DRAFT

ENVIRONMENTAL IMPACT STATEMENT

for

BREMERTON WATERFRONT INFRASTRUCTURE IMPROVEMENTS

at

PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY, NAVAL BASE KITSAP-BREMERTON

VOLUME 3: APPENDICES J - R

July 2025

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MARINE INVERTEBRATES WITHIN THE DEMOLITION, CONSTRUCTION, AND OPERATIONS REGION OF INFLUENCE

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1 Marine Invertebrates that Potentially Occur along the NAVBASE Kitsap-Bremerton Waterfront

Information from multiple data sources was used to compile a list of marine invertebrates that potentially occur at Naval Base (NAVBASE) Kitsap-Bremerton.

The following data sources were used to develop the list of species presented in this table and to gather observation information presented in the third column of the table:

- *Integrated Natural Resources Management Plan (INRMP) Naval Base Kitsap* (Navy, 2018). Appendix E of the INRMP includes a list of benthic and shellfish species that may occur at NAVBASE Kitsap-Bremerton. This source was used to help compile the list presented in the table.
- Remotely Operated Vehicle (ROV) underwater imagery. ROV footage recorded as part of a habitat survey effort for the project (Navy, 2020) was reviewed to identify invertebrates. Data obtained include counts of invertebrates that could be readily identified from ROV footage, although identification to species was not possible.
- Final Assessment of Threatened and Endangered Marine and Anadromous Fish Presence and Their Critical Habitat Occurrence Adjacent to Naval Base Kitsap Bremerton: 2013-2015 Survey Results (Frierson et al., 2016). Information about invertebrate species outside the floating security barrier was obtained in 2014 during ROV and lighted trap surveys.
- Results of the 2020-22 Entrainment Study to Assess Potential Impacts to ESA-Listed Salmonids and Other Fish During Dry Dock Dewatering Events at Naval Base Kitsap-Bremerton (Pacunski et al., 2022). Invertebrate counts from Washington Department of Fish and Wildlife fish entrainment surveys at Dry Docks 1, 3, 5 and 6. Data from June and September 2020, March, June, and September 2021, and February 2022.
- Invertebrate data from field surveys and sediment samples associated with the ex-USS Independence, formerly located at Dry Dock 6. Surveys included an inventory of biofouling organisms present on the ship's hull prior to cleaning (Earley et al., 2017) and of benthic invertebrates found in sediment samples taken from below the ship (Johnson et al., 2018).

While sunflower sea star (proposed for federal listing) is not documented in any of these data sources, it has been included in the table because the species was present in nearby Port Madison during surveys conducted from 1997 – 2019 (Casendino et al., 2023). Therefore, the sunflower sea star may be present along the waterfront (pending surveys scheduled in Summer 2025). Supplemental habitat information is provided as appropriate, and where readily available, from sources identified in the table that follows. Sources of habitat information include Dethier, 2006; Palomeres and Pauly, 2020;, Puget Sound Institute, 2012–2021; Cowles, 2002–Present; Washington Department of Ecology, 2014; and Washington Department of Fish and Wildlife (WDFW), 2021.

Table 1 Marine Invertebrates that Potentially Occur within the Demolition, Construction, and Operations ROI

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
CRUSTACEANS				
Amphipods	*Aoroides* sp.	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Caprellid amphipods (*Caprella* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N + I
	Tube-dwelling amphipods (*Jassa* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N + I
	Tube-building amphipods (*Monocorophium* spp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N+I
	Pleustidae	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
Decapods	Crabs (numerous species)	Observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys in rocks/riprap and in gravelly/sandy bottom areas.	Navy, 2020	--
	Graceful decorator crab (*Oregonia gracilis*)	Observed at Dry Dock 6. Habitat: intertidal, mixed composition bottoms	Navy, 2018; Pacunski et al., 2022; Cowles, 2002–present	N
	Dungeness crab (*Cancer magister*)	Observed outside floating security barrier. Habitat: intertidal and subtidal sediments	Navy, 2018; Frierson et al., 2016; Dethier, 2006	N
	Helmet crab (*Telmessus cheiragonus*)	Observed at Dry Dock 3. Habitat: surface, subtidal and sometimes intertidal, eelgrass, algae, soft bottoms, sometimes rocky bottoms	Navy, 2018; Pacunski et al., 2022; Cowles 2002–present	N
	Graceful crab/graceful rock crab/slender crab (*Cancer gracilis*)	Observed at Dry Docks 3, 4, and 5 and captured in lighted fish traps adjacent to NAVBASE Kitsap Bremerton. Habitat: surface, subtidal sand and mud, sometimes near eelgrass beds, may be on pilings	Navy, 2018; Pacunski et al., 2022; Cowles, 2002–present; Frierson et al., 2016	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Longhorn decorator crab (*Chorilia longipes*)	Observed at Dry Docks 3 and 6. Habitat: subtidal rocks and boulders, gravel, shelly, and muddy bottoms	Pacunski et al., 2022; Cowles 2002–present	N
	Epialtidae	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Northern kelp crab (*Pugettia producta*)	Observed at Dry Docks 3, 5, and 6. Habitat: intertidal areas, kelp beds, common on pilings	Navy, 2018; Pacunski et al., 2022; Cowles, 2002–present	N
	Pygmy rock crab (*Cancer oregonensis*)	Observed at Dry Docks 3, 5, and 6. Habitat: Intertidal areas under and between rocks, subtidally in dead barnacles	Pacunski et al., 2022; Cowles, 2002–present	N
	Red rock crab (*Cancer productus*)	Observed at Dry Dock 3 and outside floating security barrier. Habitat: rocky and soft bottoms, common around rocks	Pacunski et al., 2022; Navy, 2018; Cowles, 2002–present; Frierson et al., 2016	N
	Shore crabs (*Hemigrapsus oregonensis*, *Hemigrapsus* sp.)	Observed at Dry Dock 3 and on ship hull at Dry Dock 6.	Earley et al., 2017; Pacunski et al,. 2022	N + I
	Blackclaw crestleg crab (*Lophopanopeus bellus*)	Observed on ship hull at Dry Dock 6. Habitat: intertidal under rocks	Earley et al., 2017; Cowles, 2002–present	N
	Pea crab (*Pinnixa* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Western tube crab (*Polyonyx quadriungulatus*)	Observed at Dry Dock 6. Habitat: benthic	Pacunski et al., 2022	N
	Porcelain crab (Porcellanidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Sharpnose crab (*Scyra acutifrons*)	Observed at Dry Dock 6. Habitat: Rocky areas, sometimes found on pilings	Pacunski et al., 2022	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Shrimp	Unidentified shrimps observed at Dry Docks 5 and 6.	Pacunski et al., 2022	--
	Coastal sand shrimp (*Heptacarpus* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Stout shrimp (*Heptacarpus brevirostris*)	Captured in lighted fish traps adjacent to NAVBASE Kitsap Bremerton. Habitat: rocky intertidal and subtidal, common in harbors on floats and pilings	Frierson et al., 2016; Cowles, 2002–present	N
	Crangon shrimp (*Crangon* sp.)	Captured in lighted fish traps adjacent to NAVBASE Kitsap Bremerton. Observed at Dry Dock 6. Habitat: on surface or burrowed in sand, intertidal	Frierson et al., 2016; Pacunski et al., 2022	N
	Pandalid shrimp/ dock shrimp (*Pandalus* sp. *Pandalus danae Pandalus hypsinotus*)	Observed at Dry Docks 3, 5, and 6 and captured in lighted fish traps adjacent to NAVBASE Kitsap Bremerton. Habitat: subtidal to low intertidal, on rocky or sandy bottoms	Navy, 2018; Pacunski et al., 2022; Cowles, 2002–present; Frierson et al., 2016	N
	Spiny lebbeid (*Lebbeus groenlandicus*)	Observed at Dry Dock 6. Habitat: soft bottoms with sand, gravel, and shells	Pacunski et al., 2022; Cowles, 2022-present	N
Isopods	*Laniropsis* sp.	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N + I
	Munnidae	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
Other crustaceans	Barnacles (*Balanus* and. *Semibalanus* spp.)	Observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys on piles and other in-water structures; acorn barnacles (*Balanus crenatus*) observed on ship hull in Dry Dock 6 and in sediments below the ship. Habitat: surface, low intertidal to subtidal rocks or pilings	Earley et al., 2017; Navy, 2020; Navy, 2018; Cowles, 2002–present; Johnson et al., 2018	N
	Leptostracans (*Nebalia* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Mysids (Mysidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
MOLLUSKS				
Mollusks	Bivalves	One unidentified clam observed at Dry Dock 3; *Macoma* sp. *(*taxon unknown) found in sediment below ship at Dry Dock 6; and shell fragments commonly observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys.	Navy, 2020; Pacunski et al., 2022	--
	Spiny scallop (*Chlamys hastata*)	Observed on ship hull at Dry Dock 6. Habitat: mostly subtidal on sandy or shelly hash bottoms and among boulders	Earley et al., 2017; Cowles, 2002–present	N
	Giant rock scallop (*Crassodoma gigantea*)	Habitat: low intertidal, on rock substrates	Navy, 2018; Cowles, 2002–present	N
	Pacific oyster (*Crassostrea gigas*)	Habitat: surface, subtidal mud, rock, and shell substrates	Navy, 2018	I

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Rock entodesma (*Entodesma navicula*)	Observed on ship hull at Dry Dock 6. Habitat: low intertidal in holes and crevices in rocks and in holdfasts of kelp and barnacles	Earley et al., 2017; Cowles, 2002–present	N
	Arctic hiatella (*Hiatella arctica*)	Observed on ship hull at Dry Dock 6. Habitat: surface, intertidal on hard bottoms, attached to algal holdfasts, mussel mats, and empty burrows of rock-boring bivalves	Earley et al., 2017; Palomares and Pauly, 2020	C
	Suborbicular kellyclam (*Kellia suborbicularis*)	Observed on ship hull at Dry Dock 6. Habitat: intertidal in empty shells, empty holes in crevices, and in mussel beds	Earley et al., 2017; Palomares and Pauly, 2020	N
	Pacific littleneck clam (*Protothaca staminea*)	Habitat: buried in intertidal sediments; mixed coarse substrates	Navy, 2018; Dethier, 2006; Puget Sound Institute, 2012–2021	N
	Bent-nose macoma clam (*Macoma nasuta*)	Habitat: buried in sand substrate, intertidal and subtidal zones	Navy, 2018; WDFW, 2021	N
	Northern horse mussel (*Modiolus modiolus*)	Observed on ship hull in Dry Dock 6. Habitat: surface, subtidal, muddy bottoms with shell hash	Earley et al., 2017; Cowles, 2002–present	N
	Soft-shell clam (*Mya arenaria*)	Habitat: buried, intertidal mud and sandy mud, sometimes mixed with gravel	Navy, 2018; Cowles, 2002–present	N
	Mussels (*Mytilus* spp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017; Navy, 2018	N + I
	Mediterranean mussel (*Mytilus galloprovincialis*)	Habitat: intertidal, hard substrates, wharves, docks, pilings	Navy, 2018	I
	Foolish mussel (*Mytilus trossulus*)	Habitat: intertidal, hard substrates, wharves, docks, pilings	Cowles, 2002–present	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Olympia oyster (*Ostrea lurida*)	Observed on ship hull at Dry Dock 6. Habitat: surface, subtidal mud, rock, and shell substrates	Earley et al., 2017; Navy, 2018; Dethier, 2006	N
	Pacific geoduck (*Panopea generosa*)	Habitat: intertidal-subtidal, buried in sediments, primarily sand and sand-mud	Navy, 2018; Dethier, 2006; Puget Sound Institute, 2012–2021	N
	Green false jingle (*Pododesmus macrochasma*)	Observed on ship hull at Dry Dock 6. Habitat: intertidal and subtidal, cemented to rocks, plastic, or wood; common on pilings	Earley et al., 2017; Cowles, 2002–present	N
	Washington butter clam (*Saxidomus gigantea*)	Habitat: buried, low intertidal, sheltered sand, sandy mud, and gravel beaches	Navy, 2018; Cowles, 2002–present	N
	Sickle jackknife clam (*Solen sicarius*)	Habitat: buried, intertidal and subtidal, in sandy-muddy substrate, in relatively sheltered areas	Palomares and Pauly, 2020	N
	Horse clam, fat gaper clam (*Tresus capax*)	Habitat: buried, intertidal and subtidal sediments; sand, mixed coarse, and fine substrates	Navy, 2018; Dethier, 2006; Puget Sound Institute, 2012–2021	N
	Manila clam, Japanese littleneck (*Venerupis philippinarum*)	Habitat: buried, intertidal sediments; mixed coarse substrates	Navy, 2018; Dethier, 2006; Puget Sound Institute, 2012–2021	I
Gastropods	Carinate dovesnail (*Alia carinata*) and (*Alia gouldi*)	Observed on ship hull at Dry Dock 6. Habitat: surface, intertidal, often kelp and among eelgrass	Earley et al., 2017; Cowles, 2002–present	N
	Dove snails (*Alia* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Alvania compacta	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Common Atlantic slippersnail (*Crepidula fornicata*)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	I

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Pacific half-slippersnail (*Crepipatella lingulata*)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Limpet (order Patellogastropoda)	Habitat: surface, intertidal and subtidal on rock substrates	Navy, 2018; Cowles, 2002–present	--
	Shield limpet (*Lottia pelta*)	Observed on ship hull at Dry Dock 6. Habitat: intertidal, typically in protected locations on rocks	Earley et al., 2017; Cowles, 2002–present	N
	Lean western nassa (*Nassarius mendicus*)	Observed in sediment under ship in Dry Dock 6.	Earley et al., 2017	N
	Nudibranch (order Nudibranchia)	Unidentified species observed in NAVBASE Kitsap-Bremerton waterfront area on in-water structures and debris.	Navy, 2020; Navy, 2018	--
	Opalescent nudibranch (*Hermissenda crassicornis*)	Observed at Dry Dock 5. Habitat: surface, intertidal and subtidal, usually rocky pools, marina floats, pilings, and mud flats	Cowles, 2002–present	N
	Minute slipper snail (*Odostomia* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
Other Mollusks	California market squid (*Loligo opalescens*)	Observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys in the water column, at Dry Dock 5 and Dry Dock 6. Habitat: offshore, except when spawning in coastal sandy habitats	Navy, 2020; Pacunski et al., 2022	N
	Chitons (*Mopalia* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
Other Arthropods	Marine mites (*Halacaridae*)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	--
CNIDARIANS				
Anemones	Anemones	Observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys in rocks/riprap areas.	Navy, 2020; Navy, 2018	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Burrowing anemone (*Anthopleura artemisia*)	Habitat: mostly buried in sediment, low intertidal and subtidal, areas with rocks or cobble.	Navy, 2018; Cowles, 2002–present	N
	Frilled anemone, clonal plumose anemone (*Metridium senile*)	Observed on ship hull at Dry Dock 6. Habitat: surface, intertidal on rocks, shells, floating docks, pilings, occasionally on the carapace and claws of kelp crabs	Earley et al., 2017; Cowles, 2002–present	N
	Coral (class Anthozoa)	Unidentified species observed in NAVBASE Kitsap-Bremerton waterfront area on rocks/riprap along shoreline.	Navy, 2020	N
	Sea pen (order Pennatulacea)	Unidentified species observed in NAVBASE Kitsap-Bremerton waterfront area on muddy bottoms in deeper water. Habitat: anchored to sandy or muddy substrates	Navy, 2018	N
Hydroids	*Obelia* sp.	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Orthopyxis sp.	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
BRYOZOANS				
Bryozoans	Jelly bryozoans (*Aequorea* sp. and others)	Observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys in deeper water; observed at Dry Dock 5. Habitat: pelagic zone, near shore	Navy, 2020; Early et al., 2017	N + I
	Alcyonidium sp.	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N + I
	Celleporella hyaline and Amathia gracilis	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Single horn bryozoan (*Schizoporella unicornis*)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	I

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Red-rust bryozoan (*Watersipora subtorquata*)	Observed on ship hull at Dry Dock 6. Habitat: surface, epibenthic, encrusting	Earley et al., 2017; Palomares and Pauly, 2020	I
ECHINODERMS				
Echinoderms	Sea stars (Asteroidea)	Unidentified species observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys in rocks/riprap and gravelly/sandy bottom areas; outside floating security barrier.	Navy, 2020; Frierson et al., 2016	N
	Sunflower sea star (*Pycnopodia helianthoides*)	None. Included based on potential to occur.	Cowles, 2002-present	N
	Ochre star (*Pisaster ochraceus*)	Observed at Dry Dock 3 and Dry Dock 6. Habitat: surface, intertidal and subtidal, on rocky shores	Navy, 2018; Cowles, 2002–present; Pacunski et al., 2022	N
	Brittle star (*Amphiodia urtica/periercta*)	Habitat: muddy areas, submerged in sediment	Navy, 2018; Cowles, 2002–present	N
	Sea cucumbers (Holothuroidea)	Unidentified species observed in NAVBASE Kitsap-Bremerton waterfront area during 2020 ROV surveys in rocks/riprap along shoreline.	Navy, 2020	N
	Orange sea cucumber (*Cucumaria miniata*)	Observed on ship hull and during entrainment studies at Dry Dock 6. Habitat: in cobble and rocky areas, living between rocks and in crevices	Earley et al., 2017; Cowles, 2002–present; Pacunski et al., 2022	N
	Peppered sea cucumber (*Cucumaria piperata*)	Observed on ship hull at Dry Dock 6. Habitat: wedged between and under rocks and cobble	Earley et al., 2017; Cowles, 2002–present	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	White sea cucumber (*Eupentacta pseudoquinquesemita*)	Observed on ship hull at Dry Dock 6. Habitat: under and between rocks and in crevices, often in areas of strong current	Earley et al., 2017; Cowles, 2002–present	N
	California sea cucumber (*Parastichopus californicus)*	Observed at Dry Dock 6.	Navy, 2018	N
	Giant red sea cucumber (*Apostichopus californicus*)	Observed at Dry Dock 5 and Dry Dock 6 and outside floating security barrier. Habitat: surface, subtidal rock or sediment	Cowles, 2002-present	N
	Crescent sea cucumber (*Pentamera lissoplaca*)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Green sea urchin (*Stronglyocentrotus droebachiensis*)	Observed at Dry Dock 5. Habitat: sheltered and exposed kelp beds and rocky areas	Pacunski et al., 2022	N
	Sea urchin (*Strongylocentrotus* spp.)	Unidentified green urchin observed outside floating security barrier. Habitat: surface, subtidal rock	Navy, 2018; Frierson et al., 2016; Dethier, 2006	N
ANNELID WORMS				
Polychaetes	Vancouver feather duster and others (Sabellidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Cossura candida (Cossuridae)	Observed in sediment below ship in Dry Dock 6. Habitat: sandy and muddy sediments	Washington Department of Ecology, 2014	N
	Threadworms (*Aphelochaeta* sp., Capitellidae, Chrysopetalidae, Cirratulidae, Dorvilleidae, Flabelligeridae)	Observed on ship hull at Dry Dock 6; found in sediment below ship.	Earley et al., 2017; Johnson et al., 2018	--
	Scoletoma sp.	Observed in sediment below ship at Dry Dock 6.	Johnson et al., 2018	--

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Bloodworms (Glyceridae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	--
	Bristle worms (Hesionidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Ragworms/clamworms (Nieridídae, Orbiniidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	--
	Paddleworms (Phyllodocidae)	Observed on ship hull at Dry Dock 6; *Bipalponephtys cornuta* found in sediment below ship.	Earley et al., 2017; Johnson et al., 2018	--
	Scale Worms (Polynoidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Fanworms (Serpulidae, Spionidae, Syllidae, Terebellidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	--
NON-ANNELID WORMS				
Non-Annelid Worms	*Eurylepta aurantiaca*	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Notoplana longastyletta	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Zygonemertes virescens	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Horseshoe worm (*Phoronis* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Ribbonworm (*Tetrastemma* sp.)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Orange ribbonworm (*Tubulanus polymorphus*)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Flatworms (Euryleptidae)	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	--
SPONGES				
Sponges	Purple scallop sponge (*Mycale adhaerens*)	Observed on ship hull at Dry Dock 6. Habitat: live symbiotically on scallop shells	Earley et al., 2017; Cowles, 2002–present	N
TUNICATES				
Tunicates	Spiny-headed tunicate (*Boltenia villosa*)	Observed on ship hull at Dry Dock 6. Habitat: attached to hard substrates in-water with good circulation	Earley et al., 2017; Cowles, 2002–present	N

Invertebrate Type	*Taxon(a)*	*Observations in NAVBASE Kitsap-Bremerton Waterfront Area and/or Habitat Information*	*Sources*	*Native or Invasive?*
	Disc-top tunicate (*Chelysoma productum*)	Observed on ship hull at Dry Dock 6. Habitat: low intertidal and subtidal on rocks, common on floats and pilings	Earley et al., 2017; Cowles, 2002–present	N
	Sea vase tunicate (*Ciona intestinalis*)	Observed on ship hull at Dry Dock 6. Habitat: Attached to hard substrates, on ship hulls, and harbor installations	Earley et al., 2017; Palomares and Pauly, 2020	I
	Shiny red sea squirt (*Cnemidocarpa finmarkiensis*)	Observed on ship hull at Dry Dock 6. Habitat: hard substrates in well-circulated waters, on floats, in holes	Earley et al., 2017; Cowles, 2002–present	N
	Abbott's sea squirt *Dendrodoa abotti*	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N
	Mushroom ascidian (*Distaplia occidentalis*)	Observed on ship hull at Dry Dock 6. Habitat: protected floats and pilings, subtidal on rocks with good current, among surfgrass roots, open coast	Earley et al., 2017; Cowles, 2002–present	N
	Sea peach (*Halocynthia aurantium*)	Observed on ship hull at Dry Dock 6. Habitat: on rocks in subtidal areas	Earley et al., 2017; Palomares and Pauly, 2020	N
	Peanut sea squirt (*Styela gibbsii*)	Observed on ship hull at Dry Dock 6. Habitat: subtidal and rarely intertidal, on pilings, rocky substrates, stones, or shells	Earley et al., 2017; Cowles, 2002–present	N
	Styelidae	Observed on ship hull at Dry Dock 6.	Earley et al., 2017	N + I

Note: Common and scientific names of some taxa have been changed from the way they are presented in cited references to match the Integrated Taxonomic Information System.

Legend: NAVBASE = Naval Base; ROV = Remotely Operated Vehicle; sp. = species (singular); spp. = species (plural). Key to Native or Invasive: N = native to Puget Sound; N + I = Taxa includes native and invasive species; I = invasive; C = cryptogenic (origin is unknown) -- means the taxonomic level to which the observed organism was identified is too broad to determine whether it is native or invasive

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APPENDIX K
Fish Species Present within the Demolition, Construction, and Operations Region of Influence

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1 Fish Species Documented in the Demolition, Construction, Operations Region of Influence

Table 1 provides a list of fish species that have been documented within the Demolition, Construction, Operations region of influence (ROI) during various fish studies at Naval Base (NAVBASE) Kitsap-Bremerton and within Sinclair Inlet in general.

Table 1 Documented Fish Presence in the Demolition and Construction Region of Influence

Common Name	*Scientific Name*	*Fish Studies at NAVBASE Kitsap-Bremerton and Vicinity*						*Designated EFH in the ROI*
		2001–2002 Sinclair Inlet Juvenile Salmonid Fish Study[1]	*2012–2013 Rockfish and Groundfish Study at NAVBASE-Kitsap Bremerton*[2]	*2013–2015 Rockfish Study at NAVBASE-Kitsap Bremerton*[3]	*2014 Trawl Surveys in Sinclair Inlet*[4]	*2018 OU B Monitoring-Trawl Surveys at NAVBASE-Kitsap Bremerton*[5]	*2020–2022 Bremerton Naval Dry Dock Fish Entrainment Study*[6]	
Salmonids								
Chinook salmon*	*Oncorhynchus tshawytscha*	X			X		X	X
Chum salmon	*Oncorhynchus keta*	X			X		X	
Coho salmon	*Oncorhynchus kisutch*	X			X		X	X
Cutthroat trout	*Oncorhynchus clarkii*	X		X		X		
Pink salmon	*Oncorhynchus gorbuscha*				X			X
Steelhead *	*Oncorhynchus mykiss*	X			X			
Forage Fish								
Forage fish (unidentified)				X				
Northern anchovy	*Engraulis mordax*						X	X
Pacific herring	*Clupea pallasii*	X				X	X	
Pacific sand lance	*Ammodytes personatus*						X	
Surf smelt	*Hypomesus pretiosus*	X					X	
Groundfish								
Big skate	*Raja binoculata*	X				X		
Brown rockfish	*Sebastes auriculatus*			X		X	X	

Common Name	*Scientific Name*	*Fish Studies at NAVBASE Kitsap-Bremerton and Vicinity*						*Designated EFH in the ROI*
		2001–2002 Sinclair Inlet Juvenile Salmonid Fish Study[1]	*2012–2013 Rockfish and Groundfish Study at NAVBASE-Kitsap Bremerton*[2]	*2013–2015 Rockfish Study at NAVBASE-Kitsap Bremerton*[3]	*2014 Trawl Surveys in Sinclair Inlet*[4]	*2018 OU B Monitoring-Trawl Surveys at NAVBASE-Kitsap Bremerton*[5]	*2020–2022 Bremerton Naval Dry Dock Fish Entrainment Study*[6]	
C-O sole	*Pleuronichthys coenosus*	X	X					
Copper rockfish	*Sebastes caurinus*			X			X	X
English sole	*Parophrys vetulus*	X		X		X		X
Flatfish (unidentified)	Pleuronectiformes		X	X			X	X
Pacific sanddab	*Citharichthys sordidus*	X					X	X
Painted greenling	*Oxylebius pictus*						X	
Quillback rockfish	*Sebastes maliger*						X	
Rock sole	*Lepidopsetta bilineata*	X				X		X
Sand sole	*Psettichthys melanostictus*	X	X			X		X
Starry flounder	*Platichthys stellatus*	X	X	X	X	X	X	X
Other Fish Species								
Bay goby	*Lepidogobius lepidus*					X		
Bay pipefish	*Syngnathus leptorhynchus*	X		X	X		X	
Blackeye goby	*Rhinogobiops nicholsii*			X		X		
Buffalo sculpin	*Enophrys bison*	X			X	X	X	
Crescent gunnel	*Pholis laeta*	X						

Common Name	*Scientific Name*	*Fish Studies at NAVBASE Kitsap-Bremerton and Vicinity*						*Designated EFH in the ROI*
		2001–2002 Sinclair Inlet Juvenile Salmonid Fish Study[1]	*2012–2013 Rockfish and Groundfish Study at NAVBASE-Kitsap Bremerton*[2]	*2013–2015 Rockfish Study at NAVBASE-Kitsap Bremerton*[3]	*2014 Trawl Surveys in Sinclair Inlet*[4]	*2018 OU B Monitoring-Trawl Surveys at NAVBASE-Kitsap Bremerton*[5]	*2020–2022 Bremerton Naval Dry Dock Fish Entrainment Study*[6]	
Decorated warbonnet	*Chirolophis decoratus*						*X*	
Great sculpin	*Myoxocephalus polyacanthocephalus*			*X*			*X*	
Gunnel (unidentified)	Pholidae	*X*						
Irish lord	*Hemilepidotus* spp.	*X*						
Kelp perch	*Brachyistius frenatus*						*X*	
Longfin sculpin	*Jordania zonope*						*X*	
Northern clingfish	*Gobiesox maeandricus*						*X*	
Pacific staghorn sculpin	*Leptocottus armatus*	*X*				*X*	*X*	
Pacific tomcod	*Microgadus proximus*					*X*		
Padded sculpin	*Artedius fenestralis*						*X*	
Penpoint gunnel	*Apodichthys flavidus*	*X*					*X*	
Pile perch	*Rhacochilus vacca*	*X*						
Plainfin midshipman	*Porichthys notatus*	*X*				*X*	*X*	
Poacher (unidentified)	Agonidae						X	
Prickleback (unidentified)	Stichaeidae			X				
Saddleback gunnel	*Pholis ornata*	*X*			*X*		*X*	
Sailfin sculpin	*Nautichthys oculofasciatus*						*X*	

Common Name	*Scientific Name*	*Fish Studies at NAVBASE Kitsap-Bremerton and Vicinity*						*Designated EFH in the ROI*
		2001–2002 Sinclair Inlet Juvenile Salmonid Fish Study[1]	*2012–2013 Rockfish and Groundfish Study at NAVBASE-Kitsap Bremerton*[2]	*2013–2015 Rockfish Study at NAVBASE-Kitsap Bremerton*[3]	*2014 Trawl Surveys in Sinclair Inlet*[4]	*2018 OU B Monitoring-Trawl Surveys at NAVBASE-Kitsap Bremerton*[5]	*2020–2022 Bremerton Naval Dry Dock Fish Entrainment Study*[6]	
Sculpin (unidentified)	Cottidae	X	X	X			X	
Shiner perch	*Cymatogaster aggregata*	X		X	X	X	X	
Snailfish (unidentified)	*Liparis*						X	
Snake prickleback	*Lumpenus sagitta*	X					X	
Staghorn sculpin	*Leptocottus armatus*				X			
Striped seaperch	*Embiotoca lateralis*	X					X	
Tadpole sculpin	*Psychrolutes paradoxus*	X						
Threespine stickleback	*Gasterosteus aculeatus*	X			X		X	
Tidepool sculpin	*Oligocottus maculosus*				X		X	
Tubesnout	*Aulorhynchus flavidus*	X					X	
Walleye pollock	*Gadus chalcogrammus*						X	

Note: * – ESA-listed species.
Legend: EFH = Essential Fish Habitat; NAVBASE = Naval Base; OU = Operable Unit; ROI = region of influence.
Sources: [1]Fresh et al., 2006; [2]Lowry et al., 2013; [3]Frierson et al., 2016; [4]Meador, 2014; [5]Navy, 2020; [6]Pacunski et al., 2022.

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APPENDIX L
Essential Fish Habitats within the Demolition, Construction, and Operations Region of Influence

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1 Essential Fish Habitat

1.1 Background

United States (U.S.) fisheries are managed within a framework of overlapping international, federal, state, interstate, and tribal authorities. Individual states and territories generally have jurisdiction over fisheries in marine waters within 3 nautical miles (5.6 kilometers) of their coast. Federal jurisdiction includes fisheries in marine waters inside the U.S. Exclusive Economic Zone, which encompasses the area from 3 nautical miles (1.8 kilometers) to 200 nautical miles (370 kilometers) offshore of any U.S. coastline (61 Federal Register [FR] 19390).

The Magnuson Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-276) led to the formation of eight fishery management councils (FMCs) that share authority with the National Marine Fisheries Service (NMFS) to help regulate and oversee fishery management in federal waters. The MSA, through the Essential Fish Habitat (EFH) provision, protects the waters and substrate necessary for the spawning, breeding, feeding, or growth to maturity of certain commercially managed fisheries species [16 United States Code 1802(10)]. EFH designations include descriptions of the physical and biological environment and the location of all necessary habitats. The EFH regulations clarify that "waters" may include aquatic areas and their associated physical, chemical, and biological properties that are used by the managed fish species, and those areas historically used by those species, where appropriate. "Substrate" includes sediment, hard bottom, structures underlying the waters and associated biological communities (e.g., seagrass). "Necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. "Spawning, breeding, feeding, and growth to maturity" covers a species' full life cycle (50 Code of Federal Regulations [CFR] § 600.10).

Federal agencies are required to consult with NMFS on proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH [Section 305(b)(2)]. NMFS is required to provide conservation recommendations for any federal activity that would adversely affect EFH [Section 305(b)(4)(A)]. "Adverse effects" may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for federally managed species within the waters of Washington, Oregon, and California. The waters of the greater Puget Sound are designated EFH for Pacific Coast Groundfish, Coastal Pelagic Species, and Pacific Coast Salmon Fishery Species (PFMC, 2024a, 2024b, 2024c).

In addition to EFH designations, areas called Habitat Areas of Particular Concern (HAPC) are also designated by the regional FMCs. Designated HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation (50 CFR 600.805-600.815). Regional FMCs may designate a specific habitat area as an HAPC based on one or more of the following reasons: (1) importance of the ecological function provided by the habitat; (2) the extent to which the habitat is sensitive to human-induced environmental degradation; (3) whether, and to what extent, development activities are, or will be, stressing the habitat type; and (4) rarity of the habitat type (67 FR 2343-2383). Categorization as HAPC does not confer additional protection or restriction to the designated area.

1.2 Essential Fish Habitat–managed Species

1.2.1 Pacific Coast Groundfish

Pacific Coast Groundfish EFH consists of the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem (PFMC, 2024a). The PFMC (2024a) identifies the overall area designated as Pacific Coast Groundfish EFH for all species covered in the Fishery Management Plan (FMP) as all waters and substrate within "depths less than or equal to 11,500 feet (3,500 meters) to mean higher high water (MHHW) level or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 parts per thousand during the period of average annual low flow." Furthermore, the PFMC (2019, 2024a) has also updated EFH designations for each individual groundfish species by life stage. Using the EFH Mapper (NMFS, 2022), it was determined which groundfish species and life stages have EFH designated within the Demolition and Construction portion of the Region of Influence (ROI). A summary of these species/life stages and their designated habitat is provided in Table 1). The management unit in the Pacific Coast Groundfish FMP includes over 90 groundfish species (PFMC, 2024a).

Pacific Coast Groundfish species are considered sensitive to overfishing, the loss of habitat, and reduction in water and sediment quality. In addition to use of habitat types, larval and juvenile groundfish (notably rockfish) are dependent on a variety of habitat factors, including current patterns for larval transport to suitable recruitment habitat (i.e., kelp and eelgrass), good water quality, and abundant food resources.

Based on the analysis, the primary habitats designated as EFH for Pacific Coast Groundfish include the following:

- The epipelagic zone of the water column, including macrophyte canopies and "drift algae"
- Unconsolidated sediments consisting of mud, sand, or mixed mud/sand
- Hard bottom habitats composed of boulder, bedrock, cobble, gravel, or mixed gravel/cobble
- Mixed sediments composed of sand and rocks
- Vegetated bottoms consisting of algal beds, macrophytes, or rooted vascular plants

The mix of mud and shell bottom substrate along the Naval Base (NAVBASE) Kitsap-Bremerton waterfront as well as the epipelagic zone of the water column provides Pacific Coast Groundfish EFH for many different species of groundfish (Navy, 2021).

Various groundfish species have been documented in the Demolition and Construction portion of the ROI and include brown rockfish (*Sebastes auriculatus*), copper rockfish (*S. caurinus*), unidentified rockfish (*Sebastes* spp.), Pacific sanddab (*Citharichthys sordidus*), big skate (*Raja binoculata*), English sole (*Parophrys vetulus*), rock sole (*Lepidopsetta* spp.), sand sole (*Psettichthys melanostictus*), and flounder (unidentified) (Pleuronectiformes) (Pacunski et al., 2022).

1.2.2 Coastal Pelagic Species

The PFMC's Coastal Pelagic Species FMP includes 21 amendments to date that specifies a management framework for northern anchovy (*Engraulis mordax*), market squid (*Loligo opalescens*), Pacific sardine (*Sardinops sagax*), Pacific (chub) mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), and krill (*Euphausia pacifica*) (PFMC, 2024b). Two of these coastal pelagic species are known to occur in the greater Puget Sound, including Sinclair Inlet: northern anchovy and market squid (Pacunski et al.,

2022). A summary of these species/life stages and their designated habitat is provided in Table 1. The definition for Coastal Pelagic Species EFH is based on the geographic range and in-water temperatures where these species are present during a particular life stage (67 FR 2343-2383). EFH for Coastal Pelagic Species is defined as all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone (EEZ) and above the thermocline where sea surface temperatures range from 50 to 68 degrees Fahrenheit (10 to 20 degrees Celsius). These boundaries include the waters of Sinclair Inlet.

Coastal pelagic species have value to commercial Pacific fisheries and are also important as food for other fish, marine mammals, and birds (PFMC, 2024b). Coastal pelagic species are considered sensitive to overfishing, loss of habitat, reduction in water and sediment quality, and changes in marine hydrology, including entrainment through water intakes. The general descriptions of northern anchovy, and market squid provided in the FMP (PFMC, 1998, 2024b) are summarized below.

Northern anchovy are small, short-lived fish that are typically found in schools near the surface. They eat phytoplankton and zooplankton and spawn year-round, with peaks from February to April. They frequently occur in estuaries through the Pacific Coast and may be associated with the neritic portion of the nearshore environment within the current-swept waterways of the Puget Sound Basin (Penttila, 2007). All life stages are preyed on by a variety of predators, including salmon and numerous fishes.

Market squid are harvested near the surface, but they also can occur at great depths. They prefer areas of higher salinity and temperature (Chasco et al., 2022), but are found throughout Puget Sound, including within the Demolition and Construction ROI. This species feeds on copepods as juveniles and on euphausiids, other small crustaceans, small fish, and other squid as they grow. Habitat requirements for spawning are not well understood, although documented spawning areas along the coast consist of shallow, semi-protected nearshore areas with sandy or mud bottoms adjacent to submarine canyons. Spawning occurs during most of the year, typically beginning in late summer off Washington. Squid are important as forage foods for many fish such as Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), lingcod (*Ophiodon elongatus*), and rockfish.

Market squid are recreationally fished for from late May until February at Waterman Point Pier located on the south side of Sinclair Inlet and approximately 3 miles (5 kilometers) northeast of NAVBASE Kitsap-Bremerton (WDFW, 2023a). Market squid were recorded during dry dock sampling events in 2020 (June) and 2021 (March and September) as well as northern anchovy that were recorded in June 2020 (Pacunski et al., 2022). Coastal pelagic species are considered sensitive to overfishing, loss of habitat, reduction in water and sediment quality, and changes in marine hydrology, including entrainment through water intakes.

1.2.3 Pacific Coast Salmon

The Pacific Coast Salmon FMP includes Chinook, coho, and pink (*O. gorbuscha*) salmon. The EFH designation for the Pacific salmon fishery in estuarine and marine environments in the state of Washington extends from nearshore and tidal submerged environments within state territorial waters out to the full extent of the Exclusive Economic Zone (200 nautical miles [370 kilometers]) offshore (PFMC, 2024c). In addition to marine and estuarine waters, salmon species have a defined freshwater EFH, which includes all lakes, streams, ponds, rivers, wetlands, and other bodies of water that have been historically accessible to salmon (PFMC, 2024c).

The current salmon FMP includes 24 subsequent amendments. Amendment 18 was updated to reflect new information on EFH, including criteria for impassable barriers; addition of HAPCs; adjustments to geographic extent of EFH; and addition of non-fishing activities and conservation measures (PFMC, 2024c).

Pacific salmon EFH is primarily affected by the loss of suitable spawning habitat, barriers to fish migration (habitat access), reduction in water and sediment quality, changes in estuarine hydrology, and decreases in prey food source (PFMC, 2024c). The most abundant fish species that are prey for salmonids include Pacific herring (*Clupea pallasii*), surf smelt (*Hypomesus pretiosus*), and Pacific sand lance (*Ammodytes personatus*).

Puget Sound provides Pacific Coast Salmon EFH for various life stages of Chinook, pink, and coho salmon (PFMC, 2024c). Chinook and coho salmon utilize Sinclair Inlet as a migration corridor, returning to the Gorst Creek Rearing Facility and spawning and rearing in the Gorst Creek system, streams located on the south side of Sinclair Inlet and likely other areas in Puget Sound (WDFW, 2023b). Sinclair Inlet is also used by Chinook as rearing habitat from non-local streams (Fresh et al., 2006). Stray pink salmon have been observed attempting to spawn in Gorst Creek; otherwise, they have not been known to utilize tributaries of Sinclair Inlet, and there are no streams near NAVBASE Kitsap-Bremerton that support this species (Rod Malcolm, pers. comm., 2023; WDFW, 2023b). However, during two trawls surveys conducted by NMFS in June 2014, 20 pink salmon were captured in Sinclair Inlet (NMFS 2014).

1.3 Habitat Areas of Particular Concern

Designated HAPCs are regarded as essential for protection of federally managed species. HAPCs may be more vulnerable to degradation than the more general EFH designated by the PFMC. HAPCs are designated based on four criteria: rarity of the habitat type, ecological importance to EFH species, sensitivity of the habitat to human-induced environmental degradation, and whether and to what extent development will stress the habitat type. Categorization as HAPC does not confer additional protection or restrictions to the designated area (NMFS, 2021).

There are four HAPCs designated for Pacific Coast Groundfish: (1) seagrass; (2) canopy kelp; (3) rocky reef; and (4) estuarine habitats along the Pacific Coast, including Puget Sound (PFMC, 2024a). The estuarine habitats HAPC extends landward to MHHW or the upriver extent of saltwater intrusion. The seagrasses HAPC includes eelgrass beds in estuaries. Seagrass, canopy kelp, and estuarine habitat HAPC occur within the Demolition and Construction portion of the ROI.

Five HAPCs have been designated for Pacific Coast Salmon: (1) complex channels and floodplain habitats; (2) thermal refugia; (3) spawning habitat; (4) estuaries; and (5) marine and estuarine submerged aquatic vegetation (PFMC, 2014).

Puget Sound, including all marine habitat in the Demolition and Construction portion of the ROI, is designated as an estuary HAPC for Pacific Coast Salmon (PFMC, 2014). Marine and estuarine submerged aquatic vegetation HAPC is also present within the Demolition and Construction portion of the ROI (Navy, 2021).

HAPCs have not been formally designated for Coastal Pelagic Species (PFMC, 2024b).

Table 1 Species of Fishes with Designated EFH Potentially Occurring within the Demolition and Construction Portion of the ROI

Species	*Applicable Life Stages*	*Habitat*
Pacific Coast Groundfish		
Arrowtooth flounder *(Atheresthes stomias)*	L, E	Unconsolidated bottom, epipelagic zone
Big skate (*Raja binoculata*)	A, J, E	Mixed sediments
Black rockfish *(Sebastes melanops)*	A, J	Vegetated bottom, hard bottom, Unconsolidated sediment
Blue rockfish *(Sebastes mystinus)*	A, L	Vegetated bottom, hard bottom, epipelagic zone
Bocaccio *(Sebastes paucispinis)*	A, J	Steep slopes consisting of sand or rocky substrates
Brown rockfish *(Sebastes auriculatus)*	A, J	Rocky habitat, artificial structures, kelp
Butter sole *(Isopsetta isolepis)*	A	Muddy or silty sediment
Cabezon *(Scorpaenichthys marmoratus)*	A	Hard bottom
California skate *(Raja inornata)*	E	Soft (muddy) bottom sediments
Canary rockfish *(Sebastes pinniger)*	A, J	Rocky, coarse habitat
China rockfish *(Sebastes nebulosus)*	J	Rocky reef, vegetated bottoms (kelp)
Copper rockfish *(Sebastes caurinus)*	A, J	Rocky reef, artificial structures, kelp
Dover sole *(Microstomus pacificus)*	J	Muddy bottom
English sole *(Parophrys vetulus)*	A, J, L	Unconsolidated bottom, epipelagic zone
Flathead sole *(Hippoglossoides elassodon)*	J	Unconsolidated sediments
Greenstriped rockfish *(Sebastes elongatus)*	A	Sandy, coarse sediments
Kelp greenling *(Hexagrammos decagrammus)*	A, L	Rocky reefs near dense algae or kelp, epipelagic zone
Lingcod *(Ophiodon elongates)*	A, J, E	Unconsolidated sediments, rocky reefs, kelp and eelgrass beds, epipelagic zone
Longnose skate *(Raja rhina)*	A, J, E	Mixed sediments
Pacific cod *(Gadus macrocephalus)*	E	Unconsolidated sediments
Pacific grenadier *(Coryphaenoides acrolepis)*	E, L	Unconsolidated sediments, epipelagic zone
Pacific hake *(Merluccius productus)*	A	Epipelagic zone
Pacific sanddab *(Citharichthys sordidus)*	A, J, L, E	Mixed bottom, unconsolidated, epipelagic zone
Petrale sole *(Eopsetta jordani)*	J	Soft sediments
Quillback rockfish *(Sebastes maliger)*	A, J	Artificial structure, rocky reef, mixed bottom, vegetated bottom
Rex sole *(Glyptocephalus zachirus)*	J	Unconsolidated sediments
Rock sole *(Lepidopsetta bilineata)*	A	Hard bottom
Sablefish *(Anoplopoma fimbria)*	A, E	Unconsolidated sediments, drifting kelp, epipelagic zone
Sand sole *(Psettichthys melanostictus)*	A, J, L	Unconsolidated sediments, epipelagic zone
Shortspine thornyhead *(Sebastolobus alascanus)*	A	Deep, high rocky relief habitats
Soupfin shark *(Galeorhinus galeus)*	A, J	Unconsolidated sediments, epipelagic zone
Spiny dogfish *(Squalus acanthias)*	A, J	Unconsolidated sediments, epipelagic zone
Splitnose rockfish *(Sebastes diploproa)*	L	Muddy, vegetated bottoms (specifically eelgrass and kelp), epipelagic zone

Species	*Applicable Life Stages*	*Habitat*
Spotted ratfish *(Hydrolagus colliei)*	A, J, E	Unconsolidated sediments, low-rocky relief
Starry flounder *(Platichthys stellatus)*	A, J, E	Unconsolidated sediments, epipelagic zone
Yelloweye rockfish *(Sebastes ruberrimus)*	A, J	Deep, high-relief rocky habitat, steep slopes
Yellowtail rockfish *(Sebastes flavidus)*	J	Deep, high-relief rocky habitat, steep slopes
Vermilion rockfish *(Sebastes miniatus)*	A	Deep, high-relief rocky habitat, steep slopes
Coastal Pelagics Species		
Market squid *(Loligo opalescens)*	A	Same as for anchovy
Northern anchovy *(Engraulis mordax)*	A, L, E	From the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range from 50 to 68 °F (10 to 20 °C)
Pacific Coast Salmon		
Chinook *(Oncorhynchus tshawytscha)*	A, J	Estuarine waters and substrates, including the nearshore and tidal submerged environments, and most freshwater bodies historically accessible to salmon (except above certain impassable natural barriers)
Coho *(Oncorhynchus kisutch)*	A, J	Same as for Chinook
Pink *(Oncorhynchus gorbuscha)*	A, J	Same as for Chinook

Legend: A = adult; E = eggs; J = juvenile; L = larvae.
Source: Pacific Fishery Management Council, 1998, 2005, 2014, 2019, 2024a, 2024b, 2024c; NMFS, 2022.

2 References

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APPENDIX M
Visual Resources

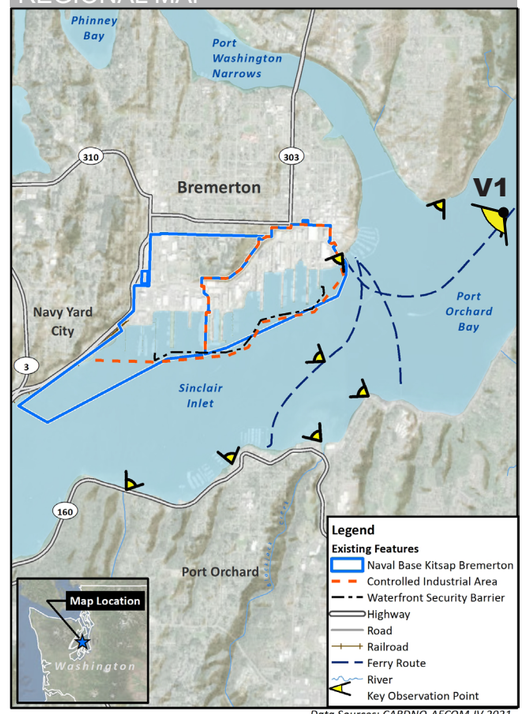
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Key Observation Point V1 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

Date: 10/18/2022



PHOTOGRAPH INFORMATION

Time of photograph:	7:50 AM
Date of photograph:	2-15-20
Viewing direction:	SouthWest (248°)
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Longitude:	-122°36'6.00"W
Camera elevation:	25 Feet
Distance to project:	1.2 Miles

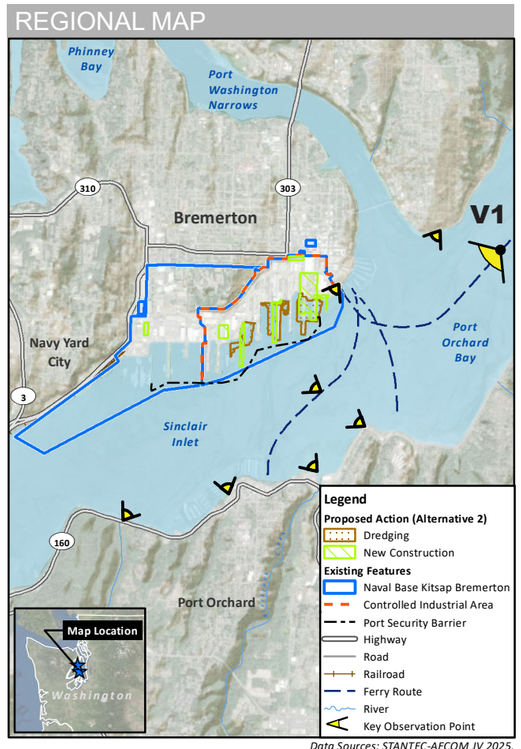
JULY 2025



Key Observation Point V1 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

Time of photograph:	7:50 AM
Date of photograph:	2-15-20
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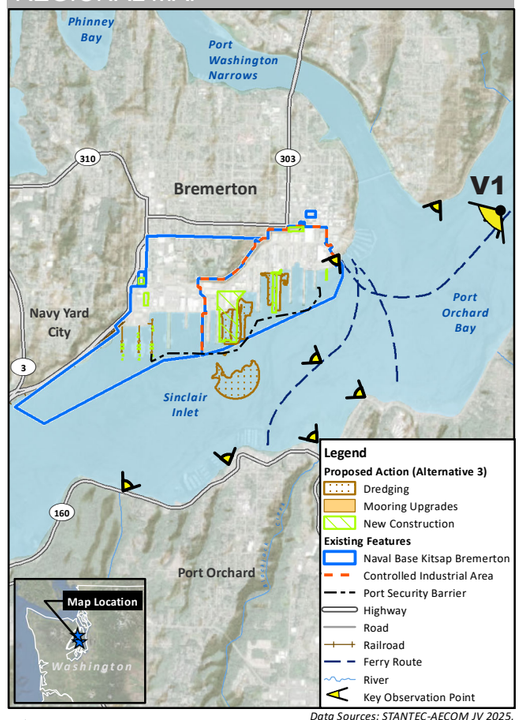
JULY 2025



Key Observation Point V1 Simulated Visual Conditions Alternative 3

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

Time of photograph:	7:50 AM
Date of photograph:	2-15-20
Viewing direction:	SouthWest (248°)
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Camera elevation:	25 Feet
Distance to project:	1.2 Miles

** Proposed parking garage not visible*

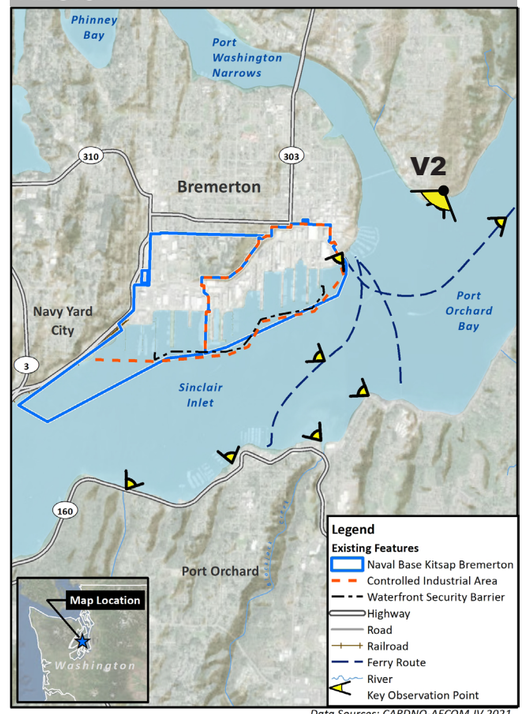
JULY 2025



Key Observation Point V2 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 10/18/2022



PHOTOGRAPH INFORMATION

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Date of photograph:	9-10-20
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Distance to project:	1 Mile

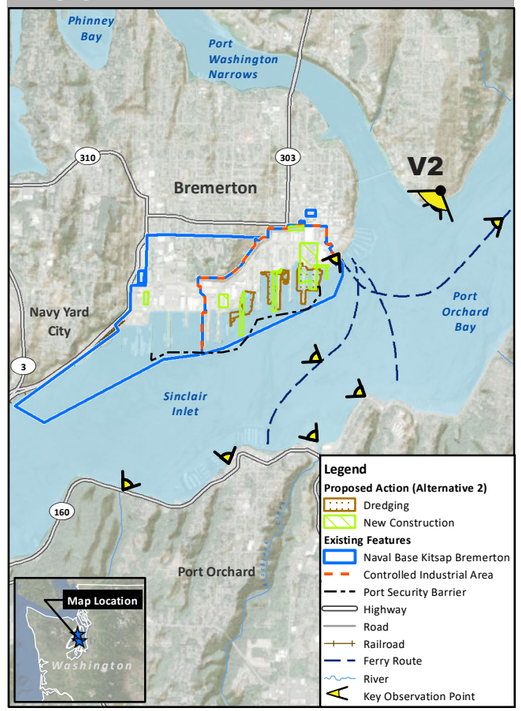
JULY 2025



Key Observation Point V2 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

Time of photograph:	7:09 AM
Date of photograph:	9-10-20
Viewing direction:	South (234°)
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Distance to project:	1 Mile

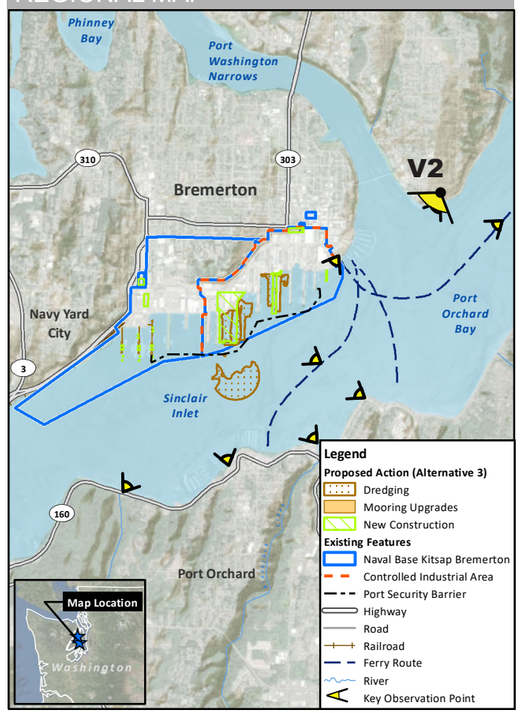
JULY 2025



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Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

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Camera elevation:	8.5 Feet
Distance to project:	1 Mile

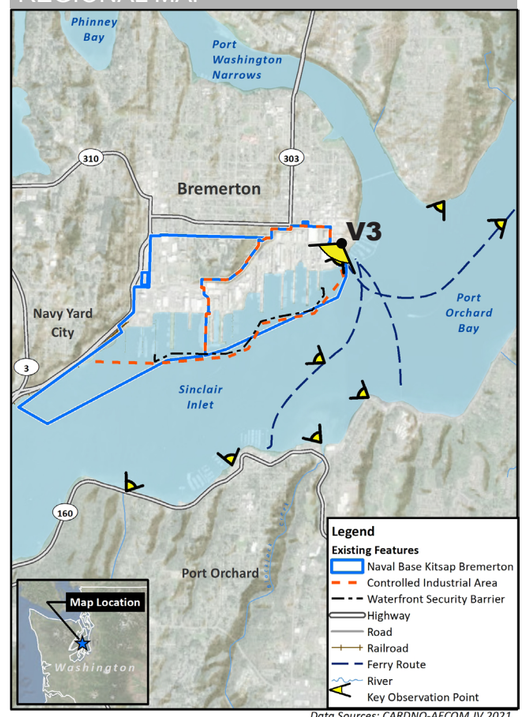
JULY 2025



Key Observation Point V3 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

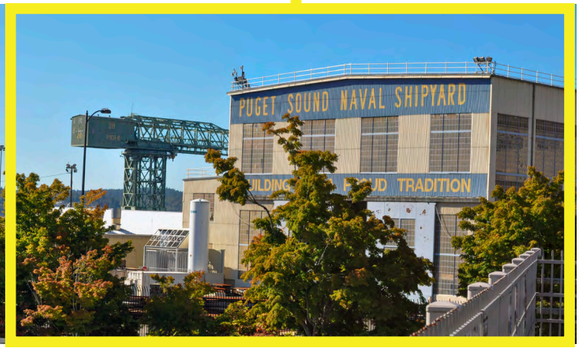
REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

Date: 10/18/2022





PHOTOGRAPH INFORMATION

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Date of photograph:	2-15-20
Viewing direction:	Southeast (220°)
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Longitude:	-122°37'31.12"W
Camera elevation:	20.5 Feet
Distance to project:	0.03 Mile

JULY 2025



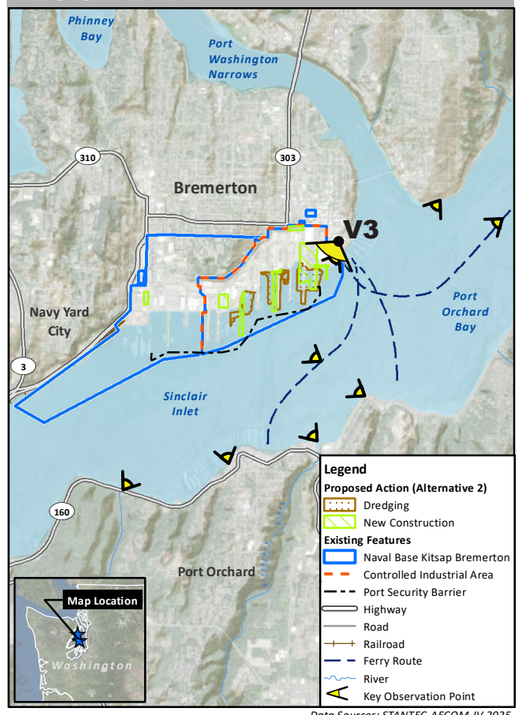




Key Observation Point V3 Simulated Visual Conditions Alternative 2 - Not Visible

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025

PHOTOGRAPH INFORMATION

Time of photograph:	8:25 AM
Date of photograph:	2-15-20
Viewing direction:	Southeast (220°)
Latitude:	47°33'43.90"N
Longitude:	-122°37'31.12"W
Camera elevation:	20.5 Feet
Distance to project:	0.03 Mile

JULY 2025



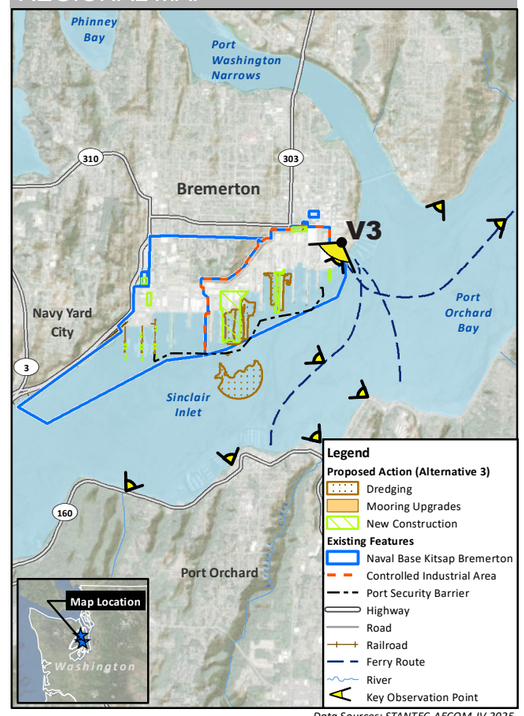




Key Observation Point V3 Simulated Visual Conditions Alternative 3 - Not Visible

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025

PHOTOGRAPH INFORMATION

Time of photograph:	8:25 AM
Date of photograph:	2-15-20
Viewing direction:	Southeast (220°)
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Camera elevation:	20.5 Feet
Distance to project:	0.03 Mile

