6.0 Cumulative Effects

This chapter considers the incremental potential effects of the addition of the Capitol Lake – Deschutes Estuary Long-Term Management Project when considered with other proposed projects.

SEPA requires cumulative effects to be evaluated as part of environmental review per WAC 197-11-060 and 197-11-792. However, cumulative effects are not defined in the SEPA rules; thus, for this analysis, the NEPA definition was used as a guide. A cumulative effect is the "*impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions*" (40 CFR Part 1508; although this definition was removed in 2019, it is still used to describe cumulative effects for the purposes of the EIS).

6.1 WHAT IS THE STUDY AREA & TIME HORIZON FOR THIS ANALYSIS?

The study area used for each environmental discipline is also used for the cumulative effects analysis, and is therefore different for each resource. These were described in Chapter 3.0, Affected Environment.

Capitol Lake was formed in 1951 following construction of the 5th Avenue Dam. Historically, local tribes used the Deschutes Estuary for subsistence and ceremonial purposes. The past temporal boundary is approximately the 1830s when nonindigenous people began to settle in the area. The future temporal boundary for this analysis is 2050, the time horizon for the project.

6.2 WHAT WAS THE APPROACH TO ANALYZE CUMULATIVE EFFECTS?

This analysis generally follows the guidance developed by the Council on Environmental Quality (CEQ) for assessing cumulative effects. Based on CEQ guidance (1997, 2005), the following guidelines were used to evaluate the cumulative effects of construction and operation of the proposed project:

- Identify the environmental disciplines with the potential to be adversely affected by the proposed project, as discussed in the discipline reports prepared for the EIS.
- Consider other actions in relation to the geographic scope of the proposed project (i.e., those actions that would have effects in the same area as the proposed project).
- Consider other actions in relation to the temporal period of the proposed project (i.e., those actions that would have effects during the same time as the proposed project).
- Rely on the best available data at the time of analysis.

6.3 WHAT ARE THE POTENTIAL ADVERSE IMPACTS OF THE PROJECT?

The cumulative effect analysis focuses on those environmental disciplines that could be substantially affected by the project in combination with other reasonably foreseeable projects. In general, if the impacts of the project's action alternatives are minor or less than significant, they are assumed not to contribute to cumulative effects unless other reasonably foreseeable future actions could cause substantial effects.

Table 6.3.1 lists which resources identified through the analysis in the EIS have a potential significant adverse impact as a result of construction or operation of one or more of project's action alternatives. Notably, implementation of the Capitol Lake – Deschutes Estuary Long-Term Management Project would not preclude construction and operation of these other reasonably foreseeable projects.

Table 6.3.1 Potential Adverse Impacts

Environmental Discipline	Potential for Significant Adverse Impact during Construction?	Potential for Significant Adverse Impact during Operation?
Hydrodynamics and Sediment Transport [1]	NA[1]	NA
Navigation	No	Yes
Water Quality	Yes	Yes
Wetlands	No	No
Fish and Wildlife	No	Yes
Air Quality and Odor	No	No
Land Use, Shorelines, and Recreation	Yes	No
Cultural Resources	Yes	Yes
Visual Resources	Yes	Yes
Environmental Health	No	No
Transportation	Yes	Yes
Public Services and Utilities	No	Yes

Note:

1. Potential adverse impacts from hydrodynamics and sediment transport are incorporated into the evaluations of the other disciplines.

For economics, cumulative effects are generally associated with the implications of additional development downtown. These cumulative effects were considered as part of the economics analysis and are not further described here (see Chapter 4.0 [Section 4.14, Economics], and the Economics Discipline Report [Attachment 18]).

6.4 WHAT PAST ACTIONS OCCURRED IN THE WATERBODY?

Historically, the Deschutes River formed a broad estuary as it flowed into Budd Inlet in the area that is now Capitol Lake. The historic delta consisted of river deposits, with braided channels and scattered tidal marshes. This area is located within the traditional territory of the Southern Coast Salish cultural group, which includes, but is not limited to, the Steh-Chass, Nusehchatl, Squaxin, and Nisqually peoples; see the Cultural Resources Discipline Report for more information (Attachment 13).

An early survey in the 1870s shows the Deschutes Estuary as a waterway, with the first constriction in the estuary mouth near the 4th Avenue Bridge (Figure 6.4.1). Subsequent surveys performed during the next few decades, but prior to the installation of the 5th Avenue Dam, show extensive tideflats as well as encroachment by railroad trestles. In 1929, the BNSF Railway Trestle was constructed across the mouth of the Deschutes River, separating what is now the North Basin and Middle Basin, and a railway was installed at the mouth of Percival Creek, creating Percival Cove. Around 1942, the 5th Avenue Bridge was constructed using earthen fill.

Exhibit 6.1 Aerial view of Capital Lake area, 1946 (Source: Photographer Leonard Delano, Washington State Archives)

Construction of the 5th Avenue Dam in 1951 blocked the tidal exchange between the Deschutes River and Budd Inlet and created Capitol Lake. Capitol Lake is now a freshwater lake in Olympia and Tumwater, formed by this damming of the mouth of the Deschutes River. The 5th Avenue Dam, which was intended to form a reflecting pool for the State Capitol Building, has altered the morphology and ecology of the lower river system.

