suspension, and the dilution that occurs during dispersion, the suspension of sediments around the project site is not likely to lead to appreciable reductions in dissolved oxygen nor increases in turbidity. Overall, the impacts are expected to be minor due to the fact that placement will take place over only one to two days. Also the material used will be clean and free of any contamination. Nevertheless, to minimize potential impacts, the Corps will restrict construction activity to periods when salmonids are least likely to inhabit the area of construction.

3. Water Quality [230.22]

The Corps has determined that there would be no adverse long-term impacts to the water column from sediment exposure. Changes in water quality would be limited to a slight increase in suspended particulates and turbidity during and immediately after construction. Long term water quality would not significantly change. Water quality parameters other than turbidity, such as fecal coliform, temperature and dissolved oxygen will not be affected by the project. The site will be carefully monitored in accordance the 401 Certification for the action.

4. Current Patterns and Water Circulation [230.23]

The Corps expects no disruption of current patterns and water circulation at this site during or after construction.

5. Normal Water Fluctuations [230.24]

There will be no effect on normal (non-flood) water fluctuations as a result of this project.

6. Salinity Gradients [230.25]

This project would occur in freshwater; therefore, no effects on salinity are expected.

Potential Impacts On Biological Characteristics of the Aquatic Ecosystem (Subpart D)

1. Threatened and Endangered Species [230.30]

The Corps is in the process of preparing a biological assessment for this project and will be in close coordination with the U.S. Fish and Wildlife Service and National Marine Fisheries Service to assure compliance with the Endangered Species Act.

2. Aquatic Food Web [230.31]

In several areas along the shoreline, quarry spalls have washed out into the nearshore habitat creating an "armored" substrate. Substrate is important because it has potential use as cover, spawning, and feeding habitat for juvenile salmonids. The quarry spalls lack any habitat quality for salmon but may provide good ambush habitat for several species of sculpins that prey upon juvenile salmon. Spalding (1998) indicated a change in sediment composition could cause a change in meiofauna density and that bulkheads could adversely affect benthic organisms in freshwater lakes. Another potential problem of the quarry spalls may be that it eliminates any potential sockeye spawning since it is too large to use for spawning. Piaskowski and Tabor (2001) documented that chinook appear to have a preference for a sand/gravel substrate and an avoidance for cobble or boulder substrate. The addition of the projects substrate is likely to be a substantial increase in the quality of habitat for juvenile chinook.

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3. Wildlife [230.32]

No wildlife species are expected to be adversely affected by the proposed action. Bird and wildlife life use may be temporarily disrupted at the sites during construction. These impacts will be short-term and insignificant in nature.

Potential Impacts to Special Aquatic Sites (Subpart E)

Proposed actions are not anticipated to have any impact on special aquatic sites as described in subpart E of the Section 404(b)(1) guidelines.

1. Sanctuaries and Refuges [230.40]

The proposed action will have no effect on sanctuaries or refuges

2. Wetlands [230.41]

The proposed action will have no effect on wetlands.

3. Mudflats [230.42]

The proposed action will have no effect on mudflats.

4. Vegetated Shallows [230.43]

The proposed action will have no effect on vegetated shallows.

5. Coral Reefs [230.44]

Not applicable.

6. Riffle and Pool Complexes [230.45]

The proposed action will have no direct effect on riffle and pool complexes.

Potential Effects on Human Use Characteristics (Subpart F)

1. Municipal and Private Water Supplies [230.50]

Following completion, the proposed action would not adversely affect water supplies municipal and private water supplies.

2. Recreation and Commercial Fisheries [230.51]

The site is not located in the vicinity of public water supply or commercial fishing use. Tribal fishing does occur in Lake Washington but would not be affected by this project. Some recreational fishing occurs in the area and may be temporarily affected. Minor effects from construction noise and disturbance would be expected during construction.

3. Water-related Recreation [230.52]

Water-related recreation is not expected to be impacted other than the 1-2 days of construction.

4. Aesthetics [230.53]

Aesthetics will not be impacted. The construction activities at the site will be temporarily unsightly, but the long-term effect will be negligible. The action will not significantly change the general character of this area.

5. Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves [230.54]

Not applicable.

Evaluation and Testing (Subpart G)

1. General Evaluation of Dredged or Fill Material [230.60]

All material to be placed at the project site will be commercially purchased from a commercial quarry and is not likely to contain toxic or hazardous substances.

2. Chemical, Biological, and Physical Evaluation and Testing [230.61]

Chemical, biological, and physical testing are not considered to be necessary for this project.