JULY 2025

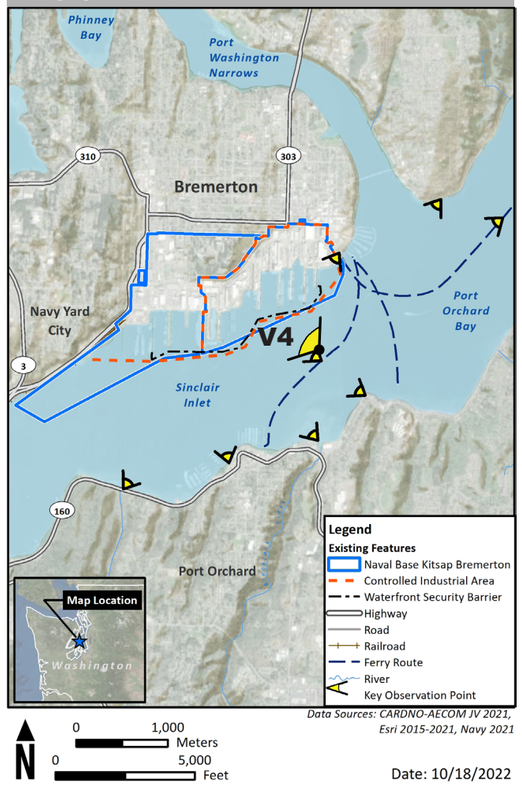




Key Observation Point V4 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

Date: 10/18/2022

PHOTOGRAPH INFORMATION

Time of photograph:	10:33 AM
Date of photograph:	2-15-20
Viewing direction:	North (342°)
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Longitude:	-122°37'39.04"W
Camera elevation:	10 Feet
Distance to project:	0.40 Mile

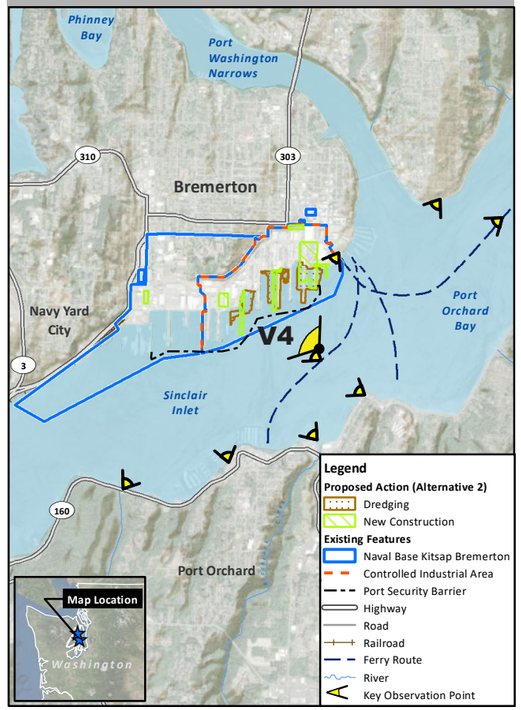
JULY 2025



Key Observation Point V4 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

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Distance to project:	0.40 Mile

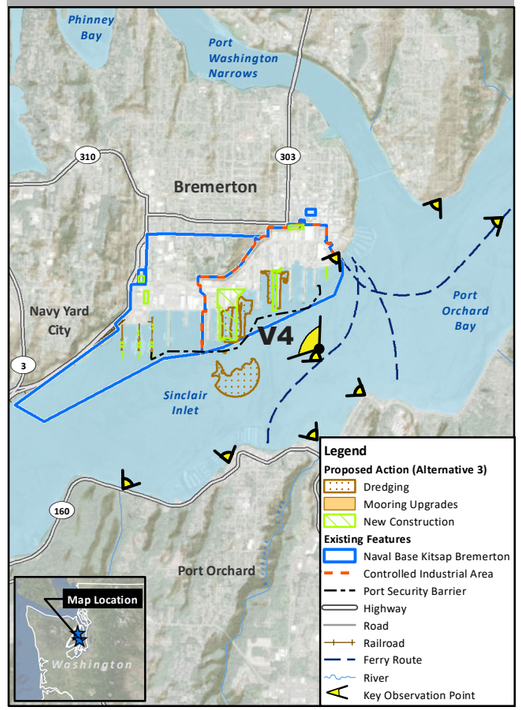
JULY 2025



Key Observation Point V4 Simulated Visual Conditions Alternative 3

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025



PHOTOGRAPH INFORMATION

Time of photograph:	10:33 AM
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Viewing direction:	North (342°)
Latitude:	47°33'5.66"N
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Camera elevation:	10 Feet
Distance to project:	0.40 Mile

** Proposed parking garage not visible*

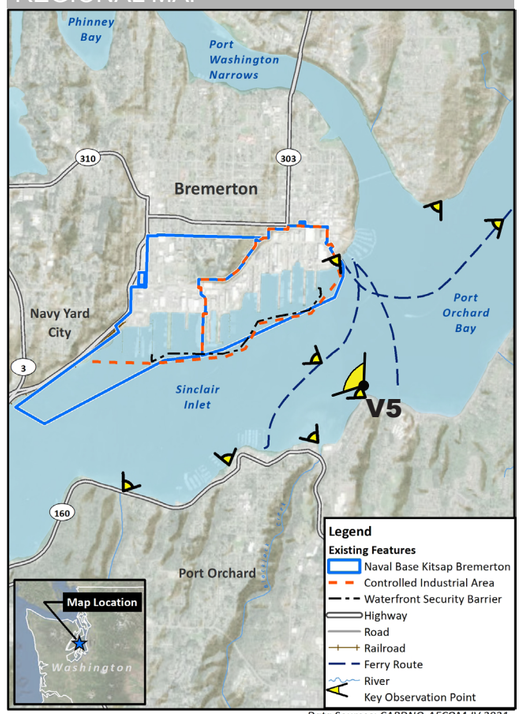
JULY 2025



Key Observation Point V5 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

Date: 10/18/2022



PHOTOGRAPH INFORMATION

Time of photograph:	10:56 AM
Date of photograph:	2-15-20
Viewing direction:	Northwest (326°)
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Longitude:	-122°37’15.69”W
Camera elevation:	10.5 Feet
Distance to project:	0.75 Mile

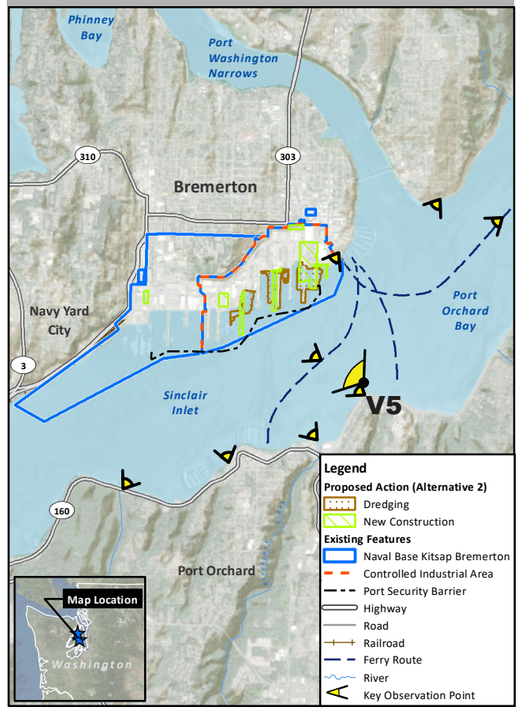
JULY 2025



Key Observation Point V5 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

Time of photograph:	10:56 AM
Date of photograph:	2-15-20
Viewing direction:	Northwest (326°)
Latitude:	47°32'53.80"N
Longitude:	-122°37'15.69"W
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Distance to project:	0.75 Mile

JULY 2025

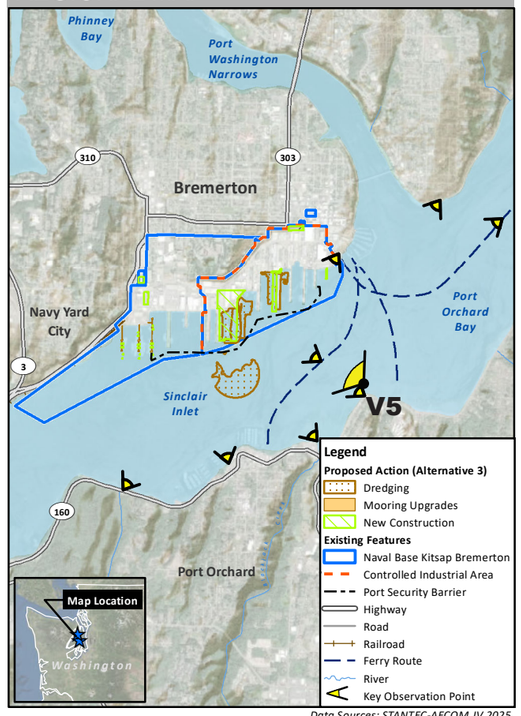




Key Observation Point V5 Simulated Visual Conditions Alternative 3

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025

PHOTOGRAPH INFORMATION

Time of photograph:	10:56 AM
Date of photograph:	2-15-20
Viewing direction:	Northwest (326°)
Latitude:	47°32’53.80”N
Longitude:	-122°37’15.69”W
Camera elevation:	10.5 Feet
Distance to project:	0.75 Mile

** Proposed parking garage not visible*

JULY 2025

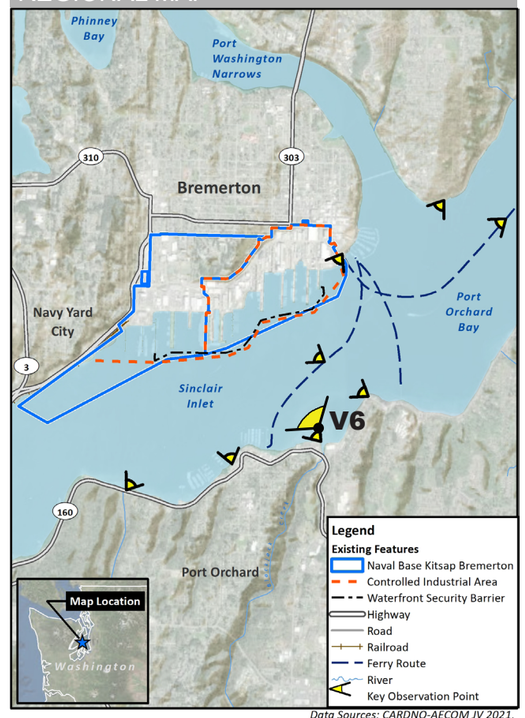




Key Observation Point V6 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

Date: 10/18/2022

PHOTOGRAPH INFORMATION

Time of photograph:	10:04 AM
Date of photograph:	2-15-20
Viewing direction:	North (352°)
Latitude:	47°32’37.47”N
Longitude:	-122°37’40.05”W
Camera elevation:	6 Feet
Distance to project:	1 Mile

JULY 2025

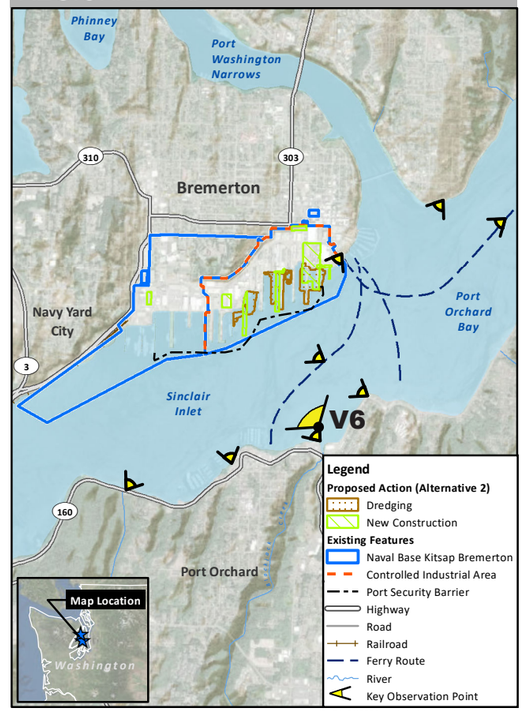




Key Observation Point V6 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025

PHOTOGRAPH INFORMATION

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Viewing direction:	North (352°)
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Camera elevation:	6 Feet
Distance to project:	1 Mile

JULY 2025

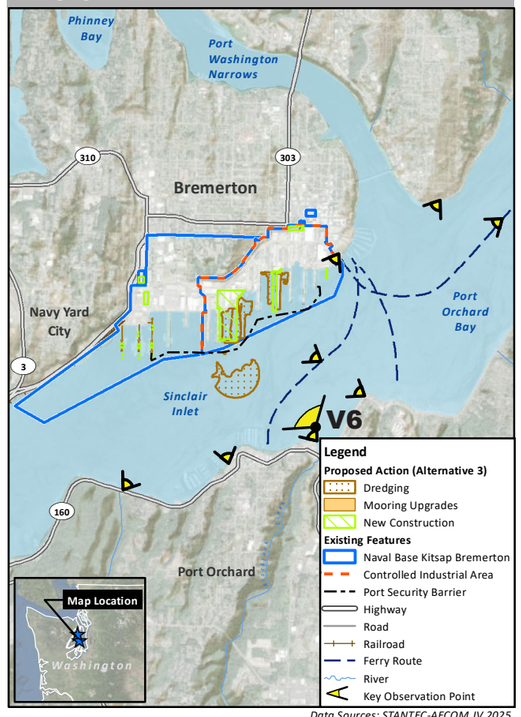




Key Observation Point V6 Simulated Visual Conditions Alternative 3

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025

PHOTOGRAPH INFORMATION

Time of photograph:	10:04 AM
Date of photograph:	2-15-20
Viewing direction:	North (352°)
Latitude:	47°32'37.47"N
Longitude:	-122°37'40.05"W
Camera elevation:	6 Feet
Distance to project:	1 Mile

** Proposed parking garage not visible*

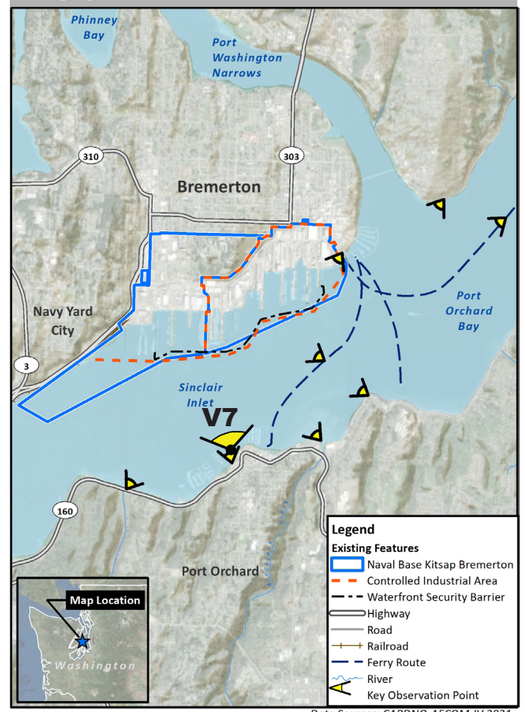
JULY 2025



Key Observation Point V7 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 10/18/2022



PHOTOGRAPH INFORMATION

Time of photograph:	9:50 AM
Date of photograph:	2-15-20
Viewing direction:	Northeast (22°)
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Distance to project:	0.80 Mile

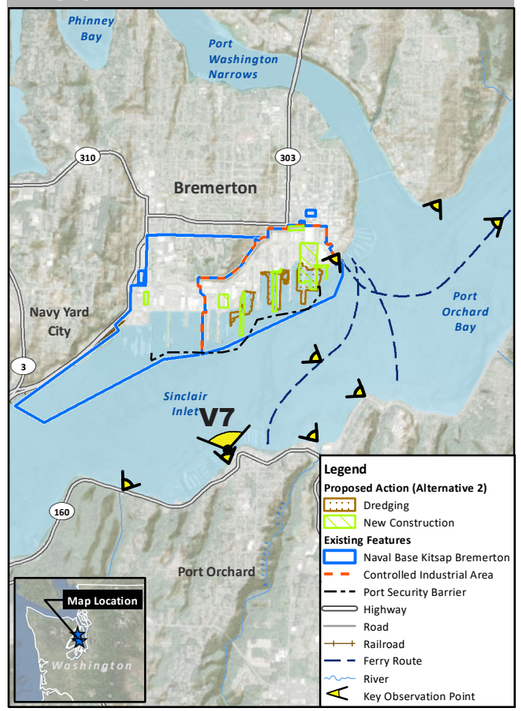
JULY 2025



Key Observation Point V7 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

Date: 3/31/2025



PHOTOGRAPH INFORMATION

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Date of photograph:	2-15-20
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Distance to project:	0.80 Mile

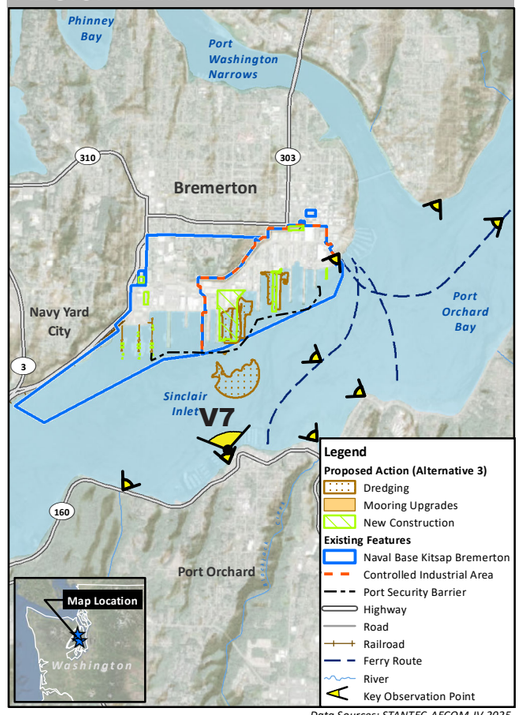
JULY 2025



Key Observation Point V7 Simulated Visual Conditions Alternative 3

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025



PHOTOGRAPH INFORMATION

Time of photograph:	9:50 AM
Date of photograph:	2-15-20
Viewing direction:	Northeast (22°)
Latitude:	47°32'28.74"N
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Distance to project:	0.80 Mile

** Proposed parking garage not visible*

JULY 2025

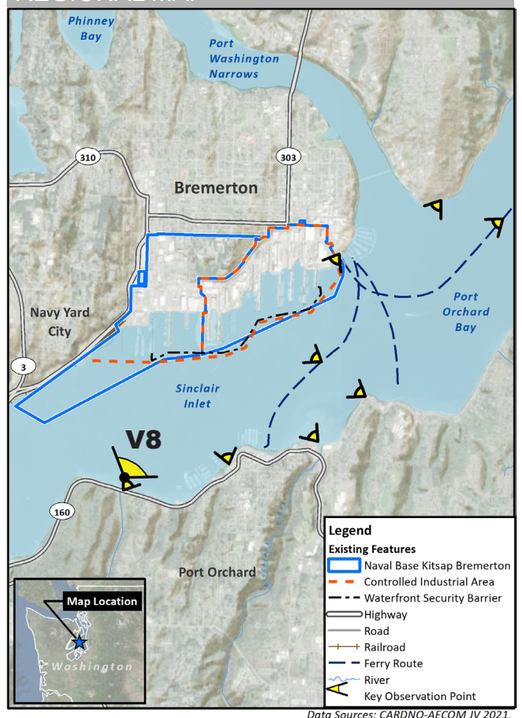




Key Observation Point V8 Existing Visual Conditions Alternative 1 - No Action

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2021, Esri 2015-2021, Navy 2021

Date: 10/18/2022

PHOTOGRAPH INFORMATION

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Date of photograph:	2-13-20
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JULY 2025

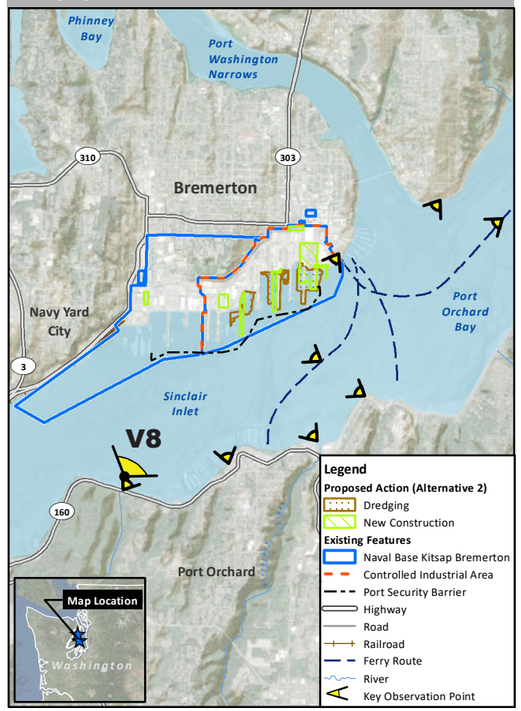




Key Observation Point V8 Simulated Visual Conditions Alternative 2

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025

PHOTOGRAPH INFORMATION

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Date of photograph:	2-13-20
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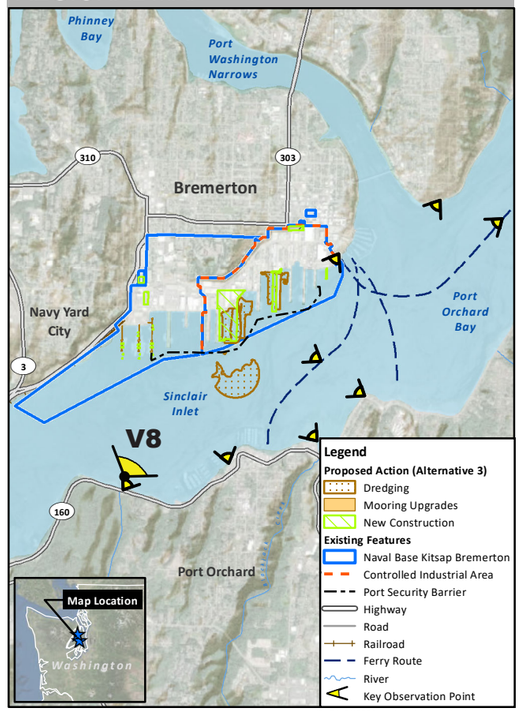
JULY 2025



Key Observation Point V8 Simulated Visual Conditions Alternative 3

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: STANTEC-AECOM JV 2025, Esri 2015-2025, Navy 2021

N

0 1,000 Meters

0 5,000 Feet

Date: 3/31/2025



PHOTOGRAPH INFORMATION

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Date of photograph:	2-13-20
Viewing direction:	Northeast (42°)
Latitude:	47°32’18.64”N
Longitude:	-122°39’21.03”W
Camera elevation:	13.5 Feet
Distance to project:	0.90 Mile

** Proposed parking garage and recycle material transfer site not visible*

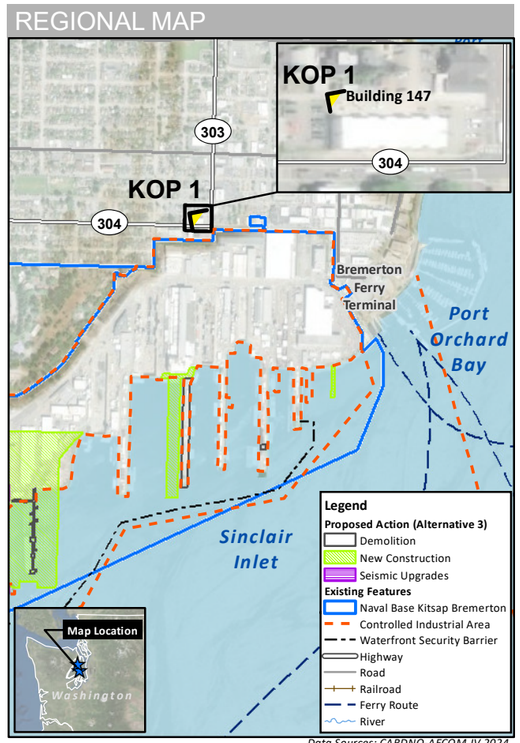
JULY 2025



Key Observation Point V9 Existing Conditions

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2024, Esri 2015-2024, Navy 2021

N

0 500 Meters

0 2,000 Feet

Date: 4/22/2024



PHOTOGRAPH INFORMATION

Time of photograph:	7:47 AM
Date of photograph:	2-9-2003
Viewing direction:	Southeast (133°)
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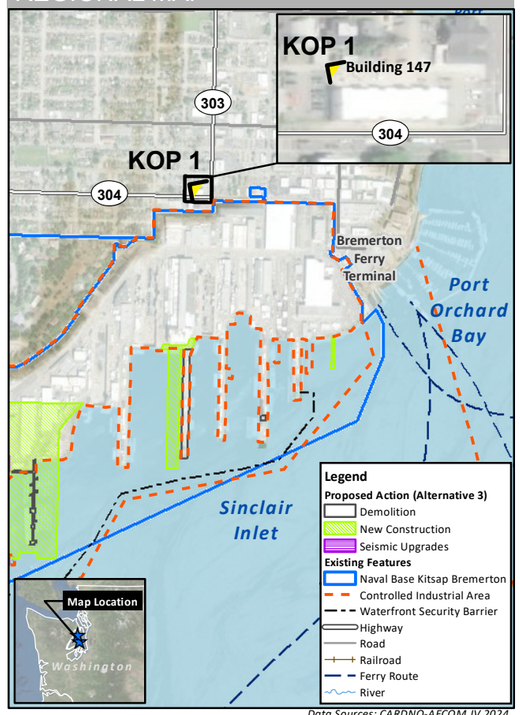
JULY 2025



Key Observation Point V9 Simulated Conditions Proposed Building 76ft Tall

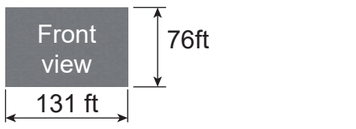
Bremerton Waterfront Infrastructure Improvements EIS

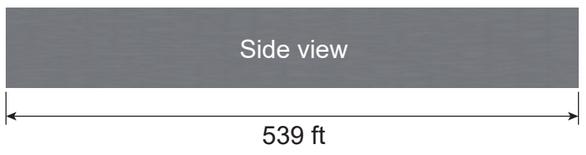
REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2024, Esri 2015-2024, Navy 2021

Date: 4/22/2024







PHOTOGRAPH INFORMATION

Time of photograph:	7:47 AM
Date of photograph:	2-9-2003
Viewing direction:	Southeast (133°)
Latitude:	47° 33’ 54.4340” N
Longitude:	122° 37’ 59.1006” W
Camera elevation:	62.8 Feet
Distance to building:	160 Feet

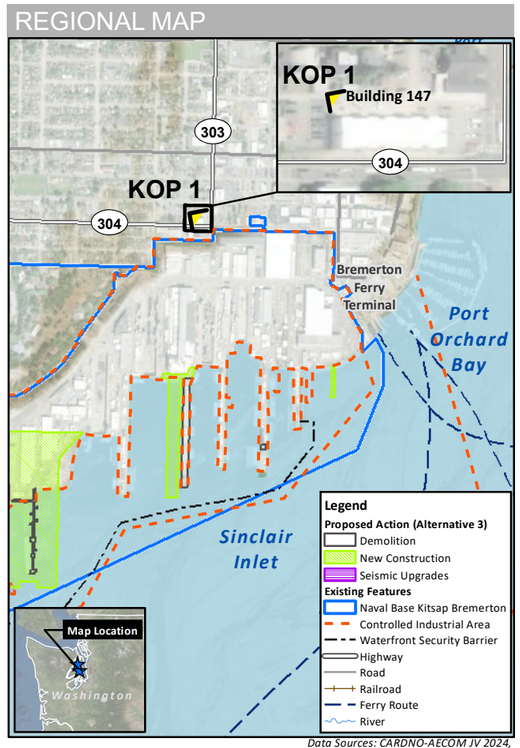
JULY 2025



Key Observation Point V9 Simulated Conditions Proposed Building 91ft Tall

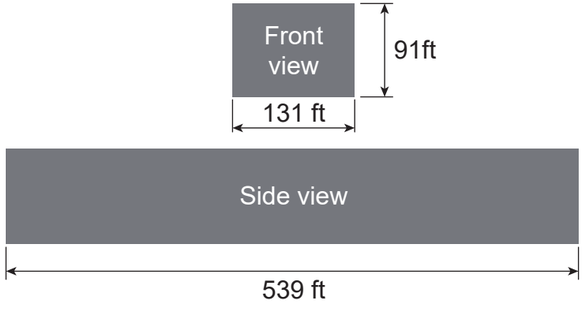
Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2024, Esri 2015-2024, Navy 2021

Date: 4/22/2024





PHOTOGRAPH INFORMATION

Time of photograph:	7:47 AM
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Viewing direction:	Southeast (133°)
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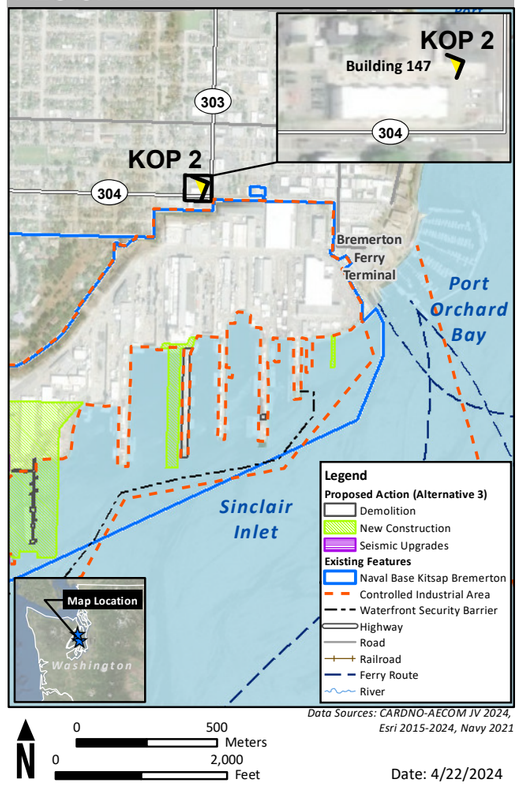
JULY 2025



Key Observation Point V10 Existing Conditions

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Data Sources: CARDNO-AECOM JV 2024, Esri 2015-2024, Navy 2021

Date: 4/22/2024

PHOTOGRAPH INFORMATION

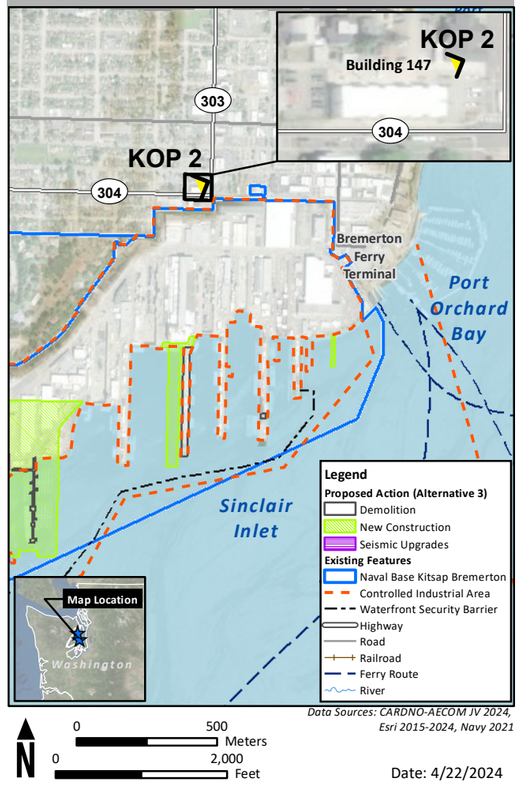
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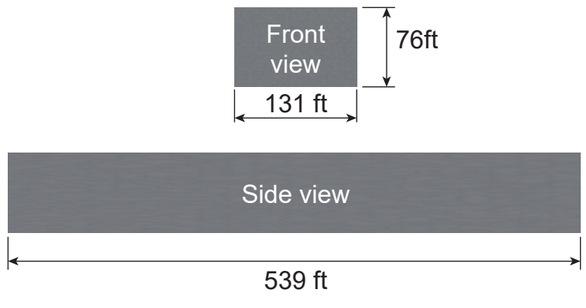


Key Observation Point V10 Simulated Conditions Proposed Building 76ft Tall

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP





PHOTOGRAPH INFORMATION

Time of photograph:	7:44 AM
Date of photograph:	2-9-2003
Viewing direction:	Southwest (257°)
Latitude:	47° 33’ 54.3972” N,
Longitude:	122° 37’ 48.6673” W
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Distance to project:	119 Feet

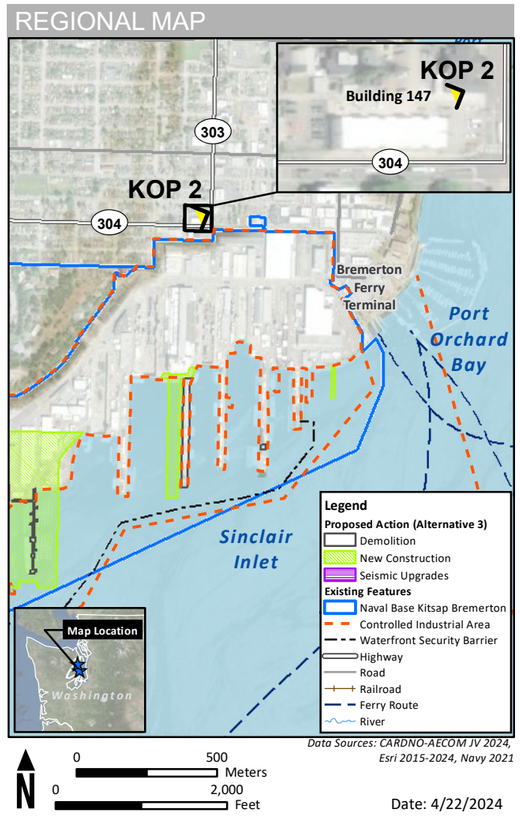
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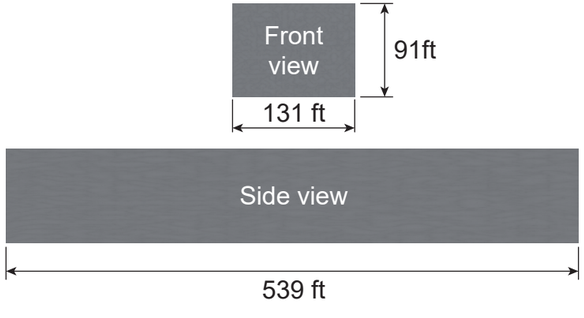
Key Observation Point V10 Simulated Conditions Proposed Building 91ft Tall

Bremerton Waterfront Infrastructure Improvements EIS

REGIONAL MAP



Date: 4/22/2024



PHOTOGRAPH INFORMATION

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Date of photograph:	2-9-2003
Viewing direction:	Southwest (257°)
Latitude:	47° 33’ 54.3972” N,
Longitude:	122° 37’ 48.6673” W
Camera elevation:	27.9 Feet
Distance to project:	119 Feet

JULY 2025

APPENDIX N
Supplemental Sound Terminology and Noise Analysis

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1 Supplemental Sound Terminology and Noise Analysis

Bioacoustics, or the study of how sound affects living organisms, is a complex interdisciplinary field that includes the physics of sound production and propagation, the source characteristics of sounds, and the perceptual capabilities of receivers. This appendix provides supplemental information for the noise analyses presented in *Section 3.10, Noise*, of this Environmental Impact Statement (EIS) as it relates to humans. This appendix also provides a larger focus on how sound is perceived by animals in the marine environment and introduces various sound exposure criterion by marine organisms evaluated in Section 3.5, *Biological Resources*. The supplemental information includes definitions of sound terminologies (Section 1); sound propagation through different environmental media (Section 2); sounds produced by activities proposed under both the Proposed Action alternatives (Alternative 2 and Alternative 3) (Section 3); sound exposure criteria for various organisms (Section 4); and acoustic effects analysis (Section 5) on these organisms. This analysis is specific to noise generated within the Demolition and Construction Area Region of Influence (ROI). Alternative 2 is the Preferred Alternative.

1.1 Definitions of Sound Terminologies

This section introduces the reader to the basics of sound measurements and sound propagation. Sound may be purposely created to convey information, communicate, or obtain information about the environment. Examples of such sounds are vocalizations, echolocation, and tones used in hearing experiments. Whether a sound is considered undesirable noise depends on the receiver (i.e., human, animal, or system that detects the sound). For example, sonar pings used to locate a submarine are useful sounds to sailors but may be considered undesirable noise by marine mammals. Noise also refers to sound sources that may interfere with detection of a desired sound; the combination of all the sounds at a particular location is referred to as ambient noise and is the background level of noise that is consistently present but may also vary over time (e.g., daytime vs. nighttime).

Table 1-1 summarizes common acoustic terminology. Two common descriptors are the instantaneous peak sound pressure level (SPL) and the root mean square (RMS) SPL (dB RMS) during the pulse or over a defined averaging period. The peak pressure is the instantaneous maximum or minimum overpressure observed during each pulse or sound event and is presented in pascals (Pa) or as dB referenced to a pressure of 1 micropascal (re 1 µPa) for underwater sound. The RMS level is the square root of the energy divided by a defined time period, such as the time interval that encompasses 90 percent of the energy from a single sound event.

Table 1-1 Definitions of Common Airborne and Underwater Acoustical Terms

Term	*Definition*
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 micropascal (µPa) and for air is 20 µPa (approximate threshold of human audibility).
Sound Pressure Level (SPL)	Sound pressure is the force per unit area, usually expressed in micropascals (or 20 micro-Newtons per square meter), where 1 pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The SPL is expressed in decibels and is the quantity directly measured by a sound level meter.
Frequency	Frequency is expressed in terms of the number of pressure variation cycles occurring per second, commonly referred to as hertz (Hz). Typical human hearing ranges from 20 Hz to 20,000 Hz.

Term	*Definition*
Peak Sound Pressure (unweighted)	Peak SPL is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 Hz to 20,000 Hz. This pressure is expressed as peak SPL dB re 1 µPa for underwater sound.
Root Mean Square (RMS)	The RMS level is the square root of the energy divided by a defined time period. For pulses (e.g., pile driver strikes), the RMS has been defined as the average of the squared pressures over the time that comprise that portion of waveform containing 90 percent of the sound energy for one impulse sound (i.e., impact pile driving). RMS is expressed as dB re 1 µPa for underwater sound applications.
Sound Exposure Level (SEL)	SEL combines both the intensity of a sound and its duration by equating the total acoustic energy normalized to a specific time interval. Unless otherwise noted, noise analysis presented in this document reflects the standardized SEL time interval of 1 second. The exception is cumulative SEL (SEL_{cum}), which sums all single-strike equipment noise occurring in a single day time interval with a reference pressure of 1 µPa2•s.
Waveforms	A graphical plot illustrating the time history of sound pressure of individual impulsive sounds shown as a plot of µPa over time (i.e., seconds).
Intensity	The power carried by a sound wave per unit area, in a direction perpendicular to the direction in which the sound waves are travelling.
A-Weighting Sound Level	The SPL in decibels as measured on a sound level meter using A-weighting filter network. The A-weighting filter de-emphasizes the low- and high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective human reactions to noise.
Ambient Noise Level	The background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Maximum Sound Level (L_{max})	The maximum sound level (L_{max}) measured over a duration of one-eighth of a second.
Equivalent Sound Level (L_{eq})	Combines a series of noise events over a period of time by averaging the sound energy. The time period specified for L_{eq} typically relates to a type of activity and is presented in parenthesis (e.g., $L_{eq(24)}$ for 24 hours). For example, a 1-hour L_{eq} ($L_{eq(1hr)}$) is most common for construction noise impact analysis.
Day-Night Average Sound Level (DNL or L_{dn})	A cumulative metric that is calculated as the energy average of all noise events occurring over a 24-hour period with a 10 dB penalty applied to events occurring during the nighttime period between 10 p.m. and 7 a.m.
Attenuation System	A system whereby air bubbles or other materials are placed around the submerged portion of the pile in order to reflect or absorb sound energy, thus reducing the transmission of sound energy to surrounding waters.

Legend: µPa = micropascal; dB = decibel; dB re 1 µPa = decibels referenced to a pressure of 1 micropascal; dB re 1 µPa2•s = decibel referenced to 1 micropascal squared seconds; dBA = A-weighted decibel; Hz = hertz; L_{max} = maximum sound level; RMS = root mean square; SEL = sound exposure level; SPL = sound pressure level

1.2 Basics of Sound and A-Weighted Sound Levels

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound, also referred to as the sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB re 20 µPa. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second, or Hertz (Hz). To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale, which places less weight on very low and very high frequencies in order to replicate human hearing sensitivity. The general range of human hearing is from 20 to 20,000 cycles per second, or Hz; humans hear best in the range of 1,000 to 4,000 Hz. A-weighting is a frequency-dependent adjustment of sound level used to approximate the natural range and sensitivity of the human auditory system. Table 1-2 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.

Table 1-2 Subjective Responses to Changes in A-Weighted Decibels

Change	***Change in Perceived Loudness***
3 dB	Barely perceptible
5 dB	Quite noticeable
10 dB	Dramatic – twice or half as loud
20 dB	Striking – fourfold change

Legend: dB = decibel

Figure 1-1 provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time. A variety of noise metrics have been developed to describe noise over different time periods, as discussed below.

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air or water. Sound is characterized primarily by two factors, frequency and intensity (Table 1-1). For in-air sound pressure, the standard reference value is 20 micropascal (µPa) and is expressed as "dB re 20 µPa." (µPa, or 10^{-6} pascals). When describing underwater sound pressure, the standard reference value is 1 and is expressed as dB re 1 µPa. Sound levels measured in air and water are not directly comparable, and it is important to note which reference value is associated with a given sound level. Because the dB is a logarithmic measure, each increase of 20 dB reflects a ten-fold increase in signal amplitude (i.e., 20 dB means ten times the amplitude, 40 dB means one hundred times the amplitude, 60 dB means one thousand times the amplitude, and so on). Because the decibel is a relative measure, any value expressed in decibels is meaningless without an accompanying reference.

All sounds have a spectral content, which means their magnitude or level varies by frequency. Many organisms perceive sounds with the same magnitude but different spectra differently. Presenting noise levels as "A-weighted" better mimics the human ear's non-linear sensitivity to different frequencies of sound by de-emphasizing very low and very high frequencies. A-weighted sound is denoted as dBA but is often simplified to dB for brevity when the weighting used is obvious.

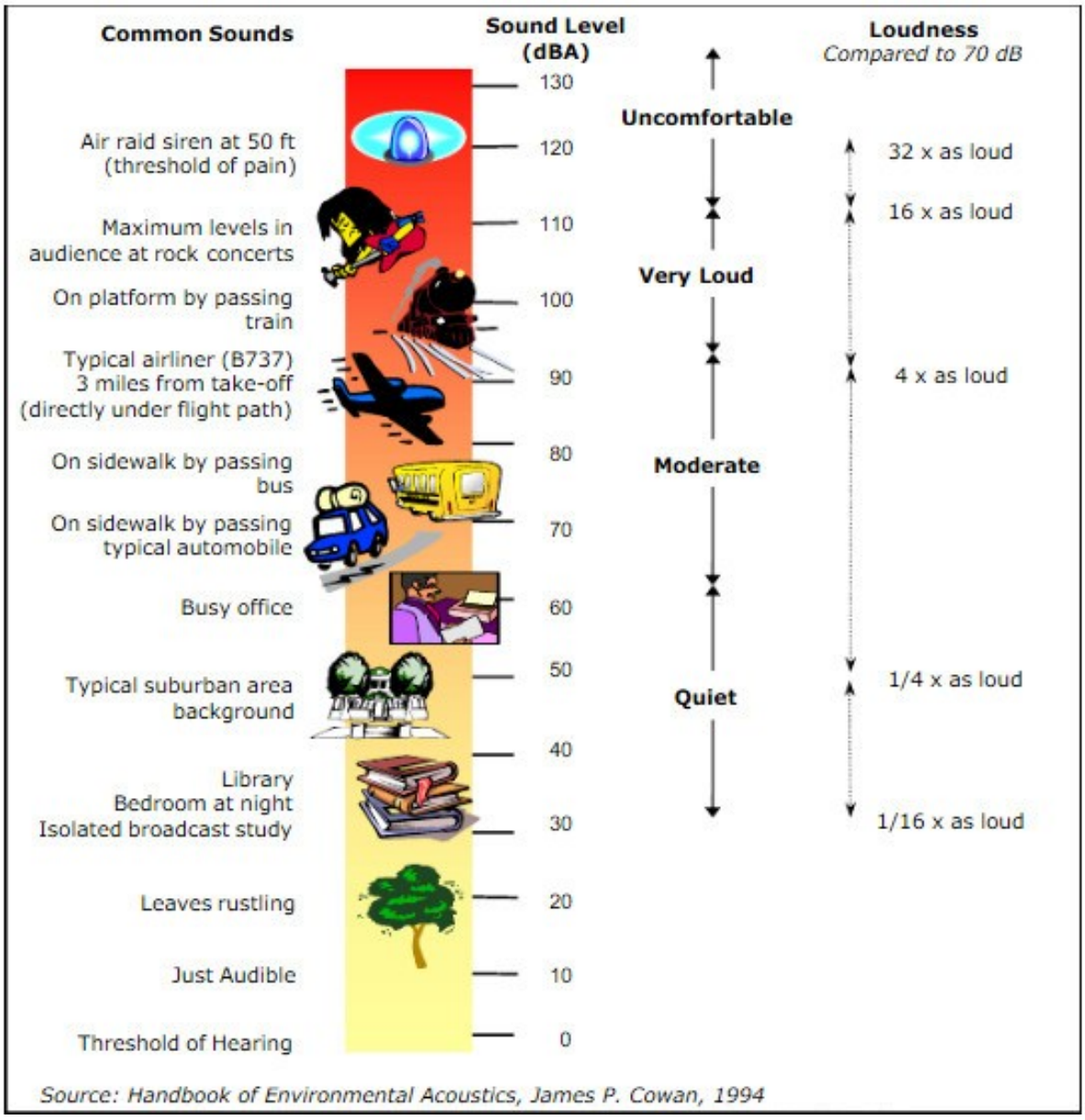


Figure 1-1 A-Weighted Sound Levels from Typical Sources

2 Sound Propagation Through Environmental Media

This section presents sound properties and propagation through different environmental media, which includes water and air.

2.1 Ambient Underwater Sound

Ambient (typical background) underwater sound is a composite of sounds from multiple sources, including environmental events, biological sources, and anthropogenic activities. Physical noise sources include waves at the surface, precipitation, earthquakes, ice, and atmospheric noise, among other events. Biological sources include marine mammals, fishes, birds, insects, and other invertebrates. Anthropogenic sounds are produced by vessels (small and large), dredging, aircraft overflights, construction activities, geophysical explorations, commercial and military sonars, and other activities. Known noise levels and frequency ranges associated with anthropogenic sources similar to those that will be used for the proposed action alternatives are summarized in Table 2-1.

Ambient (typical background) underwater noise levels in Sinclair Inlet, along the Naval Base (NAVBASE) Kitsap-Bremerton waterfront (measured at Pier 6) ranged from 118 dB RMS (minimum or "quiet" ambient) to 132 dB RMS (7 to 20 kilohertz [kHz]), with a mean value of 128 dB RMS re 1 µPa (Navy 2016). Ambient underwater noise varies considerably as noise sources, especially vessel engines, machinery, and equipment, operate intermittently.

Table 2-1 Representative Underwater Noise Levels of Anthropogenic Sources

Noise Source	*Source Level*	*Frequency Range*	*Reference*
Dredging	161 – 186 dB RMS re 1 µPa at 1 meter	1 – 500 Hz	Richardson et al. 1995; Reine et al. 2014
Small Vessel	141 – 175 dB RMS re 1 µPa at 1 meter	860 – 8,000 Hz	Galli et al. 2003
Large Ship	176 – 186 dB re 1 μPa^2•sec SEL at 1 meter	20 – 1,000 Hz	McKenna 2011; Sebastianutto et al. 2011
Pile Driving	At 10 meters (32.8 feet) from source: 165 – 185 dB RMS (vibratory) re 1 µPa 177 – 220 dB PEAK (impact) re 1 µPa 153 – 205 dB RMS (impact) re 1 µPa 146 – 195 dB SEL (impact) re 1 µPa	100 – 2,000 Hz 100 – 2,000 HZ	Discovery of Sound in the Sea 2020; Caltrans 2020

Legend: µPa = micropascal; μPa^2•sec = micropascal squared-second; dB = decibels; Hz = Hertz; re = referenced to; RMS = root mean square; sec = second; SEL = sound exposure level (measured as single-strike SEL)

2.1.1 Underwater Sound Propagation

Modeling sound propagation is useful in evaluating noise levels to determine the distance from noise-producing activity that certain sound levels may travel. Transmission loss (TL) is defined as the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source until the source becomes indistinguishable from ambient sound. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition

and topography. “Spherical spreading” occurs when the noise from the source is free to expand with no refraction or reflection from boundaries (i.e., the sediment or water surface) and results in a general 6 dB decrease in the intensity of the noise per doubling of distance from the source to the receptor at acoustically hard surfaces, such as water, concrete, or hard-packed soil. “Cylindrical spreading” applies when noise energy spreads outwards in a cylindrical fashion bounded by the sediment and water surface, within relatively shallow water conditions as compared to the wavelength of sound and results generally in 3 dB decrease per doubling of distance from the noise source. “Practical spreading” (often referred to as the “practical spreading model”) is widely used for intermediate or spatially varying conditions when actual values for TL are unknown. This model follows a geometric propagation loss based on the distance from the driven pile, resulting in a 4.5 dB reduction in SPL for each doubling of distance from the source. In this model, the SPL at some distance away from the source (e.g., driven pile/noise source) is governed by a measured source level, minus the TL of the energy as it dissipates with distance. The TL equation used in the practical spreading model is:

$$\mathrm{TL}=15\log_{10}\left(\frac{\mathrm{R}_1}{\mathrm{R}_2}\right)$$

Where:

TL is the transmission loss in dB.

R1 is the distance of the modeled SPL from the noise source.

R2 is the distance (usually 32.8 feet) (10 meters) from the noise source of the initial measurement.

The degree to which underwater noise propagates away from a noise source is dependent on a variety of factors, most notably by bathymetry and the presence or absence of reflective or absorptive conditions including the sea surface and sediment type. As discussed in *Section 3.4 Geological Resources* of the Draft EIS, the seafloor in Sinclair Inlet, off NAVBASE Kitsap-Bremerton, is relatively flat with depths ranging from approximately 30 to 60 feet (9 to 18 meters) mean lower low water, then transitioning to steep shorelines along the Puget Sound Naval Shipyard & Intermediate Maintenance Facility (PSNS & IMF) (see Figure 3.4-4 of the Draft EIS) (WSP, 2021). The center of the inlet generally ranges between 35 and 65 feet (11 to 20 meters) (Noble et al., 2013).

Per accepted approach from National Marine Fisheries Service (NMFS), the TL model used is the practical spreading model and described above was used to calculate the expected noise propagation from pile driving activities, using representative source levels to estimate the Zone of Influence (ZOI) or area exceeding the noise criteria. The noise-affected areas are assumed to take a circular shape around the notional pile being driven, but land features (e.g., shorelines) may result in some areas being “clipped,” as sounds will attenuate or be blocked/shadowed as they encounter land or other solid obstacles. Reflection of sound also interferes with propagation of sound waves. As a result, the ranges calculated by the model may not actually be attained and are expected to overestimate the actual distance to expected sound levels.

Sinclair Inlet is bounded on the north, west, and south by sections of Kitsap County shoreline, and opens slightly to the east in the direction of Port Orchard Bay and Rich Passage (see Figure 3.3-2 of the Draft EIS). Acoustic propagation of pile driving sound is limited in this direction due to the indirect, circuitous route along Rich Passage. Port Washington Narrows is adjacent to Sinclair Inlet and is also shielded from project-related sound due to the land area occupied by the City of Bremerton (Navy, 2016).

2.2 Ambient Airborne Sound

Airborne sound at NAVBASE Kitsap-Bremerton is produced by common industrial equipment, including trucks, cranes, compressors, generators, pumps, and other equipment that might typically be employed along industrial waterfronts, and small boat noise. Airborne sound is produced by many natural sources such as wind-driven wave noise and precipitation. Sound levels are highly variable based on the types and operational states of equipment at the recording location, and sound levels may even vary within a single location, with some piers/wharfs very loud and others relatively quiet.

As described in Table 1-1, airborne sounds are commonly referenced to human hearing using a method that weights sound frequencies according to measures of human perception, de-emphasizing very low and very high frequencies that are not perceived well by humans (measured in dBA). See Section 3.10 of the Draft EIS for description and analysis of airborne noise in reference to human hearing. Ambient airborne sound measurements at NAVBASE Kitsap-Bremerton ranged from 62 to 76 dB (A-weighted average at re 20 µPa) (Navy, 2024).

Noise levels at NAVBASE Kitsap-Bangor vary based on location but are estimated to average around 65 dBA in the residential and office park areas, with traffic noise ranging from 60 to 80 dBA during daytime hours (Navy, 2011). The more rural/vegetated areas, such as the proposed location for the expanded laydown area and forge shop would be expected to have ambient noise levels of approximately 55 to 60 dBA (Navy, 2020a).

2.2.1 Airborne Sound Propagation

Airborne noise propagates freely in all directions from the source, resulting in spherical spreading loss, which equates to 6 dB decrease in SPL per doubling of distance. The water surface is considered a hard surface and acts as a reflective surface where it does not provide any attenuation (Washington State Department of Transportation [WSDOT], 2023). The TL equation is:

$$TL = 20 \log_{10} \left(\frac{R_1}{R_2} \right)$$

Where:

TL is the transmission loss in dB.

R1 is the distance of the modeled SPL from the noise source.

R2 is the distance (usually 50 feet [15 meters]) from the noise source of the initial measurement).

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3 Sound Produced by the Project Alternatives

This section presents sounds that would be produced by construction of the project alternatives, with a special focus on pile driving.

3.1 Analysis of Construction Activity Noise Impacts

Construction activities will result in temporarily elevated underwater and airborne noise levels. Noise will be generated from support vessels, small boat traffic, pile installation, dredging equipment, and barge-mounted equipment, such as generators. Noise levels from all construction activities except pile driving will typically not exceed ambient sound levels resulting from routine waterfront operations in the vicinity of any of the structures. The most significant project-related noise source would be impact pile driving of steel piles, particularly impact driving of steel piles (Navy, 2020b; Caltrans, 2020; Navy, 2015; Laughlin, 2010a, 2010b).

The analysis of pile driving noise impacts requires consideration of noise levels resulting from pile driving; the duration and timing of pile driving; noise level thresholds for acoustic effects on marine mammals, fish, and marine birds (see Chapter 4 of this appendix); and estimation of the extent of elevated noise levels above these thresholds.

3.1.1 Impulsive and Non-Impulsive Sound

Among various underwater sound sources in Sinclair Inlet, in-water construction using impact and vibratory pile drivers will generally produce the highest sound levels. The sounds produced by pile driving activities fall into two sound types: impulsive and non-impulsive (defined below). Impact pile driving produces impulsive sounds, while vibratory pile driving produces non-impulsive/continuous sounds. The distinction between these two general sound types is important because they have differing potential to cause physical effects on receptors such as marine mammals, fish, and marine birds, particularly with regard to hearing (Popper et al., 2014, 2019; SAIC, 2012; Southall et al., 2019, 2021).

Impulsive sounds (e.g., explosions, seismic air gun pulses, and impact pile driving), which are referred to as pulsed sounds in Southall et al. (2007), are brief, broadband, atonal transient sounds (Harris, 1998) and occur either as isolated events or repeated in some succession (Southall et al., 2007). Impulsive sounds are characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a decay period that may include a period of diminishing, oscillating maximal and minimal pressures (Southall et al., 2007). Impulsive sounds generally have a greater capacity to induce physical injury compared with sounds that lack these features (Southall et al., 2007).

Non-impulsive/continuous sounds (referred to as non-pulsed in Southall et al. [2007]) can be tonal, broadband, or both. They lack the rapid rise time and can have longer durations than impulsive sounds. Non-impulsive sounds can be either intermittent or continuous. Examples of non-impulsive sounds include vessel and aircraft engines and machinery operations such as drilling, dredging, and vibratory pile driving/extracting (Southall et al., 2007). In some environments, the duration of both impulsive and non-impulsive sounds can be extended due to reverberations.

As mentioned above, drilling and dredging are considered intermittent, non-impulsive/continuous noise source activities, similar to vibratory pile driving/extracting. Very little information is available regarding source levels for in-water drilling activities associated with nearshore pile installation. Construction monitoring during in-water drilling activities in Bechers Bay, Santa Rosa Island, California recorded

average sound levels of 154 dB RMS (Dazey et al., 2012). If any drilling is required, the drilling apparatus used would vary depending on the different applications during in-water construction activities. Down-the-hole drilling methods will not be used.

Underwater sounds generated from marine dredging activities can be variable, depending on the phase of operation and the type of dredge used. Typical dredge frequencies are low (<500 Hz) (Reine et al., 2014) and underwater sound levels using a bucket dredge (as would be used under the proposed action alternatives) is not expected to exceed SPL_{peak} of 124 dB re 1 µPa from the source (Dickerson et al., 2001).

It is generally assumed that drilling and dredging would produce less in-water noise than both impact and vibratory pile driving and does not typically result in incidental harassment of marine mammals.

3.1.2 Proxy Source Levels for Pile Driving

Data from other similar projects were reviewed to develop a list of potential proxy SPLs for steel, concrete, and sheet piles to assist in evaluating acoustic impacts to marine mammals, fish, and sea birds from proposed pile driving activities and to provide ranges of noise that specific pile types and sizes may produce under the proposed action alternatives. Summaries of underwater and airborne SPLs from similar in-situ monitored construction activities are included in Table 3-1 and Table 3-2, respectively.

Table 3-1 Underwater Sound Source Levels from Similar In-Situ Monitored Construction Activities

Pile Driving Method	*Pile Type*	*Pile Size (inches)*	*PEAK (dB re 1 µPa)*	*RMS (dB re 1 µPa)*	*SEL (dB re 1 $\mu Pa^2 \bullet sec$)*	*Source*
Impact Installation	Concrete pile[(1)]	18	184	170	159	Navy, 2015
		24	189	178	166	Navy, 2015
		36	192	176	174	WSDOT, 2023
	Steel pipe[(1)]	24	208	184	173	Caltrans, 2020; Table I.2-1a NAVBASE Kitsap-Bangor EHW
		30	216	195	186	Navy, 2015
		36	211	193	184	Navy, 2015
		48	213	190	177	Caltrans, 2020; redwood City 66-ich piles
	Steel CISS[(1)]	96	220	205	195	Caltrans, 2020; Table I.2-1a at Benicia-Martinez Bridge
	AZ Steel sheet[(1)]	24	205	190	180	Caltrans, 2020; Table 1.2-1d Berth 23, Port of Oakland
Vibratory Extraction	Timber[(1)]	12 - 18	178	161	156	NMFS, 2024b; Navy, 2016
	Concrete[(1)]	16 - 24	178	161	156	NMFS, 2024b; Navy, 2016
	AZ Steel sheet[(1)]	various	165	150	150	WSDOT, 2020

Pile Driving Method	*Pile Type*	*Pile Size (inches)*	*PEAK (dB re 1 µPa)*	*RMS (dB re 1 µPa)*	*SEL (dB re 1 µPa²•sec)*	*Source*
Vibratory Installation/ Extraction	Steel pipe[1]	24	178	161	156	Caltrans, 2020; WETA Downtown Ferry; Navy, 2015
		30	No data	167	No data	Navy, 2015
		36	No data	169	No data	Caltrans, 2020; Naval Base Kitsap; Navy, 2015
		48	195	180	180	WSDOT, 2020
	Steel CISS[1]	96	195	180	180	WSDOT, 2020
Vibratory Installation	AZ Steel sheet[1]	24	177	163	163	Caltrans, 2020; Berth 35/37 Port of Oakland

Notes: All measurements are unattenuated. [1]SPLs are presented for a distance of 10 meters (32.8 feet) from the pile unless otherwise noted. RMS and Peak levels are relative to 1 µPa, and cumulative SEL levels are relative to 1 µPa²•sec.
Legend: µPa²•sec = micropascal squared-second; CISS = cast-in-steel shell; dB re 1 µPa = decibels referenced at 1 micropascal; RMS = root mean square; SEL = sound exposure level

The recommended unweighted airborne source level values used in this analysis were obtained from Navy (2015) and are presented in Table 3-2. Available data were limited to concrete and steel pile installation.