Exhibit 6.2 Deschutes Dam construction, May 5, 1950 (Source: The Susan Parish Collection of Photography, Washington State Archives)

In 1956, the construction of the I-5 bridge filled additional area and separated the Middle and South Basins. More fill was placed in the North Basin to construct Deschutes Parkway and Marathon Park in the 1970s, and additional armoring and fill were placed in 1999 for the construction of Heritage Park.

Exhibit 6.3 I-5 construction (Source: DNR Report, 1957 aerial photograph, flight information: 1373MCS, M-65, Roll-3, 1370PMG, 55-AM-46, frame 217, dated May 29, 1957, USGS Image, available on Earth Explorer at: <https://earthexplorer.usgs.gov/> 4/3/2019)

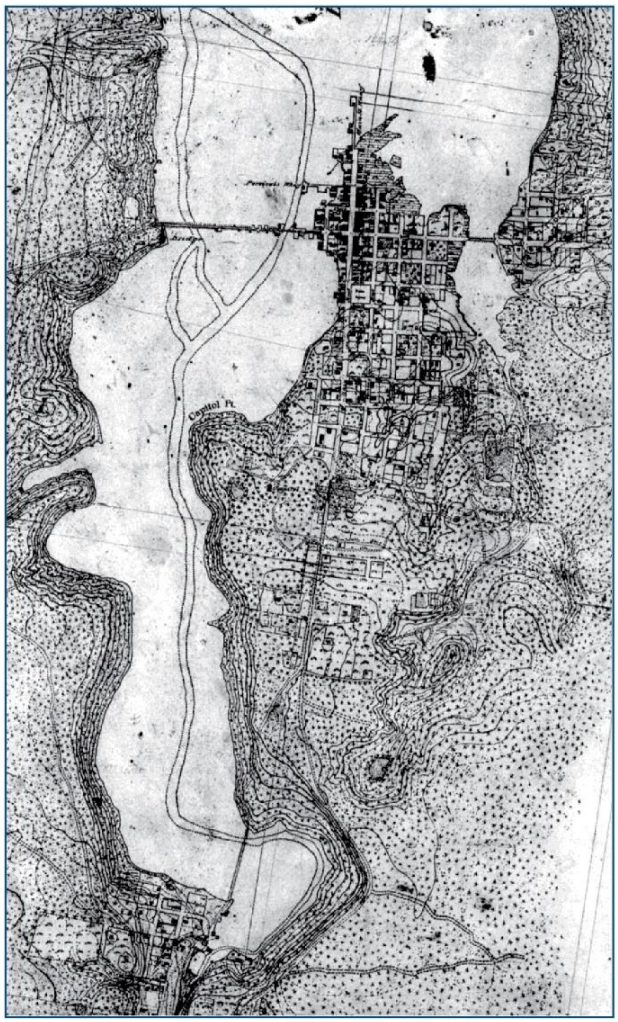
Although different from their historic condition, Capitol Lake Basin, lower Deschutes River, and West Bay now include wetlands that provide habitat for a range of birds, fish, bats, aquatic and semiaquatic mammals, and dozens of invertebrate species. The Deschutes River basin includes commercial forestry in the upper basin and agriculture and rural residential in the middle of the watershed. Urban land uses in the lower watershed include portions of the Cities of Tumwater and Olympia.

6.5 WHAT FUTURE PROJECTS ARE REASONABLY FORESEEABLE?

To determine reasonably foreseeable future projects, Enterprise Services engaged the Technical Work Group, described in Chapter 1.0, Introduction, Project Background, and History. Members of the Technical Work Group were asked to provide lists of potential projects that may overlap in space and time with the Capitol Lake – Deschutes Estuary Long-Term Management Project. Reasonably foreseeable future projects are those that are likely or probable, but do not include those that are merely possible. The projects listed in

Table 6.5.1 are the reasonably foreseeable future projects used for the analysis in this chapter. See Chapter 8.0, Engagement with Work Groups, Community Sounding Board, & State Government, for more information about the Technical Work Group. Land use planning documents and agency websites were also reviewed.

Figure 6.4.1 Historical Condition of the Capitol Lake Basin



1873

1941

Table 6.5.1 Reasonably Foreseeable Projects

Project	Proponent	Location	Description	Schedule or Status	Contributing Activity (for cumulative impacts)
Budd Inlet TMDL	Ecology	Budd Inlet marine waters and Deschutes River watershed including Capitol Lake	TMDL for dissolved oxygen in marine waters of Budd Inlet. Will assign allocations for all source contributing toward dissolved oxygen depletion in Budd Inlet, including Capitol Lake.	In progress – TMDL draft issued for public comment on June 8, 2022.	TMDL established under this plan is anticipated to result in positive outcomes for dissolved oxygen levels in Budd Inlet.
Deschutes River TMDL	USEPA Ecology	Deschutes River watershed including Capitol Lake	TMDL for sediment, bacteria, dissolved oxygen, pH, and temperature in the Deschutes River.	Completed. Implementation will be ongoing.	TMDL established under this plan is anticipated to result in positive outcomes for noted parameters in Deschutes River.
Puget Sound Nutrient Reduction Project	Ecology	Entire Puget Sound	Collaborative effort with Puget Sound communities and stakeholders to address human sources of nutrients.	Draft expected 2022.	This project could reduce nutrients in Deschutes River.
Deschutes Watershed Restoration and Enhancement Plan: WRIA 13 Deschutes Watershed	Ecology	Deschutes River watershed	The plan estimates the potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over 20 years (2018 to 2038) and identifies projects and actions to offset those impacts and provide a net ecological benefit to the watershed.	Final draft plan issued March 2022. In agency review prior to finalization.	Implementation of the plan is anticipated to result in habitat improvements by individual projects.