Action to Minimize Adverse Effects (Subpart H)

1. Actions Concerning the Location of the Discharge [230.70]

The materials to be discharged are clean and the materials and no material will be excavated. Also, see 230.61 above.

2. Actions Concerning the Material to be Discharged [230.71]

Materials for the revetment would be obtained from local quarries and would not contain toxic materials or organic soils.

3. Actions Controlling the Material after Discharge [230.72]

Following placement of new substrate, no further dispersion is expected, therefore no measures to control placement of these materials are considered necessary.

4. Actions Affecting the Method of Dispersion [230.73]

The new substrate will be placed at the site in the quickest possible method to reduce turbidity impacts. It is recognized that there will be an elevation of turbidity nearby the project site, and the Corps will continue to coordinate with EPA and Washington Department of Ecology as a permit requirement for Section 401 Water Quality Certification.

5. Actions Related to Technology [270.74].

The technology used in the proposed project is considered acceptable for this scope of work. No other specific actions to minimize effects are considered necessary.

6. Actions Affecting Plant and Animal Populations [270.75]

The Corps will coordinate construction activities with the Tribal, State, and Federal resource agencies to assure minimal impacts to fishery resources and other wildlife. Impacts to existing plant and animal populations will be reduced or compensated for through timing (to avoid impacts to juvenile salmon, threatened and endangered species).

7. Actions Affecting Human Use [230.76]

The Corps has taken all appropriate and practicable steps to assure minimal impacts to human use, their safety and general appreciation of the area.

8. Other Actions [230.77]

General Policies for the Evaluation of Permit Applications [33 CFR §320.4]

1. Public Interest Review [320.4(a)]

The Corps finds these actions to be in compliance with the 404(B)(1) guidelines and not contrary to public interest.

2. Effects on Wetlands [320.4(b)]

The proposed action will have no effect on wetlands.

3. Fish and Wildlife [320.4(c)]

The Corps consulted with State and Federal resource agencies and other interested members of the public on this action.

4. Water Quality [320.4(d)]

The Corps will certify that this project will not violate State Water Quality Standards as part of their equivalent 401 Certification that will be prepared specifically for the construction design.

5. Historic, Cultural, Scenic, and Recreational Values [320.4(e)]

A review of the Washington State Office of Archaeology and Historic Preservation (OAHP) cultural resources database by a Corps staff archaeologist revealed no recorded archaeological or historical sites in the project area. It is unlikely that cultural resources exist within the 30 foot by 1,000 foot project footprint immediately offshore of Seward Park. Furthermore, the placement of new substrate will not disturb any of the underlying native sediments that have the potential, however slight, to contain intact cultural deposits. Therefore, the Corps has determined that the project has no potential to affect properties eligible for listing on the National Register of Historic Places (NRHP).

6. Effects on Limits of the Territorial Sea [320.4(f)]

Not applicable.

7. Consideration of property ownership [320.4(g)]

All real estate requirements for this project have been met. The proposed project is located entirely on land owned by the Seattle Parks Department. The Corps received a license from the Parks Department June 5, 2001 for this work. No further permit or easement is required.

8. Activities Affecting Coastal Zones [320.4(h)]

Not applicable

9. Activities in Marine Sanctuaries [320.4(i)]

Not applicable.

10. Other Federal, State, or Local Requirements [320.4(j)]

The Corps will obtain ESA concurrence from the US Fish and Wildlife Service and National Marine Fisheries Service before construction of project.

11. Safety of Impoundment Structures [320.4(k)]

Not applicable.

12. Floodplain Management [320.4(l)]

The study is in full compliance. The Corps considered alternatives supporting avoidance of development in the flood plain, continuing to reduce hazards and risks associated with floods and to minimize the impact of floods on human safety, health and welfare, and restoring and preserving the natural and beneficial values of the base flood plain.

13. Water Supply and Conservation [320.4(m)]

Not applicable.

14. Energy Conservation and Development [320.4(n)]

Not applicable.

15. Navigation [320.4(o)]

This project will not impede current navigation.

16. Environmental Benefits [320.4(p)]

See the biological assessment and environmental assessment.

17. Economics [320.4(q)]

Economic studies were undertaken which included studies enumerating and evaluating damages related to the existing economic development in the flood plain, sensitivity evaluations and optimization scenarios evaluating the benefits and costs of alternative project scopes. The outcome of these evaluations combined with engineering, environmental, and local sponsor considerations have led to the selection of the recommended plan.

18. Mitigation [320.49(r)]

Appropriate and practicable steps such as planning for anticipated impacts, sensitivity to the environment through design, mitigation for lost resources, and maintenance controls to minimize potential adverse impact of the proposed project on the aquatic ecosystem have been incorporated into the project design.