Table 3-2 Airborne Sound Levels for Similar In-Situ Monitored Construction Activities

Pile Type	*Size (diameter in inches)*	*Impact Installation RMS L_{max}*	*Vibratory Installation/Extraction RMS L_{eq}*
Concrete	24	109	N/A
Steel Pipe	18	110[1]	88
	24	110[2]	92[2]
	30	112[1]	95
	36	112	95
Steel Sheet	N/A	N/A	92[3]

Notes: All values relative to 20 µPa and at 15 meters (50 feet) from pile. All values unweighted.
[1]Data not available for this pile size. Source level assumed to be equivalent to next larger size pile.
[2]Limited data set.
[3]Data not available. Source level assumed to be equivalent to 24-inch steel pipe.
Legend: L_{eq} = equivalent sound level; L_{max} = maximum sound level; µPa = micropascal; N/A = not applicable; RMS = root mean square

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4 Sound Exposure for Various Organisms

This section presents sound exposure criteria for various organisms. Living organisms that may be receptors to the proposed action activities include marine mammals, fish and invertebrates, marine birds, and humans.

4.1 Marine Mammals

4.1.1 Vocalizations and Hearing of Marine Mammals

All marine mammals that have been studied can produce sounds and use sounds to forage, orient, detect, respond to predators, and facilitate social interactions (Richardson et al., 1995). Measurements of marine mammal sound production and hearing capabilities provide some basis for assessing whether exposure to a particular sound source may affect a marine mammal behaviorally or physiologically. Marine mammal hearing abilities are quantified using live animals via either behavioral audiometry or electrophysiology (Schusterman, 1981; Au, 1993; Wartzok and Ketten, 1999; Nachtigall et al., 2007). Behavioral audiograms, which are plots of animals' exhibited hearing threshold versus frequency, are obtained from captive, trained live animals using standard testing procedures with appropriate controls and are considered to be a more accurate representation of a subject's hearing abilities. Behavioral audiograms of marine mammals are difficult to obtain because many species are too large, too rare, and too difficult to acquire and maintain for experiments in captivity. Consequently, our understanding of a species' hearing ability may be based on the behavioral audiogram of a single individual or small group of animals. In addition, captive animals may be exposed to local ambient sounds and other environmental factors that may impact their hearing abilities and may not accurately reflect the hearing abilities of animals in the wild.

For animals not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are based on anatomical and physiological structures, the frequency range of the species' vocalizations, and extrapolations from related species.

Electrophysiological audiometry measures small electrical voltages produced by neural activity when the auditory system is stimulated by sound. The technique is relatively fast, does not require a conscious response, and is routinely used to assess the hearing of newborn humans. It has been adapted for use on non-humans, including marine mammals (Dolphin, 2000; Nachigtall et al., 2007; Mulsow et al., 2021). For both methods of evaluating hearing ability, hearing response in relation to frequency is a generalized U-shaped curve or audiogram showing the frequency range of best sensitivity (lowest hearing threshold) and frequencies above and below with higher threshold values.

The NMFS reviewed studies of hearing sensitivity of marine mammals and developed thresholds for use as guidance when assessing the effects of anthropogenic sound on marine mammals based on measured or estimated hearing ranges, as stated above (NMFS, 2024a). The guidance places marine mammals into the following functional hearing groups based on their generalized hearing sensitivities: very high-frequency cetaceans, high-frequency cetaceans, low-frequency cetaceans, phocid pinnipeds, and otariid pinnipeds. Table 4-1 presents the species and hearing range for each group. Research is underway to further subdivide these hearing groups in the future (Southall et al., 2019, 2021).

Table 4-1 Hearing and Vocalization Ranges for Marine Mammal Functional Hearing Groups

Functional Hearing Group	*Species*	*Functional Hearing Range[(1)(2)]*
Low-frequency cetaceans	Baleen whales (e.g., humpback whale, gray whale, minke whale)	7 Hz to 36 kHz
High-frequency cetaceans	Killer whale, dolphins, toothed whales, beaked whales, bottlenose whales	150 Hz to 160 kHz
Very high-frequency cetaceans	True porpoises (e.g., harbor porpoise, Dall's porpoise)	200 Hz to 165 kHz
Phocidae	True seals (e.g., harbor seal, elephant seal)	Underwater: 40 Hz to 90 kHz[(2)] In-air: 42 Hz to 52 kHz
Otariids	Sea lions, walrus, sea otter	Underwater: 60 Hz to 68 kHz[(2)] In-air: 90 Hz to 40 kHz

Notes: [(1)]Hearing ranges are generalized as a composite of all species within that group. Animals may be able to detect very loud sounds above and below their functional hearing range.
[(2)]Underwater and in-air hearing data from NMFS 2024a.
Legend: Hz = Hertz; kHz = kilohertz

Animals are not equally sensitive to all frequencies and so auditory weighting functions (mathematical functions) are used to emphasize frequencies where animals are more susceptible to noise exposure and de-emphasize frequencies where animals are less susceptible (Finneran, 2016). In order to set acoustic threshold levels for each group, a frequency-dependent weighting function and numeric thresholds for the onset of temporary threshold shift (TTS) and the onset of auditory injury (AUD INJ) were derived from available data compiled for hearing abilities and effects of noise on marine mammals (NMFS, 2024)a. These thresholds are presented in Table 4-2 for hearing groups evaluated under the proposed action alternatives. In 2024, NMFS guidance began using the term AUD INJ, which includes but is not limited to, permanent threshold shift (PTS), which had been used in past guidance in a similar capacity.

4.1.2 Sound Exposure Criteria and Thresholds

The Marine Mammal Protection Act (MMPA) defines "harassment" as any act of pursuit, torment, or annoyance which: (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (50 Code of Federal Regulations, Part 216, Subpart A, Section 216.3-Definitions). Level A is the more severe form of harassment because it may result in injury, whereas Level B only results in behavioral disturbance or TTS without the potential for injury.

In 2024, NMFS updated the acoustic threshold levels for determining the onset of AUD INJ in marine mammals in response to underwater impulsive and non-impulsive sound sources (NMFS, 2024a). Prior to 2018, NMFS used a dB RMS criteria, rather than cumulative sound exposure level (SEL) metrics (dB SEL_{cum}) and peak pressure (dB_{pk}) in use now (NMFS 2018). NMFS equates the onset of auditory injury with Level A harassment under the MMPA and "harm" under the Endangered Species Act. Level B harassment is considered to occur when marine mammals are exposed to impulsive underwater sounds greater than 160 dB RMS re 1 µPa from impact pile driving and to non-impulsive underwater sounds greater than 120 dB RMS re 1 µPa (e.g., from vibratory pile driving) (NMFS, 2005) (Table 4-2). The

application of the 120 dB RMS threshold is considered precautionary (74 *Federal Register* 41684) as it can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. Behavioral harassment may or may not result in a stress response.

Table 4-2 Auditory Injury Onset and Behavioral Disturbance Threshold Criteria for Underwater and Airborne Noise

Marine Mammals	*Airborne Noise (impact and vibratory pile driving) (re 20 µPa)*[1]	*Underwater Vibratory Pile Driving Noise (non-impulsive sounds) (re 1 µPa)*		*Underwater Impact Pile Driving Noise (impulsive sounds) (re 1 µPa)*	
	Disturbance Guideline (Level B) (haul-out)[2]	*AUD INJ Onset (Level A) Threshold*	*Level B Disturbance Threshold*	*AUD INJ Onset (Level A) Threshold*[3]	*Level B Disturbance Threshold*
Low-frequency cetaceans	Not applicable	197 dB SEL_{CUM}[4]	120 dB RMS	222 dB Peak[5] 183 dB SEL_{CUM}[4]	160 dB RMS
High-frequency cetaceans	Not applicable	201 dB SEL_{CUM}[4]	120 dB RMS	230 dB Peak[5] 193 dB SEL_{CUM}[4]	160 dB RMS
Very High-frequency cetaceans	Not applicable	181 dB SEL_{cum}[4]	120 dB RMS	202 dB Peak5 159 dB SEL_{cum}[4]	160 dB RMS
Otariidae (sea lions)	100 dB RMS (unweighted)	199 dB SEL_{cum}[4]	120 dB RMS	230 dB Peak5 185 dB SEL_{cum}[4]	160 dB RMS
Phocidae (harbor seal)	90 dB RMS (unweighted)	195 dB SEL_{CUM}[4]	120 dB RMS	223 dB Peak[5] 183 dB SEL_{CUM}[4]	160 dB RMS

Notes: [1]Airborne disturbance thresholds not specific to pile driver type. AUD INJ onset criteria for in-air noise have been established for otariids and phocids, but would only be exceeded over a short distance (18 feet or less) where hauled-out pinnipeds would not be present.
[2]Sound level at which pinniped haul-out disturbance has been documented. This is not considered an official threshold but is used as a guideline.
[3]Dual metric acoustic thresholds for impulsive sounds. Whichever results in the largest isopleth for calculating AUD INJ onset is used in the analysis.
[4]Cumulative SEL over 24 hours.
[5]Flat weighted or unweighted peak sound pressure within the generalized hearing range.

Legend: µPa = micropascal; dB = decibel; AUD INJ = auditory injury; re = referenced to; RMS = root mean square; SEL = sound exposure level

Acoustic disturbance levels from vibratory or impact pile driving have the potential to exceed the harassment levels defined in Table 4-2 for both impulsive and non-impulsive/continuous sound levels. This table incorporates thresholds for Level A (AUD INJ onset) and Level B (disturbance).

For airborne sounds, thresholds for Level A and Level B harassment have been established for phocids and otariids (NMFS, 2024a). However, only Level B airborne sound exposure thresholds for seals and other pinnipeds are included in Table 4-2 as project-related pile driving noise would not expose hauled-out pinnipeds to noise above airborne AUD INJ thresholds.

With the increase in in-water construction activities that require use of impulsive and non-impulsive/continuous sound-producing equipment such as impact and vibratory pile drivers and drilling equipment, many research studies have been conducted over the recent years to both measure underwater SPLs during these activities (Illingworth and Rodkin, 2013; Navy, 2015, 2017; Caltrans, 2015, 2020; Illingworth and Rodkin, 2013) and observe behavior of marine mammals to such exposure (Dahl et

al., 2014; Southall et al., 2007, 2019, 2021; Graham et al., 2017; Branstetter et al., 2018). Southall et al. (2007, 2019, 2021) reviewed studies conducted to document behavioral responses of harbor seals and northern elephant seals to continuous sounds under various conditions and concluded that those limited studies suggest that exposures between 90 dB and 140 dB re 1 µPa RMS generally do not appear to induce strong behavioral responses. Broadband underwater noise from vessels typically ranges from about 141 to 186 dB re 1 µPa RMS at the source (see Table 2-1). Vessel activity within the harbor can reasonably be expected to mask the distant sound of the vibratory driver as it is SPL diminished below the vessel noise, especially when a marine mammal is within close proximity to a vessel. Under these circumstances, it would be very unlikely that a marine mammal would differentiate and respond negatively to the distant sound of the vibratory driver in a way that would constitute harassment under the MMPA. Nevertheless, the proposed approach is to model the transmission of continuous sound to the full extent of the 120 dB isopleth, or to the point at which the shoreline blocks transmission.

4.2 Fish

4.2.1 Fish Hearing

Fish have traditionally been grouped into two hearing categories: “hearing generalists” and “hearing specialists” (Hastings and Popper, 2005), although this is now recognized as an oversimplification (Popper and Fay, 2011; Hawkins and Popper, 2018a). Using this dichotomy, fish considered under the proposed action are hearing generalists and do not have specialized hearing capabilities apart from their swim bladder, inner ear, and lateral line. They sense sound directly through the inner ear, and some use the inner ear coupled with the swim bladder to sense additional energy.

Fishes are vulnerable to tissue damage and hearing loss from impact pile driving activities, but studies evaluating how fish detect particle motion components of sound indicate that exposure levels associated with vibratory or continuous sound do not produce tissue damage (Hastings, 2014; Hawkins and Popper, 2018a, 2018b). Results of studies on various stress parameters and behavioral responses in fishes are highly variable. All studies, including those for long- and short-term exposure, were conducted on captive fish in enclosed areas where fish could not avoid the sounds. It is possible that it was not necessarily the sound itself that resulted in the stress response but rather the inability for the fish to move away from the disturbing sound.

Research has shown that stress from noise is greater as a result of intermittent sounds than for vibratory and continuous sounds (Popper et al., 2019). Vibratory pile driving would possibly elicit behavioral reactions from fish such as temporary avoidance of the area but is unlikely to cause injuries to fish or have persistent effects on local fish populations.

4.2.2 Sound Exposure Criteria and Thresholds

Although many researchers have investigated hearing and vocalizations in fish species (Ladich & Fay, 2013; Popper et al., 2014), hearing capability data only exist for a small subset of the currently known 36,600 marine and freshwater fish species (Frick, Eschmeyer, & Fong, 2023). Therefore, fish hearing groups are defined by species that possess a similar continuum of anatomical features, which result in varying degrees of estimated hearing sensitivity (Popper & Fay, 2010; Popper & Hastings, 2009). Categories and descriptions of hearing sensitivities are further defined in this document (modified from Popper et al., 2014) as the following:

- Fishes without a swim bladder—hearing capabilities are limited to particle motion detection at frequencies well below 2 kHz.
- Fishes with a swim bladder not involved in hearing—species lack notable anatomical specializations and primarily detect particle motion at frequencies below 2 kHz.
- Fishes with a swim bladder involved in hearing—species can detect frequencies below 2 kHz, possess anatomical specializations to enhance hearing, and are capable of sound pressure detection up to a few kHz.
- Fishes with a swim bladder and high-frequency hearing—species can detect frequencies below 2 kHz, possess anatomical specializations, and are capable of sound pressure detection at frequencies up to 10 kHz to over 100 kHz (not present in ROI).

Data suggest that most species of marine fish either lack a swim bladder (e.g., flatfishes) or have a swim bladder not involved in hearing (e.g., codfishes) and can only detect sounds below 1 kHz. Endangered Species Act (ESA)-listed species that may occur within the ROI include Chinook salmon, steelhead, bull trout, yelloweye rockfish, and boccacio rockfish. These ESA-listed species have a swim bladder that is not involved in hearing. There are no ESA-listed species that occur in the ROI that have a swim bladder that is involved in hearing, or that have high-frequency hearing (the two most sensitive hearing groups).

Table 4-3 presents the thresholds for sound produced by impact pile driving on fishes (ESA-listed and non-ESA-listed) that may occur in the ROI. Consistent with Popper et al. (2014), dual metric sound exposure criteria are utilized. It is assumed that a specified effect would occur when either metric (cumulative SEL or peak SPLs) is met or exceeded. Popper et al. (2014) developed guidelines for mortality, recoverable injury (the lowest level where injury was found) and the onset of TTS as described in Table 4-3.

Table 4-3 Fish Impact Pile Driving Injury Guidance

Fish Hearing Group	*Onset of Mortality*		*Recoverable Injury*		*TTS*
	SEL_{cum}	SPL_{peak}	SEL_{cum}	SPL_{peak}	SEL_{cum}
Fishes without a swim bladder (flatfishes)	> 219	> 213	> 216	> 213	NC
Fishes with a swim bladder not involved in hearing (salmonids, rockfish)	210	> 207	203	> 207	186
Fishes with a swim bladder involved in hearing (herring)	207	> 207	203	> 207	186

Notes: SEL_{cum} = Cumulative sound exposure level (decibel referenced to 1 micropascal squared seconds [dB re 1 µPa2-s]). SPL_{peak} = Peak sound pressure level (decibel referenced to 1 micropascal [dB re 1 µPa]). ">" indicates that the given effect would occur above the reported threshold.

In summary, based on the best available information for various types of fishes, underwater noise at or above the levels presented in Table 4-3 has the potential to cause injury or behavioral modification to fish in the ROI. The acoustic effects analysis for fishes is provided in Section 5.

4.3 Invertebrates

As acoustic research has become more sophisticated over the years with more data available for evaluating noise exposure to marine species such as fish, marine mammals, and birds, research has increased for evaluating acoustic stressors on invertebrates (Murchy et al., 2019; Roberts et al., 2016). Activities such as pile driving, and vessels movement can produce vibrations that may interfere with

foraging and predator avoidance. Vibrations may be used by some invertebrates to detect falling prey items in the water column or within the sediment (Klages et al., 2002). Particle motion within the sediment (Aircher and Tautz, 1990) and in the water column (Hazelwood and Macey, 2016) has been explored in the aquaria setting. A study conducted on sediment-dwelling invertebrates (hermit crabs [*Pagurus bernhardus*] and blue mussel [*Mytilus edulis*]) evaluated behaviors from pile driving activities where behavioral reactions such as "flinching", antennule changes, movement, valve closures, and shell retraction during active pile driving were observed (Robert et al., 2016). Hermit crabs were observed lifting the shell from the sediment during vibrations and high amplitude levels resulted in a number of individual hermit crabs leaving their shells entirely (Robert et al. 2016). Because specific sensitivities (i.e., thresholds) to vibrations are still relatively unknown, it is assumed that in-water activities such as pile driving, and dredging are likely to impact invertebrates through masking potential prey and predator detection and thus reducing fitness.

4.4 Marine Birds

4.4.1 Auditory Sensitivity in Marine Birds

Impacts of elevated noise levels due to pile driving were evaluated in the context of established criteria for ESA consultation with the United States (U.S.) Fish and Wildlife Service (USFWS) on the threatened marbled murrelet. No criteria have been established for determining impacts of elevated noise levels on other marine bird species, some of which forage underwater like the marbled murrelet, and general conclusions about impacts on marbled murrelets could be applied to other marine bird species.

Assessing whether a sound may disturb or injure a marbled murrelet involves understanding the characteristics of the acoustic source and the potential effects that sound may have on the physiology and behavior of the species. Although it is recognized that project-related sound may affect marbled murrelet communication and predator detection, other factors besides the received level of sound may affect a bird's reaction, such as its activity state, prior experience with the sound, and proximity to the source of the sound.

Actively foraging marbled murrelets dive repeatedly into waters ranging up to approximately 160 feet (49 meters) in depth for periods ranging up to 60 seconds (Nelson et al., 2006). Foraging bouts typically last over a period of 27 to 33 minutes, with approximately 50 percent of the time spent underwater (Jodice and Collopy, 1999). When startled by loud sounds, the foraging pattern may be altered, and birds may flush or dive and swim away underwater. While underwater they would be susceptible to injury or behavioral disturbance due to elevated sound pressure waves generated by pile driving.

4.4.2 Sound Exposure Criteria and Thresholds

Like the fish injury thresholds (Section 4.2.2 of this appendix), underwater onset of injury thresholds for marbled murrelets only apply to impact pile driving, and the distance to the injury criterion is dependent upon the number of strikes of the impact hammer that are carried out within a 24-hour period. The USFWS uses thresholds developed by the Marbled Murrelet Hydroacoustic Science Panel (SAIC, 2011), and subsequently revised (USFWS, 2013), for two general forms of injury: (1) auditory injury (generally damage to sensory hair cells of the ear) beginning at 202 dB SEL cumulative, and (2) non-auditory injury (trauma to non-auditory body tissues/organs) beginning at 208 dB SEL cumulative. The onset of auditory injury is defined as the loss of hair cells due to impulsive acoustic overexposure. Injuries associated with non-auditory injury (barotrauma) could include bruising, hemorrhaging, rupture of internal organs,

and/or death. Since the underwater criterion for auditory injury was the lower of the two thresholds, this is the criterion used for assessing injurious impacts to the marbled murrelet in this analysis.

Based on the finding of the Marbled Murrelet Hydroacoustic Science Panel tasked with evaluating non-injurious thresholds for pile driving noise (SAIC, 2012), the USFWS determined that airborne acoustic masking due to impact pile driving may affect foraging marbled murrelets. Marbled murrelets typically perform foraging dives in pairs and are highly vocal when they are above the surface (Strachan et al., 1995). On the water's surface, birds typically stay within 100 ft of their partners during foraging bouts. This behavior is thought to play a role in foraging efficiency, and therefore airborne noise that masks their vocalizations has the potential to affect foraging success (Carter & Sealy, 1990; Strachan et al., 1995). Unlike other noise effects criteria and guidelines established for injury and behavioral disturbances, the distance from a pile driving source within which communications will be masked is dependent upon ambient airborne noise levels and therefore is site-specific. Masking effects cease immediately when the masking noise stops.

The Marbled Murrelet Hydroacoustic Science Panel (SAIC, 2012) developed methods to calculate masking distances due to impact pile driving and applied the procedure to sample cases using ambient and pile driving source data from a test pile program (Illingworth & Rodkin, 2012) on the NAVBASE Kitsap-Bangor waterfront on Hood Canal. During the test pile program, the maximum distance within which pile driving noise for steel piles <36 inches in diameter was expected to compromise communication between pairs of murrelets foraging 30 m apart will be 42 m and for piles > 36 inches in diameter communication is compromised at 168 m (USFWS, 2013). Acoustic monitoring during Explosive Handling Wharf-2 construction (Illingworth & Rodkin, 2013) indicated that average airborne source levels during impact driving of 36-in steel piles were the same as, and in some cases lower than, 24-in steel piles.

4.5 Humans

4.5.1 Impacts of Noise

The potential adverse effects of noise on humans include speech interference, sleep disturbance, and noise-induced hearing impairment. Annoyance provides the most accurate indicator of impacts to communities exposed to environmental noise (Department of Defense Noise Working Group, 2009).

Annoyance

Early noise survey studies performed after the introduction of jet aircraft gained common ground in the 1970s when Schultz correlated the Day-Night Average Sound Level (DNL) metric to the percent of highly annoyed people (Schultz, 1978), as depicted in Figure 4-1. A refinement of that relationship by Finegold et al. 1994 used additional study data, which was later endorsed by the U.S. Federal Interagency Committee on Aviation Noise (FICAN) for use in transportation noise analysis (FICAN, 1997).

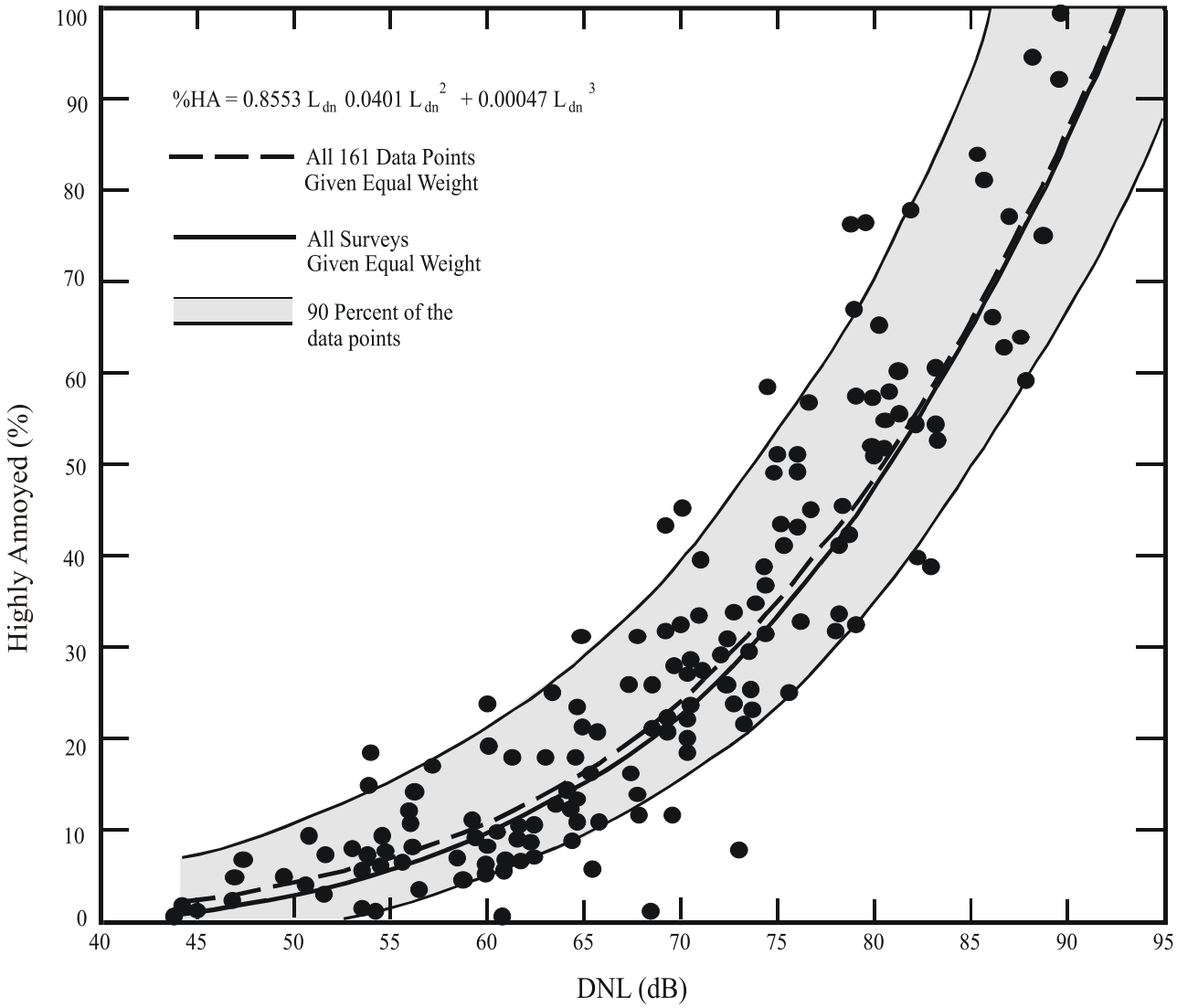


Figure 4-1 Schultz Curve Relating Percent Highly Annoyed to Day-Night Average Sound Level (Schultz, 1978)

When the fit of survey data to the Schultz curve is examined, the correlation between groups of people is high, but the correlation between individuals is far lower due to personal differences. Newman and Beattie (1985) divided the non-acoustic factors into the emotional and physical variables shown in Table 4-4.

Table 4-4 Non-Acoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables	*Physical Variables*
• Feeling about the necessity or preventability of the noise • Judgement of the importance and value of the activity that is producing the noise • Activity at the time an individual hears the noise • Attitude about the environment • General sensitivity to noise • Belief about the effect of noise on health • Feeling of fear associated with the noise	• Type of neighborhood • Time of day • Season • Predictability of the noise • Control over the noise source • Length of time individual is exposed to a noise

Speech Interference

Speech interference from noise disrupts routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

Classroom Learning Interference

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in elevated noise environments. Children have lower stored phonological knowledge to reconstruct degraded speech, reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

Early studies in several countries (Bronzaft and McCarthy, 1975; Cohen et al., 1973, 1980, 1981; Evans et al., 1998; Green et al., 1982; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies, noise-exposed children were less likely to solve difficult puzzles or more likely to give up.

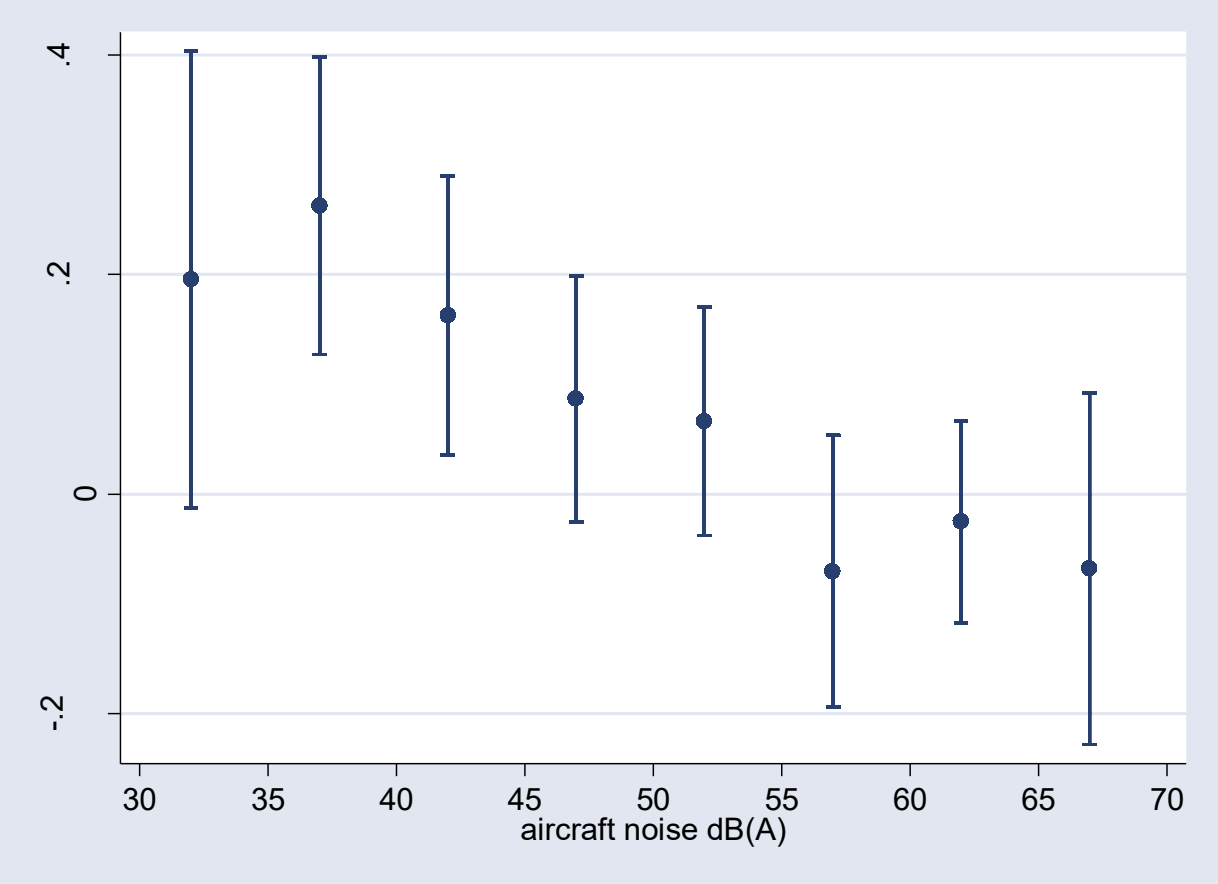
A longitudinal study reported by Evans et al. (1998) conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Clark et al., 2005; Stansfeld et al., 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better

performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Clark et al., 2005, 2009; Stansfeld et al., 2005).

Figure 4-2 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at equivalent sound level (L_{eq}) greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.



Sources: Clark et al., 2005; Stansfeld et al., 2005

Figure 4-2 RANCH Study Reading Scores Varying with L_{eq}

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high noise levels may impair learning. This awareness has led World Health Organization (WHO) and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standards described in Table 4-5 providing noise level criteria for speech intelligibility across various agencies. Other than the Federal Aviation Administration (1985) 45 dB maximum sound level (L_{max}) criterion, they are consistent with a limit on indoor background noise of 35–40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table 4-5 Indoor Noise Level Criteria Based on Speech Intelligibility

Metric/Level (dB)	*Effects and Notes*	*Source*
$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.	FAA, 1985
L_{max} = 50 dB/SIL 45	Single event level permissible in the classroom.	Lind et al., 1998; Sharp and Plotkin, 1984; Wesler, 1986
L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.	WHO, 1999
L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.	ANSI, 2010
$L_{eq(30min)}$ = 30–35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.	UKDFES, 2003

Legend: ANSI = American National Standards Institute; dB = decibel; FAA = Federal Aviation Administration; L_{eq} = equivalent sound level; L_{max} = maximum sound level; UKDFES = United Kingdom Department for Education and Skills; WHO = World Health Organization

Building attenuation with windows open typically reduces the interior sound levels to 15 dB less than exterior levels for external noise sources and with windows closed reduces by 25 dB. For windows open, the higher risk of impact condition, the corresponding exterior thresholds for screening purposes equate to 55 dB L_{eq} and 65 L_{max}.

Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to elevated noise at night. A large amount of research developed in the laboratory during the past 30 years has produced variable results suggesting a complex interaction of factors, including the noise characteristics and individual sensitivity, rather than a clear dose-effect relationship (Muzet, 2007; Mulsow et al., 2021). Sleep disorders may cause negative health effects such as cardiovascular problems, neuroendocrine abnormalities and changes in cognition, mood and memory. The causal relationships between noise exposure, effects on sleep, and contribution to health disturbances, both behavioral and physical, are not yet firmly established (Zaharna, 2010).

Noise-induced Hearing Impairment

This section provides a brief overview of hearing loss caused by noise exposure. Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound (i.e., a shift in the hearing threshold to a higher level). This change can either be a TTS or a PTS (Berger et al., 1995), as defined in Section 5.1 regarding marine mammal hearing.

TTS can result from exposure to loud noise over a given amount of time. An example of TTS might be a person attending a loud music concert. After the concert is over, there can be a threshold shift that may last several hours. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the speech range (typically near 4,000 Hz). Normal hearing eventually returns, as long as the person has enough time to recover within a relatively quiet environment.

PTS usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover. A common example of PTS is the result of regularly working in a loud factory. A TTS can

eventually become a PTS over time with repeated exposure to high noise levels. Even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a TTS results in a PTS is difficult to identify and varies with a person's sensitivity. The National Institute for Occupational Health and Safety had assumed the audiogram to be the standard functional test and therefore that an exposure that causes only a TTS to be considered benign. However, recent work has shown that noise-induced neuropathy can exist independent of PTS but would likely affect more complex auditory tasks such as speech discrimination in noise (Liberman, 2016).

Occupational Noise Exposure Regulations and Potential for Hearing Loss

The Occupational Safety and Health Administration issues workplace health and safety regulations and prescribes permissible noise exposure levels applicable to federal, state, and private sector employees, as detailed in Table 4-6. In situations where workers need to operate in environments above these thresholds the employer is required to provide sufficient personal protective equipment to mitigate the noise exposure to within the permissible levels, which were developed based upon an assumed 40-year working lifetime.

Table 4-6 OSHA Permissible Noise Exposures

Duration Per Day (hours)[(1)]	*Sound Level (dBA, slow response)2*
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼	115

Note: [(1)] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak SPL.
[(2)] OSHA sound levels presented are based upon worker exposure over a 40-year working lifetime, which is not directly applicable to short term exposure like the Leq noise levels presented in construction noise analysis of annoyance (OSHA 1983).

Legend: dBA = A-weighted decibel; OSHA = Occupational Safety and Health Administration

As part of the noise analysis in environmental studies, such as environmental impact statements, DoD prescribes the 80 Day-Night A-Weighted (DNL) noise contour to screen for populations at the most risk of potential hearing loss based upon EPA Report No. 550/9-82-105, Guidelines for Noise Impact Analysis (EPA 1982). If populations are expected to be exposed to 80 dB DNL or greater, then a count of the population exposed to 80 dB Leq or greater provides the threshold of impact for the potential for hearing loss. For reference, a lifetime noise exposure of 80 $L_{eq(24hr)}$ is expected to result in an averagereduction 3 dB in hearing sensitivity (DNWG 2013). This approach provides the most conservative methodology because it assumes that a person is outdoors. The actual 24-hour noise exposure (L_{eq24hr}) for any person living in the at-risk area is determined by the time that person is

outdoors and directly exposed to the noise. Many of the people living within the 80 dB Leq24 will not be resident during the daytime hours – they may be at work, at school, or involved in other activities outside the at-risk area. Some will be inside their homes and exposed to lower noise levels, benefitting from the noise attenuation provided by the house structure – a minimum of 15 dB with windows open so the actual risk of potential for hearing loss will be less than calculated.

Non-auditory Health Impacts

The potential for environmental noise to impair one's health deserves special attention and accordingly has been the subject of numerous epidemiological studies and meta-analyses of the gathered data.

The basic premise is that noise can cause annoyance, annoyance can cause stress, and prolonged stress is known to be a contributor to a number of health disorders, such as hypertension, myocardial infarction (heart attack), cardiovascular disease, and stroke. Research studies seem to indicate that aircraft noise may contribute to the risk of health disorders, along with other factors such as heredity, medical history, smoking, alcohol use, diet, lack of exercise, air pollution, etc., but that the measured effect is small compared to these other factors, and often not statistically significant, i.e., not necessarily real.

According to Kryter and Poza (1980), "It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body." The WHO notes that there is still considerable variation among studies (WHO, 2011). Additionally, almost without exception, research studies conclude that additional research is needed to determine if such a causal relationship exists. The European Network on Noise and Health (European Network on Noise and Health, 2013) in its summary report of 2013 concludes that "while the literature on non-auditory health effects of environmental noise is extensive, the scientific evidence of the relationship between noise and non-auditory effects is still contradictory."

4.5.2 Sound Exposure Criteria and Thresholds

Noise-sensitive locations, such as schools, places of worship, healthcare facilities, and residential areas, within 1 mile (1.6 kilometer) of the project site include receptors in proximity to NAVBASE Kitsap-Bremerton, as detailed in Table 4-7 and depicted in Figure 4-3.The first letter at the beginning of each receptor identification number represents the category of noise-sensitive use, with H referring to Healthcare Facility, S to School, W to Place of Worship, and R to Residential Area. A specific representative point nearest the sound source is analyzed to represent each residential area. Figures 4-4 and 4-5 depict the proposed construction areas at Bangor and the nearest noise-sensitive receptors, which are all located within the NAVBASE Kitsap-Bangor boundary.

The Navy does not specify thresholds or criteria for annoyance to humans caused by environmental noise and instead investigates proposed noise levels within the context of the existing noise environment to determine the potential for significant increases. Kitsap County defines maximum allowable noise levels of 60 dB for residential areas when noise originates from industrial uses, which includes NAVBASE Kitsap-Bremerton (Kitsap County Administrative Code 10.28) while various noise sources are exempted (existing commercial operations, temporary construction noise, Washington Administrative Code regulated motor vehicles, aircraft flights, etc.). One example of a school specific threshold includes the interior 50 dB L_{max} for classroom learning interference that is estimated using building attenuation transmission losses of 15 dB for windows open and 25 dB for windows closed (Department of Defense

Noise Working Group, 2009b) (Table 4-5). Many of the noise-sensitive locations are in urban settings that experience noise-generating activities. Existing noise levels at these receptors are likely within the range of 60 to 65 dB (A) during the daytime.

The Road Construction Noise Model (RCNM Version 2), as discussed in more detail in Section 5.4, was used to estimate the proposed L_{eq} assumed to occur during the DNL daytime (7 a.m. to 10 p.m.). In addition, the L_{max} is calculated for each noise-sensitive location in Table 4-7. Because detailed construction activity was not available at the time of the noise analysis, a "worst-case" scenario was modeled using the loudest equipment expected to be utilized for the proposed action alternatives. Distances used for the model assumed equipment would operate along the portion of the construction area nearest the noise-sensitive receptor. For most noise sensitive areas, the pile driving activity represents the worst-case. Impact analysis involved comparing the resulting calculated proposed 1-hour L_{eq} ($L_{eq(1hr)}$) noise levels to conditions typical of the existing land uses that were assumed less than 65 $L_{eq(1hr)}$ for a typical daytime hour, which is when pile driving activity would occur.

Table 4-7 Noise-Sensitive Receptors Within 1 Mile of Project Site

ID	*Type*	*Description*
H01	Healthcare Facility	Forest Ridge Health & Rehab
H02	Healthcare Facility	Peninsula Community Health Services Admin
R01	Residential Area	Washington Beach Ave and Burwell St
R02	Residential Area	State Street and Mahan Ave
R03	Residential Area	Naval Ave and Mahan Ave
R04	Residential Area	S Cambrian Ave and Coontz St
R05	Residential Area	S Lafayette Ave and Preble St
R06	Residential Area	S Summit Ave and S Charleston Ave
R07	Residential Area	W Charlotte Ave and McCall Blvd W
R08	Residential Area	Lawrence St and Perry Ave
R09	Residential Area	Prospect St and Frederick Ave
R01	Residential Area	606 Burwell Apartments
S01	School/Learning	Little Sprouts Preschool
S02	School/Learning	Our Lady Star of the Sea Catholic School
S03	School/Learning	Embassy Educational Center
S04	School/Learning	Sycamore Tree School
S05	School/Learning	West Hills STEM Academy School
S06	School/Learning	Renaissance and Marion Schools
S07	School/Learning	Naval Avenue Elementary School
W01	Place of Worship	Faith Community Bible Church
W02	Place of Worship	Summit Ave Presbyterian Church
W03	Place of Worship	First Christian, Apostolic Life Tabernacle, and Community of Christ
W04	Place of Worship	Our Lady Star of the Sea Catholic Church
W05	Place of Worship	Church of Christ Scientist
W06	Place of Worship	Lutheran Community Services NW
W07	Place of Worship	Emmanuel Apostolic Church
W08	Place of Worship	The Salvation Army
W09	Place of Worship	Emanuel Apostolic Church
W10	Place of Worship	Ebenezer AME Church

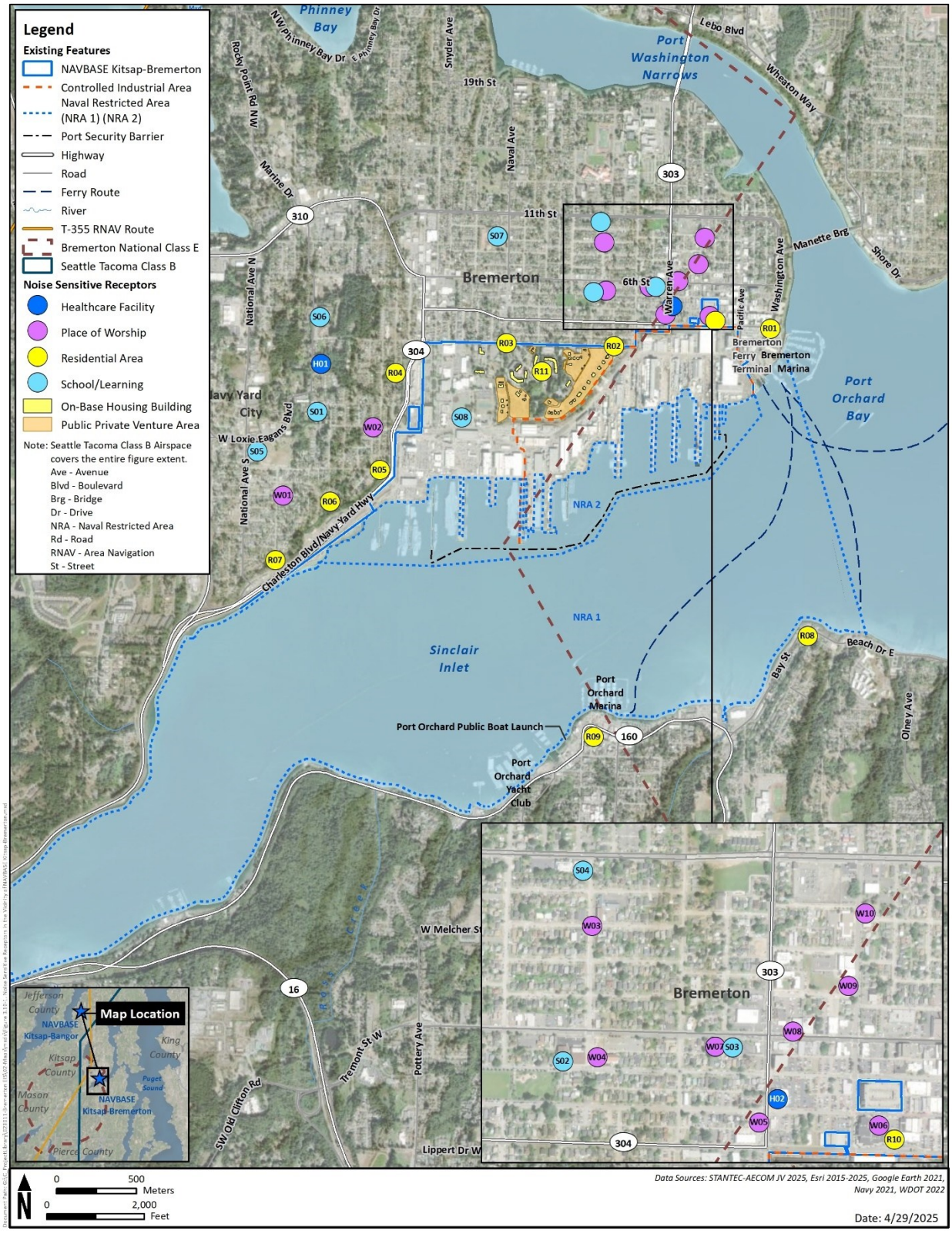


Figure 4-3 Noise-Sensitive Receptors in the Vicinity of NAVBASE Kitsap-Bremerton

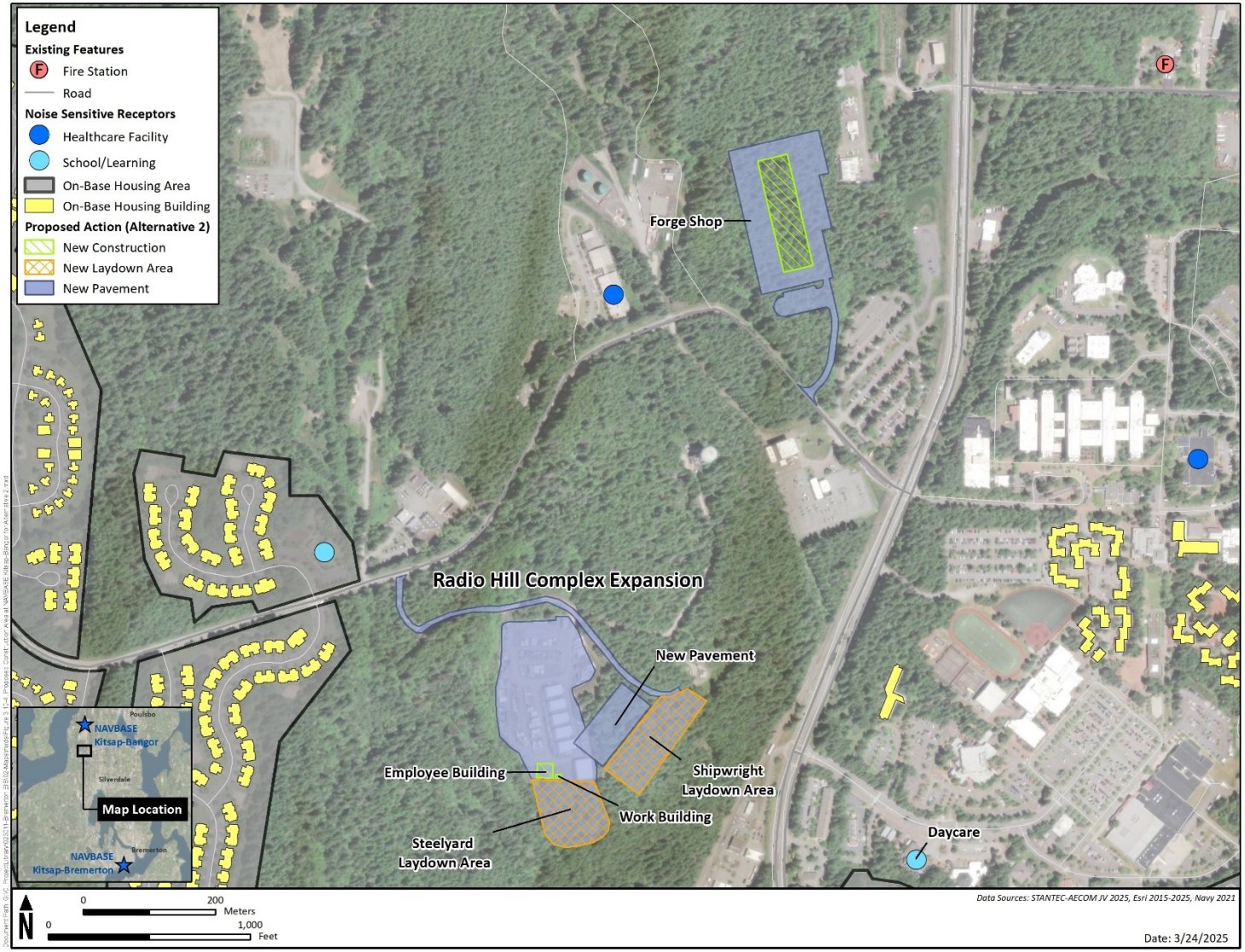


Figure 4-4 Noise-Sensitive Receptors in the Vicinity of Alternative 2 Actions at NAVBASE Kitsap-Bangor

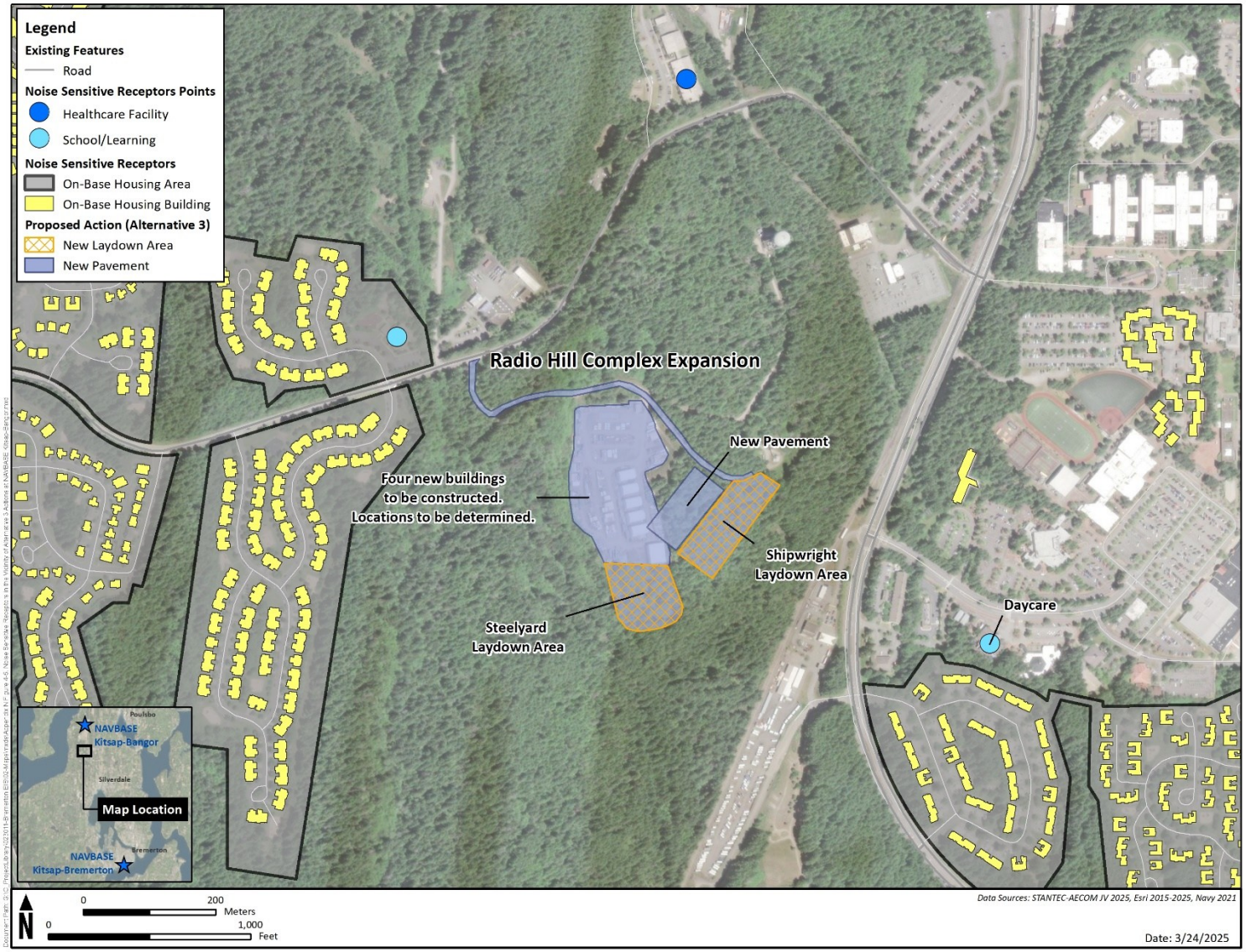


Figure 4-5 Noise-Sensitive Receptors in the Vicinity of Alternative 3 Actions at NAVBASE Kitsap-Bangor

5 Acoustic Effects Analysis

5.1 Acoustic Analysis and Results for Marine Mammals

5.1.1 Acoustic Analysis Approach

The proposed construction of multi-mission dry dock (M2D2), piers, mooring dolphin modifications, and temporary pile-supported multi-use fixed access pier would require installation of steel piles ranging in size from 20-inch to 96-inch, concrete piles ranging from 18-inch to 24-inch (octagonal or square), and sheet piles. Steel piles would be installed using both vibratory and impact methods and concrete piles would be installed using only impact pile driving methods but may also require pre-drilling. Impact pile driving of steel pipe piles would be installed using an attenuation device (i.e., bubble curtain). For proposed pier demolition, a variety of steel, concrete, and timber piles would be removed using primarily vibratory extraction methods. Temporary sheet piles would also need to be installed to support construction of M2D2 using vibratory methods and then removed at the conclusion of construction using vibratory extraction methods. Anticipated pile installation methods for the in-water construction and upgrades within the Demolition and Construction ROI are assumed as follows:

- Steel pipe and sheet piles would be driven using a vibratory pile driver to the extent practicable. If a steel pipe or sheet pile reaches vibratory refusal prior to its required depth, it would be driven to the design elevation using a diesel impact hammer. Pre-drilling may be required for some piles.
- A bubble curtain or similar attenuation system will be used whenever steel pipe piles are driven into the waters of Sinclair Inlet with an impact hammer. For these piles, a minimum 8 dB reduction in source sound levels is assumed due to the use of an attenuation system, which is consistent with attenuation data collected by the Navy (Navy, 2023).
- Pre-cast concrete piles would be driven using a diesel impact hammer only; vibratory hammers would not be used.
- Pile drivers may operate from barges or on-water platforms.

The Navy has indicated that multiple pile drivers may be concurrently running during pile installation/removal at the piers and dry dock locations, as follows:

- Pier Demolition and Construction – up to two pile driving rigs operating simultaneously, with each rig conducting up to 6,600 strikes per day (165 minutes) or vibratory driving/removal of up to 250 minutes per day. Daily totals would thus be up to 13,200 impact driver strikes or 500 minutes of vibratory driving.
- Dry Dock Construction and Associated Demolition – up to three pile driving rigs operating simultaneously, with each rig conducting up to 6,600 strikes per day (165 minutes) or vibratory driving/removal of up to 375 minutes per day. Daily totals would thus be up to 19,800 impact driver strikes or 1,125 minutes of vibratory driving.

During some portions of the construction period, up to 5 pile drivers (impact, vibratory, or a combination thereof) may be operating simultaneously when work is occurring at both pier and dry dock construction. NMFS (2021, unpublished) has provided guidance for simultaneous noise sources that have overlapping noise fields. For impact driving, this guidance provides that the peak noise pulses of multiple impact pile drivers are rarely expected to align and thus would not have an additive effect. Vibratory drivers produce noise that is more continuous in nature, and additive effects may occur. When two or more vibratory hammers are used simultaneously and the Level B harassment sound field of one source

encompasses the Level B harassment sound field of another source, the sources are considered additive and combined using the rules summarized in Table 5-1. In accordance with NMFS guidance (Fowler, 2023), the AUD INJ calculations for marine mammals are based on the noise attenuation calculations from a single pile, with a corrective factor applied as indicated in Table 5-1. For pier construction, this will result in 3 decibels (dB) being added to the estimated RMS source values when two vibratory drivers are operated simultaneously.

Table 5-1 Rules for Combining Sound Levels Generated during Simultaneous Pile Installation/Removal

Hammer Types	*Difference in SSL*	*Level A Zones*	*Level B Zones*
Vibratory, Impact	Any	Use impact zones	Use largest zone
Impact, Impact	Any	Use zones for each pile size and number of strikes	Use zone for each pile size
Vibratory, Vibratory	0 or 1 dB	Add 3 dB to the higher source level	Add 3 dB to the higher source level
	2 or 3 dB	Add 2 dB to the higher source level	Add 2 dB to the higher source level
	4 to 9 dB	Add 1 dB to the higher source level	Add 1 dB to the higher source level
	10 dB or more	Add 0 dB to the higher source level	Add 0 dB to the higher source level

Legend: dB = decibel; SSL = sound source level

For simultaneous usage of three or more continuous sound sources, such as vibratory hammers, the three overlapping sources with the highest sound source levels (SSLs) are identified. Of the three highest SSLs, the lower two are combined using the above rules, then the combination of the lower two is combined with the highest of the three. This means that for use of three simultaneous vibratory pile drivers in operation for dry dock installation, up to 6 dB will be added to the estimated RMS source values in order to calculate the ZOI. For this analysis, the ZOI is the theoretical area over which a given marine mammal sound exposure threshold may be exceeded.

For this analysis, the specific pile driving parameters for the components of each alternative have been combined with these proxy underwater noise levels, as presented in Tables 5-2 and 5-3. The daily pile driving duration for each pile type was used to calculate distances over which cumulative noise exposure may exceed NMFS thresholds for Level A harassment. In some cases, additional pile sizes not included in the proxy sound source memo have been added in and assigned proxy values that are consistent with prior assumptions. The current project alternatives provide estimates for drive duration or piles per day that in some cases have varying values depending on the project location. In those cases, the highest value for each has been selected for inclusion in the summary provided in Tables 5-2 and 5-3. This has been done in order to simplify the pile driving scenarios for estimating the ZOIs, which already includes the added variable of simultaneous pile driving.

Using these pile driving parameters, ZOIs were then developed for each pile type and location using the practical spreading model described in Section 2.1.1. Table 5-4 and 5-5 provides a summary of the calculated radii of the ZOIs for both Level A and Level B harassment thresholds for Alternatives 2 and 3, respectively. For the Level B ZOIs, areas were produced using Geographic Information System that accounted for the areas where land masses would block the spread of underwater noise. The Level A ZOIs will be used, in future coordination with NMFS, to establish shutdown zones and establish Level A harassment allowances, if needed.

The maximal ZOIs for both impact and vibratory pile driving are displayed on Figures 5-1 and 5-2, respectively. The impact pile driving figure (Figure 5-1) displays the Level B ZOI for impact driving of the largest steel pipe piles, with a theoretical ZOI area of 3.54 square miles (9.16 square kilometers). The vibratory driving figure (Figure 5-2) displays the Level B ZOI for vibratory driving of the largest steel pipe piles, with a theoretical ZOI area of 5.77 square miles (14.95 square kilometers). In both cases, the ZOIs are constrained by land masses within the same footprint, producing very similar ZOIs. Larger piles would be installed under Alternative 3.

Table 5-2 Impact Pile Driving – Estimated Source Levels and Pile Driving Parameters

Pile Type	Pile Size (inches)	PEAK[2] (dB re 1 µPa)	RMS[2] (dB re 1 µPa)	SEL[2] (dB re 1 µPa^2•sec)	Number of strikes per pile	Number of piles per rig per day[1]
Concrete	18	184	170	159	825	8
Concrete	20	188	174	164	825	8
Concrete	24	189	178	166	825	8
Steel Sheet	20 to 24	205	190	180	1,100	6
Steel	24	200	176	165	825	8
Steel	30	208	187	178	1,100	6
Steel	36	203	185	176	1,100	6
Steel	48	205	182	169	2,200	3
Steel	96	212	197	187	3,300	2

Legend: dB = decibel; RMS = root mean square; SEL = sound exposure level. Source levels at 10 meters (32.8 feet). (1) Depending on location and project phase, up to 5 installation/removal rigs that may be operating simultaneously per day. (2) A bubble curtain or similarly effective attenuation system will be used for the impact driving of all steel pipe piles, providing an assumed 8dB of attenuation which has been factored into these source levels

Table 5-3 Vibratory Removal and Installation – Estimated Source Levels and Pile Driving Parameters by Pile Type and Size

Pile Driving Method1	*Pile Type*	*Pile Size (inches)*	*PEAK (dB re 1 µPa)*	*RMS (dB re 1 µPa)*	*SEL (dB re 1 µPa²•sec)*	*Number of seconds per pile*	*Number of piles per rig per day[1]*
Vibratory Pile Removal*							
Vibratory Removal	Timber	12 to 18	178	161	156	938	16
Vibratory Removal	Concrete	16 to 30	178	161	156	938	16
Vibratory Removal	Steel	12 to 24	178	161	156	938	16
Vibratory Removal	Steel Sheet	various	165	150	150	938	16
Vibratory Pile Installation*							
Vibratory	Steel	24	178	161	156	2,812	8
Vibratory	Steel	30	No Data	167	No Data	2,812	8
Vibratory	Steel	36	No Data	169	No Data	2,812	8
Vibratory	Steel	48	200	176	165	7,500	3
Vibratory	Steel	96	195	180	180	11,250	2
Vibratory	Steel Sheet	20 or 24	177	163	163	1,875	12

Notes: *Concurrent vibratory driving would add up to 6 dB to the source levels for dry dock pile installation, and 3 dB to the source levels for all other vibratory pile driving and removal.