Project	Proponent	Location	Description	Schedule or Status	Contributing Activity (for cumulative impacts)
Budd Inlet Sediment (Site ID 2245)	Port of Olympia	Inner Budd Inlet	Cleanup of contaminated sediments in Budd Inlet from multiple industrial uses. A feasibility study is underway to determine future cleanup actions.	Sampling is ongoing to collect data on contaminated sediments. Depending on the results of the feasibility study, cleanup construction could take place over the next decade.	Cleanup activities could occur at the same time as sediment removal.
Solid Wood Inc (Site ID 4228)	City of Olympia	Inner Budd Inlet	Cleanup of contamination from past wood processing activities. A remedial investigation and feasibility study are in process to determine cleanup actions for the site.	Sampling is ongoing to determine the scope of contamination and determine cleanup actions. Cleanup construction could take place over the next decade.	Cleanup activities could occur at the same time as sediment removal.
Sites listed on CSCSL	Ecology	Capitol Lake, Inner Budd Inlet	Many sites in the area of interest are listed on the Confirmed and Suspected Contaminated Sites List (CSCSL).	Sites on the CSCSL may be in various stages; awaiting cleanup, cleanup started, or no further action.	Cleanup activities could occur at the same time as sediment removal.

Project	Proponent	Location	Description	Schedule or Status	Contributing Activity (for cumulative impacts)
Tumwater Valley Regional Stormwater Facility	City of Tumwater Department of Public Works	Thurston County parcel #33870000300, adjacent to the Deschutes River, between I-5 and the Tumwater Valley Municipal Golf Course	Convert ~4 acres of an existing wetland to a stormwater facility to provide water quality treatment to runoff prior to entering the Deschutes River. The system will treat ~100 acres of runoff.	Expected start date is within 5 years of project application (2020).	Stormwater facility could improve water quality and decrease sediment entering the system. Could potentially contribute to local construction traffic during the time frame of project construction.
West Bay Restoration & Park Master Plan	City of Olympia	West shoreline of West Bay within Budd Inlet; immediately north of the Capitol Lake dam and the Deschutes River's connection to Budd Inlet	Master plan for West Bay habitat restoration, park, and trail features. Combining ecological restoration of the site's various ecosystems with a multiuse trail and increased passive recreation opportunities The park will expand from its current 4-acre developed area to an additional 13 acres of restored habitat and developed park on Budd Inlet.	Master planning underway.	The project could provide ecological improvements and recreation opportunities in the study area.
4th Avenue Sewer Construction	City of Olympia	4th Avenue W between the bridge and Water Street	Construct additional wastewater sewer capacity.	2023	Potentially contribute to local construction traffic during time frame of project construction.
4th Avenue Street Overlay	City of Olympia	4th Avenue W between the bridge and Water Street	Street repair and reconstruction project to extend the life of the roadway.	2025	Potentially contribute to local construction traffic during time frame of project construction.
Deschutes Parkway Lakeridge Drive Roundabout	City of Olympia	Intersection of Deschutes Parkway and Lakeridge Drive	Construct a roundabout and install bicycle lane pavement markings on Lakeridge Drive.	2021	Potentially contribute to local construction traffic during time frame of project construction.

Project	Proponent	Location	Description	Schedule or Status	Contributing Activity (for cumulative impacts)
Capitol Way - Water Quality Retrofit	City of Olympia	7th Avenue and Capitol Way	Construct a water quality treatment facility to treat runoff from an area roughly bounded by Capitol Way, Adams Street, 7th Avenue, and Union Avenue.	2026	Stormwater facility could improve water quality and decrease sediment entering the system. Potentially contribute to local construction traffic during the time frame of project construction.
Downtown Flood Mitigation	City of Olympia	Various	Install tide gates on key stormwater outfalls to Budd Inlet and Capitol Lake, thereby preventing tides from flowing up the pipes and discharging to low-lying downtown streets.	Annual	This project could mitigate some of the flooding in the study area.
Near-term Capitol Lake & Heritage Park Flood Barrier	Enterprise Services, City of Olympia	Throughout Heritage Park	Minor landscaping changes to increase the elevation of low spots in Heritage Park to lessen flood impacts. Even with these actions, low-lying areas within and adjacent to Heritage Park will remain vulnerable to flooding.	2024–2025	This project could mitigate some of the flooding in the study area.
Midterm Capitol Lake & Heritage Park Flood Barrier	Enterprise Services, City of Olympia	Throughout Heritage Park	Address midterm flooding (up to 24 inches [61 cm] of sea level rise) along the Capitol Lake shoreline. Potential physical strategies include: relandscaping Heritage Park to create a raised berm; or rebuilding and raising the current floodwall and walkway, and installing a flood gate across the railroad and Powerhouse Road SW.	2025–2050	This project could mitigate some of the flooding in the study area.

Project	Proponent	Location	Description	Schedule or Status	Contributing Activity (for cumulative impacts)
Midterm North Isthmus Flood Barrier	City of Olympia	4th Avenue W between the bridge and Water Street	Address midterm flooding (up to 24 inches [61 cm] of sea level rise) along the north isthmus shoreline. Construct a linked system of planter boxes along 4th Avenue W with flood gates at Simmons Street and Sylvester Street, to create temporary shoreline during large coastal storm events to prevent flooding of low-lying inland areas of downtown.	2030–2035	This project could mitigate some of the flooding in the study area. This could potentially contribute to local construction traffic during time frame of project construction.
Projects to address requirements from the Deschutes River TMDL	City of Olympia	Various	The draft Deschutes River TMDL suggests the City of Olympia may need to investigate outfalls to the Deschutes Watershed and potentially provide water quality treatment or other mitigation. Tree planting for shade along Percival Creek and the Black Lake Ditch is also anticipated.	Unknown	Implementation of the plan is anticipated to result in water quality improvements by individual projects.
Deschutes Parkway Sidewalk Improvements	City of Olympia	Deschutes Parkway between 5th Avenue SW and Lakeridge Drive SW	City of Olympia's *Draft Transportation Master Plan (November 2020)* lists this segment as being a high priority to fill missing sidewalks.	No improvement yet planned	Improved sidewalks would enhance pedestrian access and comfort adjacent to Capitol Lake. This could potentially have a cumulative effect during construction.
Deschutes Coho Recovery Plan 2015	Squaxin Island Tribe	Upstream of Capitol Lake	Various small-scale restoration projects.	Unknown	Implementation of the plan is anticipated to result in habitat improvements by individual projects.
Deschutes Riparian Plan Assessment 2013	City of Tumwater	Upstream of Capitol Lake	Various small-scale restoration projects.	Unknown	Implementation of the updated plan is anticipated to result in habitat improvements by individual projects.

6.6 WHAT ARE THE CUMULATIVE EFFECTS FOR THIS PROJECT?

6.6.1 Hydrodynamics and Sediment Transport

6.6.1.1 Summary of Project Impacts

Hydrodynamics

Based on hydrodynamic modeling, the No Action and Managed Lake Alternative would have similar long-term hydrodynamic conditions, and the Estuary and Hybrid Alternatives would have similar long-term hydrodynamic conditions. All alternatives would experience high water levels and lowland flooding around the Capitol Lake Basin. For the No Action and Managed Lake Alternatives, high water levels are driven by extreme river flood events. Under the Estuary and Hybrid Alternatives, high water levels are influenced by extreme tides. Among all alternatives, the highest maximum water levels and greatest extent of flooding occur for the Managed Lake Alternative during extreme river floods. The No Action Alternative would experience similar, although slightly lower, water levels during extreme river floods.

Planned flood-proofing improvements as part of the Olympia Sea Level Rise Response Plan would reduce overland flooding driven by extreme tides with sea level rise. In coordination with the Olympia Sea Level Rise Response Plan, design parameters would be included for the flood protection design of the Heritage Park berm to account for extreme river flooding under the Managed Lake Alternative.

Sediment Transport

Based on sediment transport modeling, all alternatives would continue to accumulate sediment within the Capitol Lake Basin and in West Bay. Under the Managed Lake Alternative, sediment deposition in Capitol Lake and West Bay would be similar to the No Action Alternative, although there would be a slight increase in sedimentation in the North Basin under the Managed Lake Alternative because the deeper water levels established through dredging would allow sediment that is suspended in the water column to settle, instead of passing over the 5th Avenue Dam. For the Estuary and Hybrid Alternatives, removal of the 5th Avenue Dam would allow sediment to be transported farther downstream into Budd Inlet. This would result in more transport and less deposition in the South, Middle, and North Basins, and substantially more

deposition in Budd Inlet during periods of high river flows. The reflecting pool wall in the Hybrid Alternative forces water to accelerate around the wall as it exits the North Basin. Faster current speeds in this area result in localized scour and increased transport of sediment to Budd Inlet. Sediment deposition in Budd Inlet would increase up to 283% for the Estuary Alternative, and 366% for the Hybrid Alternative, on average.

6.6.1.2 Potential Cumulative Effects

Hydrodynamics

None of the projects identified in Table 6.5.1 are anticipated to have a substantial impact on water levels within the Capitol Lake Basin. Therefore, no cumulative effects related to water levels and flooding are anticipated. The separate flood mitigation and flood barrier work planned by the City of Olympia and Enterprise Services to address flooding in downtown Olympia would provide a flood reduction benefit.

Sediment Transport

Some of the projects listed in Table 6.5.1 could result in localized changes to sediment transport. The City of Tumwater's new stormwater facility and the City of Olympia's water quality treatment facility could nominally decrease sediment loads to the system, as could planned restoration activities. With the possible exception of planned cleanup actions in West Bay, none of these projects would contribute to a cumulative effect. Cleanup actions could limit or increase sediment erosion within West Bay, depending on the method of cleanup chosen (e.g., dredging to remove contaminated sediment or monitored natural recovery where accumulation of cleaner sediment upstream is considered beneficial). Combined with changes under the Estuary and Hybrid Alternatives, there may be minor contribution to cumulative effects to sediment transport in West Bay. However, none of the planned future projects would have a clear effect on modeling input parameters used for the Capitol Lake – Deschutes Estuary Long-Term Management Project.