(1) Depending on the location and project phase, up to 5 pile installation/removal rigs that may be operating simultaneously per day.

Legend: dB = decibel; RMS = root mean square; SEL = sound exposure level. Source levels at 10 meters (32.8 feet). Sound level source: Navy, 2022

Table 5-4 Summary of Marine Mammal ZOIs for Alternative 2 by Installation Method and Pile Type

Pile Driving Method	Pile Type	Pile Size (in)	Level B Isopleth	Level B ZOI	Level A Isopleth				
			All Hearing Groups[1,2]	All Hearing Groups[1,2]	Low-Frequency Cetaceans	High-Frequency Cetaceans	Very High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
Impact	Concrete	18	151 ft (46 m)	0.003 sq mi (0.007 sq km)	289 ft (88 m)	37 ft (11 m)	446 ft (136 m)	256 ft (78 m)	96 ft (29 m)
Impact	Concrete	24	518 ft (158 m)	0.03 sq mi (0.08 sq km)	845 ft (258 m)	108 ft (33 m)	1,307 ft (398 m)	751 ft (229 m)	280 ft (85 m)
Impact	Steel	36	1,522 ft (464 m)	0.23 sq mi (0.602 sq km)	3,924 ft (1196 m)	500 ft (152 m)	6,068 ft (1849 m)	3,486 ft (1,063 m)	1,299 ft (396 m)
Impact	Steel	48	961 ft (293 m)	0.08 sq mi (0.198 sq km)	1,340 ft (408 m)	171 ft (52 m)	2072 ft (631 m)	1190 ft (363 m)	444 ft (135 m)
Impact	Steel Sheet	20 or 24	3,281 ft (1,000 m)	0.69 sq mi (1.800 sq km)	7,250 ft (2,210 m)	924 ft (282 m)	11,212 ft (3,417 m)	6,442 ft (1963 m)	2,401 ft (732 m)
Vibratory	Steel Sheet	20 or 24	60,623 ft (18,478 m)	5.77 sq mi (14.953 sq km)	221 ft (67 m)	85 ft (26 m)	181 ft (55 m)	285 ft (87 m)	96 ft (29 m)
Vibratory	Steel	36	152,283 ft (46,416 m)	5.77 sq mi (14.953 sq km)	556 ft (169 m)	213 ft (65 m)	454 ft (138 m)	715 ft (218 m)	241 ft (73 m)
Vibratory	Steel	48	445,984 ft (135,936 m)	5.77 sq mi (14.953 sq km)	1627 ft (496 m)	625 ft (191 m)	1,329 ft (405 m)	2093 ft (638 m)	705 ft (215 m)
Vibratory Removal	Timber	12 to 18	28,140 ft (8,577 m)	5.77 sq mi (14.953 sq km)	124 ft (38 m)	48 ft (15 m)	101 ft (31 m)	160 ft (49 m)	54 ft (16 m)
Vibratory Removal	Concrete	18 to 30	28,140 ft (8,577 m)	5.77 sq mi (14.953 sq km)	124 ft (38 m)	48 ft (15 m)	101 ft (31 m)	160 ft (49 m)	54 ft (16 m)

Notes: ZOIs are based on source values as modified to account for concurrent pile driving, as described above. Use of bubble curtains during pile driving Practical spreading model utilized, assuming an attenuation factor of 15 (4.5 dB of attenuation per doubling of distance). Sound level source: Navy 2022.

[1]-Distances to the 160 dB RMS Threshold for impact pile driving,

[2]- Distances to the 120 dB RMS Threshold for vibratory installation/extraction, assuming piles are being installed/removed concurrently.

Legend: ZOI= Zone of influence; in = inch; ft=feet; m = meters

Table 5-5 Summary of Marine Mammal ZOIs for Alternative 3

Pile Driving Method	Pile Type	Pile Size (in)	Level B Isopleth [1,2]	Level B ZOI [1,2]	Level A Isopleth				Level A Isopleth	Level A Isopleth	Level A Isopleth	Level A Isopleth
			All Hearing Groups	All Hearing Groups	Low-Frequency Cetaceans				High-Frequency Cetaceans	Very High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
Impact	Concrete	18	151 ft (46 m)	0.003 sq mi (0.007 sq km)	289 ft (88 m)				37 ft (11 m)	446 ft (136 m)	256 ft (78 m)	96 ft (29 m)
Impact	Concrete	24	518 ft (158 m)	0.009 sq mi (0.023 sq km)	845 ft (258 m)				108 ft (33 m)	1,307 ft (398 m)	751 ft (229 m)	280 ft (85 m)
Impact	Steel	24	384 ft (117 m)	0.100 sq mi (0.253 sq km)	725 ft (221 m)				92 ft (28 m)	1,122 ft (3,42 m)	643 ft (196 m)	240 ft (73 m)
Impact	Steel	30	2,070 ft (631 m)	0.230 sq mi (0.602 sq km)	5,334 ft (1,626 m)				680 ft (207 m)	8,248 ft (2,514 m)	4,739 ft (1,444 m)	1,766 ft (538 m)
Impact	Steel	36	1,522 ft (464 m)	0.220 sq mi (0.559 sq km)	3,924 ft (1,196 m)				500 ft (152 m)	6,068 ft (1,849 m)	3,486 ft (1,063 m)	1,299 ft (396 m)
Impact	Steel	48	961 ft (293 m)	0.093 sq mi (0.241 sq km)	1,340 ft (408 m)				171 ft (52 m)	2,072 ft (631 m)	1,190 ft (363 m)	444 ft (135 m)
Impact	Steel	96	9,610 ft (2,929 m)	3.538 sq mi (9.163 sq km)	21,233 ft (6,472 m)				2,706 ft (825 m)	32,836 ft (10,008 m)	18,866 ft (5,750 m)	7,031 ft (2,143 m)
Impact	Steel Sheet	20 or 24	3,281 ft (1,000 m)	0.69 sq mi (1.800 sq km)	7,250 ft (2,210 m)				924 ft (282 m)	11,212 ft (3,417 m)	6,442 ft (1963 m)	2,401 ft (732 m)
Vibratory	Steel Sheet	20 or 24	60,623 ft (18,478 m)	5.773 sq mi (14.953 sq km)	221 ft (67 m)				85 ft (26 m)	181 ft (55 m)	285 ft (87 m)	96 ft (29 m)
Vibratory	Steel	24	28,140 ft (8,577 m)	5.773 sq mi (14.951 sq km)	121 ft (37 m)				10 ft (3 m)	177 ft (54 m)	72 ft (22 m)	7 ft (2 m)
Vibratory	Steel	30	96,083 ft (29,286 m)	5.773 sq mi (14.951 sq km)	409 ft (125 m)				157 ft (48 m)	334 ft (102 m)	526 ft (160 m)	177 ft (54 m)
Vibratory	Steel	36	519,977 ft (158,489 m)	5.773 sq mi (14.951 sq km)	556 ft (169 m)				213 ft (65 m)	454 ft (138 m)	715 ft (218 m)	241 ft (73 m)
Vibratory	Steel	48	519,977 ft (158,489 m)	5.773 sq mi (14.951 sq km)	1627 ft (496 m)	625 ft (191 m)	1,329 ft (405 m)	2093 ft (638 m)	705 ft (215 m)			
Vibratory	Steel	96	60,623 ft (18,478 m)	5.773 sq mi (14.953 sq km)	3007 ft (916 m)	1156 ft (352 m)	2455 ft (748 m)	3868 ft (1179 m)	1302 ft (397 m)			
Vibratory Removal	Steel	12 to 24	28,140 ft (8,577 m)	5.773 sq mi (14.951 sq km)	124 ft (38 m)				48 ft (15 m)	101 ft (31 m)	160 ft (49 m)	54 ft (16 m)

Pile Driving Method	*Pile Type*	*Pile Size (in)*	*Level B Isopleth [1,2]*	*Level B ZOI [1,2]*	*Level A Isopleth*	*Level A Isopleth*	*Level A Isopleth*	*Level A Isopleth*	*Level A Isopleth*
			All Hearing Groups	*All Hearing Groups*	*Low-Frequency Cetaceans*	*High-Frequency Cetaceans*	*Very High-Frequency Cetaceans*	*Phocid Pinnipeds*	*Otariid Pinnipeds*
Vibratory Removal	Timber	16	28,140 ft (8,577 m)	5.773 sq mi (14.951 sq km)	124 ft (38 m)	48 ft (15 m)	101 ft (31 m)	160 ft (49 m)	54 ft (16 m)
Vibratory Removal	Concrete	16 to 24	28,140 ft (8,577 m)	5.773 sq mi (14.951 sq km)	124 ft (38 m)	48 ft (15 m)	101 ft (31 m)	160 ft (49 m)	54 ft (16 m)
Vibratory Removal	Steel Sheet	various	5,200 ft (1,585 m)	1.892 sq mi (4.901 sq km)	23 ft (7 m)	9 ft (3 m)	19 ft (6 m)	30 ft (9 m)	10 ft (3 m)

Notes: ZOIs are based on source values as modified to account for concurrent pile driving, as described above. Practical spreading model utilized, assuming an attenuation factor of 15 (4.5 dB of attenuation per doubling of distance). Sound level source: Navy 2022.

[1]Distances to the 160 dB RMS Threshold for impact pile driving,

[2]Distances to the 120 dB RMS Threshold for vibratory installation/extraction, assuming piles are being installed/removed concurrently.

Legend: ZOI= Zone of influence; in = inch; ft=feet; m = meters

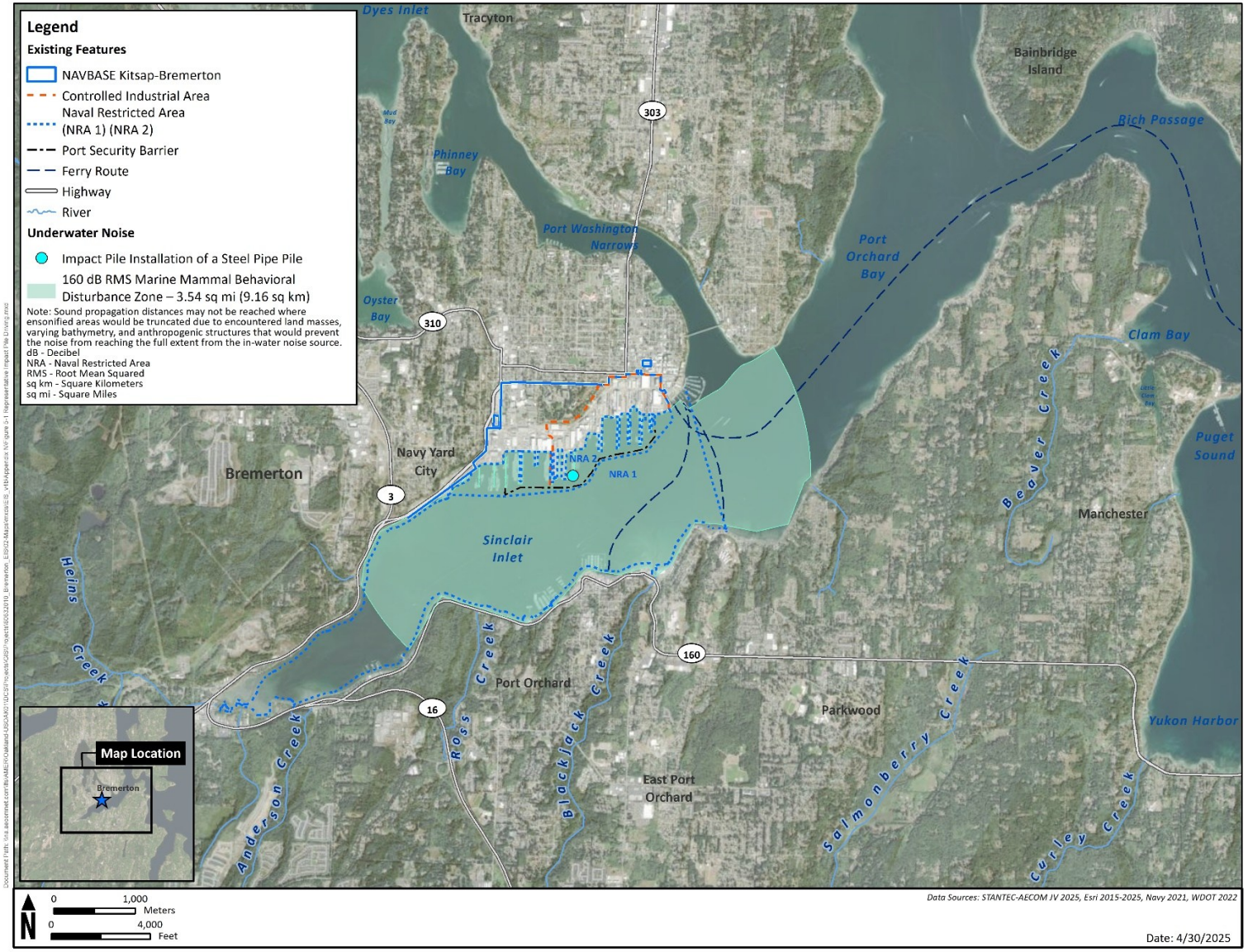


Figure 5-1 Representative Maximum Extent of Level B Behavioral Disturbance Zone for Impact Pile Driving

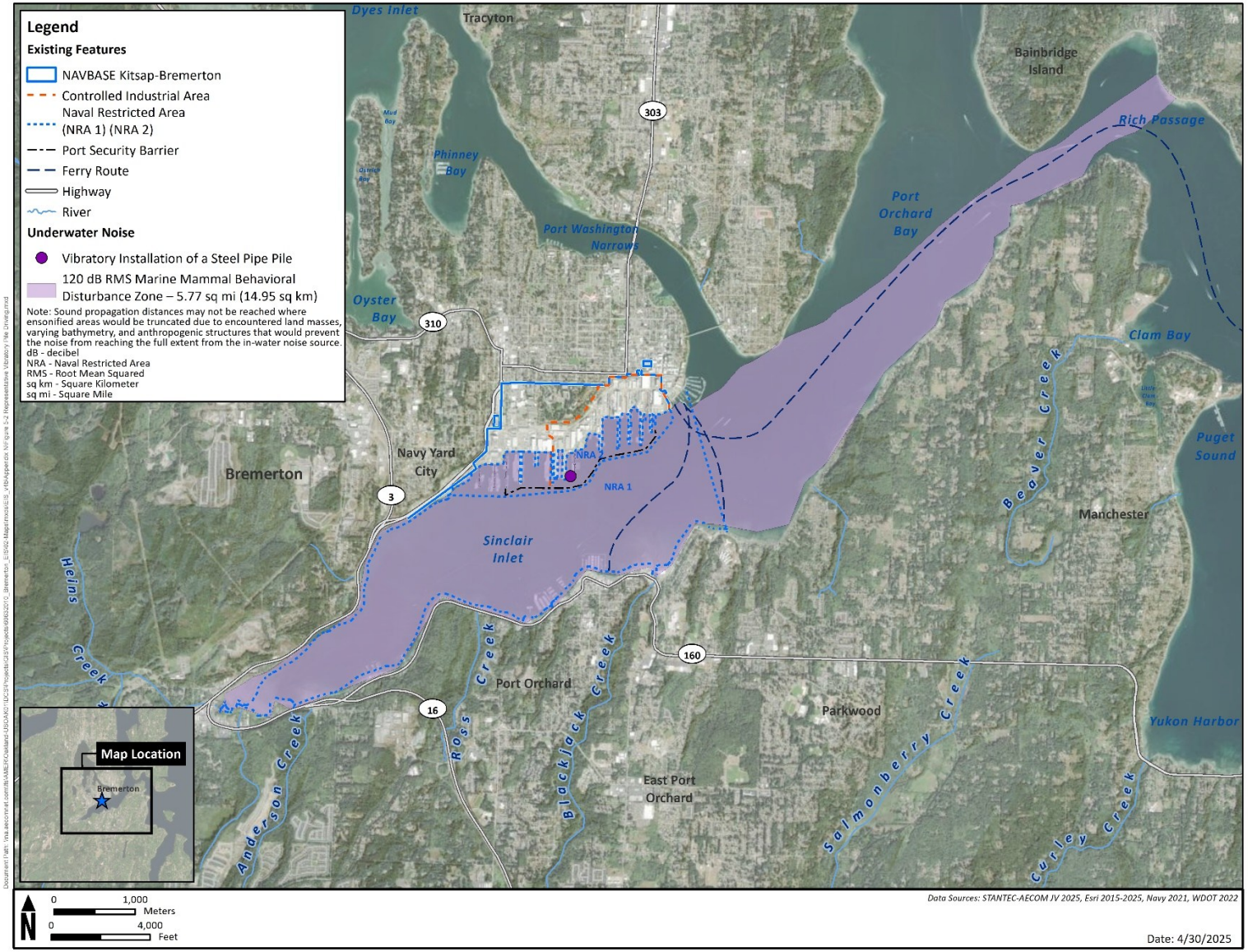


Figure 5-2 Representative Maximum Extent of Level B Behavioral Disturbance Zone for Vibratory Pile Driving

5.1.2 Estimating Marine Mammal Exposures and Abundance

This analysis of marine mammal exposures is based on species abundance data from the following three sources:

- Regional sightings data
- At-sea density estimates
- NAVBASE Kitsap-Bremerton pinniped monitoring data

In prior Navy documents, either at-sea density data from the Navy's Marine Species Density Database (NMSDD) for the Northwest Training Area (Navy, 2019) or site-specific survey information has been used to quantify take through incidental harassment. However, using at-sea density-based analysis for species that occur with a very low frequency may not adequately account for their unique temporal and spatial distributions. For species that occur rarely and only intermittently, regional sightings data and typical group size for the species in question were reviewed to develop adequate take estimates in the event that the species or a group of that species is present during project activities. For those species, utilizing the at-sea densities available may generate take estimates lower than one, and not adequately provide take coverage over this multi-year project. Therefore, potential exposure estimates for species with rare or infrequent occurrence are based on reasonable likelihood of presence based on past observations. The following species are in this category (Table 5-6): humpback whale, minke whale, gray whale, transient killer whale, Southern Resident Distinct Population Segment (DPS) killer whale, and northern elephant seal. The abundance for other marine mammal species will be estimated using either at-sea densities (harbor porpoise, Dall's porpoise, and Steller sea lion), or NAVBASE Kitsap-Bremerton or other site-specific pinniped monitoring data (California sea lion, harbor seal).

Table 5-6 Evaluation Method for Estimating Marine Mammal Species Abundance

Location	*Species*	*Analysis Method*
NAVBASE Kitsap-Bremerton	Humpback whale, minke whale, gray whale, transient killer whale, Southern Resident DPS killer whale, northern elephant seal.	Regional sightings data
	Harbor porpoise, Dall's porpoise, Steller sea lion.	At-sea densities
	California sea lion, harbor seal.	NAVBASE Kitsap-Bremerton or other site-specific pinniped monitoring data

Sources: Navy, 2019, 2022

Exposure Estimates Based on Regional Sightings Data

For those marine mammal species that rarely occur in the Demolition and Construction ROI, only a rough estimate of potential exposures to underwater noise in excess of NMFS thresholds can be made. While there are some differences in the pile driving scenarios between Alternatives 2 and 3, resolving any difference in the potential exposures of these species would be speculative. As a result, the estimated takes by Level B harassment for those species would apply equally to both Alternatives 2 and 3. Implementation of shutdown zones, as described above, would prevent these species from exposure to Level A harassment.

For species with rare or infrequent occurrence during the in-water work window, none of the species in this category are anticipated to linger for multiple days. The calculation for species with rare or infrequent occurrence is:

Exposure estimate = Probable abundance during construction × Probable duration

where:

Probable abundance = maximum expected group size.

Probable duration = probable duration of animal(s) presence at construction sites during in-water work window.

Exposure Estimates Based on At-sea Marine Mammal Densities

For species where at-sea marine mammal density estimates will be used to determine the number of animals potentially exposed, the area over which noise thresholds may be exceeded, referred to as the ZOI, for each pile driving activity is multiplied by the at-sea density, and then that value is multiplied by the number of days that activity would occur. Terrestrial areas are excluded from the underwater noise ZOI, as are any waters behind land or other solid objects that would block noise transmission. The maximum density value for each species during the in-water work window (July 16 to February 15) will be used in the marine mammal take assessment calculation.

The equation for take estimates using the at-sea density estimates and no site-specific abundance is:

Exposure estimate = N × ZOI × maximum days of pile installation/removal

where:

N = density estimate used for each species

ZOI = Zone of Influence; the in-water area where noise exceeds the noise threshold value

Exposure Estimates Based on Site-specific Monitoring Data

It is anticipated that this method will generate a higher exposure estimate for those species where such monitoring data exists (California sea lion and harbor seal) and thus will be utilized instead of the at-sea density method. For these two species, exposures will be estimated by:

Exposure estimate = Abundance × maximum days of pile installation/removal per year

where:

Abundance = average monthly maximum over the time period when pile installation/removal will occur

Average monthly maximum counts will be averaged over the in-water work window. The maximum number of animals observed during the month(s) with the highest number of animals present on a survey day will be used in the analysis.

5.1.3 Assumptions for Exposure Estimates

Of significant note is that successful implementation of mitigation methods (i.e., visual monitoring and the use of shutdown zones) will result in no Level A exposure to all marine mammals except harbor seals and California sea lions because the injury zones will be monitored. Harbor seal Level A exposure will be limited to the smallest extent practicable. Therefore, Level A exposures were only calculated for harbor seals and California sea lions where the full extent of the injury zone cannot be practicably monitored. The exposure assessment estimates the numbers of individuals potentially exposed to the effects of pile

driving noise exceeding NMFS established thresholds (NMFS, 2024a). Results from acoustic impact exposure assessments should be regarded as conservative overestimates that are strongly influenced by limited marine mammal data, the assumption that marine mammals will be present during pile driving, and the assumptions that the maximum number of piles will be removed or installed.

The following assumptions were used to calculate potential exposures to pile installation and removal noise for each threshold:

- For exposure estimation method (2) and (3), each of the 10 marine mammal species is assumed to be present in the project area for each day of pile installation and removal. Incidental harassment is defined as an individual Level B harassment exposure per individual per 24 hours.
- For project components that do not have a pile type or size specified, the pile type, size, and installation method that produces the largest ZOI will be used to estimate exposure of marine mammals to noise impacts.
- All pilings installed at each site will have an underwater noise disturbance distance equal to the pile that causes the greatest noise disturbance (i.e., the piling farthest from shore) installed with the method that has the largest ZOI. If vibratory pile driving would occur, the largest ZOI will be produced by vibratory driving. In this case, the ZOI for an impact hammer will be encompassed by the larger ZOI from the vibratory driver. Vibratory driving is assumed to occur on all days of pile driving where steel piles could be installed. Steel piles are assumed to be installed using a vibratory hammer, and concrete piles are assumed to be installed only with an impact hammer.
- All pilings installed at each site will have an airborne noise disturbance distance equal to the pile that causes the greatest noise disturbance (i.e., the piling furthest from shore) installed with the method that has the largest ZOI. The largest ZOI will be produced by impact driving. The ZOI for a vibratory hammer will be encompassed by the larger ZOI from the impact driver. Impact pile driving is assumed to occur on all days of pile driving. Exposures to airborne noise are considered included in the larger underwater ZOIs from vibratory or impact driving and will not be calculated for pinnipeds.

For those rarely occurring species where regional sightings data will be used to estimate exposure, a literature review of occurrences was conducted to generate the group size and frequencies presented in Table 5-7.

Table 5-7 Regional Sightings of Species Rarely occurring in the ROI

Species	*Regional Observations*	*Estimated Group Size and Frequency of Occurrence at NAVBASE Kitsap-Bremerton*
Humpback whale, Central America/South Mexico California-Oregon-Washington Stock, Mainland Mexico - California-Oregon-Washington Stock, and Hawai'i Stock	Uncommon but has been sighted in Puget Sound every month of the year (Orca Network 2025).	Typical group size of two, up to two occurrences per year (Orca Network, 2025).
Minke whale, CA-OR-WA stock	Uncommon in Puget Sound, rarely seen south of Admiralty Inlet (Orca Network, 2025).	Typical group size of two, up to two occurrences per year (Orca Network, 2025).
Gray whale, Eastern North Pacific Stock	Seasonally present in Puget Sound, most often seen near Whidbey and Camano Island in the spring (Pavlinovic, 2022).	Rarely observed in the waterways near NAVBASE Kitsap Bremerton. There were several observations of gray whales in Sinclair Inlet in 2021, with one stranded at PSNS (part of the 2019-2022 Unusual Mortality Event for gray whales). Single whale or group size of two, up to three occurrences per year (Orca Network, 2025).
Killer whale, West Coast Transient Stock	Occasional presence throughout Puget Sound, occur most frequently in August–September with a strong second peak occurrence in April–May (Houghton et al., 2015).	Group size of six, up to two occurrences per year (Orca Network, 2025).
Killer whale, Eastern North Pacific-Southern Resident Stock	Rare but would most likely be present in Puget Sound in the winter months; pods travel and forage together (NMFS, 2021b).	Group size of five, up to one occurrence per year. The last confirmed sighting of Southern Resident killer whales in Sinclair Inlet occurred in January 2015, just east of NAVBASE Kitsap Bremerton. The last sighting prior to that was in Dyes Inlet in 1997 (Orca Network, 2025).
Northern elephant seal, California Breeding stock	Regular haul-outs established along the Strait of Juan de Fuca and Northern Puget Sound, may occasionally haul out at other locations while molting.	Group size of one, up to 32 days per year (represents one molting animal on shore) (Worthy et al., 1992).

Legend: NAVBASE = Naval Base; NMFS = National Marine Fisheries Service; PSNS = Puget Sound Naval Shipyard
Source: Navy, 2018

For all species discussed in this memo, at-sea density estimates are available for the inland waters of Puget Sound (Table 5-8) (Navy, 2019). The occupancy of Puget Sound by harbor porpoise, Dall's porpoise, and Steller sea lion is far less stochastic and intermittent than other species. As a result, the NMSDD at-sea density estimates for these three species will be used to estimate takes, as indicated by the bolded

text in Table 5-8. Since pile driving is expected to be occurring from July 16 through February 15 time period, the highest density for the summer, fall, or winter will be used. The at-sea densities for other species are also presented in Table 5-8 for comparison purposes.

Table 5-8 Marine Mammal At-sea Densities from the Navy's Marine Mammal Species Density Database

Species	*Region Location*	*Density (July-February) Animals/sq km*
Humpback whale	Puget Sound inland waters*	0.00058 (Winter/Spring) 0.00074 (Summer/Fall)
Minke whale	Puget Sound inland waters*	0.00045
Gray whale	Puget Sound Central and South Basins	0.000086 (Winter/Summer/Fall)
Transient killer whale	Puget Sound inland waters*	0.001582 (Winter/Summer) 0.002373 (Fall)
Southern Resident DPS killer whales	Puget Sound waters west of Bainbridge Island	0.001027 (Winter) 0.0000 (Other Seasons)
Harbor porpoise	**Puget Sound inland waters around Seattle and Bremerton**	**0.54 (All Seasons)**
Dall's porpoise	**Puget Sound inland waters***	**0.00045 (All Seasons)**
Steller sea lion	**Puget Sound inland waters***	**0.0478 (Winter/Fall)** **0.0010 (Summer/Spring)**
California sea lion	Puget Sound inland waters*	0.1577 (Winter) 0.0152 (Summer) 0.2211 (Fall)
Northern elephant seal	Puget Sound inland waters*	0 (All Seasons)
Harbor seal	Puget Sound Central and South Basins	3.91 (All Seasons)

Note: *Inland waters includes waters adjacent to and south of Port Townsend and Deception Pass.
Legend: Sq km = square kilometer
Source: NMSDD (Navy, 2019; 2020c)

Long-term monitoring data are available for two pinniped species (California sea lion and harbor seal) at NAVBASE Kitsap-Bremerton (Table 5-9). For those two species, this location-specific data will be used to generate a take estimate.

Table 5-9 NAVBASE Kitsap-Bremerton Pinniped Monitoring Data

Species	*Specific Location*	*Number present during the in-water work window*
California sea lion, United States stock	PSB floats at NAVBASE Kitsap-Bremerton, may also travel through or forage in the vicinity	Based on the past 10 years of data (January 2015 to January 2025), an average monthly maximum of 132 sea lions hauled out on PSB floats during the in-water work window period of July 16-February 15. However, few individuals present mid-July to mid-August (Navy, 2025).
Harbor seal, Washington Northern Inland Waters Stock	Nearest haul-outs are in Sinclair Inlet, likely to travel through or forage in the vicinity	Average of 11 harbor seals detected per day at the Manette Bridge, just northeast of NAVBASE Kitsap-Bremerton (Washington State Department of Transportation, 2011, 2012). Maximum daily count of harbor seals observed at NAVBASE Kitsap-Bremerton is 11 individuals (Navy, 2025)

Legend: NAVBASE = Naval Base; PSB = Port Security Barrier

5.1.4 Results for Marine Mammals

Utilizing the abundance estimated described above, combined with the driving days and Level B ZOI areas where applicable, estimates of the potential Level B exposures were developed for each species potentially exposed, as summarized in Tables 5-10, 5-11, and 5-12. The estimates provided in these tables are generated under the assumption that all steel piles would be installed via vibratory driving, as that provides the largest estimate of Level B exposures. The estimates provided in these tables are for the entire multi-year life span of the project. The MMPA provides that an animal is only taken by harassment once per day, even if there is a repeat exposure.

Takes by Level A harassment will be reduced or avoided by the implementation of species- and activity-specific shutdown zones that will be established through coordination with NMFS. It is anticipated that NMFS will provide small numbers of Level A take authorizations for regularly occurring species not listed under the ESA, which would include California sea lion and harbor seal. Coordination with NMFS in development of a Letter of Authorization permit application, as required under the MMPA, will be completed in advance of the final EIS for the first five years of construction. The Navy will need to seek additional LOAs for the remaining years of construction after the EIS is finalized.

Table 5-10 Regularly Occurring Species – Total Level B Harassment Exposures Estimated for Alternative 2, all Years

Year	*Installation Method*[1]	*Level B takes – CA sea lion*[2]	*Level B takes – harbor seal*[2]	*Level B takes – harbor porpoise*[3]	*Level B takes – Dall's porpoise*[3]	*Level B takes – Steller sea lion*[3]
2027	Impact	8,547	712	3	0	0
2027	Vibratory	5,665	472	347	0	31
2028	Impact	1,650	138	0	0	0
2028	Vibratory	385	32	24	0	2
2028	Vibratory Removal	6,971	581	422	0	37
2029	Vibratory	275	23	17	0	1
2029	Vibratory Removal	13,662	1,139	836	1	74
2030	Vibratory	11,733	978	718	1	64
2031	Vibratory	3,245	270	199	0	18
2032	Vibratory	1,613	134	99	0	9
2033	Vibratory	550	46	34	0	3
2036	Impact	2,530	211	19	0	2
2036	Vibratory Removal	1,902	158	116	0	10
2037	Impact	6,138	512	2	0	0
2038	Impact	1,576	131	0	0	0
2038	Vibratory	1,267	106	78	0	7
Total Estimated Level B Exposures for Alternative 2		**67,709**	**5,642**	**2,911**	**10**[4]	**259**[4]

Notes: NMFS standard practices for estimating harassment exposures are to keep fractional takes during calculations, and only round the number when presenting totals.

[1]For installation of steel piles, vibratory driving is utilized since that method produces larger Level B harassment zones. Concrete piles can only be installed using impact driving.

[2]Estimates for this species utilizes the NAVBASE Kitsap-Bremerton pinniped monitoring data provided in Table 5-9.

[3]Estimates for this species utilizes the at-sea densities provided in Table 5-8.

[4]Annual totals are rounded up to the next whole integer if the value would be 0.

Table 5-11 Regularly Occurring Species – Total Level B Harassment Exposures Estimated for Alternative 3, all Years

Year	*Installation Method*[1]	*Level B takes – CA sea lion*[2]	*Level B takes – harbor seal*[2]	*Level B takes – harbor porpoise*[3]	*Level B takes – Dall's porpoise*[3]	*Level B takes – Steller sea lion*[3]
2027	Impact	1,452	121	0	0	0
2027	Vibratory	2,376	198	145	0	13
2027	Vibratory Removal	1,469	122	90	0	8
2028	Vibratory	2,904	242	178	0	16
2028	Vibratory Removal	1,031	86	21	0	2
2029	Vibratory	2,228	186	136	0	12
2030	Vibratory	3,795	316	232	0	21
2033	Vibratory	12,888	1,074	788	1	70
2034	Impact	908	76	0	0	0
2034	Vibratory	158	13	10	0	1
2035	Impact	600	50	0	0	0
2035	Vibratory	1,926	161	118	0	10
2038	Impact	9,207	767	1	0	0
2039	Impact	1,576	131	0	0	0
2039	Vibratory	792	66	48	0	4
Total Estimated Level B Exposures for Alternative 3		**43,309**	**3,609**	**1,767**	**9**[4]	**157**[4]

Notes: NMFS standard practices for estimating harassment exposures are to keep fractional takes during calculations, and only round the number when presenting totals.

[1]For installation of steel piles, vibratory driving is utilized since that method produces larger Level B harassment zones. Concrete piles can only be installed using impact driving.

[2]Estimates for this species utilizes the NAVBASE Kitsap-Bremerton pinniped monitoring data provided in Table 5-9.

[3]Estimates for this species utilizes the at-sea densities provided in Table 5-8.

[4]Annual totals are rounded up to the next whole integer if the value would be 0.

Table 5-12 Summary of Potential Exposures to Level B Behavioral Harassment for Species that Rarely Occur in the Demolition and Construction ROI under Alternative 2 and 3

Marine Mammal Species	*ESA Status*	*Estimated Level B Exposures per Year*
Humpback Whale	Mexico DPS – Threatened Central America DPS – Endangered	2
Humpback Whale	Hawai'i DPS – None	2
Minke Whale	None	2
Gray Whale	None	6
Killer Whale, West Coast Transient Stock	None	12
Killer Whale, Southern resident DPS	Endangered	5
Northern Elephant Seal	None	32

Notes: See Table 5-6 for abundance rationale.
Legend: DPS = Distinct Population Segment; ESA = Endangered Species Act

5.2 Acoustic Analysis and Results for Marine Birds (Marbled Murrelet)

Underwater sound levels from impact pile driving have the potential to harm (as defined by the ESA) marbled murrelets foraging and resting in the ROI. As discussed in Section 4.4.2, there are no thresholds or guidelines for installation and extraction of piles with a vibratory driver. Because the sound levels generated by vibratory drivers are typically 20–30 dB lower than impact pile driving and do not produce waveforms with sharp rise times like impact pile driving, the affected areas would be so small as to be discountable and potential impacts on marine birds would be negligible from vibratory install or extraction noise.

Murrelet responses to elevated noise levels are likely to depend on a variety of factors. These may include an individual bird's motivational state (e.g., current demand for food intake) and previous experience with elevated sound. Birds may initially startle, flush, dive, or leave the area when exposed to elevated sound levels and visual disturbance associated with human activities. Marbled murrelets resting in the waters of the project area initially will be likely to dive underwater if disturbed by airborne noise from pile driving, potentially exposing them to underwater noise impacts.

Behaviors that indicate disturbance of foraging birds may include flushing, aborted feeding attempts, or avoidance of foraging habitats over one or multiple days. Habituation may reduce these avoidance responses over time in the absence of significant negative reinforcement. Observations of marbled murrelets during pile driving for the East Half Replacement and West-Half Retrofit of the Hood Canal Bridge in 2004, suggest that foraging birds are likely to flush at the onset of pile driving, but eventually will habituate to pile driving noise (Entranco and Hamer Environmental, 2005). A recent study conducted by Smith et al. (2023) measured hearing thresholds in marbled murrelets and observed general sensitivity in aerial (in-air) hearing. The study also found that anthropogenic sounds overlapped with marbled murrelet sound sensitivities indicating susceptibility to disturbances from a range of noise types (Smith et al., 2023).

A complicating factor is related to the annual molting cycle of marbled murrelets. The late-summer, pre-basic molt condition (July to November), during which murrelets are essentially flightless for up to 2 months, will overlap with the in-water construction season. During the pre-basic molt period, marbled

murrelets will be less able to withdraw quickly from the project area when exposed to sound at disturbance levels and will likely dive underwater to avoid the disturbance.

5.2.1 Demolition, Construction, Operations Portion of the ROI – NAVBASE Kitsap-Bremerton

Under Alternative 2, marbled murrelets are unlikely to be present during impact pile driving within the relatively small areas defined by the 202 dB cumulative SEL isopleth for auditory injury during M2D2 and dry dock construction. This is because they are expected to avoid areas with high levels of human activity. Distances to auditory injury during installation of steel piles under Alternative 2 would range from 46 feet to 394 feet (14 meters to 120 meters) and would be localized to the waterfront (Figure 5-3 and Figure 5-4). Under Alternative 3, the distance to auditory injury would be larger than under Alternative 2 with a maximum distance of 1,154 feet (352 meters) from impact installation of larger steel piles (Table 5-13, Figure 5-5). These maximum distances represent the cumulative size of the injury zone as it increases through the course of a pile driving day. As a result, during the early portion of the construction day, the injury zone would be smaller and would only gradually increase out to the maximum distances modeled after all strikes have been completed (Table 5-13). Moreover, the modeled distances assumes marbled murrelets remain underwater within the range to effect during the entirety of active impact pile driving. In other words, an individual bird would have to be under water constantly within the calculated range during all impact pile driving in order to accumulate energy from every impact strike. Because this assumption is physiologically impossible for marbled murrelets, the modeling results represent an extreme worst-case scenario regarding pile driving methods and numbers, and the actual range to effect will be significantly smaller than the distances listed in Table 5-13. Further, the maximum distances (as shown in Figures 5-3 through 5-6) are still localized to the waterfront where marbled murrelet are not anticipated to occur.

Table 5-13 Calculated Radial Distances to Underwater Marbled Murrelet Pile Driving Noise Thresholds for Impact Pile Driving for Alternative 2 and 3

Structure	*Pile Size and Type*[3]	*Distance to Threshold*		*Masking Zone*
		202 dB Cumulative SEL (Auditory Injury)	*208 dB Cumulative SEL (Barotrauma)*	
Alternative 2	48-in steel pipe	249 ft (76 m)	99 ft (30 m)	551 ft (168 m)
	steel sheets	394 ft (120 m)	157 ft (48 m)	138 ft (42 m)
	36-in steel pipe	213 ft (65 m)	85 ft (26 m)	551 ft (168 m)
	24-inch concrete pipe	46 ft (14 m)	18 ft (6 m)	138 ft (42 m)

Structure	*Pile Size and Type*[3]	*Distance to Threshold*		*Masking Zone*
		202 dB Cumulative SEL (Auditory Injury)	*208 dB Cumulative SEL (Barotrauma)*	
Alternative 3	96-inch steel pipe	1,154 ft (352 m)	459 ft (140 m)	551 ft (168 m)
	48-in steel pipe	249 ft (76 m)	99 ft (30 m)	551 ft (168 m)
	24-inch concrete pipe	46 ft (14 m)	18 ft (6 m)	138 ft (42 m)
	36-in steel pipe	213 ft (65 m)	85 ft (26 m)	551 ft (168 m)
	18-inch concrete pipe	16 ft (5 m)	6 ft (2 m)	138 ft (42 m)
	30-inch steel pipe	34 ft (10 m)	13 ft (4 m)	138 ft (42 m)
	24-inch concrete pipe	46 ft (14 m)	18 ft (6 m)	138 ft (42 m)

Notes: USFWS 2023 Calculator tool used for calculations. Assumes no attenuation. Cumulative SEL calculated as single-strike SEL + 10* log (# of pile strikes). Up to 6,600 strikes per day. Used maximum piles sizes to model distances.

Legend: dB = decibels; ft = feet; in = inch; m = meters; SEL = sound exposure level

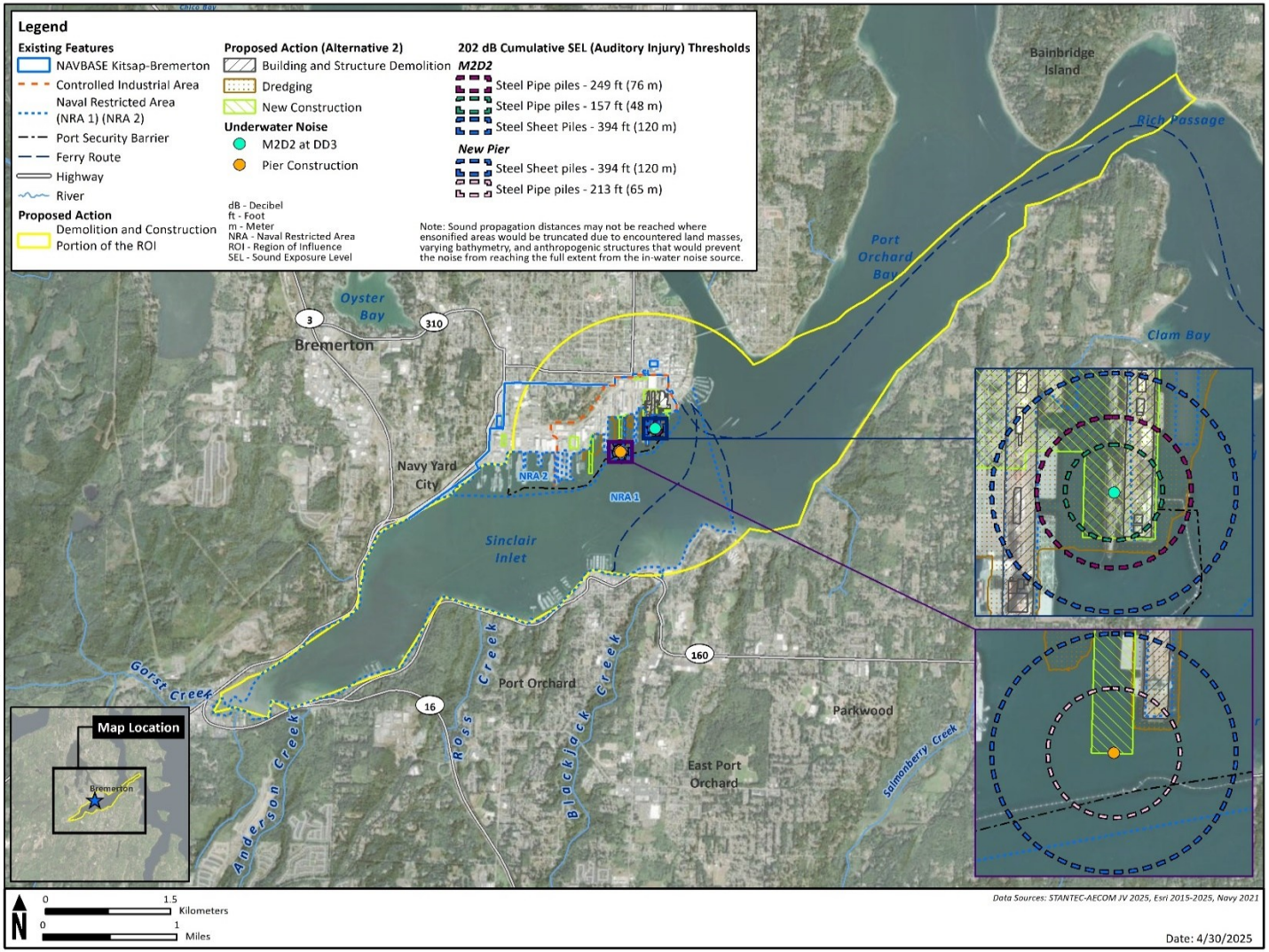


Figure 5-3 Alternative 2 Distances to Auditory Injury Threshold for Marbled Murrelet During Impact Pile Driving for M2D2 at DD3 and New Pier Construction

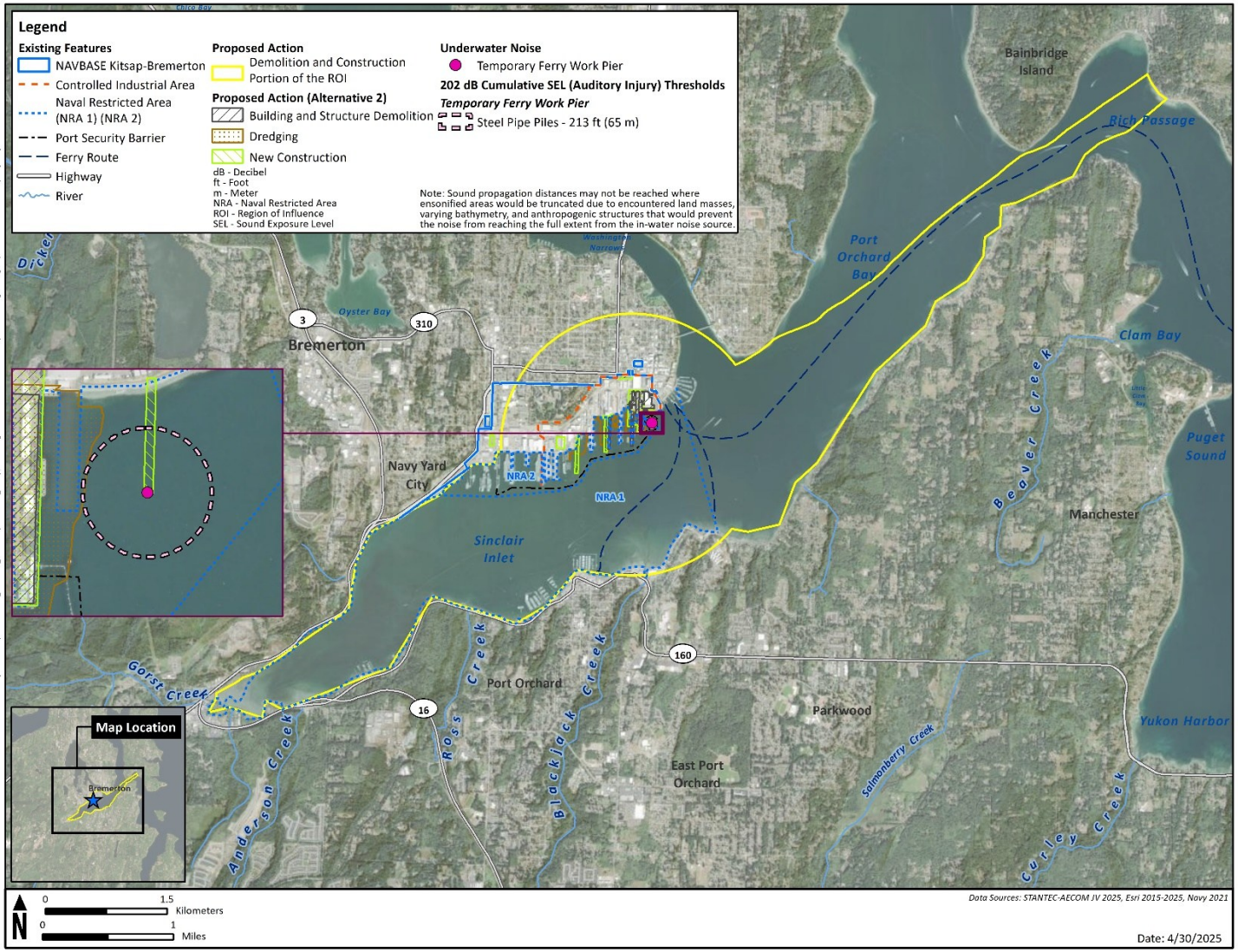


Figure 5-4 Alternative 2 Distances to Auditory Injury Threshold for Marbled Murrelet During Impact Pile Driving for Construction of Temporary Construction Access Pier

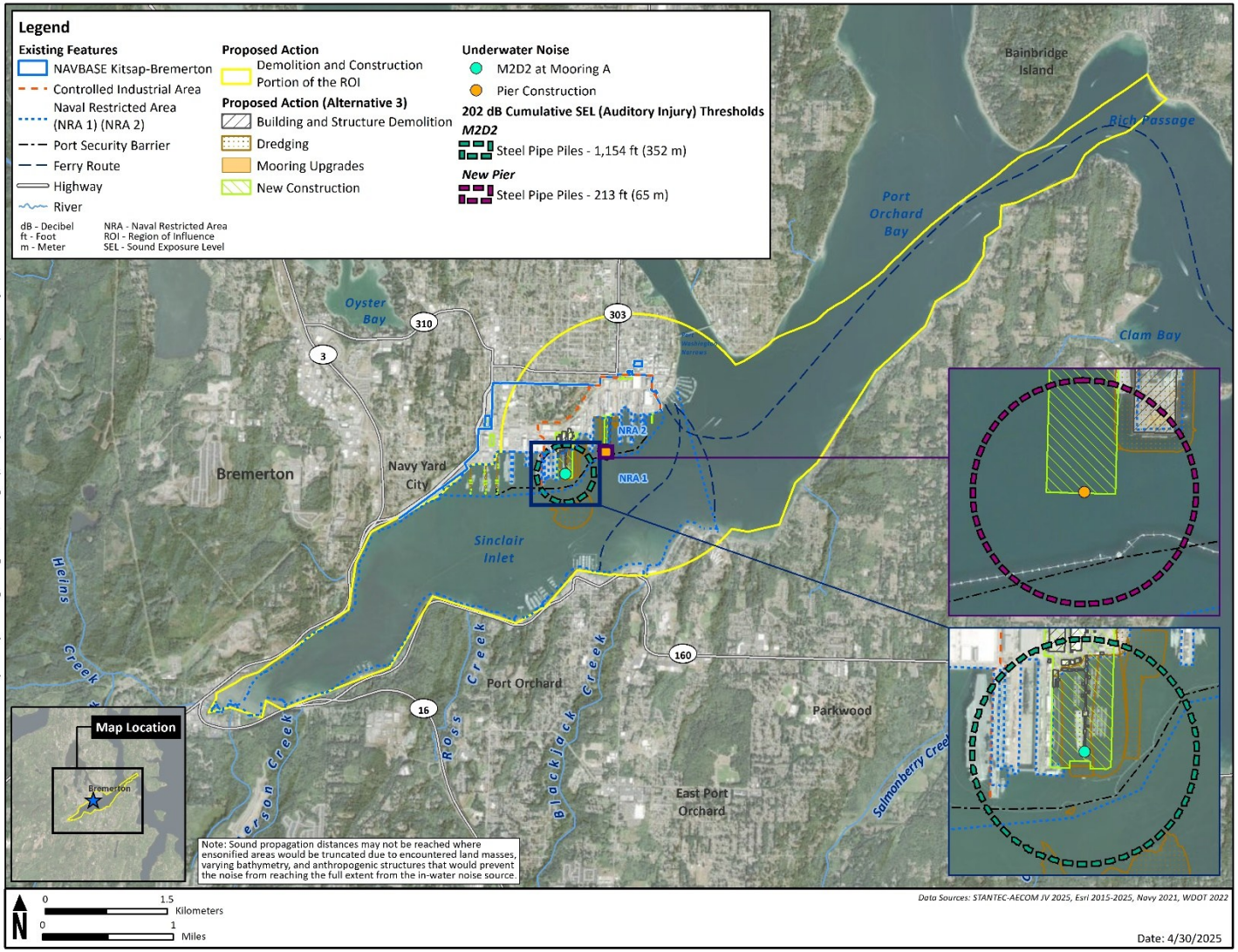


Figure 5-5 Alternative 3 Distances to Auditory Injury Threshold for Marbled Murrelet During Impact Pile Driving for M2D2 at Mooring A and New Pier Construction

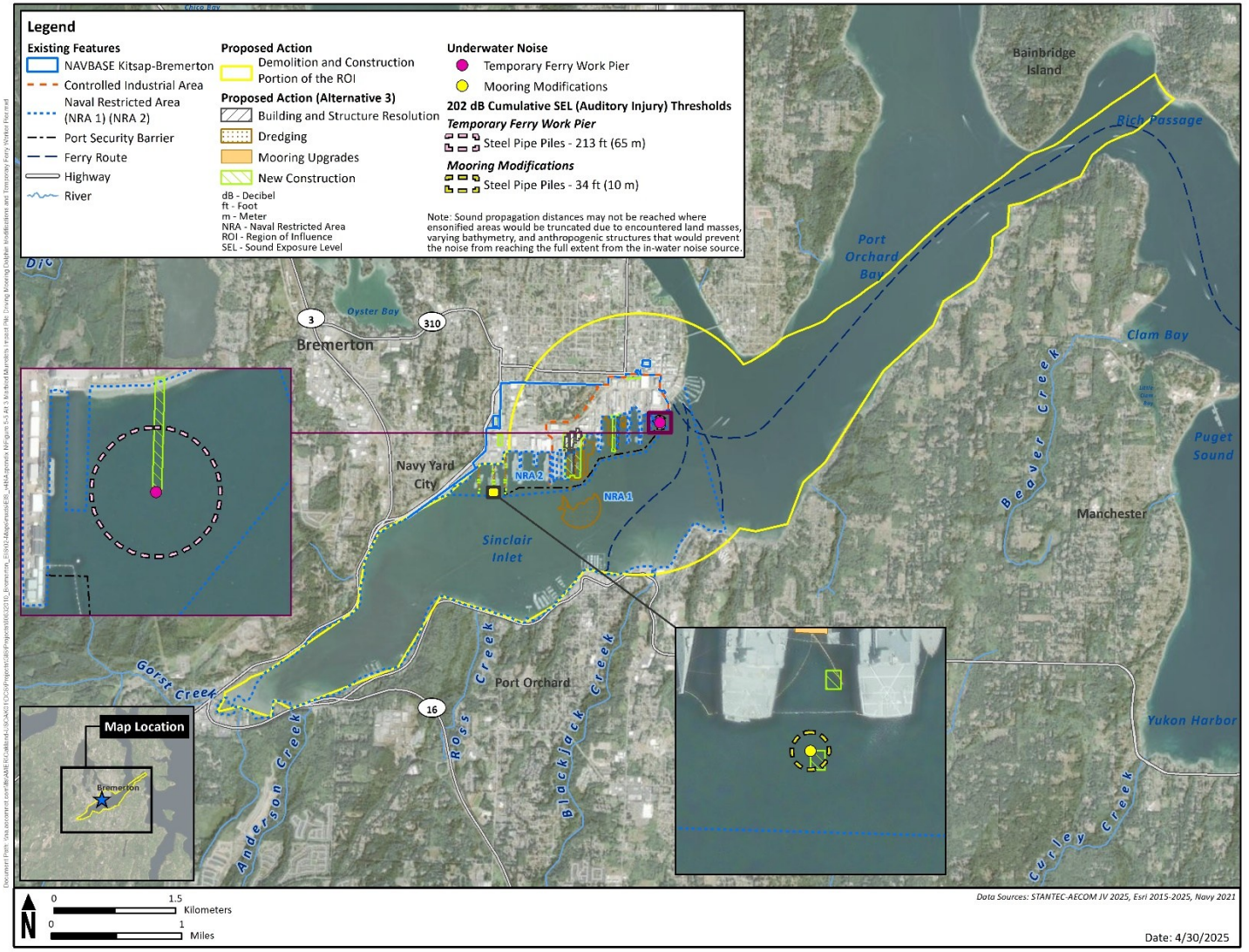


Figure 5-6 Alternative 3 Distances to Auditory Injury Threshold for Marbled Murrelet During Impact Pile Driving for Mooring Dolphin Modifications and Temporary Construction Access Pier

5.2.2 Radio Hill Complex and Forge Shop Portion of the ROI – NAVBASE Kitsap-Bangor

At NAVBASE Kitsap-Bangor, construction is proposed within an inland portion of the base that is predominantly vegetated. During construction, maximum noise levels generated from the use of bulldozers, backhoes, loaders, forklifts, and cranes would likely be between 80 to 90 dBA approximately 50 feet (15 meters) from the noise source (WSDOT, 2023).

No in-water work would occur at NAVBASE Kitsap-Bangor so impact analysis of noise on marbled murrelets focuses on upland construction activities associated with expanding the Radio Hill complex and building a new forge shop under Alternative 2, and only expanding the Radio Hill complex under Alternative 3. As discussed in Section 2.2, ambient noise levels within the more rural/vegetated areas of the Proposed Action would be expected to have noise levels of approximately 55 to 60 dBA (Navy, 2020a). Construction activities will generate airborne noise, with the greatest levels produced during bulldozer operations. Table 5-14 outlines the noise profiles of anticipated construction equipment.

Table 5-14 Maximum Airborne Noise Levels at 50 Feet for Common Construction Equipment

Equipment Type	*Maximum Noise Level*
Bulldozer	85
Chain saw	83
Dump truck	73
Loader	71

Note: Maximum sound pressure levels in dBA re 20 µPa (A-weighted).
Source: WSDOT, 2023

In general, sound pressure levels decrease as distance from the sound source increases (i.e., over soft surface such as vegetation, doubling in distance results in a 7.5 dB reduction). Maximum noise levels produced by common construction equipment, including bulldozers, trucks, and other equipment that might typically be employed are 85 dBA (WSDOT, 2023). Presuming multiple sources of noise may be present at one time, maximum combined levels may be as high as 88 dBA. This assumes that multiple co-located sources combined together increase noise levels as much as 3 dB over the level of a single piece of equipment by itself. These maximum noise levels are intermittent in nature, and not present at all times. Using an attenuation rate of 7.5 dBA per doubling of distance over soft ground, construction noise is calculated to attenuate to approximately 55 dBA at 1,045 feet (319 meters) from the noise source(s) (Figures 5-7 and 5-8).

Because the work being performed will be done outside the nesting window for marbled murrelets, it is anticipated that the noise produced will have no effect on marbled murrelet nesting (September 24 to January 15). Airborne noise produced by the proposed action, both individually and cumulatively, is not anticipated to result in significant effects to marbled murrelets. However, noise levels during construction would be consistent for three years under either Alternative 2 or Alternative 3 (see Table 2-8 of the EIS) and would create noise disturbance to marbled murrelet that may be present in adjacent habitat outside of the nesting season.