6.6.2 Navigation

6.6.2.1 Summary of Project Impacts

Under the Estuary and Hybrid Alternatives, sediment deposition would occur primarily along the east shoreline of West Bay, the

location of several marinas, the Port of Olympia, and other water-dependent businesses.

Impacts on navigation are considered significant if large commercial vessels accessing the FNC and Port of Olympia would be required to wait longer than 4 hours for channel access due to sediment deposition or maintenance dredging, or if over 10% of anticipated small-craft vessels would not be able to access their marina slip for moorage as a result of sediment accumulation. The incorporation of initial dredging and an adaptable maintenance dredging plan, combined with the implementation of a data-driven monitoring plan, would reduce significant impacts to less than significant levels under the Estuary and Hybrid Alternatives.

6.6.2.2 Potential Cumulative Effects

Dredging is expected to occur throughout West Bay within the next 10 years to address known sediment contamination and reestablish navigational depths. Dredging is also needed at the private marinas as a requirement of marina lease renewals. Based on recent and ongoing coordination with the Port of Olympia and private marinas, it is anticipated that this non-project dredging would occur prior to removal of the 5th Avenue Dam under the Estuary or Hybrid Alternative. As a result, no cumulative effects on navigation would occur due to project implementation and associated restoration of sediment loading in West Bay. Sediment monitoring would be conducted to increase certainty that maintenance dredging occurs at a frequency to avoid significant impacts to navigation. When dredging is needed, in West Bay, it would be coordinated across these downstream resources so that a single mobilization of dredging equipment is needed and to avoid disparate dredging that would result in repeated impacts to marina and port facilities. As a result, no cumulative effects in combination with the proposed project are anticipated.

No projects were identified that would be expected to change the vertical or horizontal restrictions for vessel movement in West Bay that could combine with the proposed project to produce long-term cumulative effects.

6.6.3 Water Quality

6.6.3.1 Summary of Project Impacts

Impacts on water quality for most construction activities would be less than significant, and would be minimized through implementation of protective conditions and BMPs, which would be included in the project permits. Potentially significant adverse short-term impacts on water quality are anticipated under the Estuary and Hybrid Alternatives from the initial release of sediment and nutrients after tidal flow is restored during 5th Avenue Dam removal.

Operational impacts under the Managed Lake Alternative would range from less than significant (related to maintenance dredging) to beneficial (related to water quality improvements from aquatic plant management). Seasonal exceedances of water quality standards in Capitol Lake (temperature, dissolved oxygen, total dissolved gas, and pH) are likely to continue, and there would be no change in impact to water quality in Budd Inlet where the water quality standards for dissolved oxygen would continue to not be attained and the habitat quality and quantity for cold water fish would not materially change. The analysis of impacts took into account the cumulative effects of project actions and the implementation of the Deschutes River TMDL and pollution control activities in the lake basin.

Operational impacts under the Estuary and Hybrid Alternatives would range from less than significant (related to maintenance dredging) to potentially significant (related to long-term water quality in the Capitol Lake Basin) to beneficial (related to elimination of freshwater aquatic plants). As is typical of estuarine environments in Puget Sound, the water would have seasonally low dissolved oxygen and possible increase in algal blooms. Ecology has determined that the Estuary Alternative would meet the applicable narrative water quality standard, and that it is the only alternative capable of meeting water quality standards for dissolved oxygen in Budd Inlet. However, dissolved oxygen concentrations would continue to be low.

6.6.3.2 Potential Cumulative Effects

It is possible that the projects in Table 6.5.1 could be constructed in the same general time frame as the proposed project. However, these projects would be required to implement BMPs to protect water quality, and none are anticipated to add to the sediment and nutrient release that would occur following removal of the 5th Avenue Dam

under the Estuary and Hybrid Alternatives. Therefore, no short-term, construction-related cumulative effects on water quality are anticipated.

Future requirements for stormwater management through improvements in stormwater treatment technologies and discharge limits will likely gradually improve water quality in the study area waterbodies, including the Capitol Lake Basin and Budd Inlet. These improvements would result from implementation of the Deschutes River TMDL, Budd Inlet TMDL, and the Puget Sound Nutrient Reduction projects, all of which are expected to reduce nutrient loading to study area waterbodies. Implementation of individual projects, such as the Tumwater Valley Regional Stormwater Facility, Capitol Way Water Quality Retrofits, and restoration projects associated with the Water Resource Inventory Areas (WRIA) 13 Watershed Restoration and Enhancement, are expected to result in water quality improvements. Overall, the combined impact of these plans and projects would have a beneficial effect on water quality in the Capitol Lake Basin and in West Bay. However, with climate change, water temperature is expected to increase, contributing to lower dissolved oxygen. While the aforementioned projects would reduce nutrient sources to the lake and the inlet within the time horizon for the proposed project, with consideration of climate change, dissolved oxygen concentrations in the lake basin and West Bay would be expected to be similar to what currently exist.

6.6.4 Wetlands

6.6.4.1 Summary of Project Impacts

Under the Managed Lake Alternative, Capitol Lake would remain a freshwater system. The North Basin would remain deepwater habitat, and the Middle and South Basins would transition from deepwater habitat to vegetated wetlands. There would be a net gain in wetland functions, and there would be a minor beneficial effect.

The Estuary and Hybrid Alternatives would restore the Capitol Lake Basin to an estuarine system similar to historic conditions. Estuarine wetlands are a relatively scarce resource in the region and provide additional functions that are not available in freshwater deepwater habitats, and there would be a substantial beneficial effect.

All of the action alternatives would include overwater structures that would result in similar areas of wetlands shade and fill. Under the

Estuary and Hybrid Alternatives, the removal of the 5th Avenue Dam would remove approximately 3.3 acres of fill from deepwater habitats. Project design would be refined to minimize the wetland loss and maximize habitat benefits. With consideration of improved habitat functions and self-mitigating functions of the alternatives, the need for compensatory mitigation may be reduced to zero, especially under the Estuary and Hybrid Alternatives. With habitat features included in the action alternatives, and additional compensatory mitigation, if required by regulatory agencies, direct impacts from fill and indirect impacts from shade under all action alternatives would be less than significant.

6.6.4.2 Potential Cumulative Effects

With the implementation of measures to minimize impacts during construction and design measures to minimize wetland loss described in Chapter 4.0 (Section 4.6, Wetlands), adverse impacts would be less than significant. As with this project, the projects listed in Table 6.5.1 are subject to the federal, state, and local requirements related to mitigating impacts on wetlands. Even with potential for minor wetland impacts associated with the cumulative projects list, the proposed project would not result in a cumulative negative effect on wetlands.

The Estuary and Hybrid alternatives would increase the total amount of estuarine wetlands in the South Puget Sound, having a substantial beneficial effect on the availability of this rarer wetland type.

6.6.5 Fish and Wildlife

6.6.5.1 Summary of Project Impacts

Under all action alternatives, potential construction impacts on fish and wildlife would be less than significant with adherence to approved in-water work windows and standard construction BMPs. Potential construction impacts include fish entrainment and direct mortality, temporarily degraded water quality, turbidity and sedimentation, and noise and vibration. Although individual fish or wildlife could be affected, these impacts would be small and would not measurably affect local fish or wildlife populations.

Under the Managed Lake Alternative, active lake management would have minor benefits to fish and other aquatic species, although fish and wildlife distribution and use patterns would remain similar to existing conditions. The conversion of freshwater lake habitat to a

tidally influenced brackish estuary would substantially benefit (Estuary Alternative) and moderately benefit (Hybrid Alternative) anadromous fish and marine fish, potentially including ESA-listed Chinook salmon and steelhead trout, as well as shellfish. The loss of freshwater habitat that supports a foraging base for bats from the Woodard Bay colony, however, would be a potentially significant impact. Similarly, the elimination of habitat for native freshwater fish under the Estuary and Hybrid Alternatives from the conversion of freshwater deepwater habitat would be a significant impact. Other changes in habitat types under the action alternatives would provide minor to substantial benefits for other species, such as raptors, songbirds, and shorebirds. All action alternatives would also create habitat areas with a mosaic of habitat types, a benefit to wildlife.

6.6.5.2 Potential Cumulative Effects

As described above, construction impacts on fish would be less than significant with implementation of minimization and mitigation measures; however, they could contribute to cumulative effects. It is possible that some of the projects in Table 6.5.1 could be constructed in the same general time frame as the proposed project; however, these projects would be required to implement similar measures for the protection of aquatic species. Any adverse impacts would be temporary and localized. Therefore, no short-term, construction-related cumulative effects on fish and wildlife are anticipated.

The estuary habitat conditions reestablished by dam removal (Estuary and Hybrid Alternatives) would result in beneficial effects for salmon, other anadromous species, and marine fish. Due to historical declines, estuary habitat is a relatively scarce and valued habitat in the region compared to freshwater ponds and lakes, which remain relatively abundant. Conversely, there would be significant impacts to freshwater fish and bats from the Estuary and Hybrid Alternatives. However, none of the reasonably foreseeable projects in Table 6.5.1 are anticipated to contribute to similar impacts on those species. None of the projects would similarly reduce freshwater habitat needed for freshwater fish and bats (for foraging). Many of the projects listed in Table 6.5.1 have the potential to beneficially affect fish and wildlife. Implementation of the Deschutes River TMDL, Capitol Lake/Budd Inlet TMDL, and the Puget Sound Nutrient Reduction projects are expected to reduce nutrient loading to study area waterbodies, which would benefit fish through improved dissolved oxygen levels. Restoration projects along the Deschutes River associated with the Watershed Restoration and

Enhancement Program would improve and increase the amount of habitat available for fish and other aquatic species. Stormwater facility and retrofit projects would improve water quality in the Project Area, improving aquatic habitat. Overall, the combined impact of these planned projects would have a beneficial effect on aquatic habitat in the Capitol Lake Basin and in Budd Inlet.

Overall, none of the action alternatives, when combined with the impacts of the projects listed in Table 6.5.1, are anticipated to contribute to cumulative effects on fish and wildlife but would have long-term beneficial effects on certain aquatic species and habitats.

6.6.6 Air Quality and Odors

6.6.6.1 Summary of Project Impacts

Both the Estuary and Hybrid Alternatives would create additional tideflats in the area, with the potential to emit odors in an urban location. In consideration of the variability in frequency, intensity, duration, and differing perceptions of the odors, odor impacts from the Estuary Alternative are expected to be less than significant.