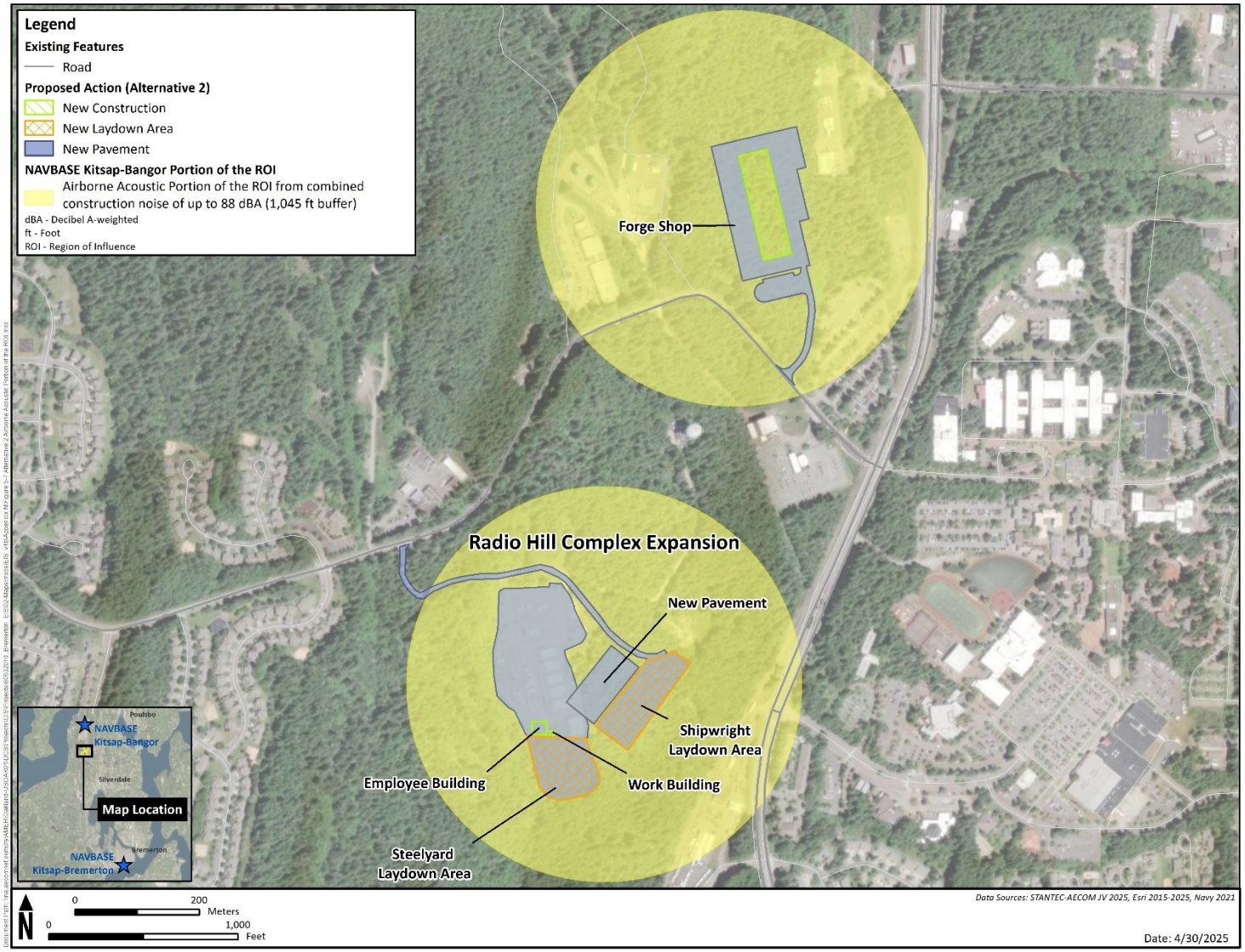


Figure 5-7 Alternative 2 Airborne Acoustic Portion of the ROI

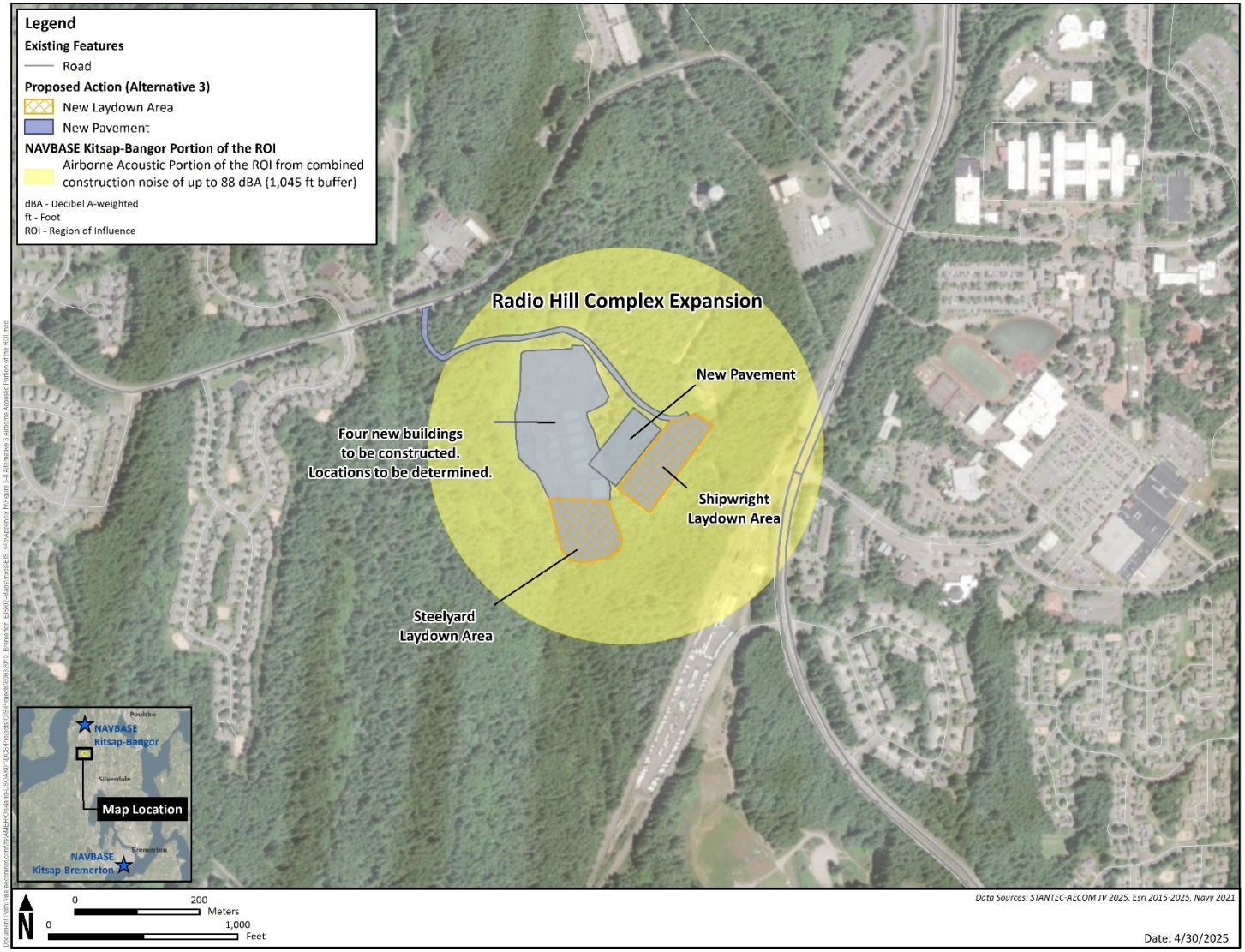


Figure 5-8 Alternative 3 Airborne Acoustic Portion of the ROI

5.3 Acoustic Analysis and Results for Fishes

The degree to which an individual fish exposed to underwater sound will be affected depends on a number of variables, including species, size, and physical condition of the fish; presence of a swim bladder; physiological hearing capabilities; maximum sustained sound pressure and frequency; shape of the sound wave (rise time); depth of the water; depth of the fish in the water column; amount of air in the water; size and number of waves on the water surface; bottom substrate composition and texture; effectiveness of bubble curtain sound/pressure attenuation technology; currents; and presence of predators. Depending on these factors, effects on fish can range from changes in behavior to immediate mortality. Fish injury and mortality from impact pile driving steel piles has been documented (ICF Jones & Stokes and Illingworth & Rodkin, 2009). As previously stated, there is no documented injury from vibratory pile driving. Vibratory pile driving would possibly elicit behavioral reactions from fish such as temporary avoidance of the area but is unlikely to cause injuries to fish or have persistent effects on local fish populations (Popper et al., 2019). Therefore, the discussion below on the physiological responses of fish is focused on impact pile driving.

5.3.1 Demolition, Construction, Operations Portion of the ROI

Physiological Responses

The effects to fish at different intensities of underwater sound are unclear. Many of the previous studies cited for the physical effects, including injury and mortality, of underwater sound on fish were based on seismic air gun and underwater explosives studies. These physical effects can include swim bladder, otolith, and other organ damage; hearing loss; and mortality (Hastings and Popper, 2005).

Fish with swim bladders, including salmonids, are more susceptible to barotraumas from impulsive sounds (sounds of very short duration with a rapid rise in pressure like steel impact pile driving) because of swim bladder resonance (vibration at a frequency determined by the physical parameters of the vibrating object). When a sound pressure wave strikes a gas-filled space, such as the swim bladder, it causes that space to vibrate (expand and contract) at its resonant frequency. When the amplitude of this vibration is sufficiently high, the pulsing swim bladder can press against, and strain, adjacent organs, such as the liver and kidney. This pneumatic compression causes demonstrable injury, in the form of ruptured capillaries, internal bleeding, and maceration of highly vascular organs (ICF Jones & Stokes and Illingworth & Rodkin, 2009).

Sound waves can cause different types of tissue to vibrate at different frequencies, and that this differential vibration can cause tearing of mesenteries and other sensitive connective tissues (Hastings and Popper, 2005; Hawkins and Popper, 2018a). Exposure to high noise levels can also lead to injury through “rectified diffusion,” the formation and growth of bubbles in tissues. These bubbles can cause inflammation, cellular damage, and blockage or rupture of capillaries, arteries, and veins (Crum and Mao, 1996; Vlahakis and Hubmayr, 2000; Stroetz et al., 2001). These effects can lead to overt injury or even mortality. Death from barotrauma and rectified diffusion injuries can be instantaneous, or delayed for minutes, hours or even days after exposure.

Even in the absence of mortality, elevated noise levels can cause sublethal injuries affecting survival, and fitness. Fish suffering damage to hearing organs may suffer equilibrium problems and may have a reduced ability to detect predators and prey (Turnpenny et al., 1994; Hastings et al., 1996). In addition,

Hawkins and Popper (2018b) evaluated directional hearing and particle motion components of sound and the effects to fish being able to seek out prey and avoid predators.

Adverse effects on survival and fitness can occur even in the absence of overt injury. Exposure to elevated noise levels can cause a temporary threshold shift in hearing sensitivity (or TTS), decreasing sensory capability for periods lasting from hours to days (Turnpenny et al., 1994; Hastings et al., 1996; Hawkins and Popper, 2018a). The severity of effects from high noise levels produced by impact driving of steel piles depends on several factors, including the size and species of fish exposed. Regardless of species, smaller fish appear to be more sensitive to injury of non-auditory tissues (Yelverton et al., 1975).

Halvorsen et al. (2012) noted that previous caged field studies (Abbott et al., 2005; Ruggerone et al., 2008) to investigate effects from underwater noise lacked appropriate biological control groups because the experimental fishes may not have been neutrally buoyant resulting in a lower risk of injury because their swim bladder may have been deflated. To better understand the effects of impulsive sounds from impact pile driving, Halvorsen et al. (2011, 2012) conducted a controlled study with juvenile Chinook (*Oncorhynchus tshawytscha*) (mean standard length 103 millimeters)). The study found that the onset of injury to Chinook salmon occurred at a minimum cumulative SEL of 210 dB. Further studies that evaluated juvenile Chinook and hybrid striped bass exposed to 213 dB re 1 μPa^2*sec, found that they recovered from all physical effects within 10 days after exposure (Casper et al., 2012). Flatfish (hogchoker [*Trinectes maculatus*]) showed no effect with an exposure to 216 dB SEL_{cum} 1 μPa^2*sec (Casper et al., 2013).

Four fish species of different life history and anatomy (Nile tilapia [*Oreochromis niloticus*], hybrid striped bass, hogchoker, and lake sturgeon [*Acipenser fulvescens*]) were exposed to a controlled number of steel impact pile strikes at known sound levels to produce a predetermined cumulative SEL. Fish were examined for bleeding, damage to swim bladder, and damage to internal organs. Of the four, no impacts resulted to the hogchoker, which has no swim bladder. Fish that did show major internal damage, had damage to kidney, gonads, and spleen that are closely positioned near the swim bladder. The onset of physical effects to the four species did not occur until the cumulative SEL was above 203 dB and in most species above 207 dB (Dahl et al., 2015). These results were also supported by other studies conducted on both larval (Bolle et al., 2012) and juvenile fishes (Debusschere et al., 2014) as well as studies conducted by Halvorsen et al. (2011, 2012).

Because of their large size, adult salmon can tolerate higher noise levels and are generally less sensitive to injury of non-auditory tissues than juveniles (Hubbs and Rechnitzer, 1952). Dahl et al. (2015) suggested that fish, in general, are likely to move away from the sound source that is too loud before physiological damage is of concern. This behavioral response can result in fish leaving breeding or feeding sites or mask the ability of fish to hear biologically important sounds (i.e., soundscape or other species) (Dahl et al., 2015; Hawkins and Popper, 2018b). However, no information is available to determine whether or not the risk of auditory tissue damage decreases with increasing size of the fish.

Distances to Onset of Mortality, Recoverable Injury, and TTS

Table 5-15 provides the distances to effects modeled for the largest pile types proposed for installation under Alternatives 2 and 3 and Figures 5-9 through 5-12 depict the zones of effect by structure. Although peak and cumulative SEL thresholds are provided, distances for cumulative involve the cumulative energy of all impact strikes over a 24-hour period, the affected area represents the maximum extent of potential injurious or TTS effects. Earlier in the construction day, these zones (onset of mortality, recoverable injury, and TTS) would be smaller, and only reach the maximum extent after all the pile

strikes have been completed. For fishes, the greatest distance to TTS under Alternative 2 would be 3,280 feet (1,000 meters) during installation of steel sheet piles. Injury and potential mortality during steel sheet pile installation could occur at distances of up to 338 feet (103 meters) and 184 feet (56 meters), respectively.

Under Alternative 3, installation of 96-inch steel pipe piles may cause TTS of fish within 9,610 feet (2,929 meters) of the pile driving operation. Distances to injury and onset of mortality would be 991 feet (302 meters) and 534 feet (163 meters), respectively. Since work would be conducted during the in-water work window, impact pile driving would occur during the timeframe when juvenile salmonids would be least likely to be present, thus exposure of juveniles to injurious noise impacts would be minimized. However, larger salmonids as well as forage fish and other resident fishes may be exposed to TTS, injury, and potential mortality from exposure during pile driving activities. With use of an attenuation system (i.e., bubble curtain) and implementation of soft start pile driving approach (BMP BIO MGMT BREM -5 and -6), year-round resident fishes, including forage fish, larger salmonids, and other fish species are less likely to be injured and may only be exposed to short-term (hours to days) impacts due to habitat avoidance and reduction of prey in the pile driving area.

Impact pile driving in the dry can also generate underwater noise in adjacent aquatic habitats. Pile driving in the dry is a minimization measure designed to reduce the amount of sound that is transmitted through the water. There is no method for calculating transmission loss through soil outside of the water, and then calculating the loss in the water. WSDOT (2023) assumes transmission loss within the soil is greater than what occurs in water or air due to the denseness of the soil, and considers pile driving in the dry is effective at minimizing the effects of sound in the water and protecting fish (WSDOT, 2023). The Navy also assumed this in the analysis.

Permanent in-water cofferdams will be installed along the east and west sides of the proposed M2D2 footprint and a temporary cofferdam will be installed along the south side. Steel sheet and pipe piles will be installed to create cofferdam structures. Once an area is closed off from the inlet via a cofferdam, construction activities outside of and within the enclosed area will be conducted as follows:

Outside of the cofferdam, in-water pile driving and dredging will only occur within the allowable in-water work window (July 16–February 15 [U.S. Army Corps of Engineers {USACE, 2017}]) that is designed to protect outmigrating juvenile salmonids.

Inside sealed cofferdam, before cofferdam is dewatered:

- In-water pile driving will only occur within the in-water work window.
- Dredging will occur year-round.

Inside sealed cofferdam, after cofferdam is dewatered:

- Pile driving would be considered upland pile driving and could occur year-round.
- Once the area is dry, removal of soil could occur year-round

Once the dry dock is complete, the temporary cofferdams will be removed using vibratory extraction methods.

Table 5-15 Sound Exposure Criteria for Fish Mortality, Recoverable Injury, and TTS from Impact Pile Driving

Pile Size and Fish Hearing Group	*Onset of Mortality*				*Recoverable Injury*				*TTS*	
	Threshold SEL_{cum}	*Distance to Threshold*	*Threshold SPL_{peak}*	*Distance to Threshold*	*Threshold SEL_{cum}*	*Distance to Threshold*	*Threshold SPL_{peak}*	*Distance to Threshold*	*Threshold SEL_{cum}*	*Distance to Threshold*
96-inch Steel Pipe										
Fishes without a swim bladder	> 219	85 ft (26 m)	> 213	29 ft (9 m)	> 216	134 ft (41 m)	> 213	29 ft (9 m)	NC	N/A
Fishes with a swim bladder not involved in hearing	210	338 ft (103 m)	> 207	72 ft (22 m)	203	991 ft (302 m)	> 207	72 ft (22 m)	> 186	9,610 ft (2,929 m)
Fishes with a swim bladder involved in hearing	207	534 ft (163 m)	>207	72 ft (22 m)	203	991 ft (302 m)	> 207	72 ft (22 m)	186	9,610 ft (2,929 m)
Steel Sheet Piles										
Fishes without a swim bladder	> 219	29 ft (9 m)	> 213	10 ft (3 m)	> 216	46 ft (14 m)	> 213	10 ft (3 m)	NC	N/A
Fishes with a swim bladder not involved in hearing	210	115 ft (35 m)	> 207	23 ft (7 m)	203	338 ft (103 m)	> 207	23 ft (7 m)	> 186	3,280 ft (1,000 m)
Fishes with a swim bladder involved in hearing	207	184 ft (56 m)	>207	23 ft (7 m)	203	338 ft (103 m)	> 207	23 ft (7 m)	186	3,280 ft (1,000 m)
48-inch Steel Pipe										
Fishes without a swim bladder	> 219	20 ft (6 m)	> 213	3 ft (1 m)	> 216	29 ft (9 m)	> 213	3 ft (1 m)	NC	N/A
Fishes with a swim bladder not involved in hearing	210	72 ft (22 m)	> 207	7 ft (2 m)	203	213 ft (65 m)	> 207	7 ft (2 m)	> 186	2,070 ft (631 m)
Fishes with a swim bladder involved in hearing	207	115 ft (35 m)	>207	7 ft (2 m)	203	213 ft (65 m)	> 207	7 ft (2 m)	186	2, 070 ft (631 m)
36-inch Steel Pipe										
Fishes without a swim bladder	> 219	16 ft (5 m)	> 213	7 ft (2 m)	> 216	26 ft (8 m)	> 213	7 ft (2 m)	NC	N/A
Fishes with a swim bladder not involved in hearing	210	62 ft (19 m)	> 207	16 ft (5 m)	203	184 ft (56 m)	> 207	16 ft (5 m)	> 186	1,775 ft (541 m)
Fishes with a swim bladder involved in hearing	207	98 ft (30 m)	>207	16 ft (5 m)	203	184 ft (56 m)	> 207	16 ft (5 m)	186	1,775 ft (541 m)
30-inch Steel Pipe										
Fishes without a swim bladder	> 219	10 ft (3 m)	> 213	3 ft (1 m)	> 216	13 ft (4 m)	> 213	3 ft (1 m)	NC	N/A

Pile Size and Fish Hearing Group	*Onset of Mortality*				*Recoverable Injury*				*TTS*	
	Threshold SEL_{cum}	*Distance to Threshold*	*Threshold SPL_{peak}*	*Distance to Threshold*	*Threshold SEL_{cum}*	*Distance to Threshold*	*Threshold SPL_{peak}*	*Distance to Threshold*	*Threshold SEL_{cum}*	*Distance to Threshold*
Fishes with a swim bladder not involved in hearing	210	33 ft (10 m)	> 207	7 ft (2 m)	203	98 ft (30 m)	> 207	6 ft (2 m)	> 186	961 ft (293 m)
Fishes with a swim bladder involved in hearing	207	52 ft (16 m)	>207	7 ft (2 m)	203	98 ft (30 m)	> 207	6 ft (2 m)	186	961 ft (293 m)

Notes: Maximum of 6,600 strikes in a day.

Legend: > = given effect would occur above the reported threshold; m = meter; NC = no criteria (effects from exposure to sound produced by impact pile driving is considered to be unlikely); N/A = not applicable; SEL_{cum} = cumulative sound exposure level (decibel referenced to 1 microPascal squared seconds [dB re 1 μPa^2-s]), SPL_{peak} = peak sound pressure level (decibel referenced to 1 microPascal [dB re 1 µPa]); TTS = temporary threshold shift; Recoverable Injury = injuries, including hair cell damage, minor internal or external hematoma, etc. None of these injuries are likely to result in mortality

Source: Popper et al., 2014

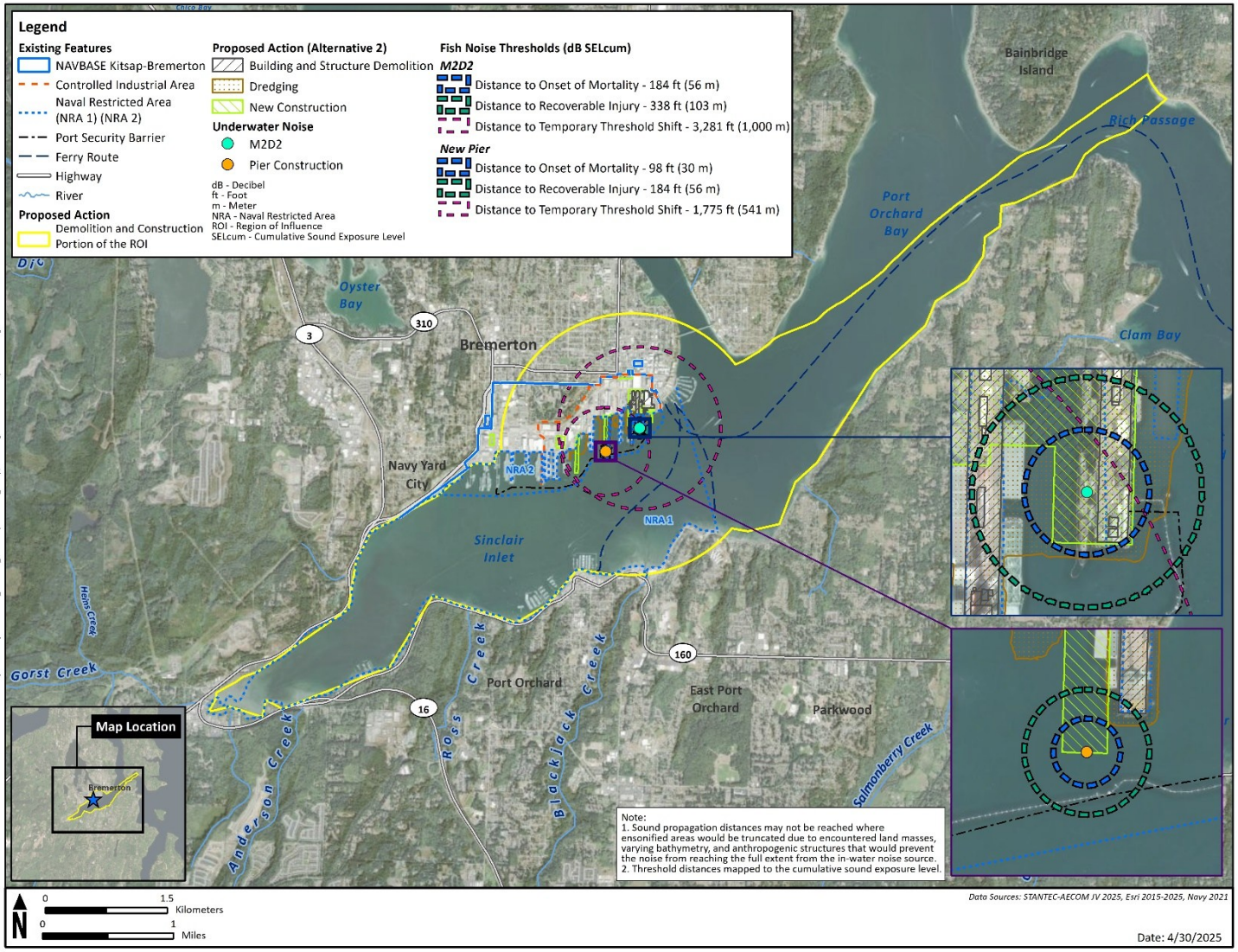


Figure 5-9 Alternative 2 Underwater Noise Thresholds for Fish during Impact Pile Driving for M2D2 at DD3 and New Pier 2 Construction

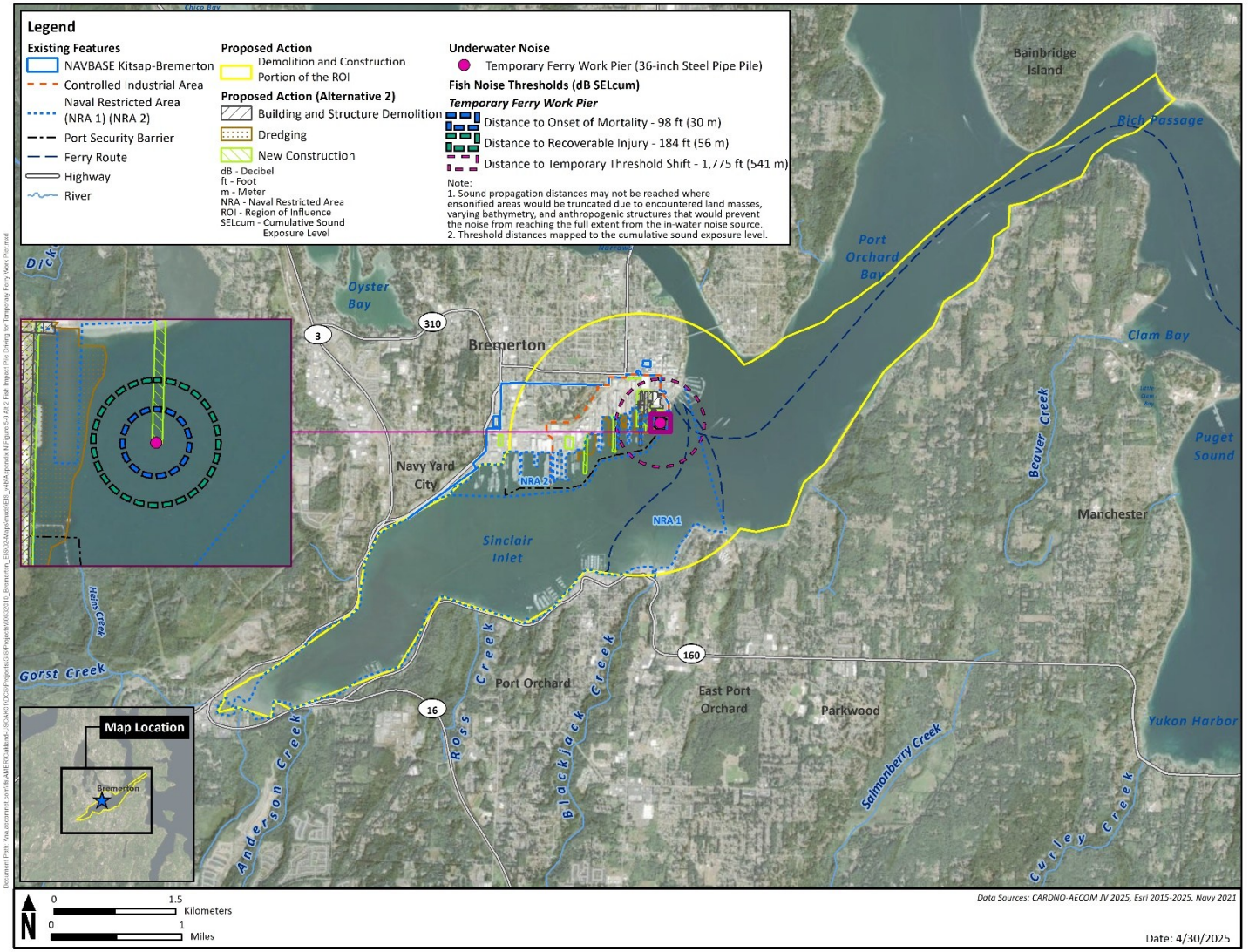


Figure 5-10 Alternative 2 Underwater Noise Thresholds for Fish during Impact Pile Driving for Temporary Ferry Worker Pier Construction

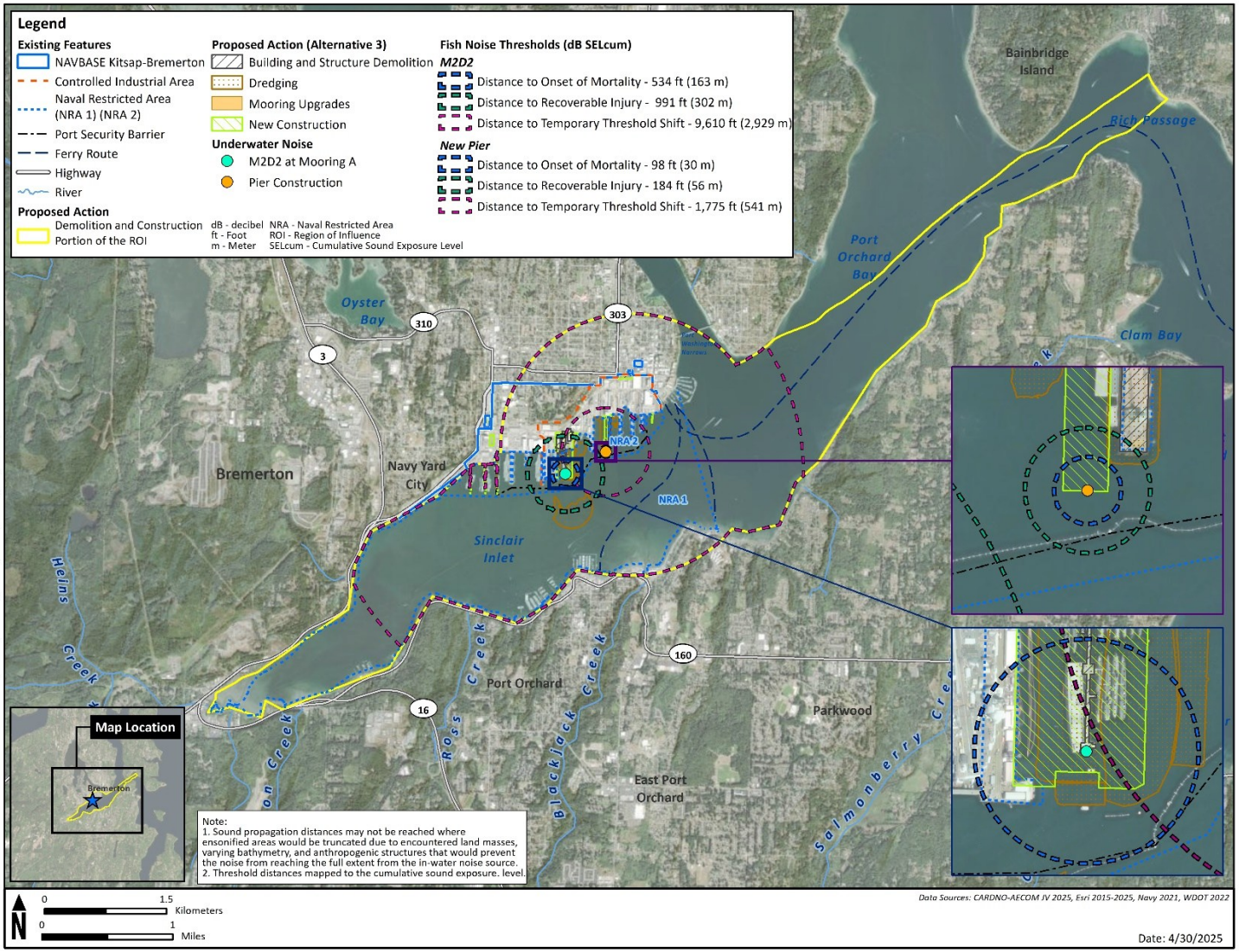


Figure 5-11 Alternative 3 Underwater Noise Thresholds for Fish during Impact Pile Driving for M2D2 and Mooring A and New Pier 2 Construction

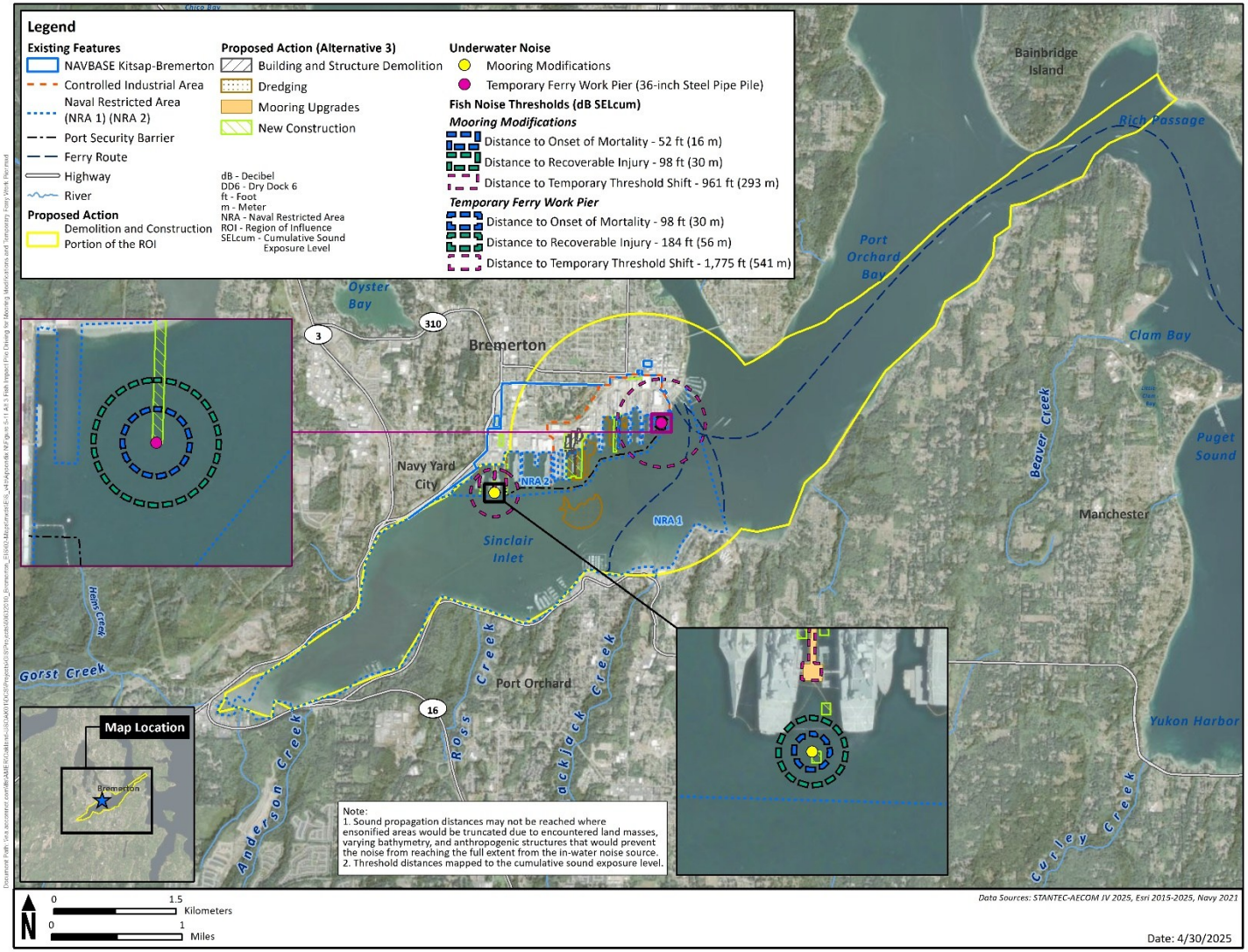


Figure 5-12 Alternative 3 Underwater Noise Thresholds for Fish during Impact Pile Driving for Mooring Dolphin Modifications and Temporary Ferry Worker Pier

5.4 Humans – Noise Modeling Methodology and Assumptions for Pile Driving

As described in Section 4.5.2, the RCNM software allows the calculation of noise levels at user-entered locations from various types of construction equipment for sound propagation paths over several types of ground surfaces.) The latest version of RCNM is now a component within the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM) software (Federal Highway Administration 2023/2006. Although either vibratory or impact pile driving equipment could be utilized, this analysis considers the greater noise level of the impact pile driving noise source specified in the RCNM software. Impact pile driving would represent the greatest noise source levels of the proposed action, necessitating the consideration of larger propagation paths that include overwater areas, while the other equipment noise levels attenuate to ambient levels in far shorter distances on the order of hundreds of feet and only over land. Pile driving is expected to occur during the DNL daytime period (7 a.m. to 10 p.m.) while no construction would occur during DNL nighttime period (10 p.m. to 7 a.m.). Although DNL is often considered for environmental impacts and is based upon L_{eq} (with the addition of a 10 dB penalty for noise occurring during the DNL nighttime period), L_{eq} provides a more appropriate metric for this study because pile driving would not occur continuously for each 24-hour period, but instead for shorter periods of several hours at a time and generally not during DNL nighttime. Without significant nighttime noise during the DNL period, for either baseline or proposed conditions, this analysis assumes both DNL and L_{eq} to be the same numerical value.

The RCNM software, a part of the FHWA's TNM, provides noise outputs for L_{max} and L_{eq}. The resulting noise levels described in Draft EIS Tables 3.10-7 and 3.10-8 represent more conservative estimates (greater L_{eq}/L_{max}) than may actually occur due to the following assumptions in the modeling:

- Pile driving assumed to occur up to 10 hours per day while actual pile driving may not require the full period or would include breaks.
- Shielding of sound due to changes in terrain elevation or buildings not considered and all propagation paths modeled over flat ground between the noise source and each sensitive noise location. Any obstructions from buildings or changes in terrain elevation would provide shielding that could reduce the proposed noise levels below those presented in this document.
- The existing L_{eq}/DNL at sensitive noise locations assumed less than 65 dB (assumed currently compatible with noise level guidelines). Because the existing noise levels could be greater than 65 dB (L_{eq} or DNL), as is often the case in areas near highways, roads, or rails, the actual change in noise from the proposed action may be less than reported.
- Recent noise monitoring of pile driving noise at several locations during the Test Pile Study conducted in 2024 found that *"The continuous monitored noise levels are lower than the noise levels presented in the analyses and conclusions in the DEIS, showing that the DEIS has provided a conservative estimate of noise impacts and that noise from pile driving activities would be lower for receivers in Bremerton due to the topography and buildings that provide shielding from the impact work. Impact work in and around Bremerton would also be less noticeable due to existing industrial activities around the base, traffic noise, and ambient urban noise."* (Navy 2024).

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APPENDIX O
Traffic Study

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FINAL

TRAFFIC STUDY

For

Bremerton Waterfront Infrastructure Improvements

at

Puget Sound Naval Shipyard and Intermediate Maintenance Facility

Naval Base Kitsap-Bremerton

Bremerton, WA

July 2025

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B Growth Rates and Volume Development

C 2023 Existing Conditions Synchro Reports

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Abbreviations and Acronyms

Acronym	Definition	Acronym	Definition
EIS	Environmental Impact Statement	PSNS & IMF	Puget Sound Naval Shipyard and Intermediate Maintenance Facility
HCM 6	*Highway Capacity Manual*, 6th edition	TWSC	Two-way STOP-controlled
LOS	Level of Service	WSDOT	Washington State Department of Transportation
mph	mile per hour		
NAVBASE	Naval Base		
Navy	Department of the Navy, United States		

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1 Introduction

This report summarizes the traffic capacity analysis findings in accordance with the Environmental Impact Statement (EIS) for the Bremerton Waterfront Infrastructure Improvements project.

1.1 Description of the Project

The United States Department of the Navy (Navy) proposes to construct dry dock and associated waterfront infrastructure improvements for future military construction at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) on Naval Base (NAVBASE) Kitsap-Bremerton. The purpose of the EIS Proposed Action is to improve dry dock capacity and capability, upgrade seismic deficiencies, and replace infrastructure that has reached the end of its design life. The Navy proposes to implement multiple component actions as part of the Proposed Action. Figure 1-1 below shows the layout of the PSNS and its significant waterfront elements. All these components are located within Comprehensive Environmental Response, Compensation, and Liability Act sites with Records of Decision in place. The Proposed Action would include demolition of existing structures, construction of new in-water structures, upgrade or replacement of existing in-water structures, and modification of upland facilities required to support the in-water structures.

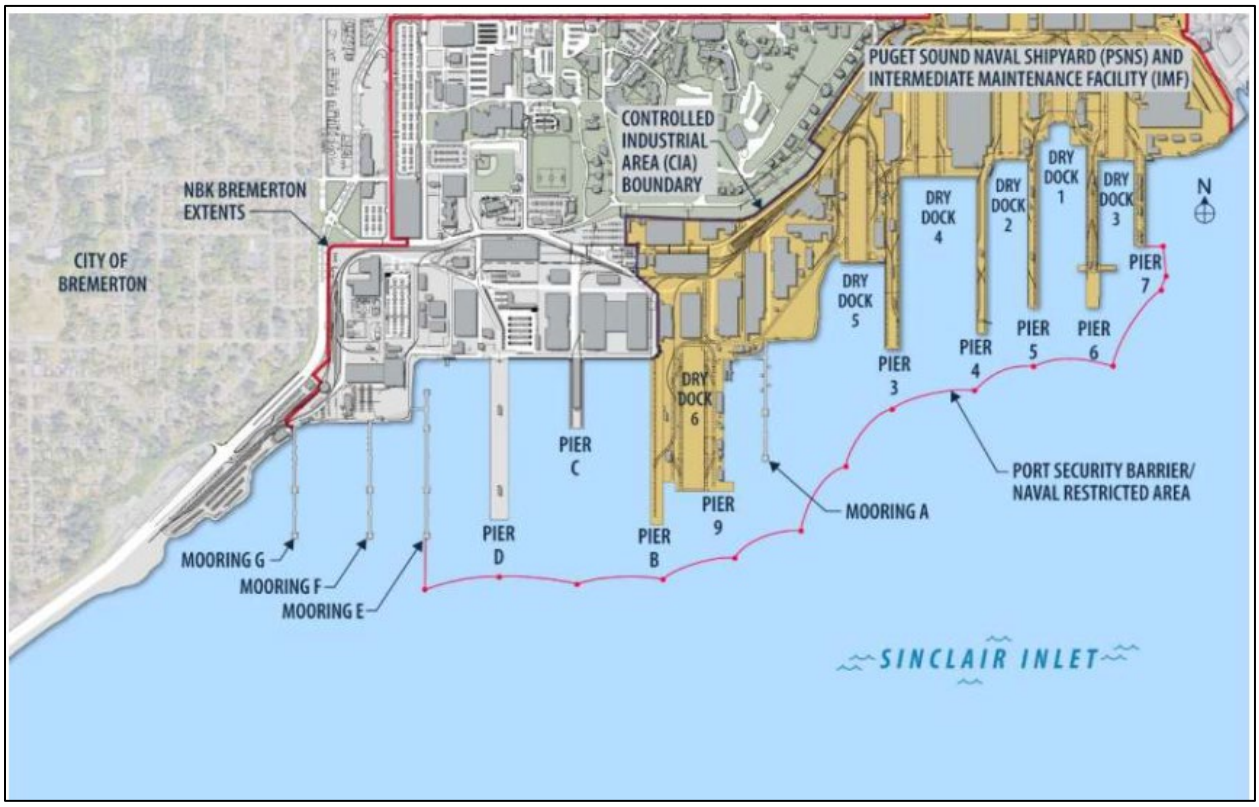


Figure 1-1 PSNS Layout

This report is an update for a portion of the overall project that involves traffic within the areas potentially affected by the proposed construction. This report only discusses the land-side transportation analysis that includes primarily vehicular travel.

Specifically, the traffic analysis work plan requires the following tasks:

- Review and evaluate existing traffic conditions at analyzed intersections to establish baseline for comparison to future analyses.
- Analyze the Proposed Action alternatives (including the no-action alternative) to identify, assess, and mitigate impacts from an increase in traffic due to the planned action.
- Provide recommendations for mitigating construction traffic impacts of the Proposed Action alternatives, if necessary.
- All analyses will be based on *Highway Capacity Manual*, 6th edition (HCM 6) (TRB 2010).

2 Scope

This report includes an evaluation of the following scenarios:

- **2023 Existing Conditions:** The 2023 Existing Conditions scenario is based on the current traffic volumes and configuration of the transportation network within the project study area. No proposed improvements have been included in this analysis.
- **2030 No Build:** The 2030 No Build scenario assumes the local transportation system would evolve as currently planned, but without implementation of the proposed project.
- **2030 Build:** The 2030 Build scenario assumes the local transportation system would evolve as currently planned, with the implementation of the proposed project.

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3 Existing Conditions

This chapter presents the traffic study area and summarizes the existing transportation conditions within the study area.

3.1 Study Area Definition

To capture and understand the movement of workers to the site and analyze and evaluate the impact to traffic, data was collected at the following 11 intersections:

- SR 305 and Viking Avenue (Signalized)
- SR 303 and NE McWilliams Road (Signalized)
- Alaskan Way and Yesler Way (Signalized)
- Callow Avenue and Charleston Boulevard (Two-way STOP-controlled [TWSC])
- Warren Avenue and Burwell Street (Signalized)
- Pacific Avenue and Burwell Street (Signalized)
- SR 166 and Sidney Avenue (Signalized)
- Fauntleroy Way and Barton Street (TWSC)
- SR 3 and W Sam Christopherson Avenue (Signalized)
- Imperial Way and SR 3 (Signalized)
- Mullenix Road and SE Spring Creek Road (TWSC)

Figure 3-1 shows the project vicinity map.

3.2 Roadway Description

The following sections describe the roadways within the study area, including the Washington State Department of Transportation (WSDOT) roadway functional classification, the number of lanes in each direction, and any noteworthy characteristics, such as a roadway's role within the transportation network.

3.2.1 SR 305 at Viking Avenue

SR 305 at Viking Avenue is a four-legged signalized intersection. The northbound approach is a three-laned facility with a dedicated left-turn lane, one shared left/through lane, and dedicated right-turn lane. The southbound approach is currently a two-laned facility with one dedicated left-turn lane and one shared through/right lane. The eastbound approach is a four-laned facility with a dedicated left-turn lane, two through lanes, and one dedicated right-turn lane. The westbound approach is a three-laned facility with a dedicated left-turn lane, one through lane, and one shared through/right lane. The speed limits for the north/southbound and east/westbound approaches are 35 miles per hours (mph) and 40 mph, respectively.

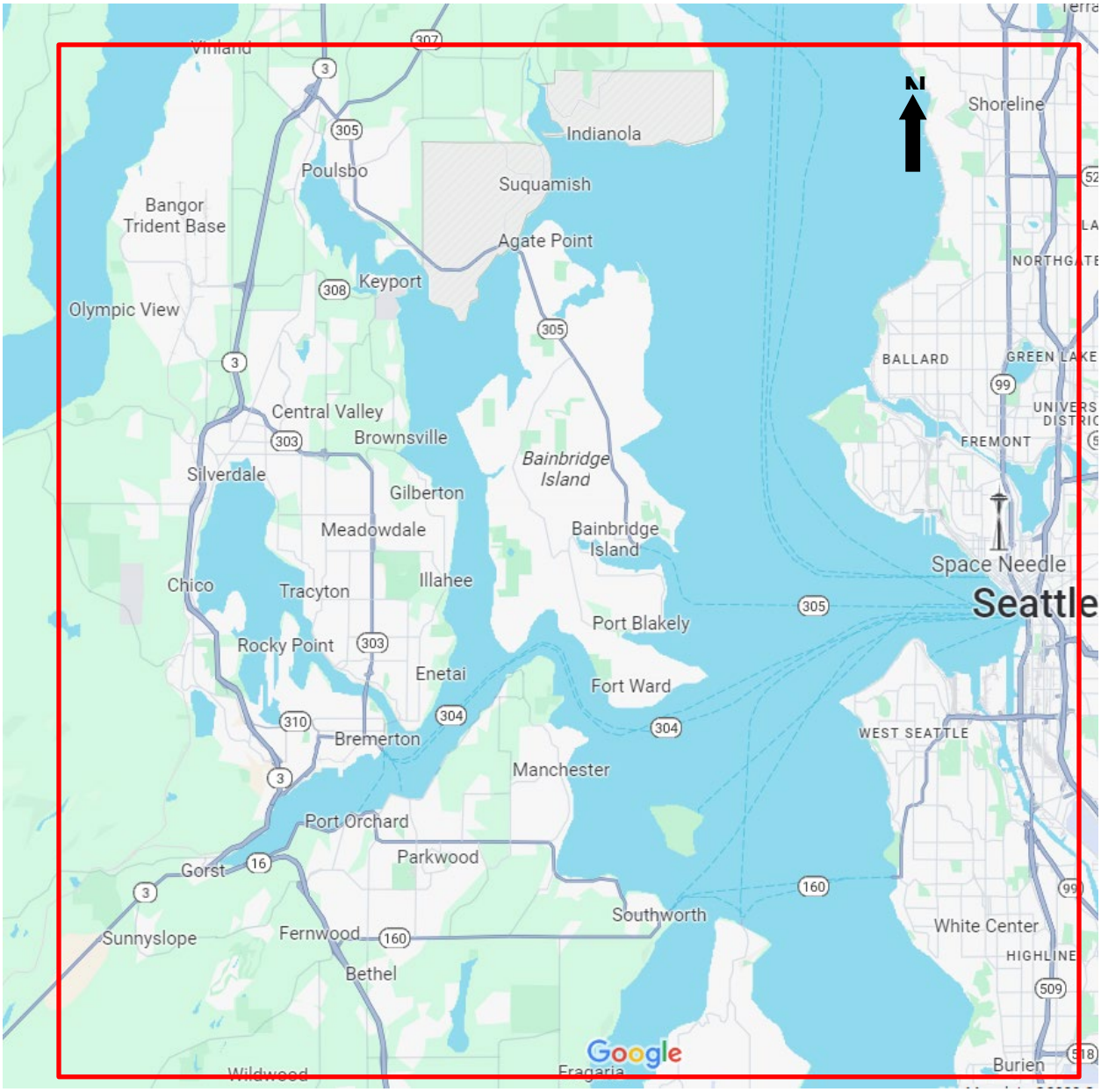


Figure 3-1 Project Vicinity Map

3.2.2 SR 303 at NE McWilliams Road

SR 303 at NE McWilliams Road is a four-legged signalized intersection. The north and southbound approaches are four-laned facilities with one dedicated left-turn lane, two through lanes, and one dedicated right-turn lane. The east and westbound approaches are three-laned facilities with a dedicated left-turn lane, through lane, and dedicated right-turn lane. The speed limits for north/southbound, eastbound, and westbound approaches are 40 mph, 25 mph, and 35 mph, respectively.

3.2.3 Alaskan Way at Yesler Way

Alaskan Way at Yesler Way is a three-legged signalized intersection. The northbound approach is currently a five-laned facility with two dedicated left-turn lanes, two through lanes, and one transit lane. The southbound approach is currently a three-laned facility with a through lane and a shared through/right lane and a transit lane. The eastbound approach is a two-laned facility with two dedicated right-turn lanes. The speed limit of the north/southbound approaches is 25 mph, and the speed limit of the eastbound approach is 10 mph.

3.2.4 Callow Avenue at Charleston Boulevard

Callow Avenue at Charleston Boulevard is a three-legged unsignalized intersection. The northbound approach is a two-laned facility with one through lane and one shared through/right lane. The southbound approach is a two-laned facility with two through lanes. The westbound approach is a one-laned facility with one right-turn lane. The speed limits of the north/southbound approaches and westbound approaches are 25 mph and 10 mph, respectively.

3.2.5 Warren Avenue at Burwell Street

Warren Avenue at Burwell Street is a four-legged signalized intersection. The northbound approach is a one-laned facility with one shared left/through/right lane. The southbound approach is a two-laned facility with one shared left/through lane and a dedicated right-turn lane. The eastbound approach is a two-laned facility with one shared left/through lane and a through lane. The westbound approach is a two-laned facility with one through lane and a dedicated right-turn lane. The speed limits of the northbound approach, southbound approach, and east/westbound approaches are 15 mph, 30 mph, and 25 mph, respectively.

3.2.6 Pacific Avenue at Burwell Street

Pacific Avenue at Burwell Street is a three-legged signalized intersection. The south/westbound approach is a one-laned facility with one shared left/through/right-turn lane. The eastbound approach is a two-laned facility with one shared left/through lane and a dedicated right-turn lane. The speed limit of the south/east/westbound approaches is 25 mph.

3.2.7 SR 166 at Sidney Avenue

SR 166 at Sidney Avenue is a four-legged signalized intersection. The north/south/east/westbound approaches are two-laned facilities with one dedicated left-turn lane and one shared through/right lane. The speed limit of the north/south/east/westbound approaches is 25 mph.

3.2.8 Fauntleroy Way at Barton Street

Fauntleroy Way at Barton Street is a three-legged unsignalized intersection. The northbound approach is a one-laned facility with one shared left/through lane. The southbound approach is a one-laned facility with one shared through/right lane. The eastbound approach is a two-laned facility with a dedicated left-turn lane and a dedicated right-turn lane. The speed limits of north/southbound approaches and eastbound approaches are 35 mph and 10 mph, respectively.

3.2.9 SR 3 at W Sam Christopherson Avenue

SR 3 at W Sam Christopherson Avenue is a four-legged signalized intersection. The northbound approach is a two-laned facility with a dedicated left-turn lane, and one shared through/right lane. The south/westbound approaches are two-laned facilities with a dedicated left-turn lane and one shared through/right-turn lane. The eastbound approach is a three-laned facility with a dedicated left-turn lane, a through lane, and a dedicated right-turn lane. The speed limits for the north/southbound approaches are 50 mph, the eastbound approach is 30 mph, and the westbound approach is 40 mph.

3.2.10 SR 3 at Imperial Way

SR 3 at Imperial Way is a four-legged signalized intersection. The northbound approach is a two-laned facility with one dedicated left-turn lane and a shared through/right lane. The southbound approach is a three-laned facility with one dedicated left-turn lane, one through lane, and one right-turn lane. The eastbound approach is a two-laned facility with a shared left/through and right-turn lane. The westbound approach is a one-laned facility with a shared left/through/right lane. The speed limit of the north/southbound approaches, eastbound approach, and westbound approach are 50 mph, 35 mph, and 10 mph, respectively.

3.2.11 Mullenix Road at SE Spring Creek Road

Mullenix Road at SE Spring Creek Road is a four-legged unsignalized intersection. The north/southbound approaches are one-laned facilities with one shared left/through/right lane. The east/westbound approaches are two-laned facilities with one dedicated left-turn lane and a shared through/right lane. The speed limits of the northbound approach, southbound approach, and east/westbound approaches are 10 mph, 35 mph, and 45 mph, respectively.

4 Method of Analysis

This section explains the concepts and definitions for analyzing the traffic operations, as well as the process used to analyze the 11 study area intersections.

4.1 Traffic Volume Assumptions

Within the PSNS & IMF study area, traffic counts were collected in 2023 at the 11 study intersections. These turning movement counts were collected in the week of November 12, 2023, during weekday a.m. and p.m. peak periods (6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m.) and peak hours were identified accordingly. Based on the counts, the a.m. peak hour for most of the intersections occurred between 7:00 a.m. and 8:00 a.m., except for the intersection of Alaskan Way and Yesler Way which occurred between 8:00 a.m. and 9:00 a.m.; and for Pacific Avenue and Burwell Street occurred between 6:00 a.m. and 7:00 a.m. The p.m. peak hour occurred between 4:00 p.m. and 5:00 p.m. These counts are included in Attachment A.

Based on the historic Annual Average Daily Traffic volumes obtained from the WSDOT website, a linear annual growth rate was derived for each intersection. The estimated growth rate for the intersections of SR 305 at Viking Avenue is 1 percent; SR 303 and NE McWilliams Road is 0.5 percent; Alaskan Way and Yesler Way is 0.5 percent; Callow Avenue and Charleston Boulevard is 1.5 percent; Warren Avenue and Burwell Street is 1.5 percent; Pacific Avenue and Burwell Street is 1 percent; SR 166 and Sidney Avenue is 0.5 percent; Fauntleroy Way and Barton Street is 2 percent; SR 3 and W Sam Christopherson Avenue is 1 percent; Imperial Way and SR 3 is 1 percent; and Mullenix Road and SE Spring Creek Road is 2 percent. The historic traffic volumes along with growth rate estimations are included in Attachment B. These growth rates were applied to the 11 study intersections accordingly, and the background traffic at these intersections were estimated for future year 2030.

Most construction equipment, construction materials, and waste would be delivered to and from NAVBASE Kitsap-Bremerton by barge to minimize congestion at shipyard gates and roads. However, the Navy expects some construction equipment, construction materials, and dredge and waste materials will arrive/depart by road through existing gates, including the Bremerton Gate. It is assumed that construction trucks would utilize the Farragut Street/Decatur Avenue route. The number of vehicles using the Bremerton Gate would range from 25 to 50 truck trips per day. It is assumed that construction equipment would generally be confined to the construction site.

Based on the NAVBASE background studies, a construction workforce of 2,000 workers was estimated during the peak construction period with two work shifts. Table 4-1 and Table 4-2 show the construction worker traffic assignment to NAVBASE per work shift, pertaining to the study area.

In the Build scenario, these daily peak one-way inbound and outbound traffic volumes for Shift 1 and Shift 2 were applied to specific study intersections accordingly to evaluate the operational impacts in the future.

Under Shift 1, the daily peak traffic volume of 50 was applied to the intersection of Callow Avenue and Charleston Boulevard; 50 was applied to the intersection of Burwell Street at Warren Avenue; 50 was applied to the intersection of Burwell Street at Pacific Avenue; 140 was applied to the intersection of SR 166 at Sidney Avenue; 700 was applied to the intersection of SR 3 at W Sam Christopherson Avenue; and 700 was applied to the intersection of SR 3 at Imperial Way.

Table 4-1 Shift 1 (0300 to 1500 hour) Trip Allocation Construction Worker Traffic Assignment to NAVBASE Kitsap-Bremerton

Construction Worker Traffic Assignment Route	*Percent*	*Daily Peak One-Way Traffic Volume*
Drive alone from all geographies to Bremerton. Park in City of Bremerton. Walk to NAVBASE Kitsap-Bremerton.	15	150
Drive alone from Bremerton/Kitsap County area to the Bremerton Airport parking area via SR 3 or SR 304. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	30	300
Drive alone from the south through Tacoma on SR 16 to SR 3, or US 101 to SR, to the Bremerton Airport parking area. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	40	400
Drive alone to Port Orchard Marina. Ride contractor-provided ferry to temporary ferry dock at NAVBASE Kitsap-Bremerton.	14	140
Use miscellaneous motorized modes and bikes.	1	10
Total	**100**	**1,000**

Legend: NAVBASE = Naval Base.

Table 4-2 Shift 2 (0700 to 1900 hour) Trip Allocation Construction Worker Traffic Assignment to NAVBASE Kitsap-Bremerton

Construction Worker Traffic Assignment Route	*Percent*	*Daily Peak One-Way Traffic Volume*
Drive alone from all geographies to Bremerton. Park in City of Bremerton. Walk to NAVBASE Kitsap-Bremerton.	10	100
Drive alone to an existing Kitsap Transit Park and Ride lot. Transit to Bremerton via Kitsap Transit bus and/or Kitsap Transit's Ferry from Annapolis or Port Orchard. Walk to NAVBASE Kitsap-Bremerton. (90 percent from North Kitsap.)	10	100
Drive alone, walk, or use public transit to arrive at Seattle Ferry Dock. Transit to Bremerton via Seattle-Bremerton Ferry to Bremerton (Washington State Ferries or Kitsap Transit). Walk to NAVBASE Kitsap-Bremerton.	20	200
Drive alone from Bremerton/Kitsap County area to the Bremerton Airport parking area via SR 3 or SR 304. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	22	220
Drive alone from the south and east through Tacoma on SR 16 to SR 3 to the Bremerton Airport parking area. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	21	210
Drive alone to Port Orchard Marina. Ride contractor-provided ferry to temporary ferry dock at NAVBASE Kitsap-Bremerton.	16	160
Use miscellaneous motorized modes and bikes.	1	10
Total	**100**	**1000**

Legend: NAVBASE = Naval Base.