The project is not expected to create any new violations of air quality standards. The total annual emissions of each pollutant during construction and operation would be less than the general conformity *de minimis* thresholds; therefore, the air quality impacts associated with the action alternatives would be less than significant.

6.6.6.2 Potential Cumulative Effects

It is possible that the projects in Table 6.5.1 could be constructed in the same general time frame as the proposed project; however, analysis of cumulative construction emission concentrations of these pollutants would be speculative due to the variability in project construction schedules and mobile source trip routes. Additionally, the study area is designated as attaining all NAAQS, indicating that existing air quality conditions are not deleterious. The proposed project's on-site and mobile emissions, when added to other projects in the vicinity, would not result in a cumulative effect.

Regional air quality is likely to improve between the present and 2030 because of more stringent regulations and trends toward cleaner vehicles. The proposed project would not result in the generation of substantial vehicle trips or other operational-related air emissions

that would contribute to a cumulative air quality impact. As a result, there would be no cumulative effect.

The annual GHG emissions for all action alternatives represent less than 0.01% of estimated annual 2015 GHG emissions within Washington, and much smaller percentages of worldwide emissions. It is important to note that the scale of global climate change is so large that the impacts from one project, no matter the size, would almost certainly have no discernible effect on increasing or decreasing global climate change. However, any project contributes cumulatively to GHG emissions.

6.6.7 Land Use, Shorelines, and Recreation

6.6.7.1 Summary of Project Impacts

Most of the recreation resources in the study area would remain open and continue to operate during construction. However, Marathon Park would be closed for 4 to 8 years, depending on the alternative, and several areas around the lake would be subject to intermittent, partial closures and construction noise and visual disturbance during the periods when dredging and other construction would occur. Given the duration of construction-related recreational closures and disturbance, construction impacts on recreation are considered significant for all action alternatives.

For all action alternatives, improved water quality, sediment management, improved ecological functions, and increased opportunities for community use are expected to have beneficial effects and would allow for the resumption of boating and fishing.

Increased flooding from extreme river flood events and extreme tides (with sea level rise), is expected under all alternatives, including the No Action Alternative, and could impact downtown land uses and low-lying parks.

The Estuary and Hybrid Alternative would increase sediment deposition in West Bay when compared to the No Action or Managed Lake Alternative. With maintenance dredging, this would not adversely affect land or shoreline uses. Impacts would be considered significant if maintenance dredging does not occur as planned, or if project actions (annual monitoring and recurring maintenance dredging) do not fully avoid impacts

6.6.7.2 Potential Cumulative Effects

Planned projects, including construction of near-term and midterm flood barrier projects at Heritage Park, would also potentially overlap with construction and/or maintenance dredging activities of the action alternatives. This could potentially contribute to the disruption to public access and recreation in the study area. If this coincided with closures at Marathon Park, there would be cumulative effects associated with short-term disruptions. Similar to the proposed project, the projects within the study area would not permanently affect recreational facilities, and some would continue to beneficially enhance recreational facilities in the area. Therefore, long-term cumulative effects on public access and recreational opportunities are generally beneficial.

6.6.8 Cultural Resources

6.6.8.1 Summary of Project Impacts

All action alternatives are expected to cause potential impacts on archaeological resources during construction from earthwork, dredging, and filling. Archaeological resources are nonrenewable, and any impact on the depositional integrity of a protected archaeological resource is considered a significant impact.

There would be significant impacts on historic built environment resources under the Estuary and Hybrid Alternatives because eligible resources would be removed (5th Avenue Bridge, 5th Avenue Dam, and Olympic Street W Bridge).

6.6.8.2 Potential Cumulative Effects

In the study area, past and ongoing development and natural elements have reduced the information potential and cultural value of prehistoric- and ethnographic-period cultural resources. In some cases, past actions, such as placement of dredged fill, may have helped to preserve cultural resources. Significant, undocumented, buried archaeological materials may be present that could be damaged or destroyed by grading or excavation associated with reasonably foreseeable actions, in addition to the proposed project. However, implementation of mitigation and minimization measures described in Chapter 4.0 (Section 4.8, Land Use, Shorelines, & Recreation), would ensure that project-related activities would not make a considerable contribution to cumulative effects on important undocumented cultural resources.

6.6.9 Visual Resources

6.6.9.1 Summary of Project Impacts

Given the duration of construction-related staging at Marathon Park and in-water construction and staging, construction impacts on visual resources are considered significant for all action alternatives. Additionally, there would be a long-term visual impact associated with the barrier wall under the Hybrid Alternative. In the North Basin, the visual impacts of the barrier wall would be severe, introducing a large, conspicuous structure that divides the waterbody and blocks views across it from the east and west. Although mitigation for the appearance of the wall could be provided, its sheer scale would result in a significant unavoidable impact.

6.6.9.2 Potential Cumulative Effects

When analyzing cumulative visual impacts, the potential for projects in Table 6.5.1 to alter the existing visual environment within the same viewshed as the project were considered. In the short term, the action alternatives would contribute to a cumulative visual impact by adding more activities and construction equipment in the area at the same time as the reasonably foreseeable projects listed in Table 6.5.1.