Under Shift 2, the daily peak traffic volume of 70 was applied to the intersection of SR 305 at Viking Avenue; 10 was applied to the intersection of SR 303 at NE McWilliams Road; 20 was applied to the

intersection of Alaskan Way and Yesler Way; 33 was applied to the intersection of Callow Avenue and Charleston Boulevard; 33 was applied to the intersection of Warren Avenue and Burwell Street; 33 was applied to the intersection of Burwell Street at Pacific Avenue; 160 was applied to the intersection of SR 166 at Sidney Avenue; 100 was applied to the intersection of Fauntleroy Way and Barton Street; 430 was applied to the intersection of SR 3 at W Sam Christopherson Avenue; 430 was applied to the intersection of SR 3 at Imperial Way; and 20 was applied to the intersection of Mullenix Road and SE Spring Creek Road.

Shift 1 and Shift 2 Existing (2023) volumes were derived from Existing (2023) peak hour volumes with a factor applied per period.

The volume development calculations are included in Attachment B.

4.2 Traffic Capacity Analysis

The highway capacity analyses performed are based on methodologies from the HCM 6 (TRB 2010). Traffic modeling software used in the capacity analyses were Synchro 11.1 and SimTraffic 11.1 (Build 2, Rev 9).

The traffic carrying ability of a roadway is described by Levels of Service (LOSs) that range from LOS A to LOS F. LOS is the primary measure of traffic operations for both signalized and unsignalized intersections. It is a standard performance measure developed by transportation professionals to quantify driver perception for elements such as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles. LOS provides a scale that is intended to match motorists' perception of how a transportation facility operates and to provide a scale to compare different facilities. Detailed LOS descriptions are presented in Figure 4-1.

4.2.1 Signalized Intersection Level of Service

The LOS for signalized intersections is based on the HCM 6 (TRB 2010), and requires the same inputs to determine an accurate LOS. Primary inputs include:

- Vehicular volumes
- Pedestrian volumes
- Traffic signal timings
- Roadway geometry
- Speed limits
- Truck percentages
- Peak hour factor (measure of vehicle 15-minute flow rate)

Level of Service

Traffic congestion is expressed by the term Level of Service (LOS), as defined by the Highway Capacity Manual. LOS is a letter code ranging from "A" for excellent conditions to "F" for failure conditions. The conditions defining the LOS for roadways are summarized as follows.



LOS A
Represents the best operating condition, where traffic stream is considered free-flow.



LOS B
Represents reasonably free-flow conditions. The ability to maneuver is only slightly restricted. Effects of minor incidents are still easily absorbed.



LOS C
Represents speeds at or near free-low conditions. The freedom to maneuver is noticeably restricted. Queues may form.



LOS D
Represents traffic operations approaching unstable flow. Speeds decline slightly with increasing flows. Road density increases more quickly. The freedom to maneuver is more noticeably limited. Minor incidents cause queuing.



LOS E
Represents operation that is near or at capacity. There are no usable gaps in the traffic stream. Operations are extremely volatile. Any disruption causes queuing.



LOS F
Represents a breakdown in flow. Queues form behind breakdown points. The demand is greater than capacity.

Figure 4-1 Level of Service Diagram

The average vehicle control delay, measured in seconds per vehicle, is calculated using these parameters with the Synchro procedures. This represents the average delay in seconds per vehicle caused by the presence of a traffic control device or traffic signal and includes the time required to decelerate, stop, and accelerate. The LOS can be characterized for the entire intersection, each intersection approach, and each lane group. Control delay is used to characterize the LOS for the entire intersection or an approach. Delay quantifies the increase in travel time due to a traffic signal control. It is also a surrogate measure for driver discomfort and fuel consumption (TRB 2010). Table 4-3 Shows the average control delay and corresponding LOS for signalized intersections. Using the Synchro method, LOS E and LOS F constitute failing operations.

Table 4-3 Signalized Intersection Control Delay and LOS Thresholds – HCM 6 Method

LOS	*Average Control Delay (sec/veh)*	*Description*
A	Less than or equal to 10	Stable conditions
B	>10–20	
C	>20–35	
D	>35–55	
E	>55–80	Unstable conditions
F	More than 80	Above capacity and unstable conditions

Legend: HCM = *Highway Capacity Manual*, 6th edition; LOS = Level of Service; sec/veh = seconds per vehicle.
Source: TRB (2010).

To determine the LOS of an intersection, the critical input values were entered into the analysis software (Synchro), and the average vehicle delay (seconds per vehicle) was calculated. Based on the average vehicle delay, the LOS was determined for the overall intersection. The 11 existing intersections analyzed consist of 8 signalized intersections and 3 unsignalized intersections.

4.2.2 Unsignalized Intersection Level of Service

The LOS for unsignalized intersections (STOP-controlled intersections) is based on HCM 6 and requires several inputs, including:

- Vehicular volumes
- Pedestrian volumes
- Roadway geometry
- Speed limits
- Truck percentages
- Peak hour factor

The average vehicle control delay, in seconds per vehicle, is calculated using these parameters. This represents the average delay caused by the presence of a stop sign or roundabout and includes the time required to decelerate, stop, and accelerate.

The LOS for a TWSC intersection (i.e., unsignalized intersection) is determined for each minor-street movement or shared movement as well as the major-street left turns. The LOS for TWSC intersections is different from the criteria used for signalized intersections primarily because user perceptions differ among transportation facility types. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Unsignalized

intersections are also associated with more uncertainty for users because delays are less predictable than at signals, which can reduce users' delay tolerance. LOS is not defined for the TWSC intersection as a whole or for major-street approaches for three primary reasons: (1) major-street through vehicles are assumed to experience zero delay; (2) the disproportionate number of major-street through vehicles at a typical TWSC intersection skews the weighted average of all movements, resulting in a very low overall average delay for all vehicles; and (3) the resulting low delay can mask important LOS deficiencies for minor movements (TRB 2010).

The capacity of the stop-controlled intersection legs is based primarily on three factors: the conflicting volume, the critical gap time defined as the number of seconds between vehicles passing the same point along the major street approach, and the follow-up time defined as the number of seconds between the departures of the first and second vehicle in queue along the minor street approach. The HCM 6-based capacity analysis procedure assumes that drivers are both consistent and homogeneous and assumes consistency for their critical gap time. Critical gap times are based on many factors including delay experienced by drivers on the approaches controlled by stop signs. As delay increases, drivers become less patient and will accept shorter gaps, resulting in higher capacities for unsignalized intersections that are operating at LOS D or worse. The unsignalized intersection procedure uses fixed critical gap times. Unless the critical gap times are adjusted, the procedure tends to overestimate the delay at unsignalized intersections that are operating at LOS D or worse. Also, poor operations at an unsignalized intersection will encourage some drivers to turn right and make a U-turn on the mainline or accept shorter critical gaps (safety issue) rather than attempt a left turn (TRB 2010).

Table 4-4 Shows the average control delay and corresponding LOS for unsignalized intersections. The worst LOS at one-way STOP-controlled and TWSC intersections represents the delay for the minor approach only. Using the HCM 6 method, LOS E and LOS F constitute failing operations.

Table 4-4 Unsignalized Intersection Control Delay and LOS Thresholds—HCM 6 Method

LOS	*Average Control Delay (sec/veh)*	*Description*
A	Less than or equal to 10	Stable conditions
B	>10–15	
C	>15–25	
D	>25–35	
E	>35–50	Unstable conditions
F	More than 50	Above capacity and unstable conditions

Legend: HCM = *Highway Capacity Manual*, 6th edition; LOS = Level of Service; sec/veh = seconds per vehicle.
Source: TRB (2010).

5 Findings

5.1 2023 Existing Conditions

A capacity analysis was performed for the 2023 Existing Conditions in both Shift 1 and Shift 2 for all the study intersections. LOSs are summarized in Table 5-1. Traffic volumes are shown in Figure 5-1 and Figure 5-2, and LOSs and lane configurations are shown in Figure 5-3 and Figure 5-4. Detailed Synchro reports are in Attachment C.

Based on the Synchro signalized intersection and unsignalized intersection analysis results, all study area intersections would operate at overall acceptable conditions during the a.m. and p.m. hours except the following intersections:

- **Shift 1 p.m.:** SR 3 and Sam Christopherson Avenue intersection (Int #9) would operate at LOS E
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS E

Table 5-1 Intersection Analysis For Existing (2023) Conditions

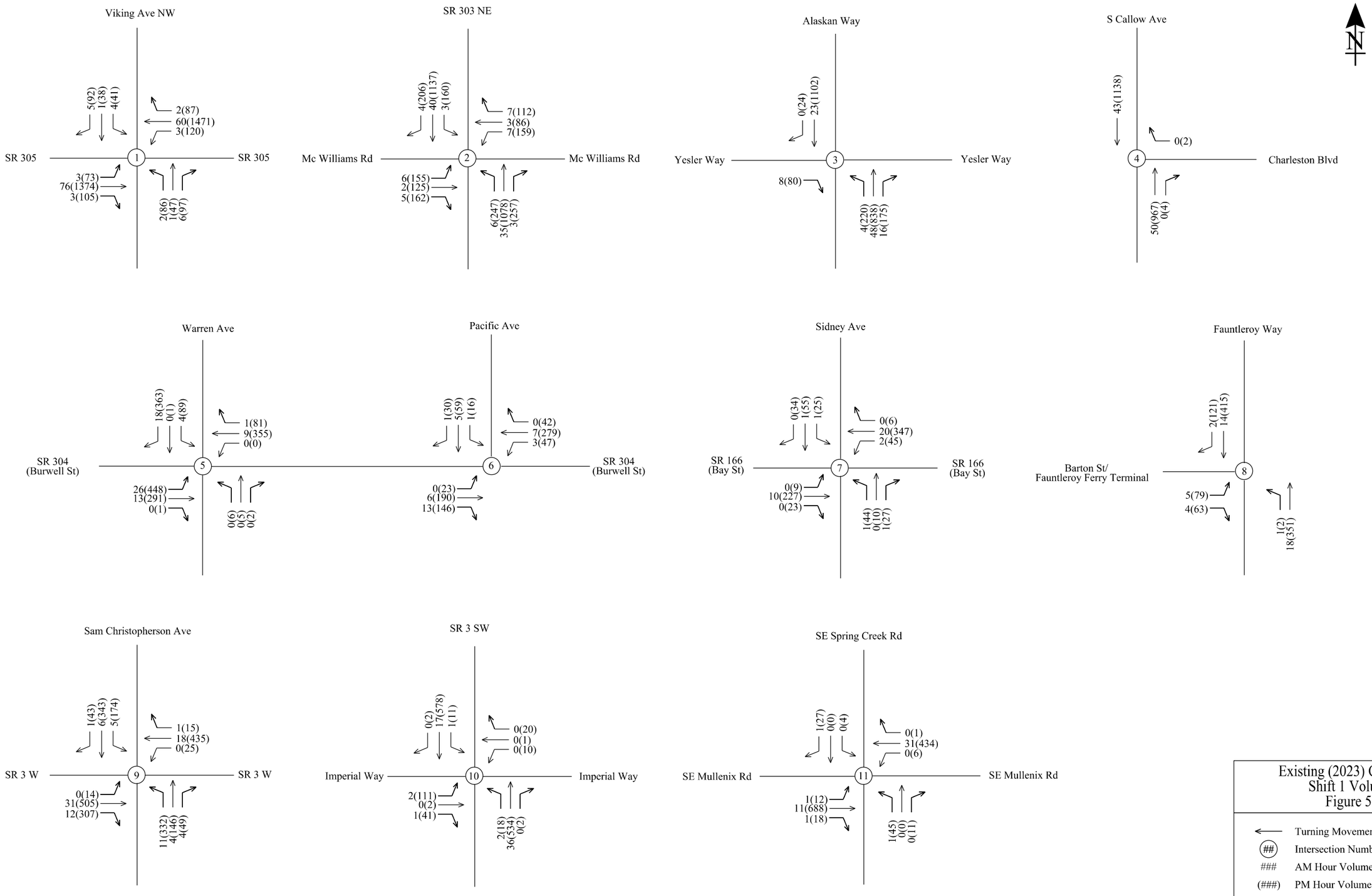
ID	Intersection	Control	Existing (2023) Conditions – Shift 1				Existing (2023) Conditions – Shift 2			
			a.m.		p.m.		a.m.		p.m.	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	Viking Ave NW and SR 305	Signalized[1]	11.4	B	26.3	C	18.7	B	18.9	B
2	SR 303 and NE McWilliams Rd	Signalized	24.2	C	45.4	D	30.5	C	31.9	C
3	Alaskan Way and Yesler Way	Signalized[1]	3.0	A	6.5	A	5.3	A	5.2	A
4	Charleston Blvd and S Callow Ave	TWSC[2]	0.0	A	12.0	B	14.6	B	10.4	B
5	Burwell St and Warren Ave	Signalized	12.5	B	32.6	C	19.2	B	24.5	C
6	Burwell St and Pacific Ave	Signalized	6.8	A	6.2	A	7.5	A	5.5	A
7	SR 166 and Sidney Ave	Signalized	7.6	A	14.2	B	10.8	B	12.4	B
8	SW Barton St and Fauntleroy Way	TWSC[2]	8.7	A	21.5	C	15.4	C	14.1	B
9	Sam Christopherson Ave and SR 3 W	Signalized	11.3	B	67.2	**E**	22.4	C	23.7	C
10	Imperial Way and SR 3 W	Signalized	6.3	A	11.3	B	9.1	A	9.9	A
11	SE Spring Creek Rd and SE Mullenix Rd	TWSC[2]	8.8	A	39.2	**E**	16.2	C	17.5	C

Note: **Bold and shaded** value denotes intersection LOS at unacceptable conditions.

Legend: Ave = Avenue; ID = identification; LOS = Level of Service; NE = Northeast; NW = Northwest; Rd = Road; sec/veh = seconds per vehicle; SR = State Route; St = Street; SW = Southwest; TWSC = Two-way STOP-Controlled unsignalized intersection; W = West.

[1] Highway Capacity Software 2000 results.

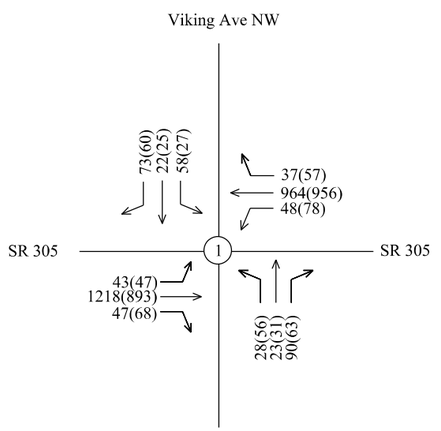
[2] The worst movement delay is reported for LOS.

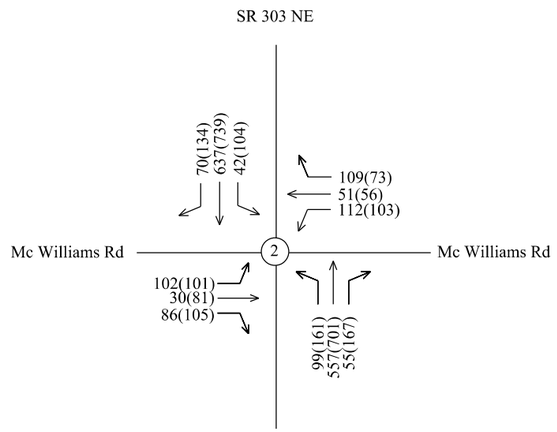


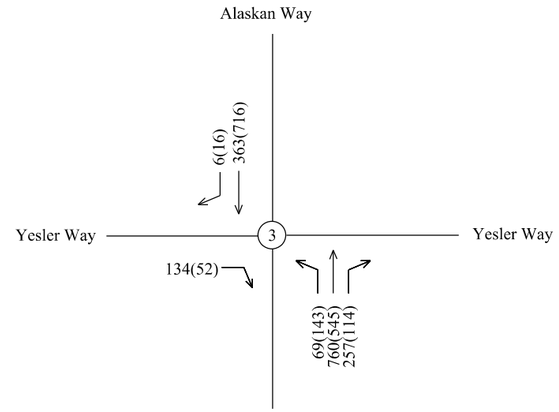
Existing (2023) Conditions
Shift 1 Volumes
Figure 5-1

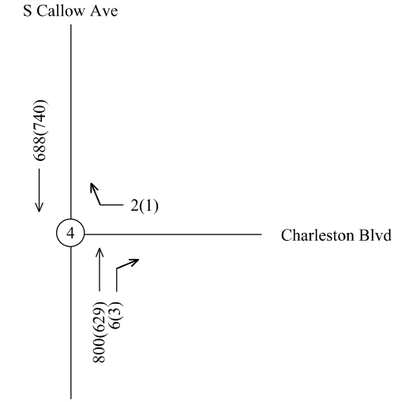
← Turning Movement
(##) Intersection Number
AM Hour Volumes
(###) PM Hour Volumes

AECOM

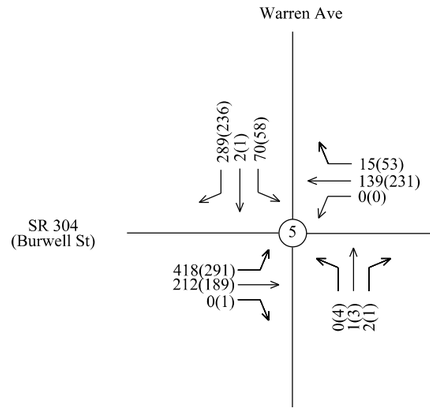


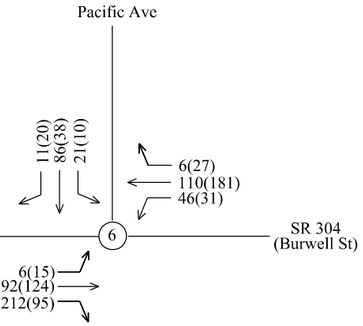


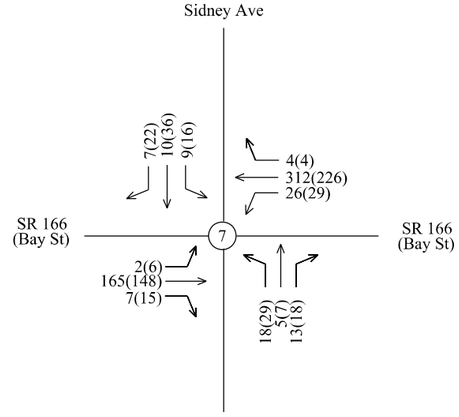


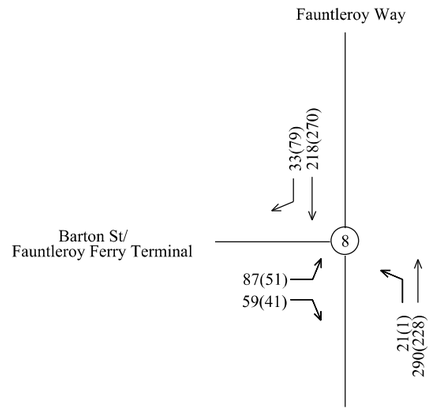


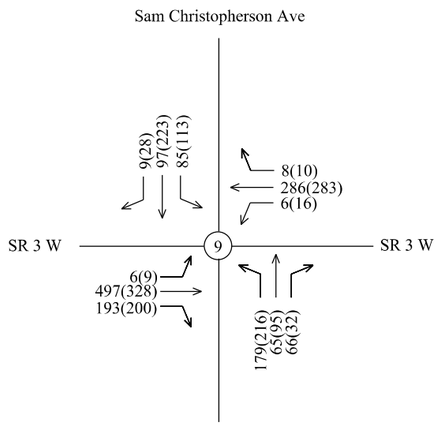


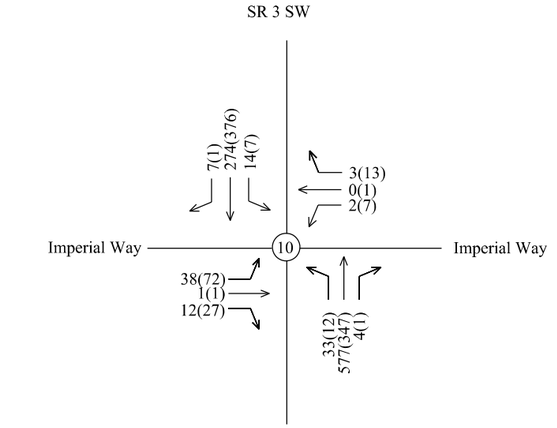


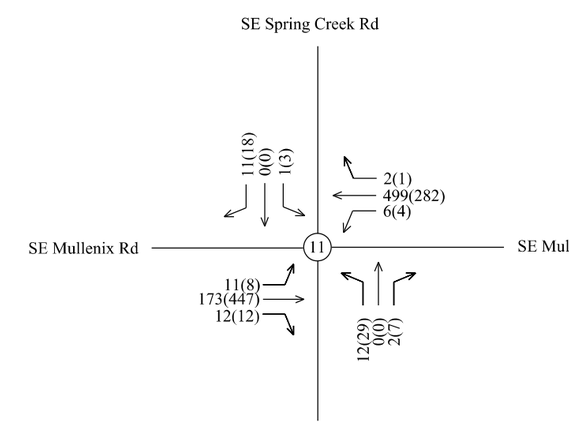












Existing (2023) Conditions
Shift 2 Volumes
Figure 5-2

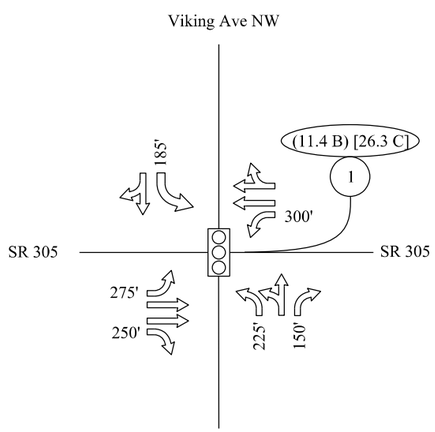
← Turning Movement

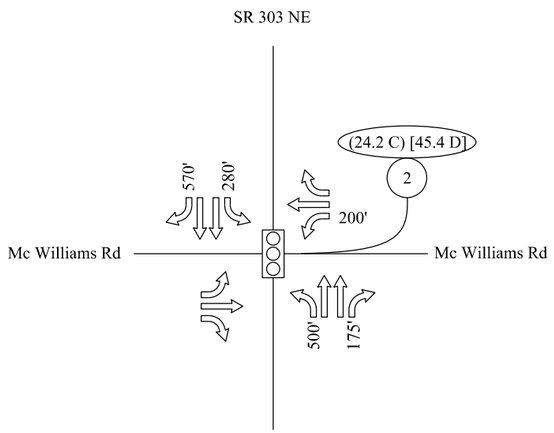
(##) Intersection Number

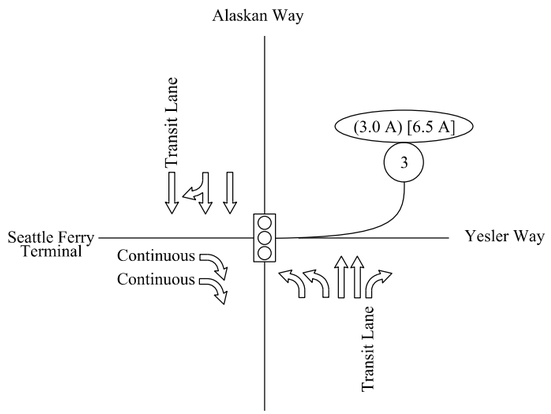
AM Hour Volumes

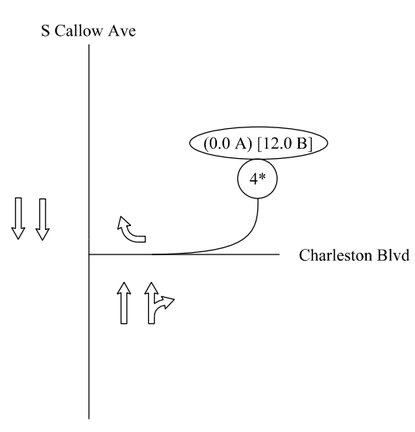
(###) PM Hour Volumes

AECOM

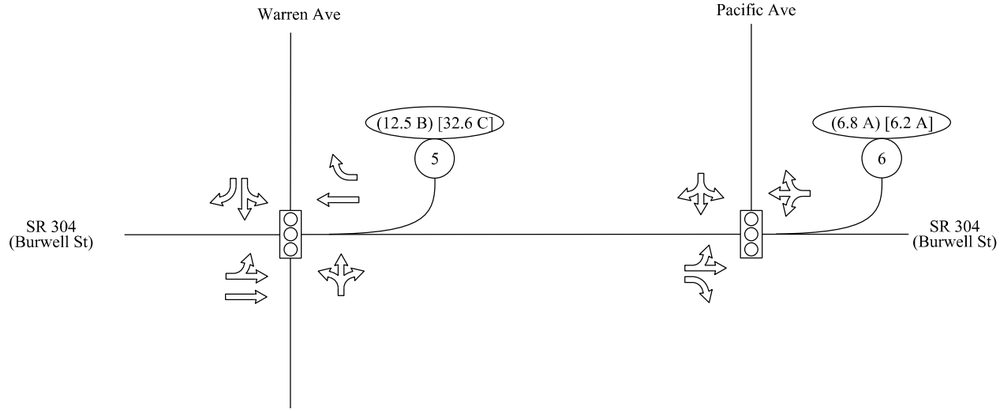


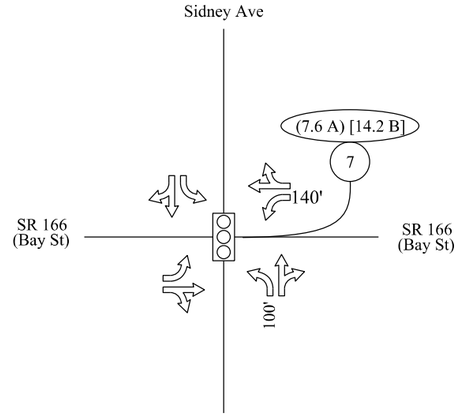


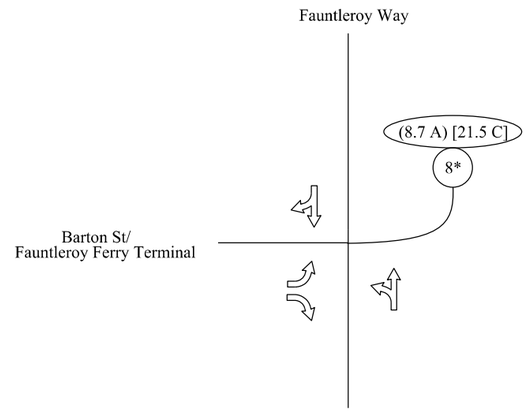


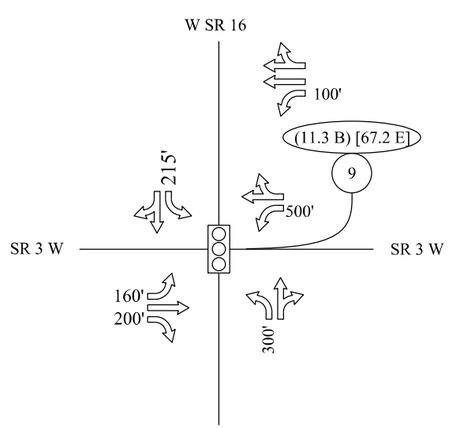


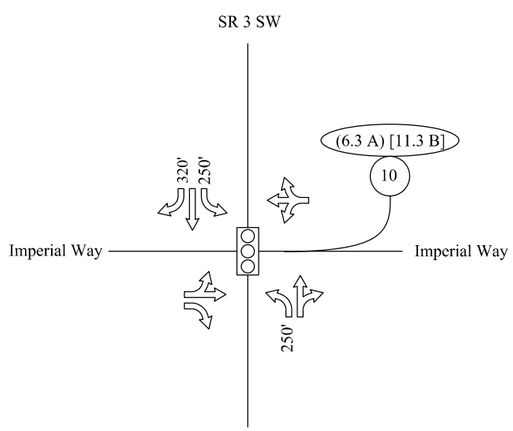


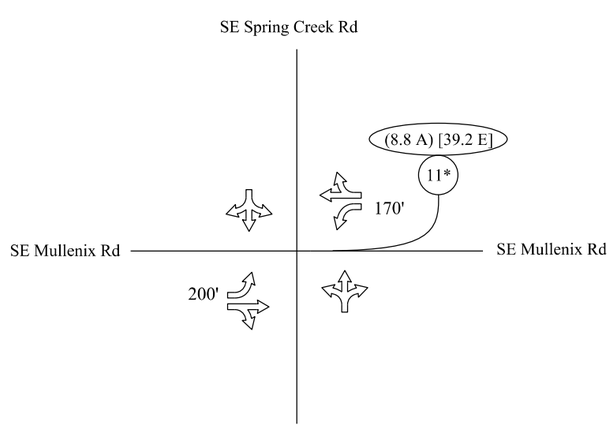












Existing (2023) Conditions
Shift 1 - LOS and Laneage
Figure 5-3

Existing Laneage

(##) Intersection Number

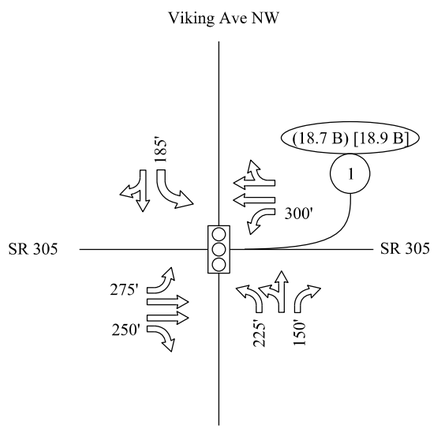
(##X)[##X] Intersection AM and PM Delay and LOS

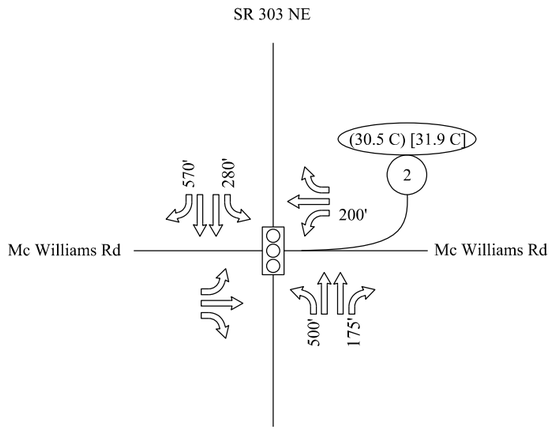
###' Storage

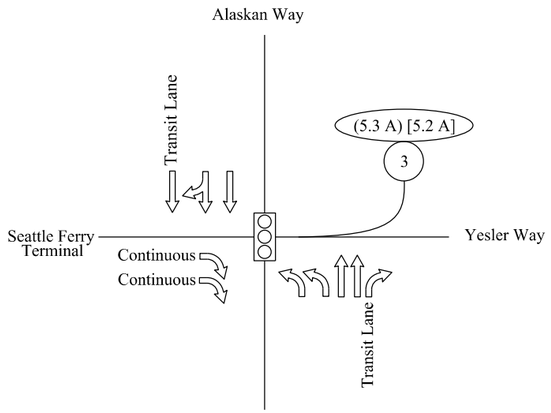
Existing Signal

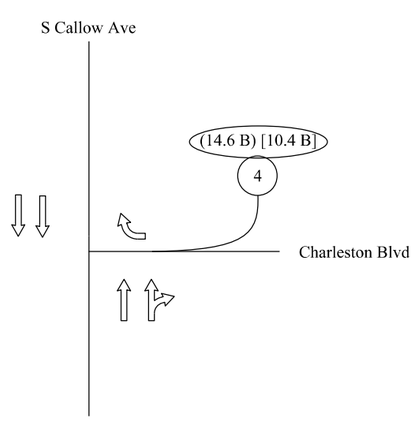
AECOM

NOTE:
* - STOP CONTROLLED INTERSECTION; THE WORST MOVEMENT DELAY REPORTED FOR LOS.

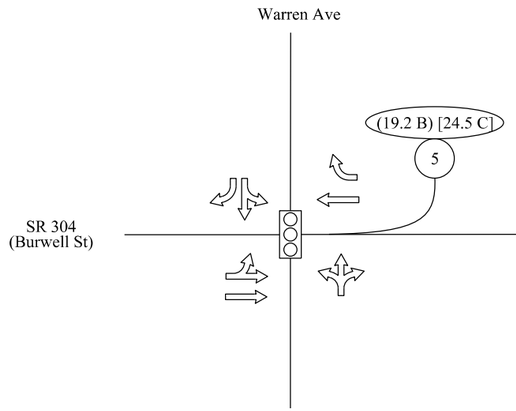


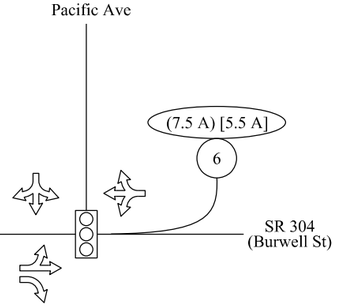


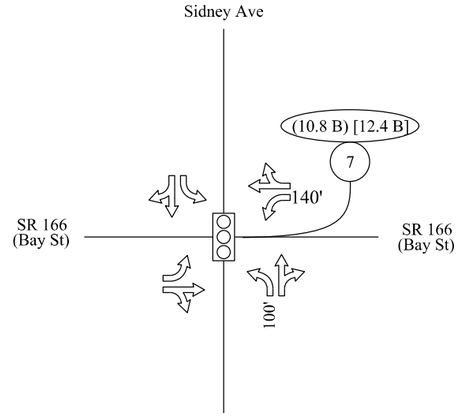


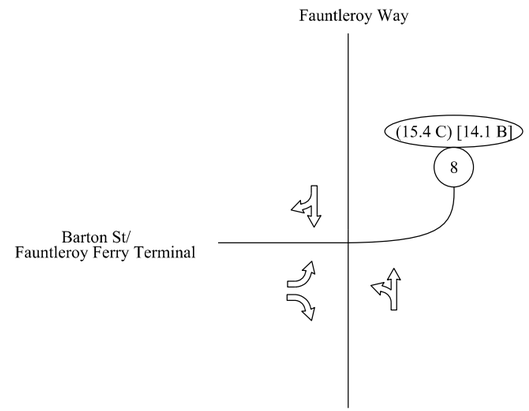


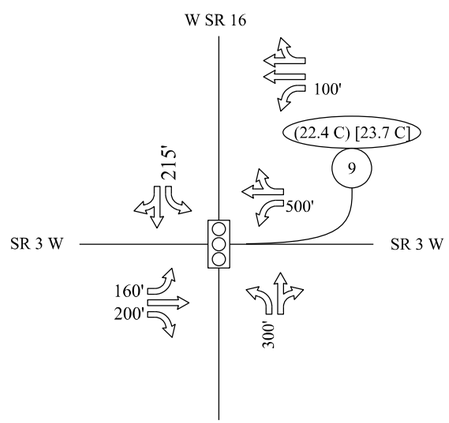


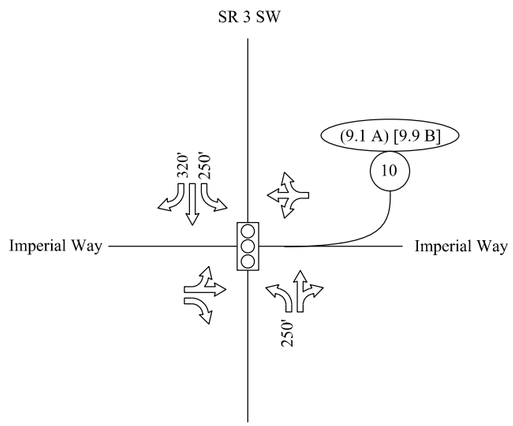


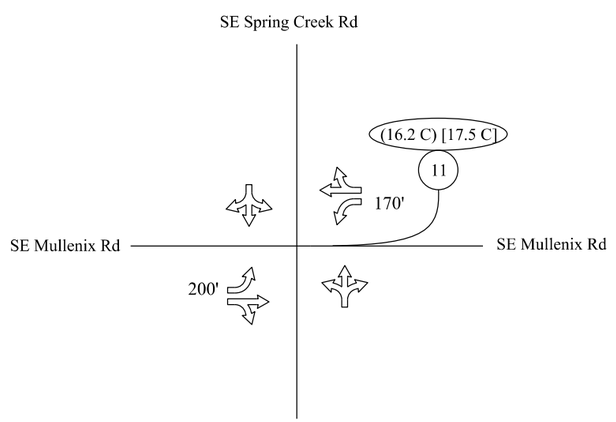












Existing (2023) Conditions
Shift 2 - LOS and Laneage
Figure 5-4

Existing Laneage
Intersection Number
(##X)[##X] Intersection AM and PM Delay and LOS
###' Storage
Existing Signal

AECOM

NOTE:
* - STOP CONTROLLED INTERSECTION; THE WORST MOVEMENT DELAY REPORTED FOR LOS.

5.2 2030 No Build

A capacity analysis was performed for the 2030 No Build scenario in both Shift 1 and Shift 2 for all the study intersections. The No-Build scenario assumes that the local transportation system would evolve as currently planned, but without the implementation of the proposed project. LOSs are summarized in Table 5-2. Traffic volumes are shown in Figure 5-5 and Figure 5-6, and LOSs and lane configurations are shown in Figure 5-7 and Figure 5-8. Detailed Synchro reports are in Attachment D.

Based on the Synchro signalized intersection and unsignalized intersection analysis results, all study area intersections would operate at overall acceptable conditions during the a.m. and p.m. hours except the following intersections:

- **Shift 1 p.m.:** SR 3 and Sam Christopherson Avenue intersection (Int #9) at LOS F
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS F

Table 5-2 Intersection Analysis For No Build (2030) Conditions

ID	Intersection	Control	No Build Conditions (2030) – Shift 1				No Build Conditions (2030) – Shift 2			
			a.m.		p.m.		a.m.		p.m.	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	Viking Ave NW and SR 305	Signalized[1]	11.0	B	29.5	C	19.5	B	19.6	B
2	SR 303 and NE McWilliams Rd	Signalized	23.7	C	48.0	D	30.9	C	32.6	C
3	Alaskan Way and Yesler Way	Signalized[1]	3.0	A	6.6	A	5.4	A	5.2	A
4	Charleston Blvd and S Callow Ave	TWSC[2]	0.0	A	12.6	B	15.5	C	10.7	B
5	Burwell St and Warren Ave	Signalized	12.3	B	35.7	D	20.3	C	25.7	C
6	Burwell St and Pacific Ave	Signalized	6.6	A	6.3	A	7.6	A	5.6	A
7	SR 166 and Sidney Ave	Signalized	7.5	A	14.4	B	10.8	B	12.5	B
8	SW Barton St and Fauntleroy Way	TWSC[2]	8.7	A	27.7	D	17.7	C	15.6	C
9	Sam Christopherson Ave and SR 3 W	Signalized	11.2	B	85.9	**F**	24.0	C	25.7	C
10	Imperial Way and SR 3 W	Signalized	6.2	A	11.5	B	9.2	A	10.2	B
11	SE Spring Creek Rd and SE Mullenix Rd	TWSC[2]	8.8	A	68.2	**F**	18.9	C	20.8	C

Note: **Bold and shaded** value denotes intersection LOS at unacceptable conditions.

Legend: Ave = Avenue; ID = identification; LOS = Level of Service; NE = Northeast; NW = Northwest; Rd = Road; sec/veh = seconds per vehicle; SR = State Route; St = Street; SW = Southwest; TWSC = Two-way STOP-Controlled unsignalized intersection; W = West.

[1] Highway Capacity Software 2000 results.

[2] The worst movement delay is reported for LOS.

No Build (2030) Conditions
Shift 1 Volumes
Figure 5-5

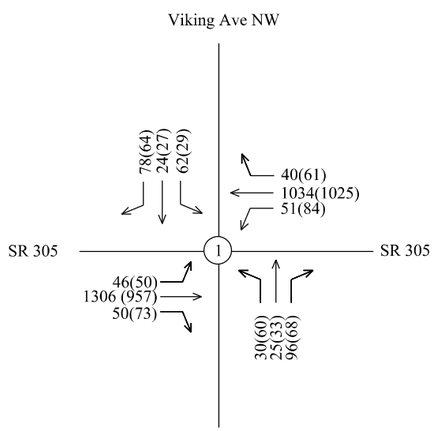
← Turning Movement

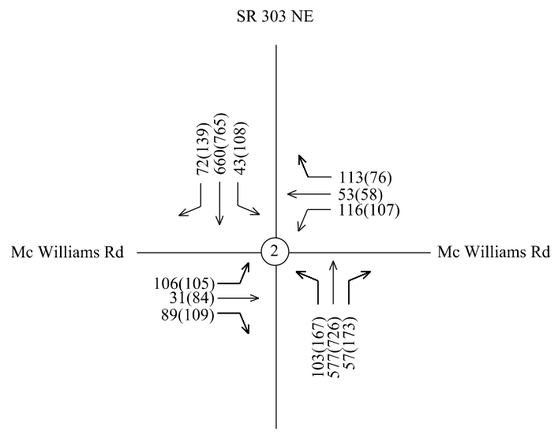
(##) Intersection Number

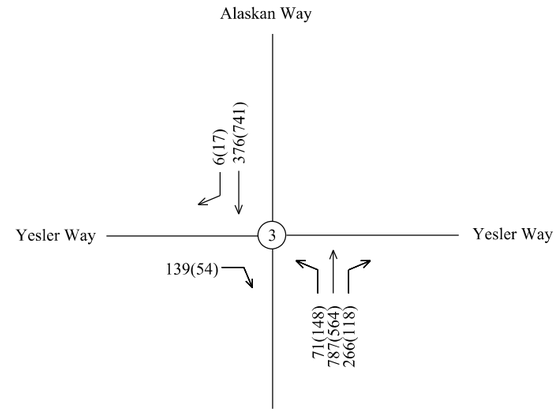
AM Hour Volumes

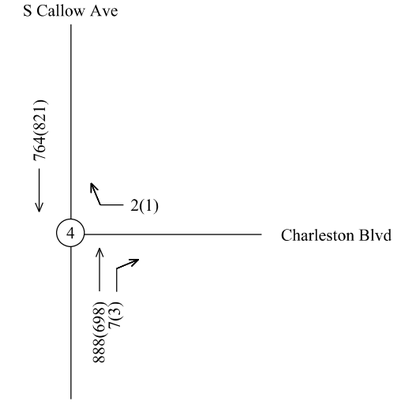
(###) PM Hour Volumes

AECOM

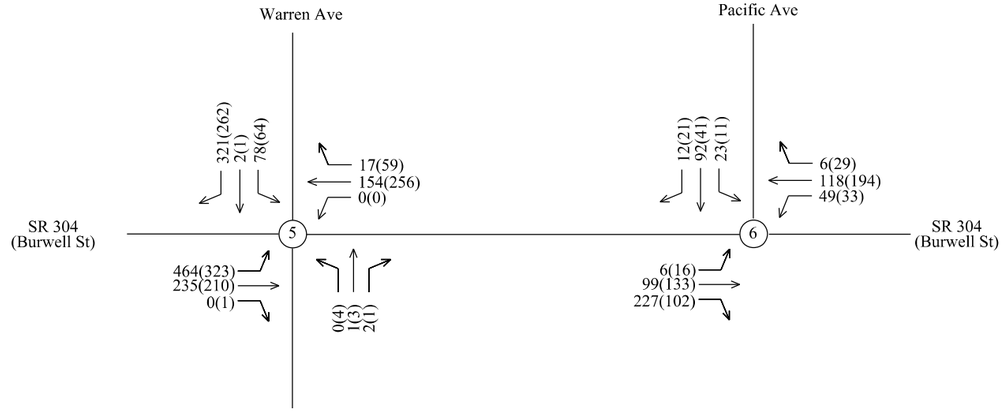


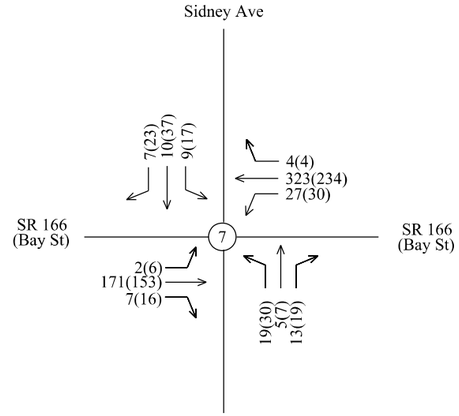


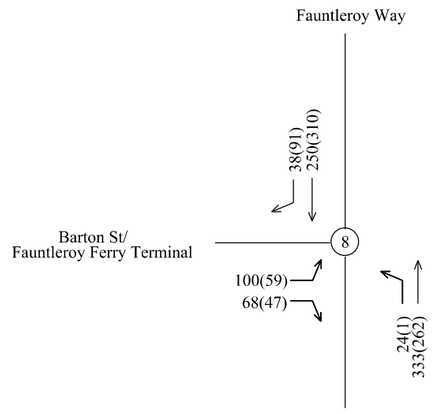


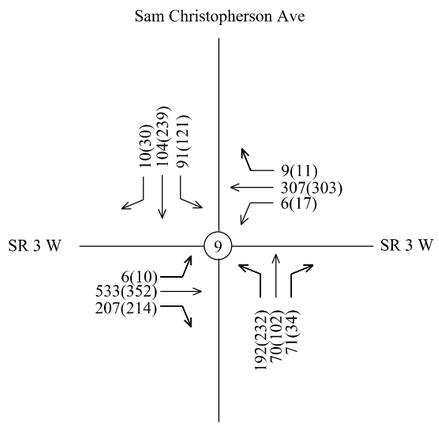


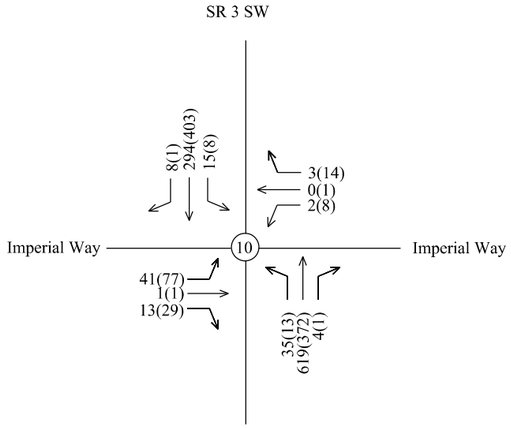


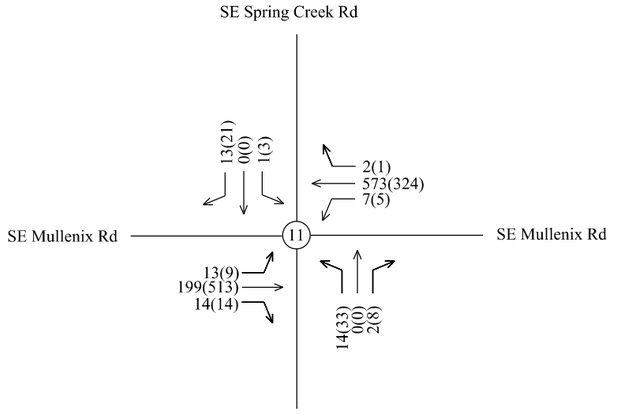








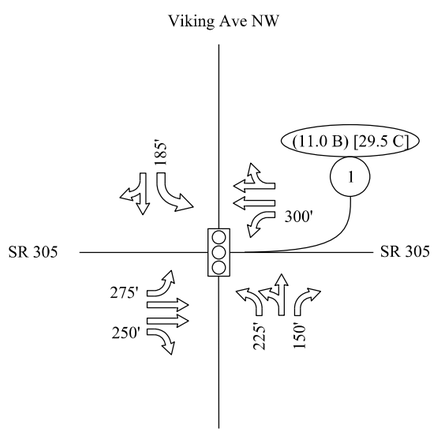


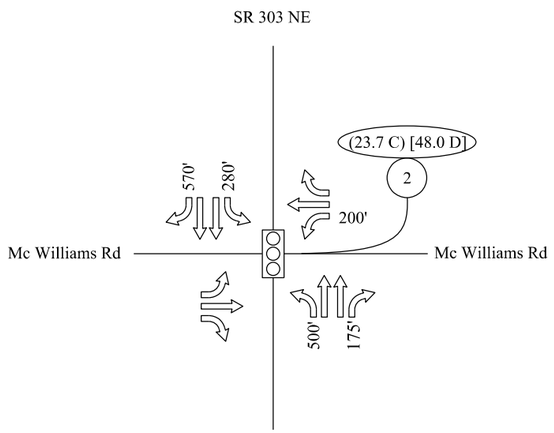


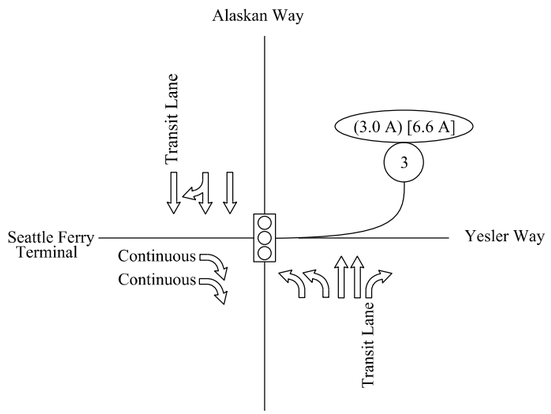
No Build (2030) Conditions
Shift 2 Volumes
Figure 5-6

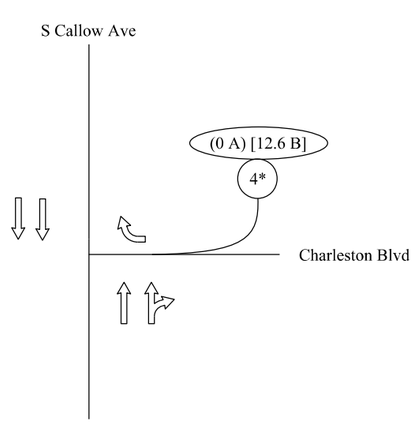
←	Turning Movement
(##)	Intersection Number
###	AM Hour Volumes
(###)	PM Hour Volumes

AECOM

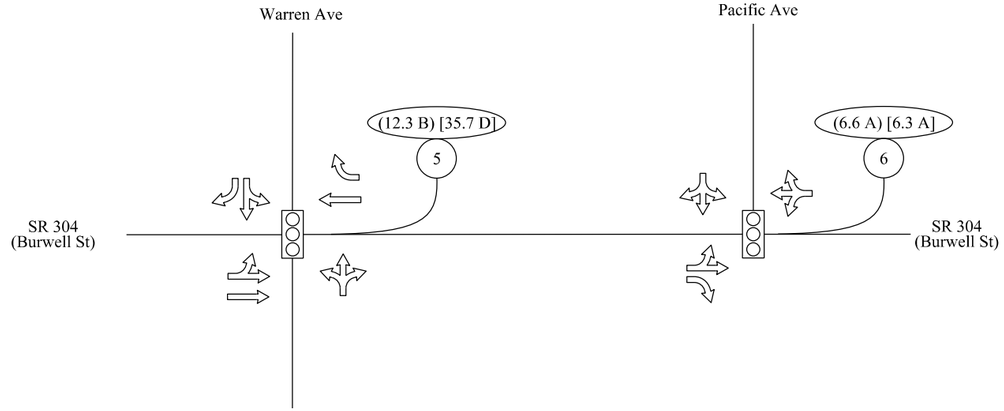


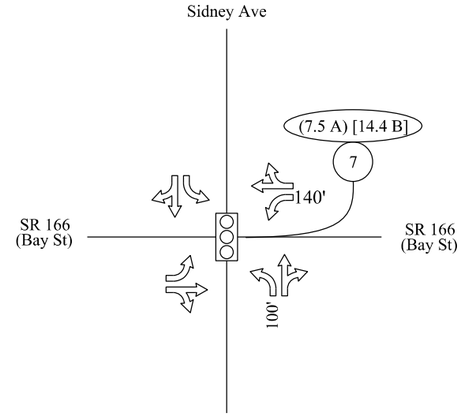


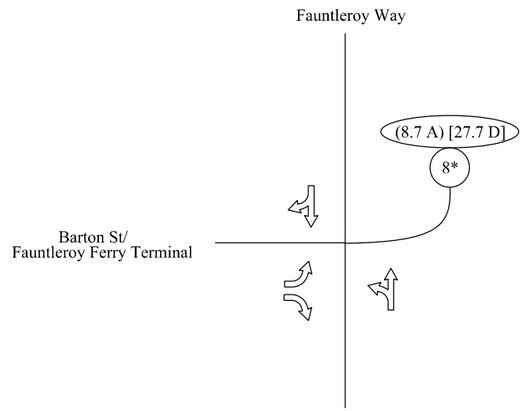


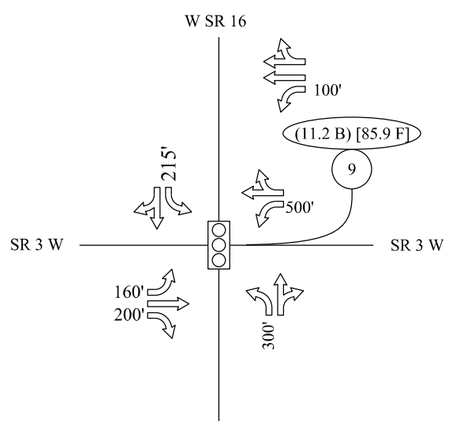


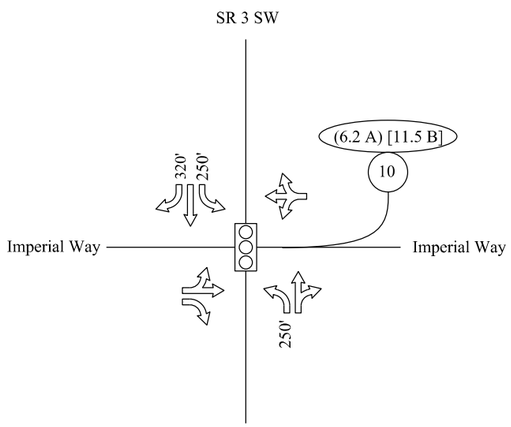


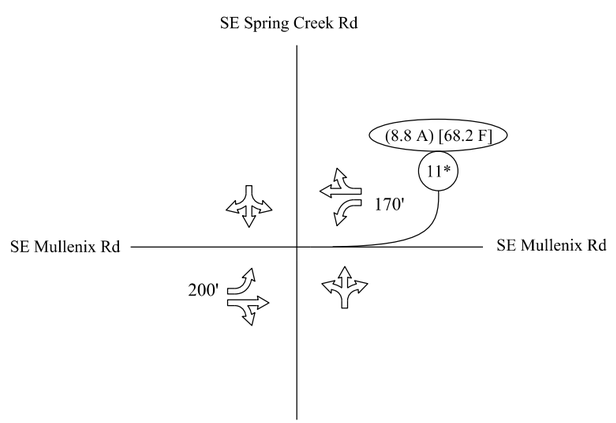












No Build (2030) Conditions
Shift 1 - LOS and Laneage
Figure 5-7

Existing Laneage

(##) Intersection Number

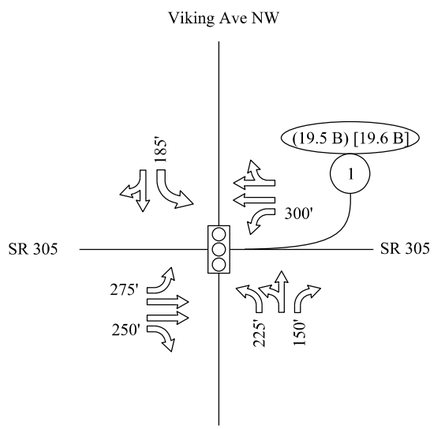
(##X)[##X] Intersection AM and PM Delay and LOS

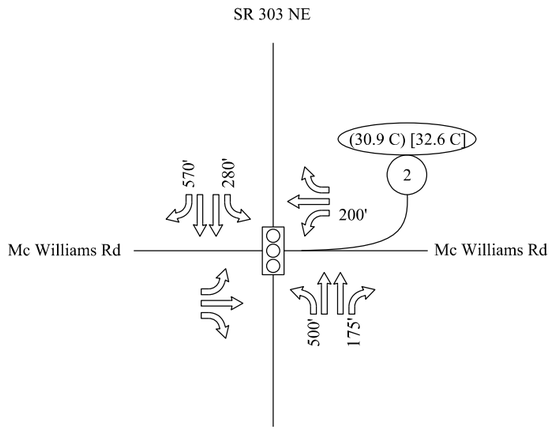
###' Storage

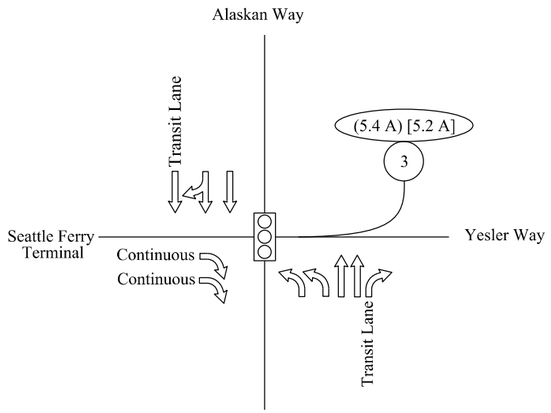
Existing Signal

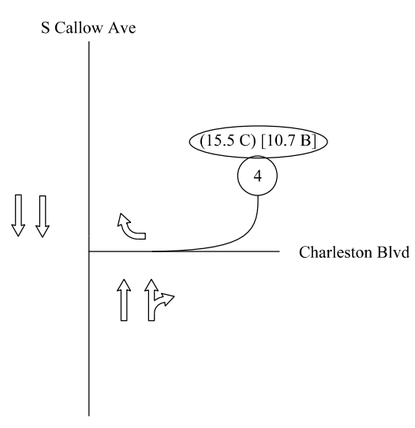
AECOM

NOTE:
* - STOP CONTROLLED INTERSECTION; THE WORST MOVEMENT DELAY REPORTED FOR LOS.

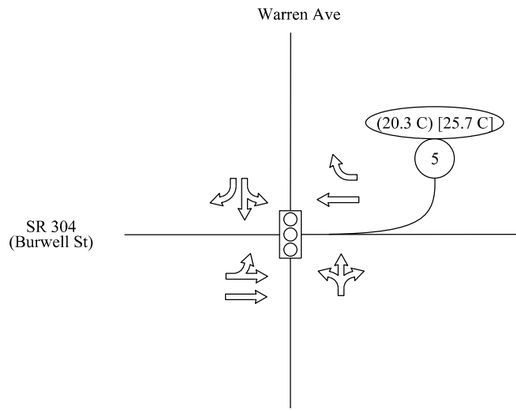


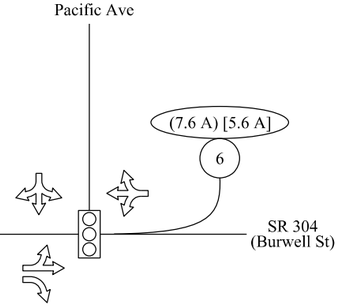


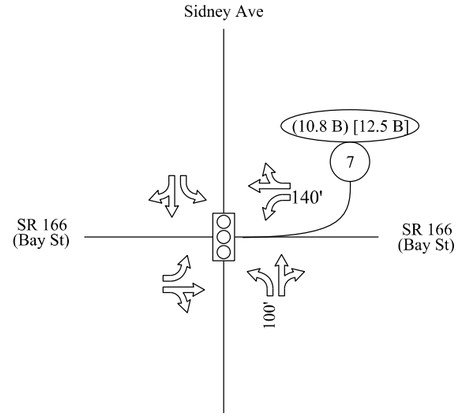


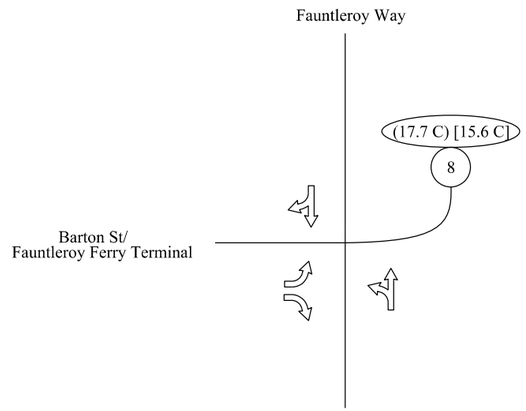


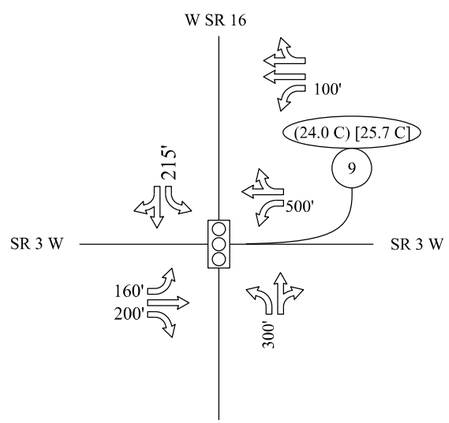


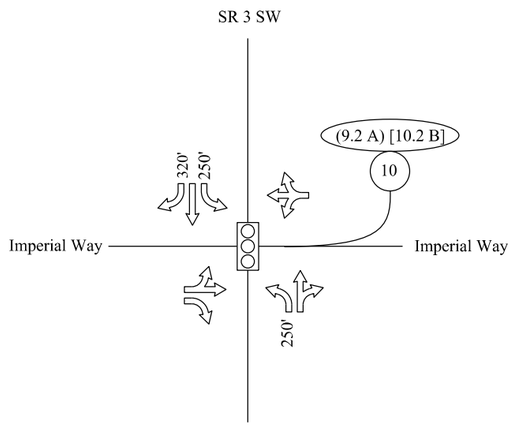


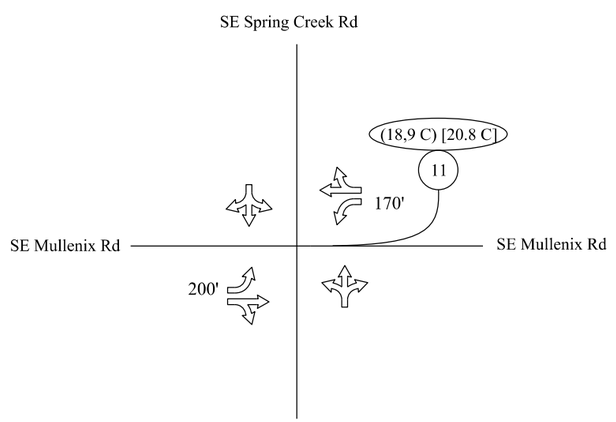












No Build (2030) Conditions
Shift 2 - LOS and Laneage
Figure 5-8

Existing Laneage

(##) Intersection Number

(##X)[##X] Intersection AM and PM Delay and LOS

###' Storage

Existing Signal

AECOM

NOTE:
* - STOP CONTROLLED INTERSECTION; THE WORST MOVEMENT DELAY REPORTED FOR LOS.

5.3 2030 Build

A capacity analysis was performed for the 2030 Build scenario in both Shift 1 and Shift 2 for all study intersections. LOSs are summarized in Table 5-3. Traffic volumes are shown in Figure 5-9 and Figure 5-10, and LOSs and lane configurations are shown in Figure 5-11 and Figure 5-12. Detailed Synchro reports are summarized in Attachment E.

Based on the Synchro signalized intersection and unsignalized intersection analysis results, all study area intersections would operate at overall acceptable conditions during the a.m. and p.m. hours except the following intersections:

- **Shift 1 p.m.:** SR 3 and Sam Christopherson Avenue intersection (Int #9) at LOS F
- **Shift 1 p.m.:** SR 3 and Imperial Way intersection (Int #10) at LOS F
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS F
- **Shift 2 a.m.:** SR 3 and Sam Christopherson Avenue intersection (Int #9) at LOS F
- **Shift 2 p.m.:** SR 3 and Imperial Way intersection (Int #10) at LOS F

Table 5-3 Intersection Analysis For Build (2030) Conditions

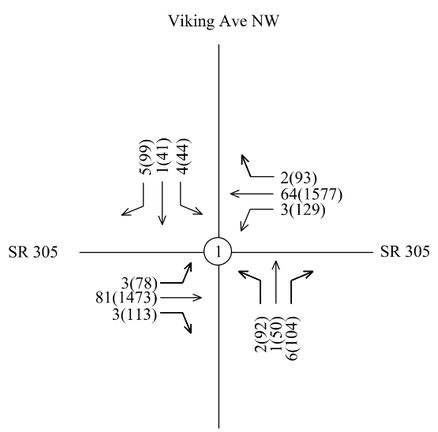
ID	Intersection	Control	Build Conditions (2030) – Shift 1				Build Conditions (2030) – Shift 2			
			a.m.		p.m.		a.m.		p.m.	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	Viking Ave NW and SR 305	Signalized[1]	11.0	B	29.5	C	21.3	C	22.2	C
2	SR 303 and NE McWilliams Rd	Signalized	23.7	C	48.0	D	31.0	C	32.9	C
3	Alaskan Way and Yesler Way	Signalized[1]	3.0	A	6.6	A	5.4	A	5.2	A
4	Charleston Blvd and S Callow Ave	TWSC[2]	0.0	A	12.6	B	16.0	C	10.8	B
5	Burwell St and Warren Ave	Signalized	17.3	B	36.2	D	21.5	C	26.2	C
6	Burwell St and Pacific Ave	Signalized	4.8	A	6.5	A	7.6	A	5.6	A
7	SR 166 and Sidney Ave	Signalized	12.5	B	15.9	B	13.5	B	14.6	B
8	SW Barton St and Fauntleroy Way	TWSC[2]	8.7	A	27.7	D	22.0	C	17.9	C
9	Sam Christopherson Ave and SR 3 W	Signalized	17.1	B	154.3	**F**	83.5	**F**	40.7	D
10	Imperial Way and SR 3 W	Signalized	9.6	A	381.6	**F**	10.4	B	135.8	**F**
11	SE Spring Creek Rd and SE Mullenix Rd	TWSC[2]	8.8	A	68.2	**F**	19.5	C	21.7	C

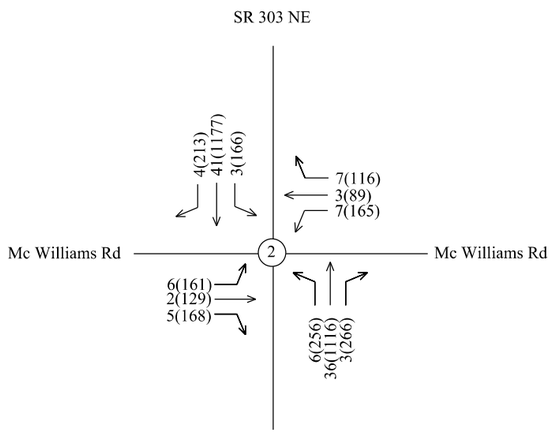
Note: **Bold and shaded** value denotes intersection LOS at unacceptable conditions.

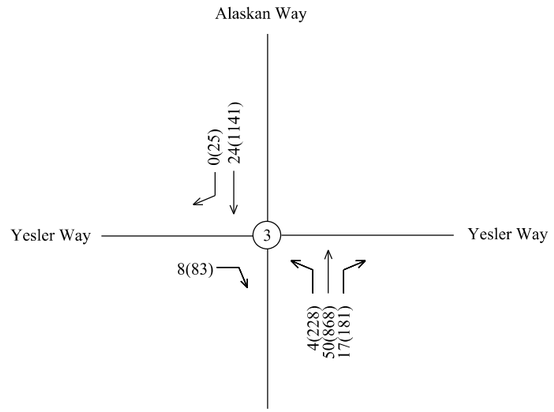
Legend: Ave = Avenue; ID = identification; LOS = Level of Service; NE = Northeast; NW = Northwest; Rd = Road; sec/veh = seconds per vehicle; SR = State Route; St = Street; SW = Southwest; TWSC = Two-way STOP-Controlled unsignalized intersection; W = West.

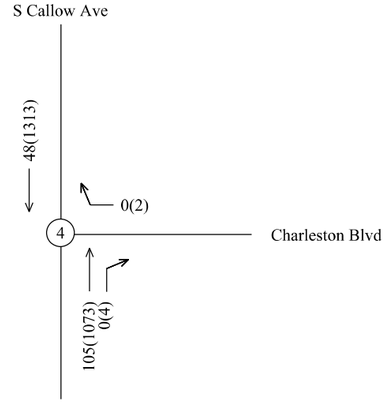
[1] Highway Capacity Software 2000 results.

[2] The worst movement delay is reported for LOS.

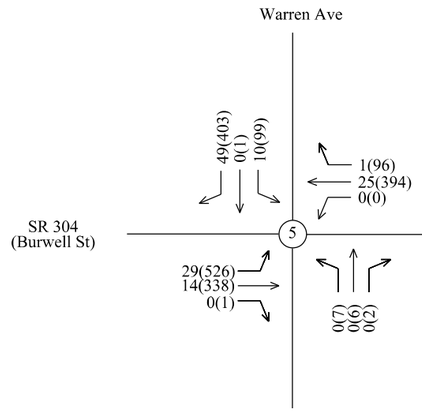


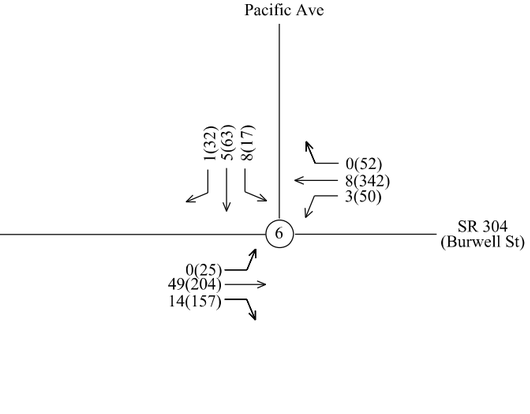


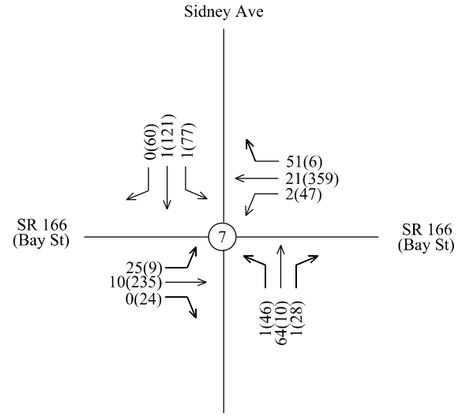


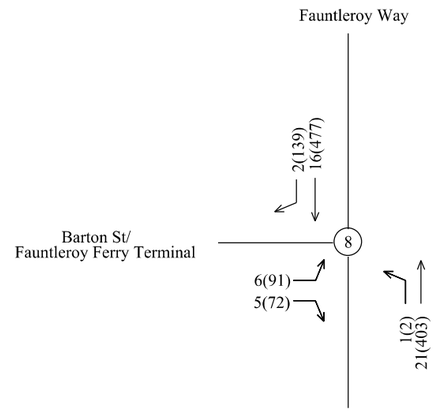


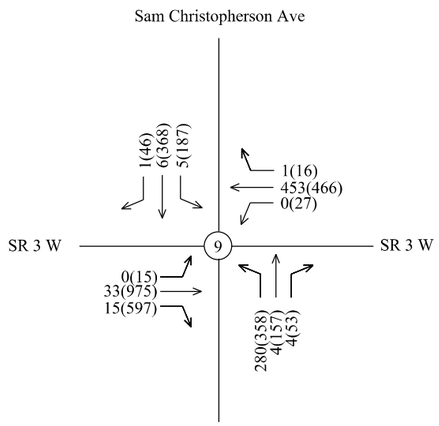


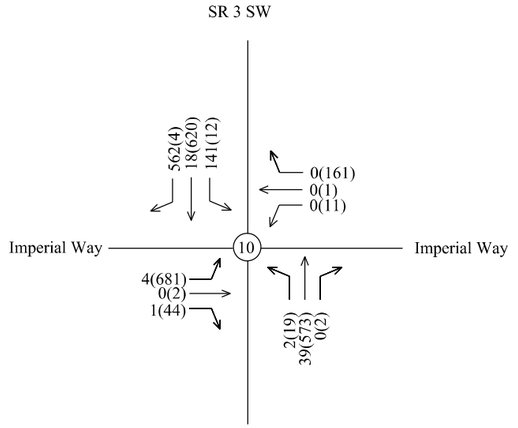


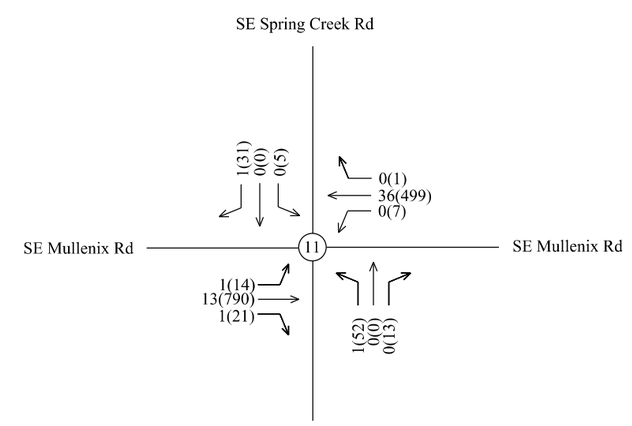








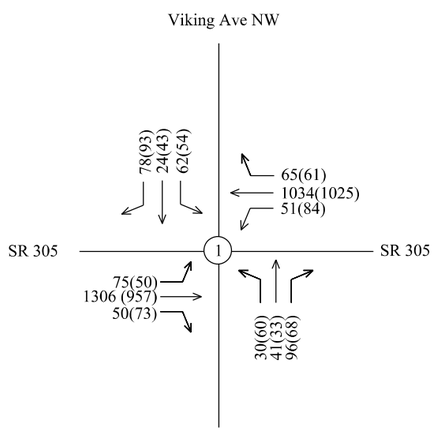


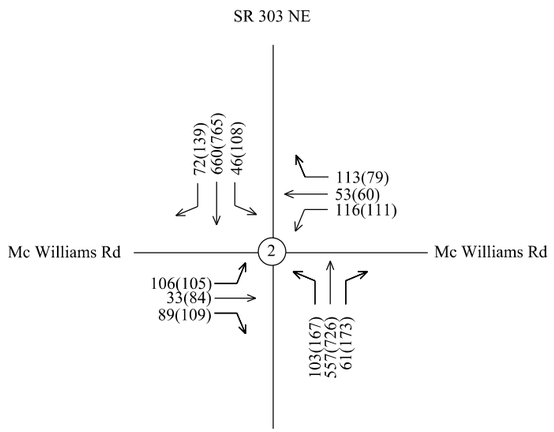


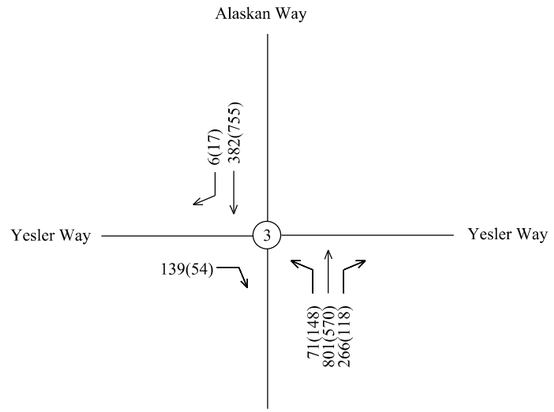
Build (2030) Conditions
Shift 1 Volumes
Figure 5-9

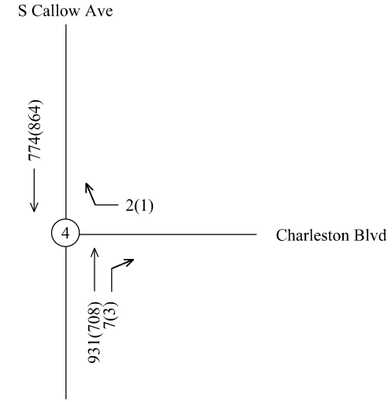
←	Turning Movement
(##)	Intersection Number
###	AM Hour Volumes
(###)	PM Hour Volumes

AECOM

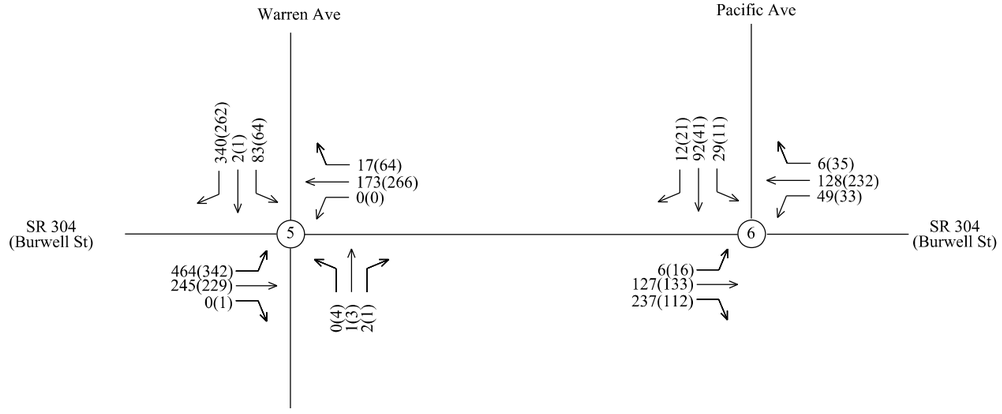


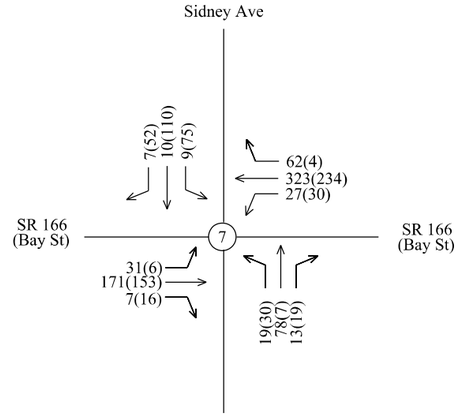


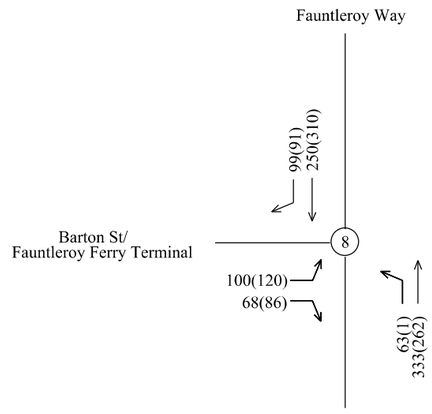


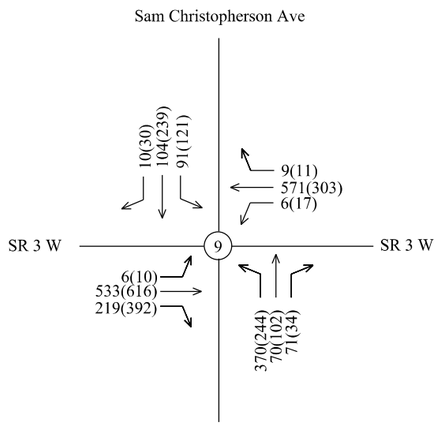


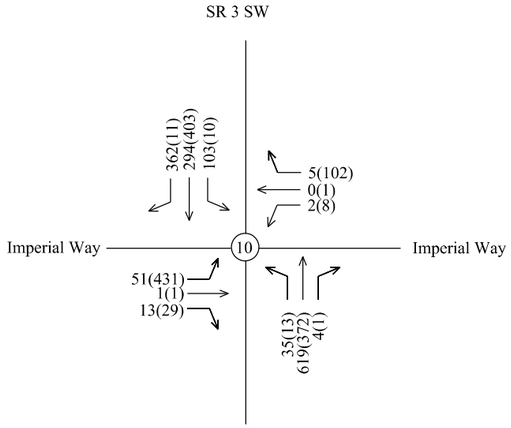


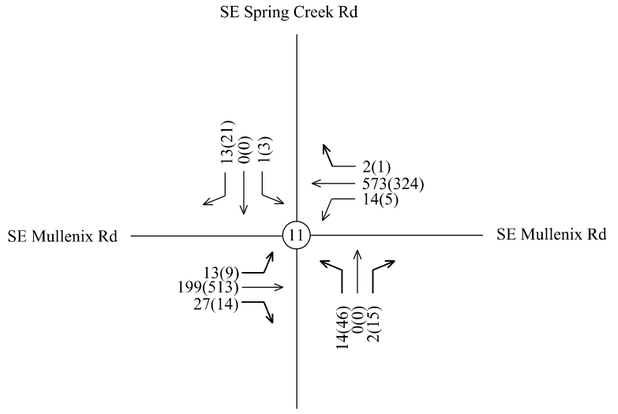








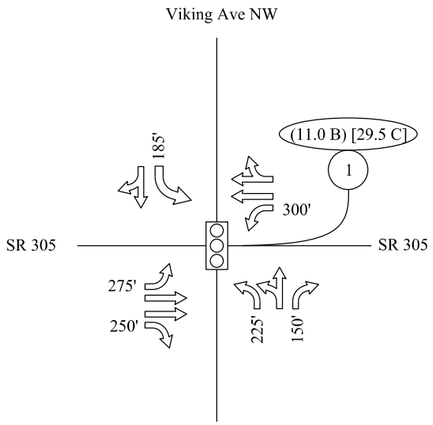


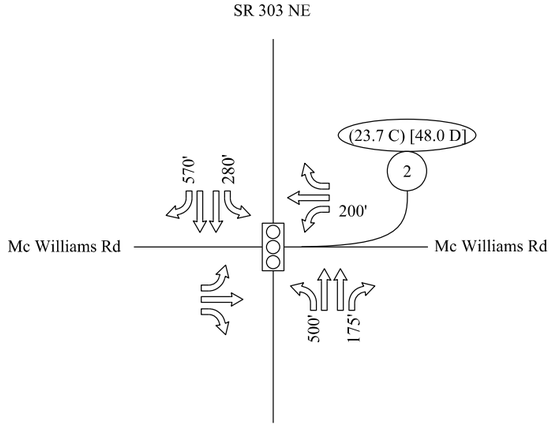


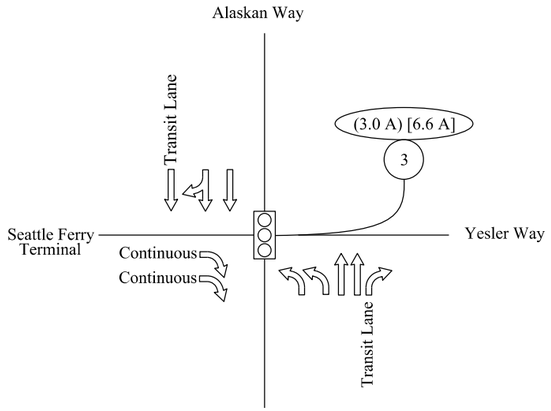
Build (2030) Conditions
Shift 2 Volumes
Figure 5-10

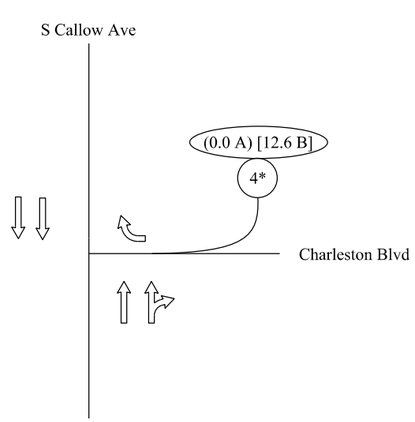
←	Turning Movement
(##)	Intersection Number
###	AM Hour Volumes
(###)	PM Hour Volumes

AECOM

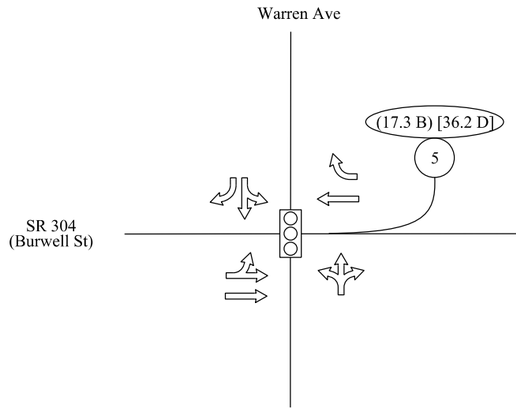


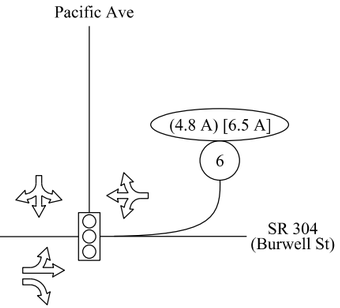


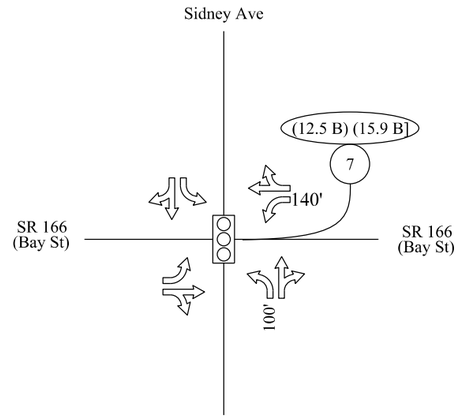


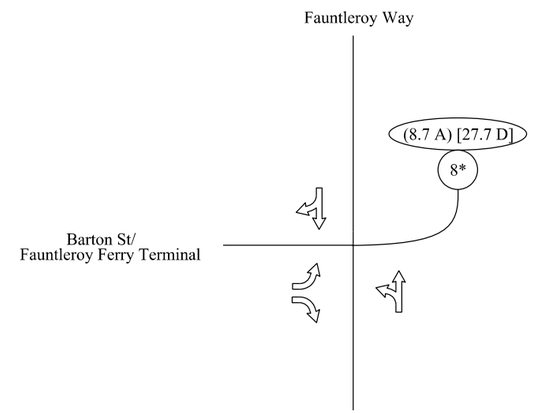


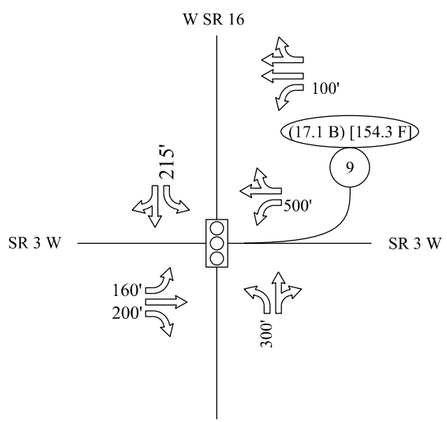


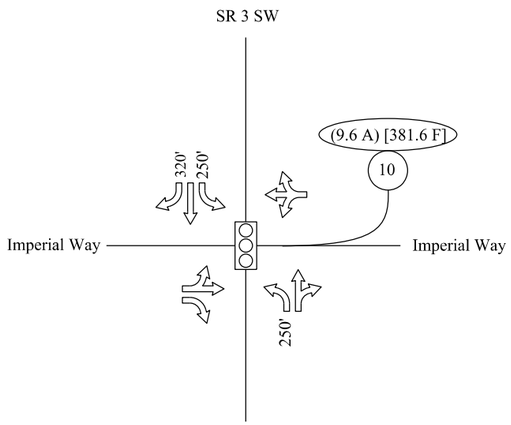


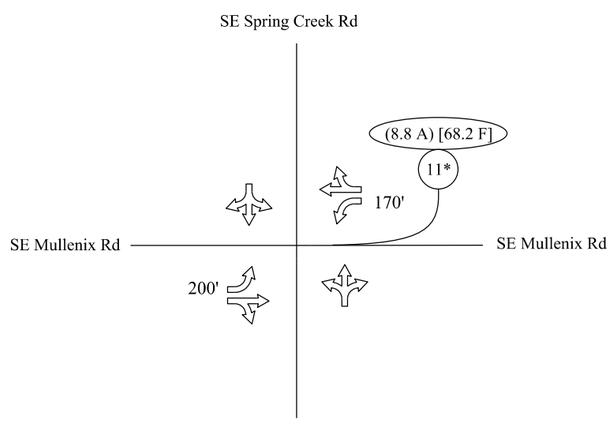












Build (2030) Conditions
Shift 1 - LOS and Laneage
Figure 5-11

Existing Laneage

(##) Intersection Number

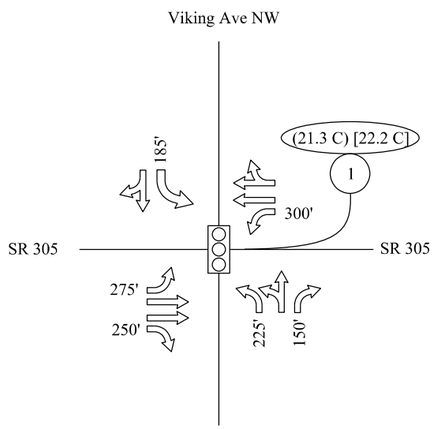
(##X)[##X] Intersection AM and PM Delay and LOS

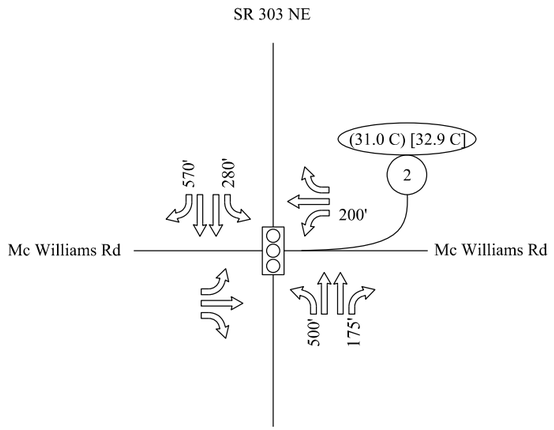
###' Storage

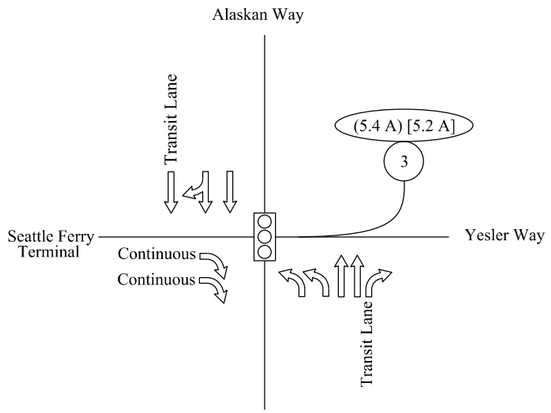
Existing Signal

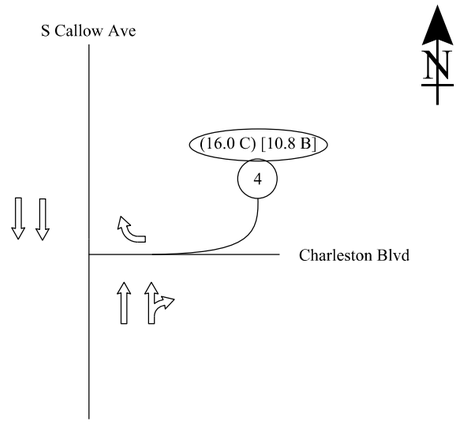
AECOM

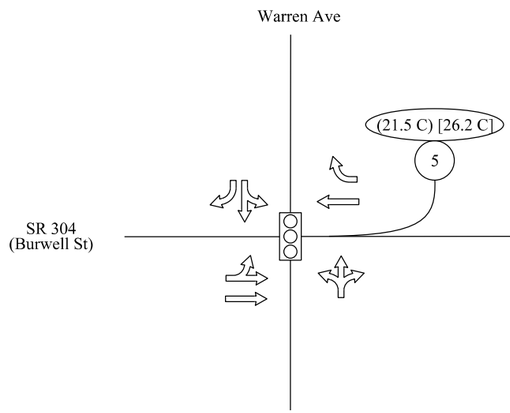
NOTE:
* - STOP CONTROLLED INTERSECTION; THE WORST MOVEMENT DELAY REPORTED FOR LOS.

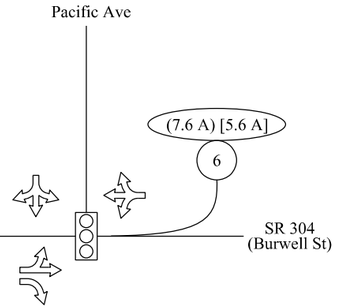


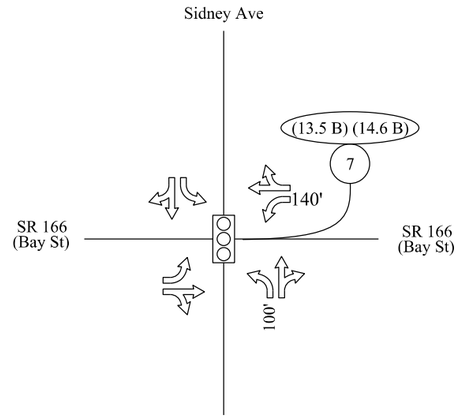


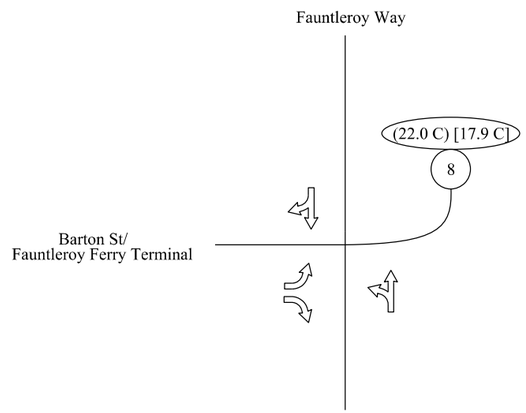


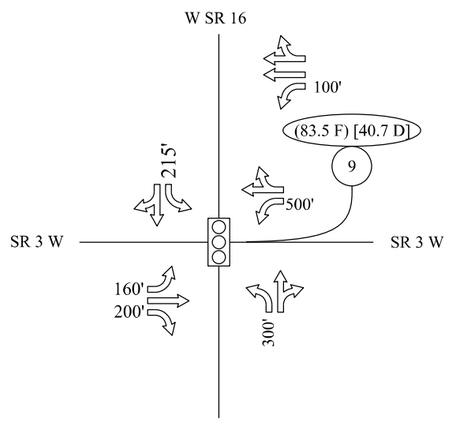


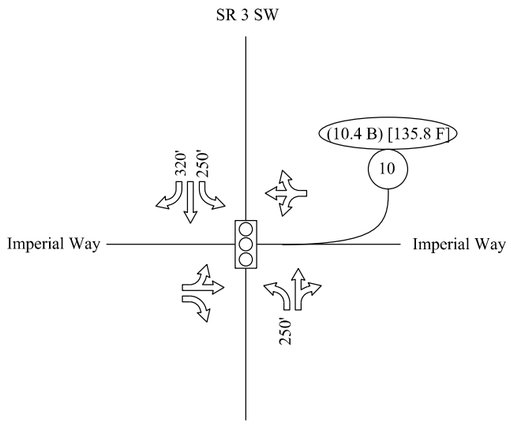


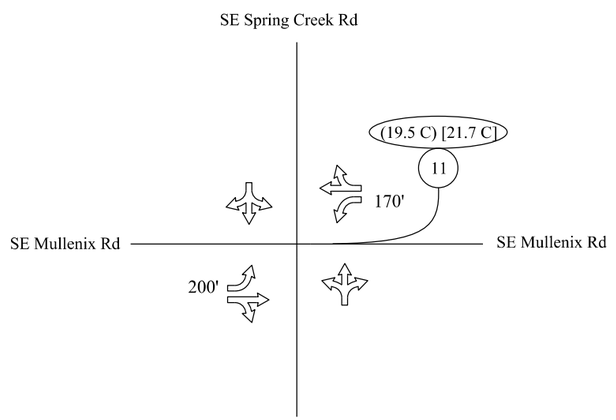












Build (2030) Conditions
Shift 2 - LOS and Laneage
Figure 5-12

Existing Laneage

(##) Intersection Number

(##X)[##X] Intersection AM and PM Delay and LOS

###' Storage

Existing Signal

AECOM

NOTE:
* - STOP CONTROLLED INTERSECTION; THE WORST MOVEMENT DELAY REPORTED FOR LOS.

5.4 Deficiencies and Improvements

Deficiencies will be identified by LOSs. According to the transportation appendix of the City of Bremerton 2016 Comprehensive Plan, the City has a LOS standard of LOS E or better (acceptable LOS), except along routes that are a WSDOT Highway of Statewide Significance.

As shown in Table 5-4 and Table 5-5, with the project, all intersections are anticipated to operate at an acceptable LOS during the peak hours, except the following intersections:

- **Shift 1 p.m.:** SR 3 at Sam Christopherson Avenue intersection (Int #9) at LOS F related to additional project trips on eastbound through movement.
- **Shift 1 p.m.:** SR 3 at Imperial Way intersection (Int #10) at LOS F related to additional project trips on eastbound left turn movement.
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS F related to the projected traffic growth.
- **Shift 2 a.m.:** SR 3 at Sam Christopherson Avenue intersection (Int #9) at LOS F related to additional project trips on northbound left turn and westbound through movements.
- **Shift 2 p.m.:** SR 3 at Imperial Way intersection (Int #10) at LOS F related to additional project trips on southbound movements.

As shown in Table 5-6 with recommended improvements listed below, these intersections anticipated to operate at unacceptable LOS can be improved to acceptable levels:

- SR 3 and Sam Christopherson Avenue intersection (Int #9) would operate at an acceptable LOS by restriping the intersection from northbound right lane to shared left/through/right lane (Sam Christopherson Avenue), adding one eastbound through lane, and changing signal timings. This would also require adding one receiving lane per approach change.
- SR 3 and Imperial Way intersection (Int #10) would operate at an acceptable LOS by restriping the intersection from eastbound right to shared left/through/right (Imperial Way) and changing signal timings. This would require adding one receiving lane to accommodate the eastbound change.

Table 5-4 Intersection Analysis For Shift 1 No Build and Build (2030) Conditions

ID	Intersection	Control	a.m.					p.m.				
			No Build		Build		Δ Delay (sec/veh)	No Build		Build		Δ Delay (sec/veh)
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	
1	Viking Ave NW and SR 305	Signalized[1]	11.0	B	11.0	B	0.0	29.5	C	29.5	C	0.0
2	SR 303 and NE McWilliams Rd	Signalized	23.7	C	23.7	C	0.0	48.0	D	48.0	D	0.0
3	Alaskan Way and Yesler Way	Signalized[1]	3.0	A	3.0	A	0.0	6.6	A	6.6	A	0.0
4	Charleston Blvd and S Callow Ave	TWSC[2]	0.0	A	0.0	A	0.0	12.6	B	12.6	B	0.0
5	Burwell St and Warren Ave	Signalized	12.3	B	17.3	B	5.0	35.7	D	36.2	D	0.5
6	Burwell St and Pacific Ave	Signalized	6.6	A	4.8	A	-1.8	6.3	A	6.5	A	0.2
7	SR 166 and Sidney Ave	Signalized	7.5	A	12.5	B	5.0	14.4	B	15.9	B	1.5
8	SW Barton St and Fauntleroy Way	TWSC[2]	8.7	A	8.7	A	0.0	27.7	D	27.7	D	0.0
9	Sam Christopherson Ave and SR 3 W	Signalized	11.2	B	17.1	B	5.9	85.9	**F**	154.3	**F**	68.4
10	Imperial Way and SR 3 W	Signalized	6.2	A	9.6	A	3.4	11.5	B	381.6	**F**	370.1
11	SE Spring Creek Rd and SE Mullenix Rd	TWSC[2]	8.8	A	8.8	A	0.0	68.2	**F**	68.2	**F**	0.0

Note: **Bold and shaded** value denotes intersection LOS at unacceptable conditions.

Legend: Δ = change; Ave = Avenue; ID = identification; LOS = Level of Service; NE = Northeast; NW = Northwest; Rd = Road; sec/veh = seconds per vehicle; SR = State Route; St = Street; SW = Southwest; TWSC = Two-way STOP-Controlled unsignalized intersection; W = West.

[1] Highway Capacity Software 2000 results.

[2] The worst movement delay is reported for LOS.

Table 5-5 Intersection Analysis For Shift 2 No Build and Build (2030) Conditions

ID	Intersection	Control	a.m.					p.m.				
			No Build		Build		Δ Delay (sec/veh)	No Build		Build		Δ Delay (sec/veh)
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	
1	Viking Ave NW and SR 305	Signalized[1]	19.5	B	21.3	C	1.8	19.6	B	22.2	C	2.6
2	SR 303 and NE McWilliams Rd	Signalized	30.9	C	31.0	C	0.1	32.6	C	32.9	C	0.3
3	Alaskan Way and Yesler Way	Signalized[1]	5.4	A	5.4	A	0.0	5.2	A	5.2	A	0.0
4	Charleston Blvd and S Callow Ave	TWSC[2]	15.5	C	16.0	C	0.5	10.7	B	10.8	B	0.1
5	Burwell St and Warren Ave	Signalized	20.3	C	21.5	C	1.2	25.7	C	26.2	C	0.5
6	Burwell St and Pacific Ave	Signalized	7.6	A	7.6	A	0.0	5.6	A	5.6	A	0.0
7	SR 166 and Sidney Ave	Signalized	10.8	B	13.5	B	2.7	12.5	B	14.6	B	2.1
8	SW Barton St and Fauntleroy Way	TWSC[2]	17.7	C	22.0	C	4.3	15.6	C	17.9	C	2.3
9	Sam Christopherson Ave and SR 3 W	Signalized	24.0	C	83.5	**F**	59.5	25.7	C	40.7	D	15.0
10	Imperial Way and SR 3 W	Signalized	9.2	A	10.4	B	1.2	10.2	B	135.8	**F**	125.6
11	SE Spring Creek Rd and SE Mullenix Rd	TWSC[2]	18.9	C	19.5	C	0.6	20.8	C	21.7	C	0.9

Note: **Bold and shaded** value denotes intersection LOS at unacceptable conditions.

Legend: Δ = change; Ave = Avenue; ID = identification; LOS = Level of Service; NE = Northeast; NW = Northwest; Rd = Road; sec/veh = seconds per vehicle; SR = State Route; St = Street; SW = Southwest; TWSC = Two-way STOP-Controlled unsignalized intersection; W = West.

[1] Highway Capacity Software 2000 results.

[2] The worst movement delay is reported for LOS.

Table 5-6 Intersection Deficiencies and Improvements For Build (2030) Conditions

ID	Intersection	Control	Shift 1				Shift 2			
			a.m.		p.m.		a.m.		p.m.	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
With Project without Improvement										
9	Sam Christopherson Ave and SR 3 W	Signalized[1]	17.1	B	154.3	**F**	83.5	**F**	40.7	D
10	Imperial Way and SR 3 W	Signalized[1]	9.6	A	381.6	**F**	10.4	B	135.8	**F**
With Project with Improvement										
9	Sam Christopherson Ave and SR 3 W	Signalized[1]	13.3	B	48.8	D	30.2	C	52.9	C
10	Imperial Way and SR 3 W	Signalized[1]	6.8	A	37.8	D	14.1	B	22.4	C

Note: **Bold and shaded** value denotes intersection LOS at unacceptable conditions.

Legend: Ave = Avenue; ID = identification; LOS = Level of Service; NE = Northeast; NW = Northwest; Rd = Road; sec/veh = seconds per vehicle; SR = State Route; St = Street; TWSC = Two-way STOP-Controlled unsignalized intersection; W = West.

[1] Highway Capacity Software 2000 results.

6 Conclusions

Based on the Synchro signalized intersection and unsignalized intersection analysis results, all study area intersections would operate at overall acceptable conditions during the a.m. and p.m. peak hours, except the following intersections:

Unacceptable conditions under Existing Conditions:

- **Shift 1 p.m.:** SR 3 at Sam Christopherson Avenue intersection (Int #9) at LOS E
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS E

Unacceptable conditions under No Build Conditions:

- **Shift 1 p.m.:** SR 3 at Sam Christopherson Avenue intersection (Int #9) at LOS F
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS F

Unacceptable conditions under Build Conditions:

- **Shift 1 p.m.:** SR 3 at Sam Christopherson Avenue intersection (Int #9) at LOS F
- **Shift 1 p.m.:** SR 3 at Imperial Way intersection (Int #10) at LOS F
- **Shift 1 p.m.:** SE Spring Creek Road and SE Mullenix Road intersection (Int #11) at LOS F
- **Shift 2 a.m.:** SR 3 at Sam Christopherson Avenue intersection (Int #9) at LOS F
- **Shift 2 p.m.:** SR 3 at Imperial Way intersection (Int #10) at LOS F

Traffic management plans shall be implemented during the peak hours of construction traffic. Also, intersection mitigations such as intersection reconfigurations, additional lane, and signal timing changes are recommended for failing intersections to improve the intersection operations to an acceptable LOS and achieve less than significant impacts.

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Attachment A
Traffic Counts

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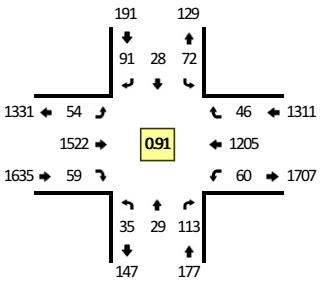
Type of peak hour being reported: Intersection Peak

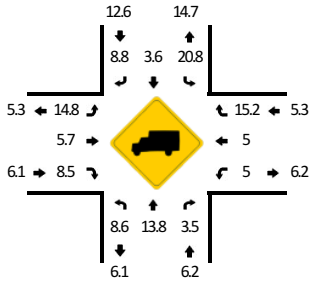
Method for determining peak hour: Total Entering Volume

LOCATION: Viking Ave NW -- SR 305
CITY/STATE: Poulsbo, WA

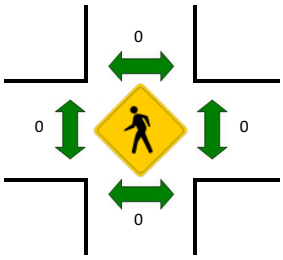
QC JOB #: 16296545
DATE: Wed, Nov 15 2023

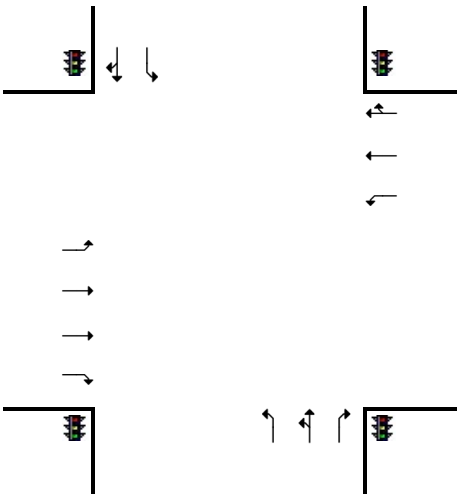
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

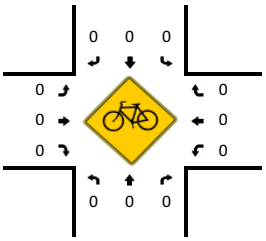


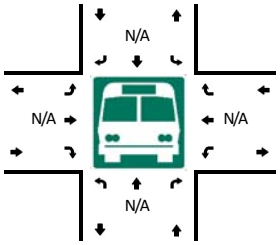


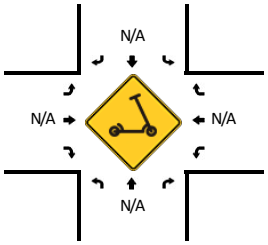
TRUE DATA TO IMPROVE MOBILITY











5-Min Count Period Beginning At	Viking Ave NW (Northbound)				Viking Ave NW (Southbound)				SR 305 (Eastbound)				SR 305 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	2	1	2	0	4	1	4	0	2	31	2	0	0	44	5	0	98	
6:05 AM	1	0	0	0	0	1	6	0	1	25	2	0	1	52	8	0	97	
6:10 AM	2	0	0	0	2	0	16	0	0	46	0	0	2	59	2	0	129	
6:15 AM	2	1	2	0	0	0	5	0	1	60	1	0	2	76	3	0	153	
6:20 AM	1	2	6	0	2	0	3	0	1	48	2	0	4	75	4	0	148	
6:25 AM	1	2	0	0	4	0	6	0	2	59	2	0	5	53	4	0	138	
6:30 AM	1	2	2	0	1	0	3	0	1	62	0	0	1	70	0	0	143	
6:35 AM	2	2	3	0	3	0	3	0	6	63	2	0	4	69	6	0	163	
6:40 AM	4	2	3	0	1	2	8	0	4	86	0	0	2	91	3	0	206	
6:45 AM	5	3	7	0	3	1	7	0	5	104	0	0	4	77	4	0	220	
6:50 AM	3	1	4	0	6	0	1	0	3	108	3	0	4	80	14	0	227	
6:55 AM	2	4	5	0	4	2	5	0	5	88	3	0	1	66	7	0	192	1914
7:00 AM	6	1	3	0	4	0	5	0	5	89	0	0	0	66	3	0	182	1998
7:05 AM	1	2	7	0	1	2	7	0	5	107	1	0	3	101	3	0	240	2141
7:10 AM	1	2	11	0	2	1	6	0	7	113	1	0	5	84	1	0	234	2246
7:15 AM	2	1	11	0	11	1	3	0	3	135	5	0	5	88	4	0	269	2362
7:20 AM	4	2	13	0	6	4	5	0	8	151	4	0	1	84	8	0	290	2504
7:25 AM	5	0	9	0	9	4	10	0	7	143	5	0	1	102	3	0	298	2664
7:30 AM	3	3	11	0	4	3	10	0	4	126	2	0	7	88	4	0	265	2786
7:35 AM	3	5	13	0	10	2	8	0	0	118	11	0	7	91	3	0	271	2894
7:40 AM	1	6	7	0	6	4	5	0	7	131	5	0	9	102	1	0	284	2972
7:45 AM	4	3	8	0	6	1	7	0	4	157	4	0	6	134	4	0	338	3090
7:50 AM	2	1	11	0	11	2	13	0	3	113	9	0	6	112	6	0	289	3152
7:55 AM	6	3	3	0	3	2	7	0	3	121	7	0	8	113	7	0	283	3243
8:00 AM	3	1	9	0	3	2	10	0	3	107	5	0	2	106	2	0	253	3314
8:05 AM	3	5	5	0	3	2	2	0	2	80	5	0	8	104	6	0	225	3299
8:10 AM	8	0	5	0	2	0	6	0	4	100	1	0	7	91	5	0	229	3294
8:15 AM	1	1	8	0	7	4	8	0	5	101	5	0	13	101	6	0	260	3285
8:20 AM	5	3	6	0	6	5	8	0	4	115	3	0	5	80	1	0	241	3236
8:25 AM	3	2	3	0	5	1	7	0	5	88	3	0	4	89	5	0	215	3153
8:30 AM	5	1	9	0	4	1	6	0	1	90	4	0	5	88	4	0	218	3106
8:35 AM	7	2	5	0	2	4	4	0	6	89	2	0	6	75	2	0	204	3039
8:40 AM	6	1	6	0	6	4	5	0	3	92	3	0	5	68	6	0	205	2960
8:45 AM	4	3	9	0	6	2	5	0	4	109	5	0	6	78	3	0	234	2856
8:50 AM	1	3	9	0	4	3	8	0	1	98	9	0	9	97	5	0	247	2814
8:55 AM	5	2	4	0	4	3	7	0	5	97	4	0	5	63	6	0	205	2736

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	28	40	104	0	92	28	100	0	56	1604	72	0	84	1392	44	0	3644
Heavy Trucks	4	8	4		24	0	16		8	104	8		4	72	4		256
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

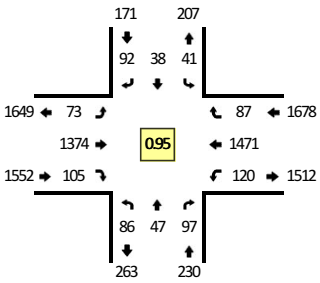
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

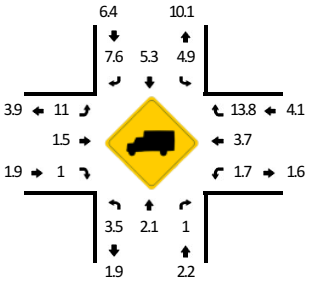
LOCATION: Viking Ave NW -- SR 305
CITY/STATE: Poulsbo, WA

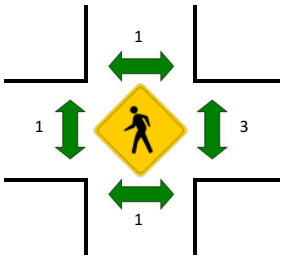
QC JOB #: 16296546
DATE: Wed, Nov 15 2023

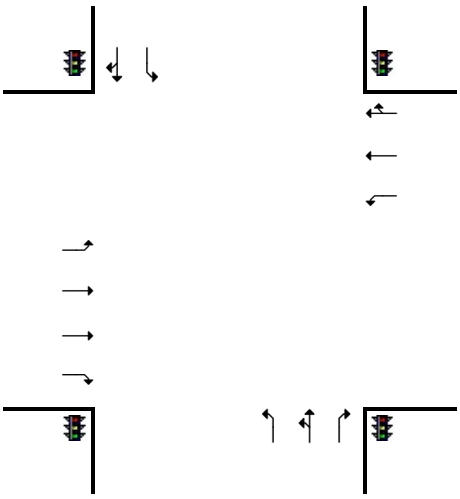
Peak-Hour: 4:05 PM -- 5:05 PM
Peak 15-Min: 4:05 PM -- 4:20 PM

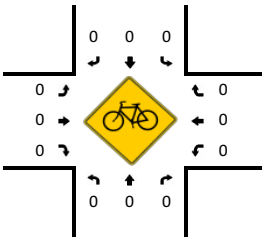


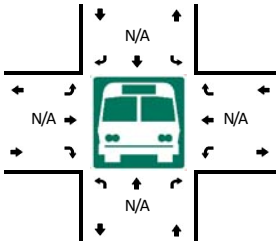


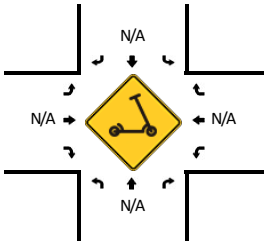












5-Min Count Period Beginning At	Viking Ave NW (Northbound)				Viking Ave NW (Southbound)				SR 305 (Eastbound)				SR 305 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	6	5	8	0	4	3	7	0	8	105	9	0	14	121	11	0	301	
4:05 PM	5	2	1	0	5	8	6	0	6	128	7	0	7	140	9	0	324	
4:10 PM	4	2	9	0	2	4	8	0	4	142	6	0	8	133	4	0	326	
4:15 PM	13	7	16	0	2	2	5	0	8	113	9	0	16	107	4	0	302	
4:20 PM	3	6	4	0	4	3	8	0	7	119	6	0	10	110	8	0	288	
4:25 PM	12	3	7	0	3	2	14	0	4	91	13	0	12	106	8	0	275	
4:30 PM	7	3	10	0	4	3	12	0	3	109	9	0	5	127	6	0	298	
4:35 PM	5	5	10	0	2	4	7	0	6	114	11	0	11	144	9	0	328	
4:40 PM	4	6	11	0	3	4	7	0	8	113	4	0	14	87	2	0	263	
4:45 PM	10	2	7	0	7	2	7	0	5	131	8	0	10	126	8	0	323	
4:50 PM	7	3	6	0	3	1	6	0	6	113	13	0	5	137	9	0	309	
4:55 PM	6	2	8	0	4	2	7	0	5	90	9	0	9	129	9	0	280	3617
5:00 PM	10	6	8	0	2	3	5	0	11	111	10	0	13	125	11	0	315	3631
5:05 PM	10	2	13	0	4	4	9	0	4	108	13	0	7	111	5	0	290	3597
5:10 PM	6	2	15	0	2	3	13	0	4	106	4	0	18	108	7	0	288	3559
5:15 PM	5	1	9	0	6	2	12	0	7	131	7	0	5	117	6	0	308	3565
5:20 PM	8	3	7	0	8	2	8	0	12	80	3	0	8	94	4	0	237	3514
5:25 PM	7	4	6	0	6	1	9	0	4	112	4	0	6	138	9	0	306	3545
5:30 PM	8	4	9	0	4	2	10	0	8	112	3	0	12	124	6	0	302	3549
5:35 PM	8	5	11	0	5	1	4	0	4	101	3	0	10	99	9	0	260	3481
5:40 PM	5	4	8	0	4	2	4	0	4	103	10	0	13	131	5	0	293	3511
5:45 PM	4	1	16	0	6	2	5	0	3	79	5	0	6	117	10	0	254	3442
5:50 PM	1	3	6	0	7	3	7	0	4	89	10	0	5	102	6	0	243	3376
5:55 PM	6	3	9	0	1	0	1	0	9	72	4	0	14	108	6	0	233	3329
6:00 PM	7	3	2	0	1	1	3	0	9	73	4	0	4	111	13	0	231	3245
6:05 PM	10	0	5	0	5	3	5	0	3	74	4	0	6	86	4	0	205	3160
6:10 PM	2	1	9	0	5	4	8	0	2	74	5	0	3	98	7	0	218	3090
6:15 PM	1	1	4	0	6	2	13	0	4	94	7	0	11	98	10	0	251	3033
6:20 PM	4	2	7	0	1	0	6	0	0	79	1	0	3	94	1	0	198	2994
6:25 PM	5	2	10	0	2	2	1	0	3	73	6	0	4	73	10	0	191	2879
6:30 PM	6	0	2	0	5	2	7	0	4	54	4	0	5	78	5	0	172	2749
6:35 PM	6	1	4	0	1	1	6	0	2	77	3	0	4	63	7	0	175	2664
6:40 PM	5	0	7	0	1	0	4	0	7	96	3	0	7	72	6	0	208	2579
6:45 PM	1	0	4	0	1	2	2	0	3	76	5	0	7	55	5	0	161	2486
6:50 PM	5	4	10	0	0	2	6	0	5	62	4	0	6	66	7	0	177	2420
6:55 PM	0	0	3	0	0	0	4	0	3	50	2	0	8	46	3	0	119	2306

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	88	44	104	0	36	56	76	0	72	1532	88	0	124	1520	68	0	3808
Heavy Trucks	4	0	4		0	4	8		8	24	4		4	56	4		120
Buses																	
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

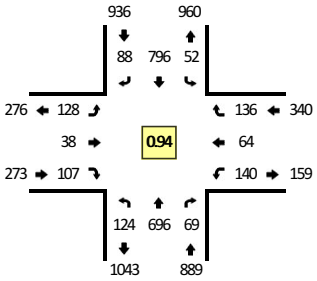
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

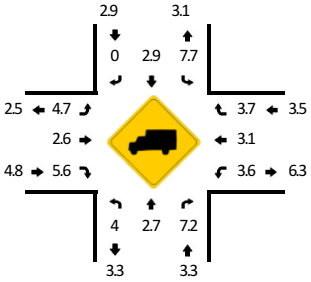
LOCATION: SR 303 -- NE McWilliams Rd
CITY/STATE: Tracyton, WA

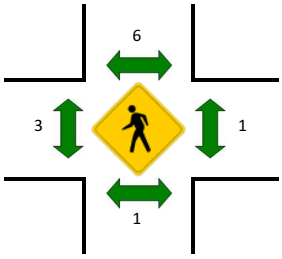
QC JOB #: 16296539
DATE: Wed, Nov 15 2023

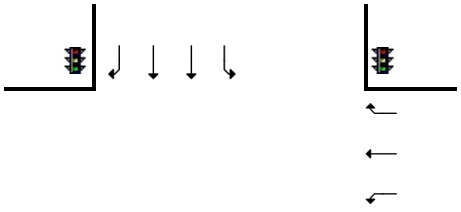
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:35 AM -- 7:50 AM