No reasonably foreseeable projects in the viewshed were identified that would introduce substantial new modifications with long-term visual impacts. For this reason, the adverse visual impacts that would occur from the project under the Hybrid Alternative would not create a cumulative effect on visual resources.

6.6.10 Environmental Health

6.6.10.1 Summary of Project Impacts

The risk of sediment quality degradation from maintenance dredging under any action alternative is low because sediment dredged would be similar to the high-quality sediment conditions currently present in Capitol Lake, resulting in less than significant impacts. Under the Estuary and Hybrid Alternatives, the natural export of sediment into West Bay would have moderate effects on sediment quality in West Bay depending on the location, deposition rates, and chemical parameters. Maintenance dredging for all action alternatives would have no adverse impacts on sediment quality.

6.6.10.2 Potential Cumulative Effects

The proposed project would not result in adverse impacts and thus not contribute to cumulative effects.

6.6.11 Transportation

6.6.11.1 Summary of Project Impacts

The action alternatives would have potential short-term impacts on traffic from construction activities. Impacts would be the greatest with the Estuary and Hybrid Alternatives. Implementation of a CTMP and Traffic Control Plan is expected to reduce impacts to less than significant levels.

Construction of all action alternatives would include a short-term closure of the 5th Avenue Bridge. Buses would be displaced from the 5th Avenue Bridge, and unless a temporary connection can be provided that allows buses to reroute to 4th Avenue, this is considered a significant unavoidable impact. Although mitigation measures would avoid or minimize all adverse traffic and pedestrian impacts during periods when the 5th Avenue Bridge would be closed, traffic increases along the 4th Avenue W detour route (or detour routes around the south end of the Middle Basin for the Managed Lake Alternative) still could result in congested operations during some periods of peak traffic demand. Truck trips associated with maintenance dredging under all action alternatives could also result in significant and unavoidable impacts if dredged spoils are removed by trucks on surface streets, which is expected to occur under the Managed Lake Alternative.

6.6.11.2 Potential Cumulative Effects

The City of Olympia has plans to install a new gravity main under 4th Avenue W between the 4th Avenue Bridge and Water Street and repave the street. Construction of that gravity main is anticipated to occur between 2023 and 2025, which is unlikely to overlap with the construction time frame of the action alternatives. However, if construction were to coincide with closure of the 5th Avenue Bridge, there would be a short-term cumulative effects on transportation, exacerbating the impacts of the bridge closure. Other planned projects, including the future sidewalk improvements along Deschutes Parkway, and near-term and midterm flood barrier projects, could potentially overlap with the construction time frame of the action alternatives. This could potentially contribute to local

construction traffic during construction of the action alternatives, but no cumulative effects would be expected. If construction of the other future projects were to coincide with maintenance dredging, construction traffic of those projects would combine with the haul trips to remove dredged spoils from the study area to produce short-term cumulative effects on transportation. This is most likely to occur under the Managed Lake Alternative because in-water disposal (using barges, not trucks) is assumed for the Estuary and Hybrid Alternatives.

As under the proposed project, implementing reasonably foreseeable projects would also not cause a long-term increase in traffic in the study area or adjacent neighborhoods, and the increase resulting from any of the action alternatives would be small relative to overall traffic and insufficient to alter levels of service. Therefore, the combined effect of implementing reasonably foreseeable projects and any of the action alternatives would not be sufficient to cause a long-term cumulative effect on traffic.

6.6.12 Public Services and Utilities

6.6.12.1 Summary of Project Impacts

Minimal amounts of utility provision or other public services would be required for the action alternatives. Prior to project implementation, utility locations would be determined in order to avoid the existing utilities, or early coordination would be initiated with utility providers to limit potential interruption of services and minimize potential impacts during construction.

During the minimal closures required for the 5th Avenue Bridge under the action alternatives, response times for emergency vehicles in the area would likely be increased. Given the limited closure durations, impacts would be less than significant with the mitigation identified in Chapter 4.0 (Section 4.13, Public Services & Utilities).

Under the Estuary and Hybrid Alternatives, with mitigation measures to monitor for corrosion and replace utility lines if corrosion starts to become considerable, impacts could be reduced to less than significant levels.

6.6.12.2 Potential Cumulative Effects

Similar to the proposed project, the reasonably foreseeable actions identified in Table 6.5.1 would have fairly minimal demands for the

provision of utilities and would generally not have a permanent need for services. Some of these projects would improve or replace old or failing utility infrastructure in the area. If construction of the new gravity main under 4th Avenue W between the 4th Avenue Bridge and Water Street NW were to coincide with the short-term closures of the 5th Avenue Bridge, there would be cumulative effects on response times for emergency vehicles.

6.6.13 Economics

As mentioned in Section 6.3, for economics, cumulative effects are generally associated with the implications of additional development downtown, and the long-term effects associated with ecosystem services. Economic impacts are largely cumulative, the result of broad interactions in the study area. All of the alternatives could affect downtown development and could change ecosystem services. These cumulative effects were considered as part of the economics analysis and are not further described here (see Chapter 4.0 [Section 4.14, Economics], and the Economics Discipline Report [Attachment 18]).

Reference Materials for Chapter 6.0

CEQ. 1997. Considering Cumulative Effects Under the National Environmental Policy Act.

CEQ. 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.