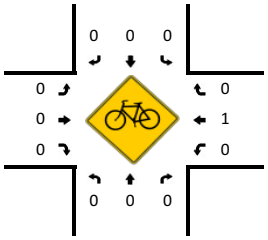


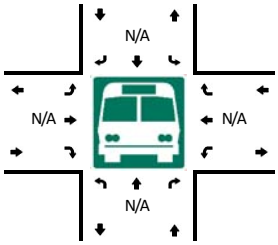


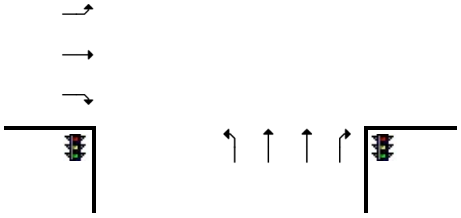


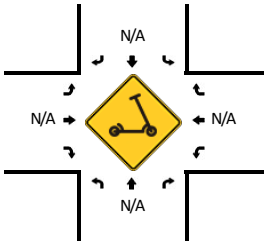












5-Min Count Period Beginning At	SR 303 (Northbound)				SR 303 (Southbound)				NE McWilliams Rd (Eastbound)				NE McWilliams Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	26	4	0	2	37	1	0	4	2	8	0	10	0	10	0	104	
6:05 AM	5	49	5	0	1	40	1	0	4	3	4	0	17	1	2	0	132	
6:10 AM	3	31	4	0	0	34	1	0	3	0	7	0	6	0	8	0	97	
6:15 AM	4	29	7	0	1	27	4	0	2	1	9	0	10	2	3	0	99	
6:20 AM	3	51	5	0	0	57	2	0	7	0	9	0	11	0	4	0	149	
6:25 AM	5	33	3	0	0	45	3	0	4	0	3	0	12	1	6	0	115	
6:30 AM	1	28	6	0	3	31	1	0	6	3	10	0	14	0	9	0	112	
6:35 AM	4	44	7	0	4	54	2	0	7	3	10	0	16	1	9	0	161	
6:40 AM	4	40	6	0	3	40	3	0	7	2	14	0	10	1	13	0	143	
6:45 AM	5	51	9	0	1	53	7	0	12	1	9	0	13	4	8	0	173	
6:50 AM	7	58	5	0	3	48	3	0	7	1	11	0	10	4	7	0	164	
6:55 AM	5	56	4	0	4	70	3	0	6	3	7	0	8	4	14	0	184	1633
7:00 AM	14	63	3	0	6	41	3	0	7	3	11	0	10	3	16	0	180	1709
7:05 AM	2	69	5	0	4	54	5	0	9	3	5	0	14	7	18	0	195	1772
7:10 AM	4	68	4	0	3	49	5	0	10	4	7	0	14	4	7	0	179	1854
7:15 AM	15	69	3	0	3	44	9	0	9	1	6	0	8	9	12	0	188	1943
7:20 AM	14	71	6	0	4	60	11	0	7	4	8	0	12	8	8	0	213	2007
7:25 AM	11	73	4	0	3	84	6	0	11	3	7	0	9	6	10	0	227	2119
7:30 AM	9	59	2	0	2	46	9	0	9	2	7	0	17	9	16	0	187	2194
7:35 AM	8	54	7	0	4	51	11	0	10	6	6	0	13	8	11	0	189	2222
7:40 AM	12	74	10	0	2	82	11	0	11	5	15	0	9	6	19	0	256	2335
7:45 AM	5	62	5	0	4	66	4	0	13	3	13	0	18	2	9	0	204	2366
7:50 AM	10	53	4	0	7	58	7	0	10	4	12	0	10	2	7	0	184	2386
7:55 AM	8	47	8	0	4	63	2	0	8	2	11	0	11	5	14	0	183	2385
8:00 AM	7	47	2	0	4	86	5	0	11	2	8	0	15	7	13	0	207	2412
8:05 AM	15	50	7	0	6	96	7	0	9	3	5	0	4	7	9	0	218	2435
8:10 AM	11	45	5	0	5	46	5	0	16	2	5	0	12	1	8	0	161	2417
8:15 AM	14	61	9	0	7	58	10	0	13	2	10	0	10	3	12	0	209	2438
8:20 AM	8	51	4	0	8	71	4	0	13	5	7	0	6	2	17	0	196	2421
8:25 AM	4	59	7	0	6	58	5	0	9	0	9	0	10	2	10	0	179	2373
8:30 AM	6	67	4	0	4	47	8	0	11	5	11	0	10	4	8	0	185	2371
8:35 AM	10	84	9	0	6	49	7	0	2	2	6	0	15	2	8	0	200	2382
8:40 AM	14	58	8	0	6	48	6	0	6	2	9	0	9	4	13	0	183	2309
8:45 AM	11	69	3	0	5	67	5	0	11	7	13	0	8	5	5	0	209	2314
8:50 AM	7	74	7	0	4	73	5	0	6	1	14	0	5	6	9	0	211	2341
8:55 AM	12	75	5	0	8	44	7	0	10	4	13	0	18	2	6	0	204	2362

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	100	760	88	0	40	796	104	0	136	56	136	0	160	64	156	0	2596
Heavy Trucks	0	16	12		4	28	0		8	4	8		4	0	4		88
Buses																	
Pedestrians		0				12				12				4			28
Bicycles	0	0	0		0	0	0		0	0	0		0	4	0		4
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

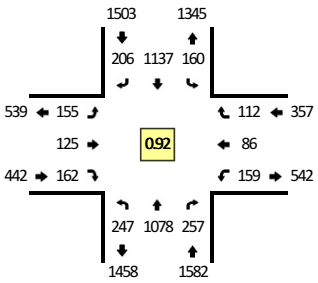
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

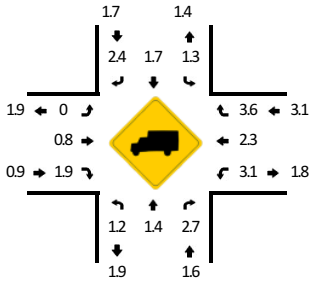
LOCATION: SR 303 -- NE McWilliams Rd
CITY/STATE: Tracyton, WA

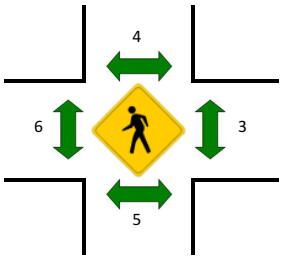
QC JOB #: 16296540
DATE: Wed, Nov 15 2023

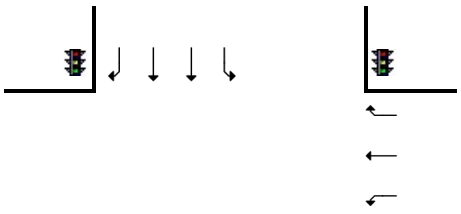
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:15 PM -- 4:30 PM

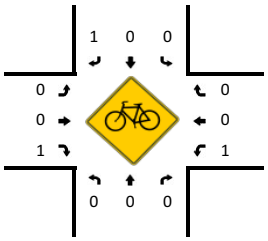


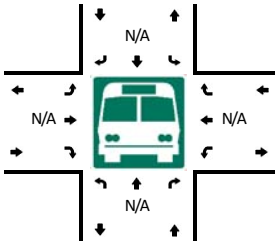


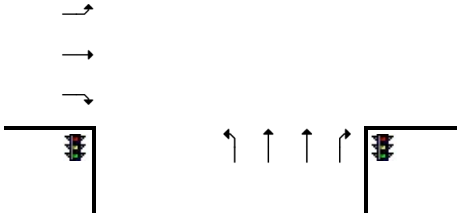


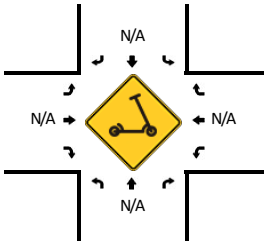












5-Min Count Period Beginning At	SR 303 (Northbound)				SR 303 (Southbound)				NE McWilliams Rd (Eastbound)				NE McWilliams Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	21	83	18	0	13	100	25	0	6	16	13	0	10	6	16	0	327	
4:05 PM	16	86	21	0	13	90	19	0	18	10	11	0	24	12	8	0	328	
4:10 PM	20	85	22	0	12	88	14	0	14	12	11	0	14	2	10	0	304	
4:15 PM	27	101	33	0	15	93	20	0	11	12	11	0	8	7	10	0	348	
4:20 PM	21	100	22	0	14	97	17	0	10	10	17	0	11	8	7	0	334	
4:25 PM	30	114	18	0	12	118	15	0	17	8	10	0	15	4	8	0	369	
4:30 PM	16	89	23	0	15	102	12	0	16	9	14	0	12	4	6	0	318	
4:35 PM	20	79	13	0	17	88	19	0	13	10	14	0	11	11	7	0	302	
4:40 PM	17	72	22	0	13	89	13	0	9	11	11	0	24	10	11	0	302	
4:45 PM	15	84	22	0	12	83	15	0	17	8	18	0	10	6	8	0	298	
4:50 PM	21	97	20	0	17	88	12	0	15	10	12	0	12	8	13	0	325	
4:55 PM	23	88	23	0	7	101	25	0	9	9	20	0	8	8	8	0	329	3884
5:00 PM	11	76	13	0	11	124	18	0	4	9	11	0	9	3	6	0	295	3852
5:05 PM	19	87	13	0	22	101	14	0	8	8	9	0	16	8	13	0	318	3842
5:10 PM	22	83	18	0	11	93	16	0	11	7	15	0	7	4	11	0	298	3836
5:15 PM	18	70	17	0	17	84	21	0	10	7	13	0	15	7	16	0	295	3783
5:20 PM	13	60	20	0	8	98	15	0	21	13	10	0	14	4	7	0	283	3732
5:25 PM	22	71	22	0	12	85	25	0	8	10	11	0	13	3	10	0	292	3655
5:30 PM	20	77	13	0	15	99	17	0	9	9	10	0	15	9	11	0	304	3641
5:35 PM	12	62	18	0	16	112	10	0	10	6	11	0	14	3	7	0	281	3620
5:40 PM	11	72	18	0	19	80	16	0	11	8	6	0	11	6	11	0	269	3587
5:45 PM	20	44	7	0	10	82	8	0	9	8	14	0	8	9	8	0	227	3516
5:50 PM	17	80	22	0	14	77	9	0	14	10	8	0	12	4	9	0	276	3467
5:55 PM	19	59	14	0	13	89	20	0	4	3	5	0	16	7	6	0	255	3393
6:00 PM	7	54	14	0	9	73	8	0	10	6	14	0	9	5	9	0	218	3316
6:05 PM	18	62	20	0	8	88	15	0	7	4	7	0	9	1	14	0	253	3251
6:10 PM	17	73	18	0	12	96	19	0	9	8	12	0	5	1	9	0	279	3232
6:15 PM	12	41	13	0	12	73	7	0	15	9	10	0	13	4	13	0	222	3159
6:20 PM	16	60	17	0	17	66	13	0	8	8	15	0	8	6	10	0	244	3120
6:25 PM	15	49	8	0	14	62	8	0	7	3	9	0	15	3	7	0	200	3028
6:30 PM	20	46	7	0	12	71	11	0	10	6	8	0	9	6	10	0	216	2940
6:35 PM	13	48	13	0	11	60	10	0	9	1	6	0	6	4	7	0	188	2847
6:40 PM	17	56	13	0	7	63	5	0	8	5	6	0	4	2	9	0	195	2773
6:45 PM	12	45	7	0	11	72	7	0	6	6	13	0	4	2	3	0	188	2734
6:50 PM	14	59	15	0	8	53	12	0	10	7	7	0	14	4	5	0	208	2666
6:55 PM	15	40	15	0	5	33	11	0	11	6	4	0	8	7	0	0	155	2566

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	312	1260	292	0	164	1232	208	0	152	120	152	0	136	76	100	0	4204
Heavy Trucks	4	32	8		4	36	0		0	0	4		4	4	4		100
Buses																	
Pedestrians		8				8				0				0			16
Bicycles	0	0	0		0	0	4		0	0	0		4	0	0		8
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

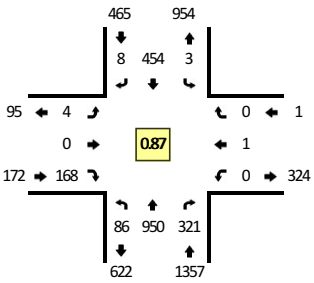
Type of peak hour being reported: Intersection Peak

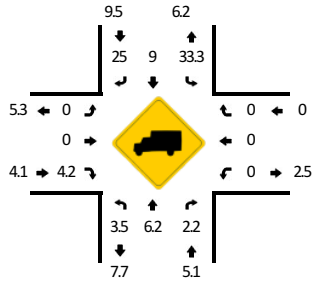
Method for determining peak hour: Total Entering Volume

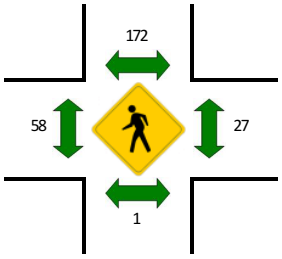
LOCATION: Alaskan Wy -- Seattle Ferry Terminal/Yesler Wy
CITY/STATE: Seattle, WA

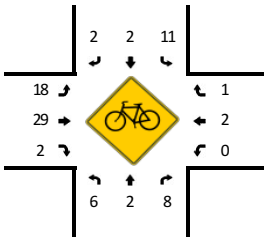
QC JOB #: 16296531
DATE: Wed, Nov 15 2023

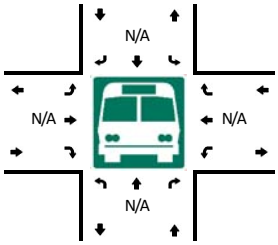
Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM

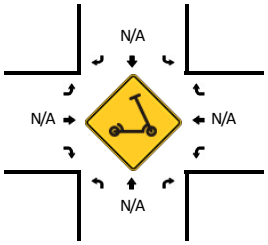












5-Min Count Period Beginning At	Alaskan Wy (Northbound)				Alaskan Wy (Southbound)				Seattle Ferry Terminal/Yesler Wy (Eastbound)				Seattle Ferry Terminal/Yesler Wy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	6	39	13	0	0	18	0	0	1	0	0	0	0	0	0	0	77	
6:05 AM	6	43	7	0	0	14	1	0	0	0	2	0	0	0	0	0	73	
6:10 AM	5	48	16	0	0	23	0	0	0	0	0	0	0	0	0	0	92	
6:15 AM	2	49	15	0	0	20	0	0	0	0	1	0	0	0	0	0	87	
6:20 AM	5	48	16	0	0	29	1	0	0	0	1	0	0	0	0	0	100	
6:25 AM	5	57	23	0	0	17	0	0	0	0	0	0	0	0	0	0	102	
6:30 AM	7	59	20	0	0	20	0	0	0	0	1	0	0	0	0	0	107	
6:35 AM	8	62	18	0	0	17	1	0	0	1	0	0	0	0	0	0	107	
6:40 AM	8	63	20	0	0	46	2	0	0	0	1	0	0	0	0	0	140	
6:45 AM	9	64	23	0	0	37	1	0	0	0	0	0	0	0	0	0	134	
6:50 AM	12	84	29	0	0	28	1	0	0	0	0	0	0	0	0	0	154	
6:55 AM	21	72	30	0	0	22	2	0	0	0	0	0	0	0	0	0	147	1320
7:00 AM	7	70	20	0	3	39	1	0	0	0	36	0	0	0	0	0	176	1419
7:05 AM	3	66	17	0	0	37	0	0	0	0	66	0	0	0	0	0	189	1535
7:10 AM	5	54	20	0	0	38	0	0	0	0	7	0	0	0	0	0	124	1567
7:15 AM	8	90	44	0	0	52	0	0	0	0	1	0	0	0	0	0	195	1675
7:20 AM	15	59	20	0	0	27	0	0	0	0	1	0	0	0	0	0	122	1697
7:25 AM	11	60	27	0	0	33	0	0	0	0	33	0	0	0	0	0	164	1759
7:30 AM	3	63	20	0	0	57	1	0	0	0	28	0	0	0	0	0	172	1824
7:35 AM	3	60	16	0	0	49	2	0	0	0	2	0	0	0	0	0	132	1849
7:40 AM	5	83	24	0	0	32	0	0	0	1	1	0	0	0	0	0	146	1855
7:45 AM	4	67	28	0	0	47	1	0	0	0	0	0	0	0	0	0	147	1868
7:50 AM	3	73	15	0	1	53	2	0	0	0	0	0	0	0	0	0	147	1861
7:55 AM	5	84	32	0	0	22	1	0	0	0	1	0	0	0	0	0	145	1859
8:00 AM	9	80	19	0	1	48	0	0	1	0	1	0	0	0	0	0	159	1842
8:05 AM	5	54	32	0	0	30	0	0	0	0	0	0	0	0	0	0	121	1774
8:10 AM	9	71	15	0	0	42	1	0	0	0	0	0	0	0	0	0	138	1788
8:15 AM	15	79	34	0	0	29	0	0	1	0	0	0	0	0	0	0	158	1751
8:20 AM	9	97	27	0	0	51	3	0	1	0	0	0	0	0	0	0	188	1817
8:25 AM	10	75	23	0	0	41	0	0	0	0	1	0	0	0	0	0	150	1803
8:30 AM	5	99	32	0	0	42	1	0	0	0	1	0	0	0	0	0	180	1811
8:35 AM	12	86	34	0	0	39	0	0	0	0	0	0	0	0	0	0	171	1850
8:40 AM	4	78	26	0	0	47	1	0	0	0	1	0	0	0	0	0	157	1861
8:45 AM	4	68	27	0	0	43	1	0	0	0	11	0	0	0	0	0	154	1868
8:50 AM	3	93	29	0	0	36	1	0	0	0	82	0	0	1	0	0	245	1966
8:55 AM	1	70	23	0	2	6	0	0	1	0	71	0	0	0	0	0	174	1995

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	32	924	316	0	8	340	8	0	4	0	656	0	0	4	0	0	2292
Heavy Trucks	0	48	4		0	24	4		0	0	20		0	0	0		100
Buses																	
Pedestrians		4				104				24				52			184
Bicycles	8	4	4		16	0	0		16	28	4		0	0	0		80
Scooters																	

Comments:

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

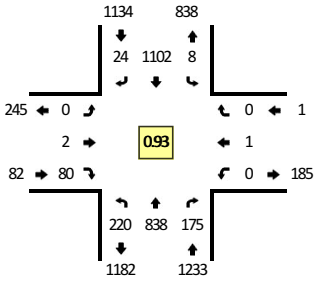
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Alaskan Wy -- Seattle Ferry Terminal/Yesler Wy
CITY/STATE: Seattle, WA

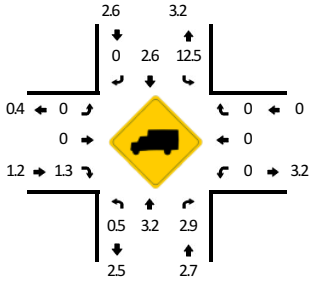
QC JOB #: 16296532
DATE: Wed, Nov 15 2023

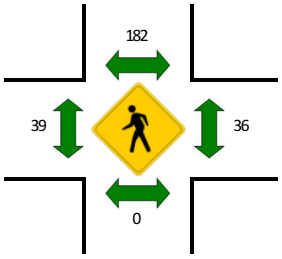
Peak-Hour: 4:40 PM -- 5:40 PM
Peak 15-Min: 5:10 PM -- 5:25 PM



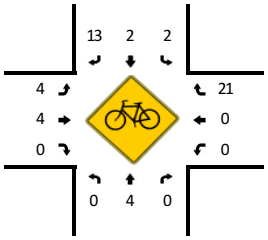


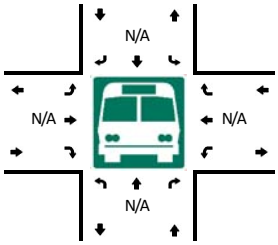
TRUE DATA TO IMPROVE MOBILITY

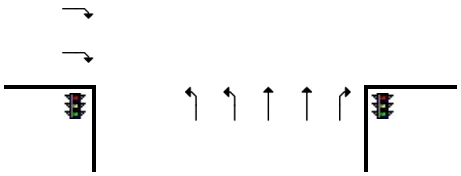


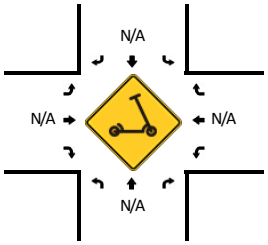












5-Min Count Period Beginning At	Alaskan Wy (Northbound)				Alaskan Wy (Southbound)				Seattle Ferry Terminal/Yesler Wy (Eastbound)				Seattle Ferry Terminal/Yesler Wy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	10	77	12	0	1	47	2	0	0	1	41	0	0	0	0	0	191	
4:05 PM	11	48	22	0	0	93	1	0	0	1	12	0	0	0	0	0	188	
4:10 PM	14	63	11	0	0	101	0	0	0	0	0	0	0	0	0	0	189	
4:15 PM	15	63	7	0	0	90	1	0	0	0	1	0	0	0	0	0	177	
4:20 PM	19	81	8	0	0	116	2	0	0	0	1	0	0	0	0	0	227	
4:25 PM	24	53	12	0	0	92	0	0	0	0	1	0	0	0	0	0	182	
4:30 PM	11	71	10	0	0	115	1	0	0	0	0	0	0	0	0	0	208	
4:35 PM	27	46	7	0	0	85	0	0	0	0	1	0	0	0	0	0	166	
4:40 PM	25	75	19	0	0	113	3	0	0	0	1	0	0	0	0	0	236	
4:45 PM	19	62	11	0	0	87	0	0	0	0	0	0	0	0	0	0	179	
4:50 PM	21	85	14	0	0	113	1	0	0	0	0	0	0	1	0	0	235	
4:55 PM	30	61	9	0	1	80	5	0	0	0	1	0	0	0	0	0	187	2365
5:00 PM	18	84	15	0	1	105	1	0	0	1	0	0	0	0	0	0	225	2399
5:05 PM	18	49	18	0	0	78	1	0	0	0	0	0	0	0	0	0	164	2375
5:10 PM	22	57	14	0	2	110	4	0	0	0	1	0	0	0	0	0	210	2396
5:15 PM	19	57	15	0	0	79	1	0	0	1	50	0	0	0	0	0	222	2441
5:20 PM	12	96	12	0	0	86	1	0	0	0	18	0	0	0	0	0	225	2439
5:25 PM	16	61	17	0	1	82	1	0	0	0	1	0	0	0	0	0	179	2436
5:30 PM	5	93	18	0	0	96	5	0	0	0	0	0	0	0	0	0	217	2445
5:35 PM	15	58	13	0	3	73	1	0	0	0	8	0	0	0	0	0	171	2450
5:40 PM	6	82	17	0	2	106	0	0	0	0	5	0	0	1	0	0	219	2433
5:45 PM	9	54	12	0	0	60	1	0	0	1	47	0	0	0	0	0	184	2438
5:50 PM	5	87	12	0	1	33	1	0	0	1	62	0	0	0	0	0	202	2405
5:55 PM	8	58	7	0	0	41	0	0	0	0	47	0	0	0	0	0	161	2379
6:00 PM	4	84	12	0	0	110	1	0	0	0	1	0	0	1	0	0	213	2367
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6:30 PM	4	67	7	0	0	61	0	0	0	0	1	0	0	0	0	0	140	2074
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6:40 PM	7	45	10	0	2	66	1	0	0	0	0	0	0	0	0	0	131	1917
6:45 PM	8	34	9	0	1	69	0	0	0	0	0	0	0	0	0	0	121	1854
6:50 PM	8	32	13	0	0	71	0	0	0	0	0	0	0	0	0	0	124	1776
6:55 PM	15	25	13	0	0	32	0	0	0	0	0	0	0	0	0	0	85	1700

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	212	840	164	0	8	1100	24	0	0	4	276	0	0	0	0	0	2628
Heavy Trucks	4	44	4		0	36	0		0	0	4		0	0	0		92
Buses																	
Pedestrians		0				204				4				36			244
Bicycles	0	4	0		4	8	12		0	4	0		0	0	32		64
Scooters																	

Comments:

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

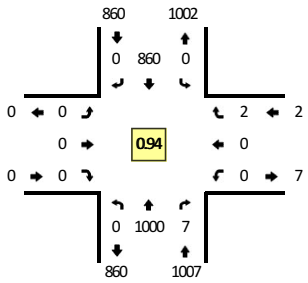
Type of peak hour being reported: Intersection Peak

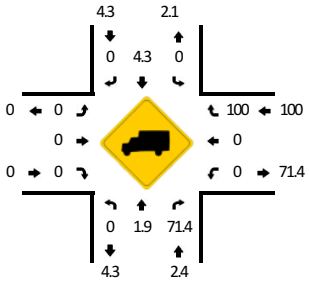
Method for determining peak hour: Total Entering Volume

LOCATION: Charleston Blvd -- Callow Ave S
CITY/STATE: Bremerton, WA

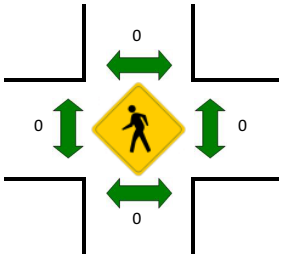
QC JOB #: 16296529
DATE: Wed, Nov 15 2023

Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

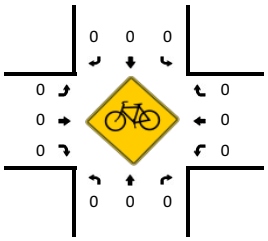


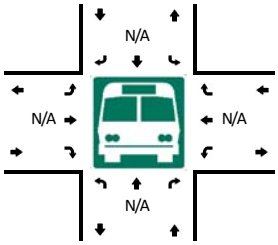


TRUE DATA TO IMPROVE MOBILITY

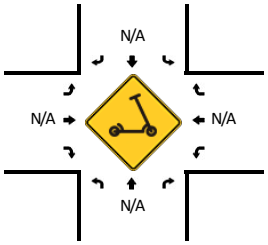












5-Min Count Period Beginning At	Charleston Blvd (Northbound)				Charleston Blvd (Southbound)				Callow Ave S (Eastbound)				Callow Ave S (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	63	0	0	0	65	0	0	0	0	0	0	0	0	0	0	128	
6:05 AM	0	56	0	0	0	55	0	0	0	0	0	0	0	0	0	0	111	
6:10 AM	0	55	2	0	0	85	0	0	0	0	0	0	0	0	0	0	142	
6:15 AM	0	60	0	0	0	69	0	0	0	0	0	0	0	0	0	0	129	
6:20 AM	0	63	1	0	0	68	0	0	0	0	0	0	0	0	0	0	132	
6:25 AM	0	65	2	0	0	70	0	0	0	0	0	0	0	0	1	0	138	
6:30 AM	0	51	0	0	0	57	0	0	0	0	0	0	0	0	0	0	108	
6:35 AM	0	76	1	0	0	60	0	0	0	0	0	0	0	0	0	0	137	
6:40 AM	0	91	0	0	0	68	0	0	0	0	0	0	0	0	0	0	159	
6:45 AM	0	74	0	0	0	72	0	0	0	0	0	0	0	0	0	0	146	
6:50 AM	0	97	0	0	0	65	0	0	0	0	0	0	0	0	1	0	163	
6:55 AM	0	103	1	0	0	46	0	0	0	0	0	0	0	0	0	0	150	1643
7:00 AM	0	78	1	0	0	67	0	0	0	0	0	0	0	0	0	0	146	1661
7:05 AM	0	66	1	0	0	67	0	0	0	0	0	0	0	0	0	0	134	1684
7:10 AM	0	96	0	0	0	62	0	0	0	0	0	0	0	0	0	0	158	1700
7:15 AM	0	76	0	0	0	79	0	0	0	0	0	0	0	0	1	0	156	1727
7:20 AM	0	69	0	0	0	69	0	0	0	0	0	0	0	0	0	0	138	1733
7:25 AM	0	79	1	0	0	80	0	0	0	0	0	0	0	0	0	0	160	1755
7:30 AM	0	94	0	0	0	71	0	0	0	0	0	0	0	0	1	0	166	1813
7:35 AM	0	73	0	0	0	80	0	0	0	0	0	0	0	0	0	0	153	1829
7:40 AM	0	79	0	0	0	81	0	0	0	0	0	0	0	0	0	0	160	1830
7:45 AM	0	99	0	0	0	77	0	0	0	0	0	0	0	0	0	0	176	1860
7:50 AM	0	88	3	0	0	62	0	0	0	0	0	0	0	0	0	0	153	1850
7:55 AM	0	89	1	0	0	76	0	0	0	0	0	0	0	0	0	0	166	1866
8:00 AM	0	92	1	0	0	56	0	0	0	0	0	0	0	0	0	0	149	1869
8:05 AM	0	62	1	0	0	57	0	0	0	0	0	0	0	0	1	0	121	1856
8:10 AM	0	68	0	0	0	70	0	0	0	0	0	0	0	0	0	0	138	1836
8:15 AM	0	64	0	0	0	72	0	0	0	0	0	0	0	0	0	0	136	1816
8:20 AM	0	66	1	0	0	64	0	0	0	0	0	0	0	0	0	0	131	1809
8:25 AM	0	85	0	0	0	42	0	0	0	0	0	0	0	0	0	0	127	1776
8:30 AM	0	71	0	0	0	75	0	0	0	0	0	0	0	0	0	0	146	1756
8:35 AM	0	63	2	0	0	57	0	0	0	0	0	0	0	0	0	0	122	1725
8:40 AM	0	68	1	0	0	51	0	0	0	0	0	0	0	0	0	0	120	1685
8:45 AM	0	66	0	0	0	66	0	0	0	0	0	0	0	0	0	0	132	1641
8:50 AM	0	88	0	0	0	66	0	0	0	0	0	0	0	0	0	0	154	1642
8:55 AM	0	79	0	0	0	48	0	0	0	0	0	0	0	0	0	0	127	1603

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1104	16	0	0	860	0	0	0	0	0	0	0	0	0	0	1980
Heavy Trucks	0	12	8		0	32	0		0	0	0		0	0	0		52
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

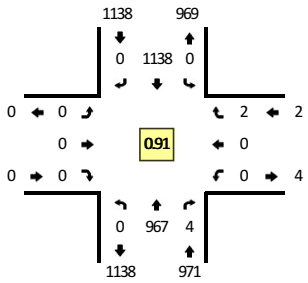
Type of peak hour being reported: Intersection Peak

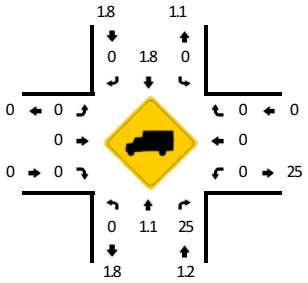
Method for determining peak hour: Total Entering Volume

LOCATION: Charleston Blvd -- Callow Ave S
CITY/STATE: Bremerton, WA

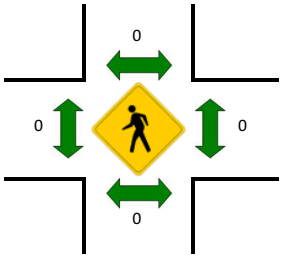
QC JOB #: 16296530
DATE: Wed, Nov 15 2023

Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:40 PM -- 4:55 PM

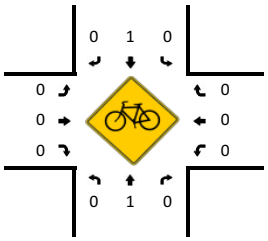


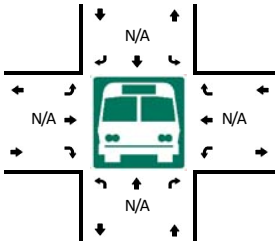


TRUE DATA TO IMPROVE MOBILITY

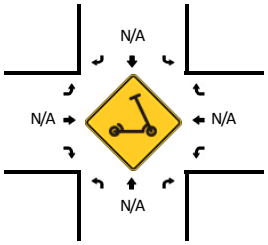












5-Min Count Period Beginning At	Charleston Blvd (Northbound)				Charleston Blvd (Southbound)				Callow Ave S (Eastbound)				Callow Ave S (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	83	0	0	0	115	0	0	0	0	0	0	0	0	0	0	198	
4:05 PM	0	68	0	0	0	100	0	0	0	0	0	0	0	0	0	0	168	
4:10 PM	0	45	0	0	0	122	0	0	0	0	0	0	0	0	1	0	168	
4:15 PM	0	80	0	0	0	111	0	0	0	0	0	0	0	0	0	0	191	
4:20 PM	0	76	1	0	0	88	0	0	0	0	0	0	0	0	0	0	165	
4:25 PM	0	73	0	0	0	114	0	0	0	0	0	0	0	0	0	0	187	
4:30 PM	0	88	1	0	0	83	0	0	0	0	0	0	0	0	0	0	172	
4:35 PM	0	77	0	0	0	58	0	0	0	0	0	0	0	0	1	0	136	
4:40 PM	0	107	0	0	0	95	0	0	0	0	0	0	0	0	0	0	202	
4:45 PM	0	91	1	0	0	106	0	0	0	0	0	0	0	0	0	0	198	
4:50 PM	0	102	0	0	0	79	0	0	0	0	0	0	0	0	0	0	181	
4:55 PM	0	77	1	0	0	67	0	0	0	0	0	0	0	0	0	0	145	2111
5:00 PM	0	62	0	0	0	87	0	0	0	0	0	0	0	0	1	0	150	2063
5:05 PM	0	83	0	0	0	94	0	0	0	0	0	0	0	0	0	0	177	2072
5:10 PM	0	62	1	0	0	74	0	0	0	0	0	0	0	0	1	0	138	2042
5:15 PM	0	90	1	0	0	118	0	0	0	0	0	0	0	0	0	0	209	2060
5:20 PM	0	86	1	0	0	105	0	0	0	0	0	0	0	0	0	0	192	2087
5:25 PM	0	57	0	0	0	97	0	0	0	0	0	0	0	0	1	0	155	2055
5:30 PM	0	96	0	0	0	97	0	0	0	0	0	0	0	0	0	0	193	2076
5:35 PM	0	56	0	0	0	93	0	0	0	0	0	0	0	0	1	0	150	2090
5:40 PM	0	106	0	0	0	64	0	0	0	0	0	0	0	0	0	0	170	2058
5:45 PM	0	61	0	0	0	95	0	0	0	0	0	0	0	0	1	0	157	2017
5:50 PM	0	50	0	0	0	85	0	0	0	0	0	0	0	0	0	0	135	1971
5:55 PM	0	57	0	0	0	85	0	0	0	0	0	0	0	0	0	0	142	1968
6:00 PM	0	60	0	0	0	70	0	0	0	0	0	0	0	0	0	0	130	1948
6:05 PM	0	66	0	0	0	63	0	0	0	0	0	0	0	0	1	0	130	1901
6:10 PM	0	64	1	0	0	62	0	0	0	0	0	0	0	0	0	0	127	1890
6:15 PM	0	64	0	0	0	50	0	0	0	0	0	0	0	0	0	0	114	1795
6:20 PM	0	64	0	0	0	64	0	0	0	0	0	0	0	0	0	0	128	1731
6:25 PM	0	67	0	0	0	53	0	0	0	0	0	0	0	0	0	0	120	1696
6:30 PM	0	65	0	0	0	82	0	0	0	0	0	0	0	0	0	0	147	1650
6:35 PM	0	59	0	0	0	63	0	0	0	0	0	0	0	0	1	0	123	1623
6:40 PM	0	49	0	0	0	72	0	0	0	0	0	0	0	0	0	0	121	1574
6:45 PM	0	38	0	0	0	71	0	0	0	0	0	0	0	0	0	0	109	1526
6:50 PM	0	40	0	0	0	39	0	0	0	0	0	0	0	0	0	0	79	1470
6:55 PM	0	47	1	0	0	60	0	0	0	0	0	0	0	0	0	0	108	1436

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	1200	4	0	0	1120	0	0	0	0	0	0	0	0	0	0	2324
Heavy Trucks	0	8	0		0	28	0		0	0	0		0	0	0		36
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

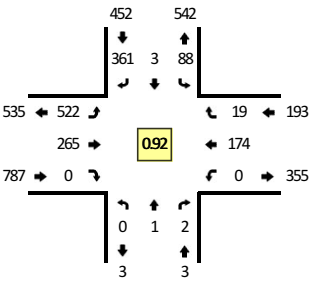
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

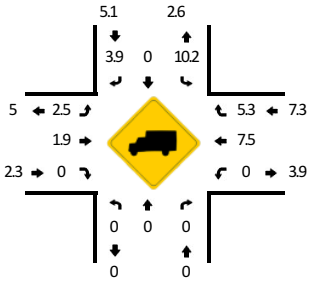
LOCATION: Warren Ave/Lot 96 Access -- Burwell St
CITY/STATE: Bremerton, WA

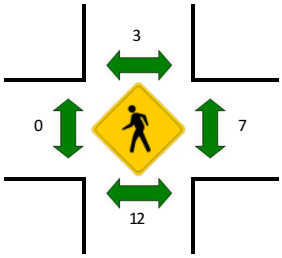
QC JOB #: 16296525
DATE: Wed, Nov 15 2023

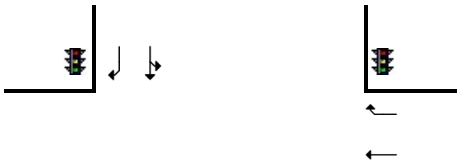
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:00 AM -- 7:15 AM

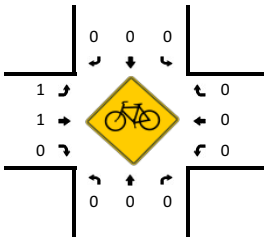


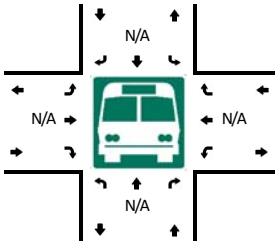
TRUE DATA TO IMPROVE MOBILITY



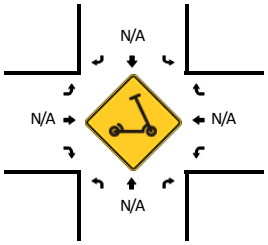












5-Min Count Period Beginning At	Warren Ave/Lot 96 Access (Northbound)				Warren Ave/Lot 96 Access (Southbound)				Burwell St (Eastbound)				Burwell St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	1	1	0	24	1	35	0	27	34	2	0	0	7	1	0	133	
6:05 AM	0	0	0	0	15	1	26	0	19	27	2	0	0	20	1	0	111	
6:10 AM	0	1	0	0	10	0	28	0	18	11	0	0	0	18	4	0	90	
6:15 AM	0	0	0	0	7	0	22	0	15	15	0	0	0	10	0	0	69	
6:20 AM	0	0	0	0	15	0	23	0	20	22	0	0	0	12	3	0	95	
6:25 AM	0	0	0	0	12	1	22	0	32	26	1	0	0	13	0	0	107	
6:30 AM	0	1	0	0	7	0	24	0	20	19	2	0	0	15	0	0	88	
6:35 AM	0	0	1	0	15	0	27	0	20	35	3	0	0	8	2	0	111	
6:40 AM	0	0	1	0	7	1	20	0	42	20	1	0	0	7	1	0	100	
6:45 AM	0	0	1	0	6	1	33	0	31	38	2	0	0	7	1	0	120	
6:50 AM	0	0	0	0	13	0	24	0	34	28	0	0	0	11	1	0	111	
6:55 AM	0	0	0	0	19	1	25	0	21	26	0	0	0	16	2	0	110	1245
7:00 AM	0	0	0	0	12	1	37	0	41	35	0	0	0	16	3	0	145	1257
7:05 AM	0	0	0	0	7	0	27	0	48	20	0	0	0	13	0	0	115	1261
7:10 AM	0	0	0	0	5	1	37	0	41	24	0	0	0	16	6	0	130	1301
7:15 AM	0	0	0	0	8	0	29	0	39	11	0	0	0	10	2	0	99	1331
7:20 AM	0	0	1	0	2	0	17	0	49	15	0	0	0	17	3	0	104	1340
7:25 AM	0	0	0	0	6	0	29	0	42	9	0	0	0	12	4	0	102	1335
7:30 AM	0	0	0	0	8	0	35	0	46	22	0	0	0	12	0	0	123	1370
7:35 AM	0	0	1	0	11	0	27	0	48	22	0	0	0	9	0	0	118	1377
7:40 AM	0	0	0	0	3	0	38	0	45	20	0	0	0	22	1	0	129	1406
7:45 AM	0	0	0	0	12	0	26	0	33	23	0	0	0	18	0	0	112	1398
7:50 AM	0	0	0	0	3	1	34	0	40	31	0	0	0	14	0	0	123	1410
7:55 AM	0	1	0	0	11	0	25	0	50	33	0	0	0	15	0	0	135	1435
8:00 AM	0	0	0	0	8	0	28	0	43	25	0	0	0	13	3	0	120	1410
8:05 AM	0	0	0	0	6	0	28	0	39	29	0	0	0	5	3	0	110	1405
8:10 AM	0	0	0	0	6	0	26	0	40	14	0	0	0	20	2	0	108	1383
8:15 AM	0	0	0	0	11	0	20	0	40	24	0	0	0	20	0	0	115	1399
8:20 AM	0	0	0	0	15	0	22	0	25	17	0	0	0	12	1	0	92	1387
8:25 AM	0	0	0	0	15	0	22	0	32	28	0	0	0	11	2	0	110	1395
8:30 AM	0	1	0	0	4	0	23	0	58	32	0	0	0	13	1	0	132	1404
8:35 AM	0	0	0	0	8	0	15	0	28	12	0	0	0	16	2	0	81	1367
8:40 AM	0	0	0	0	7	0	25	0	39	13	0	0	0	19	18	0	121	1359
8:45 AM	1	0	1	0	5	1	35	0	50	13	0	0	0	5	2	0	113	1360
8:50 AM	0	0	0	0	1	0	21	0	40	22	0	0	0	11	1	0	96	1333
8:55 AM	0	1	0	0	2	0	23	0	42	13	0	0	0	13	0	0	94	1292

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	96	8	404	0	520	316	0	0	0	180	36	0	1560
Heavy Trucks	0	0	0		12	0	8		4	4	0		0	8	0		36
Buses																	
Pedestrians		4				0				0				4			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	
Comments:																	

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

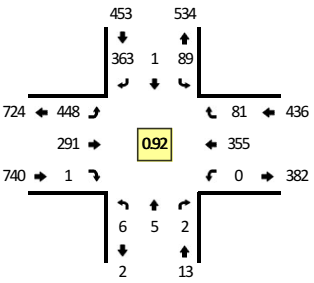
Type of peak hour being reported: Intersection Peak

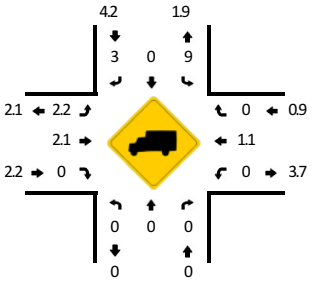
Method for determining peak hour: Total Entering Volume

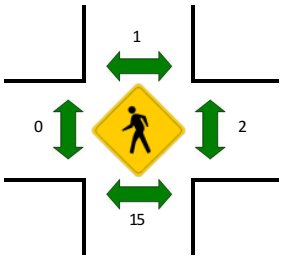
LOCATION: Warren Ave/Lot 96 Access -- Burwell St
CITY/STATE: Bremerton, WA

QC JOB #: 16296526
DATE: Wed, Nov 15 2023

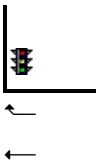
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:00 PM -- 4:15 PM

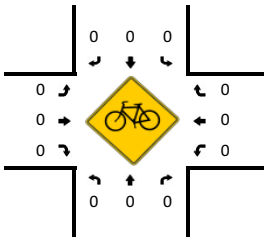


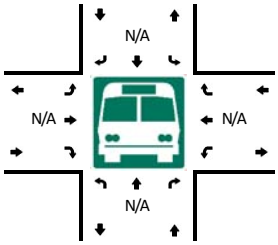


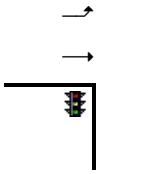


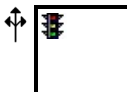


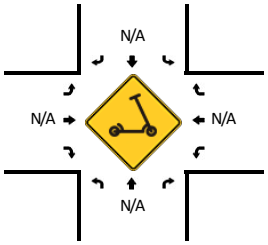












5-Min Count Period Beginning At	Warren Ave/Lot 96 Access (Northbound)				Warren Ave/Lot 96 Access (Southbound)				Burwell St (Eastbound)				Burwell St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	1	2	0	0	15	0	26	0	31	39	0	0	0	34	16	0	164	
4:05 PM	0	1	0	0	16	0	18	0	17	20	0	0	0	38	13	0	123	
4:10 PM	3	1	0	0	1	1	34	0	41	39	0	0	0	30	11	0	161	
4:15 PM	0	0	0	0	11	0	28	0	41	24	0	0	0	20	10	0	134	
4:20 PM	1	0	0	0	8	0	34	0	28	27	1	0	0	38	5	0	142	
4:25 PM	0	0	1	0	6	0	21	0	30	17	0	0	0	34	7	0	116	
4:30 PM	1	0	0	0	2	0	20	0	45	28	0	0	0	21	3	0	120	
4:35 PM	0	0	0	0	2	0	42	0	49	22	0	0	0	25	0	0	140	
4:40 PM	0	0	0	0	11	0	40	0	26	17	0	0	0	38	9	0	141	
4:45 PM	0	0	1	0	5	0	34	0	54	25	0	0	0	29	1	0	149	
4:50 PM	0	0	0	0	8	0	35	0	53	17	0	0	0	15	5	0	133	
4:55 PM	0	1	0	0	4	0	31	0	33	16	0	0	0	33	1	0	119	1642
5:00 PM	0	1	0	0	0	0	34	0	34	28	0	0	0	18	11	0	126	1604
5:05 PM	0	0	0	0	8	0	30	0	36	18	0	0	0	32	4	0	128	1609
5:10 PM	0	0	0	0	8	0	44	0	25	22	2	0	0	24	3	0	128	1576
5:15 PM	0	1	1	0	5	0	40	0	30	19	1	0	0	38	3	0	138	1580
5:20 PM	0	0	0	0	5	0	60	0	42	27	0	0	0	19	3	0	156	1594
5:25 PM	0	0	1	0	3	0	36	0	33	8	1	0	0	27	5	0	114	1592
5:30 PM	0	1	0	0	4	0	31	0	39	28	0	0	0	26	4	0	133	1605
5:35 PM	0	0	1	0	5	0	36	0	36	28	1	0	0	19	5	0	131	1596
5:40 PM	0	0	0	0	11	0	32	0	21	17	0	0	0	15	3	0	99	1554
5:45 PM	0	1	0	0	6	0	38	0	27	23	0	0	0	29	9	0	133	1538
5:50 PM	0	0	0	0	7	0	47	0	39	16	2	0	0	18	1	0	130	1535
5:55 PM	0	0	0	0	3	0	28	0	25	19	0	0	0	15	2	0	92	1508
6:00 PM	0	0	0	0	7	0	40	0	16	19	0	0	0	17	1	0	100	1482
6:05 PM	0	1	0	0	6	0	12	0	24	18	0	0	0	29	2	0	92	1446
6:10 PM	0	0	0	0	10	0	29	0	47	13	0	0	0	13	3	0	115	1433
6:15 PM	0	0	0	0	6	0	30	0	29	15	1	0	0	11	2	0	94	1389
6:20 PM	0	0	0	0	9	0	19	0	30	18	0	0	0	6	3	0	85	1318
6:25 PM	1	1	0	0	6	2	25	0	17	27	0	0	0	20	3	0	102	1306
6:30 PM	0	0	1	0	11	0	29	0	45	25	1	0	0	15	1	0	128	1301
6:35 PM	0	0	1	0	2	0	24	0	26	13	0	0	0	39	42	0	147	1317
6:40 PM	0	1	0	0	1	0	21	0	34	8	0	0	0	36	30	0	131	1349
6:45 PM	0	0	0	0	6	1	20	0	19	11	0	0	0	13	2	0	72	1288
6:50 PM	0	0	0	0	5	0	25	0	25	14	2	0	0	15	0	0	86	1244
6:55 PM	0	0	0	0	6	0	16	0	21	6	0	0	0	14	2	0	65	1217

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	16	0	0	128	4	312	0	356	392	0	0	0	408	160	0	1792
Heavy Trucks	0	0	0		4	0	8		16	0	0		0	8	0		36
Buses																	
Pedestrians		16				4				0				8			28
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	
Comments:																	

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

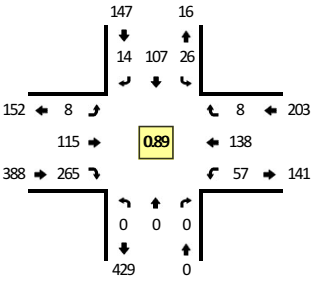
Type of peak hour being reported: Intersection Peak

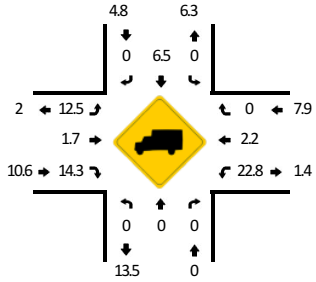
Method for determining peak hour: Total Entering Volume

LOCATION: Pacific Ave -- Burwell St
CITY/STATE: Bremerton, WA

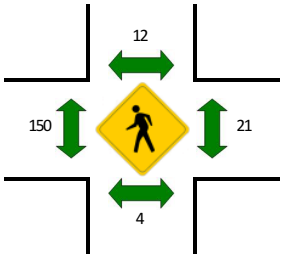
QC JOB #: 16296527
DATE: Wed, Nov 15 2023

Peak-Hour: 6:00 AM -- 7:00 AM
Peak 15-Min: 6:00 AM -- 6:15 AM

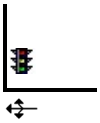


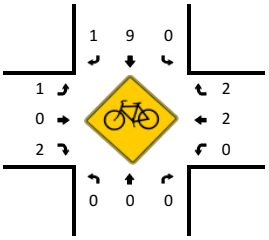


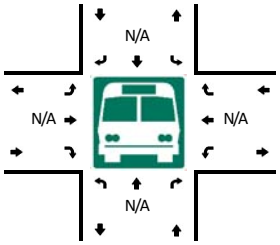


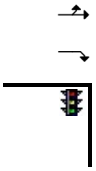




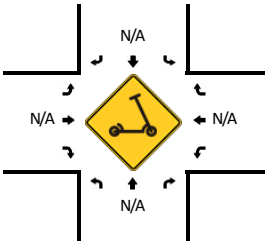












5-Min Count Period Beginning At	Pacific Ave (Northbound)				Pacific Ave (Southbound)				Burwell St (Eastbound)				Burwell St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	2	17	2	0	0	10	44	0	6	9	0	0	90	
6:05 AM	0	0	0	0	3	8	1	0	1	11	20	0	2	21	0	0	67	
6:10 AM	0	0	0	0	1	9	1	0	0	7	16	0	4	11	1	0	50	
6:15 AM	0	0	0	0	1	7	2	0	2	7	10	0	1	8	0	0	38	
6:20 AM	0	0	0	0	2	6	3	0	0	9	22	0	5	11	1	0	59	
6:25 AM	0	0	0	0	4	7	0	0	0	5	22	0	7	10	0	0	55	
6:30 AM	0	0	0	0	1	8	2	0	0	11	26	0	4	15	2	0	69	
6:35 AM	0	0	0	0	1	9	1	0	1	16	24	0	2	9	2	0	65	
6:40 AM	0	0	0	0	1	7	0	0	1	6	18	0	12	10	0	0	55	
6:45 AM	0	0	0	0	3	9	1	0	1	11	15	0	5	3	0	0	48	
6:50 AM	0	0	0	0	5	7	1	0	2	14	24	0	3	15	0	0	71	
6:55 AM	0	0	0	0	2	13	0	0	0	8	24	0	6	16	2	0	71	738
7:00 AM	0	0	0	0	2	15	1	0	3	20	23	0	7	14	1	0	86	734
7:05 AM	0	0	0	0	1	11	4	0	1	14	14	0	7	12	1	0	65	732
7:10 AM	0	0	0	0	3	6	2	0	2	12	10	0	3	17	0	0	55	737
7:15 AM	0	0	0	0	4	2	1	0	1	6	10	0	3	11	0	0	38	737
7:20 AM	0	0	0	0	0	4	0	0	0	13	7	0	0	16	0	0	40	718
7:25 AM	0	0	0	0	0	1	3	0	2	5	10	0	1	12	0	0	34	697
7:30 AM	0	0	0	0	1	5	0	0	5	7	11	0	6	13	1	0	49	677
7:35 AM	0	0	0	0	0	4	2	0	1	12	17	0	1	9	0	0	46	658
7:40 AM	0	0	0	0	1	4	0	0	0	13	11	0	4	15	1	0	49	652
7:45 AM	0	0	0	0	0	2	0	0	6	12	18	0	8	19	0	0	65	669
7:50 AM	0	0	0	0	1	4	0	0	7	8	11	0	8	10	1	0	50	648
7:55 AM	0	0	0	0	1	5	1	0	5	14	15	0	4	16	0	0	61	638
8:00 AM	0	0	0	0	1	6	0	0	4	16	16	0	2	14	0	0	59	611
8:05 AM	0	0	0	0	0	4	1	0	4	16	15	0	5	10	0	0	55	601
8:10 AM	0	0	0	0	2	5	1	0	0	5	12	0	5	18	0	0	48	594
8:15 AM	0	0	0	0	1	1	2	0	2	13	22	0	4	12	0	0	57	613
8:20 AM	0	0	0	0	0	7	1	0	0	3	26	0	10	12	1	0	60	633
8:25 AM	0	0	0	0	0	8	2	0	1	9	25	0	4	9	1	0	59	658
8:30 AM	0	0	0	0	1	3	1	0	1	16	16	0	6	11	1	0	56	665
8:35 AM	0	0	0	0	1	6	0	0	1	5	13	0	3	12	0	0	41	660
8:40 AM	0	0	0	0	1	3	1	0	1	4	12	0	0	7	0	0	29	640
8:45 AM	0	0	0	0	0	1	1	0	0	10	8	0	1	12	1	0	34	609
8:50 AM	0	0	0	0	0	3	3	0	1	10	7	0	2	2	1	0	29	588
8:55 AM	0	0	0	0	3	3	2	0	3	7	4	0	3	11	1	0	37	564

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	24	136	16	0	4	112	320	0	48	164	4	0	828
Heavy Trucks	0	0	0		0	4	0		0	0	24		0	0	0		28
Buses																	
Pedestrians		4				16				212				12			244
Bicycles	0	0	0		0	16	0		0	0	0		0	0	0		16
Scooters																	

Comments:

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

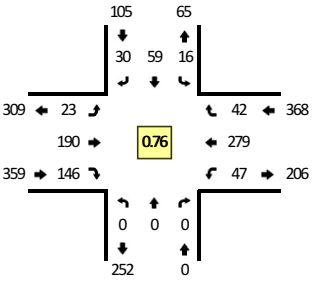
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Pacific Ave -- Burwell St
CITY/STATE: Bremerton, WA

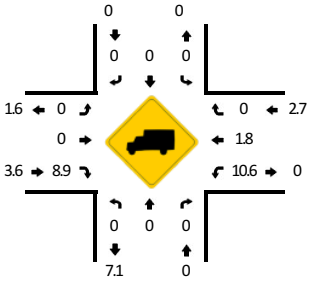
QC JOB #: 16296528
DATE: Wed, Nov 15 2023

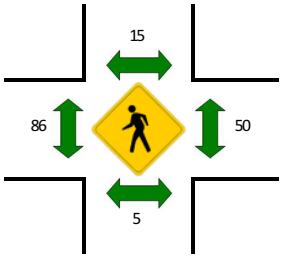
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:00 PM -- 4:15 PM



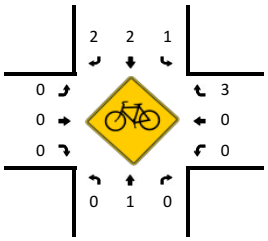


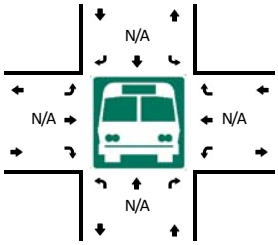
TRUE DATA TO IMPROVE MOBILITY



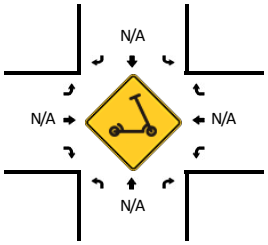












5-Min Count Period Beginning At	Pacific Ave (Northbound)				Pacific Ave (Southbound)				Burwell St (Eastbound)				Burwell St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	0	4	3	0	1	17	16	0	4	32	13	0	90	
4:05 PM	0	0	0	0	1	8	1	0	3	22	24	0	2	40	9	0	110	
4:10 PM	0	0	0	0	2	9	4	0	4	13	14	0	4	22	3	0	75	
4:15 PM	0	0	0	0	2	7	0	0	1	24	12	0	3	15	4	0	68	
4:20 PM	0	0	0	0	1	4	1	0	0	20	14	0	3	23	1	0	67	
4:25 PM	0	0	0	0	1	3	2	0	4	9	13	0	6	27	3	0	68	
4:30 PM	0	0	0	0	0	5	3	0	2	16	7	0	3	19	3	0	58	
4:35 PM	0	0	0	0	2	1	2	0	4	15	4	0	5	24	1	0	58	
4:40 PM	0	0	0	0	0	6	7	0	1	18	8	0	3	29	2	0	74	
4:45 PM	0	0	0	0	5	2	1	0	1	11	12	0	2	19	1	0	54	
4:50 PM	0	0	0	0	1	7	3	0	0	14	14	0	7	12	0	0	58	
4:55 PM	0	0	0	0	1	3	3	0	2	11	8	0	5	17	2	0	52	832
5:00 PM	0	0	0	0	4	0	1	0	2	16	4	0	8	25	2	0	62	804
5:05 PM	0	0	0	0	3	2	4	0	3	13	9	0	2	24	2	0	62	756
5:10 PM	0	0	0	0	1	3	2	0	2	15	11	0	2	30	1	0	67	748
5:15 PM	0	0	0	0	2	6	1	0	2	13	9	0	2	14	2	0	51	731
5:20 PM	0	0	0	0	1	2	2	0	3	11	8	0	0	22	2	0	51	715
5:25 PM	0	0	0	0	4	2	4	0	0	12	3	0	5	13	1	0	44	691
5:30 PM	0	0	0	0	5	8	2	0	3	13	10	0	5	21	1	0	68	701
5:35 PM	0	0	0	0	4	4	1	0	5	13	9	0	5	14	1	0	56	699
5:40 PM	0	0	0	0	2	3	2	0	2	9	13	0	2	13	3	0	49	674
5:45 PM	0	0	0	0	6	3	3	0	4	13	9	0	2	34	4	0	78	698
5:50 PM	0	0	0	0	2	4	3	0	4	13	7	0	4	13	1	0	51	691
5:55 PM	0	0	0	0	3	5	2	0	3	7	9	0	6	12	1	0	48	687
6:00 PM	0	0	0	0	1	4	2	0	1	12	9	0	6	18	0	0	53	678
6:05 PM	0	0	0	0	1	5	5	0	3	11	10	0	2	15	1	0	53	669
6:10 PM	0	0	0	0	0	5	3	0	1	7	14	0	7	14	1	0	52	654
6:15 PM	0	0	0	0	2	7	4	0	1	7	13	0	5	8	0	0	47	650
6:20 PM	0	0	0	0	1	7	3	0	2	8	12	0	9	9	1	0	52	651
6:25 PM	0	0	0	0	2	4	2	0	0	18	15	0	7	14	3	0	65	672
6:30 PM	0	0	0	0	3	5	3	0	4	15	12	0	6	13	2	0	63	667
6:35 PM	0	0	0	0	1	4	1	0	3	6	8	0	7	15	0	0	45	656
6:40 PM	0	0	0	0	4	5	2	0	3	5	4	0	2	11	2	0	38	645
6:45 PM	0	0	0	0	2	2	4	0	4	3	5	0	1	9	4	0	34	601
6:50 PM	0	0	0	0	1	3	1	0	2	10	5	0	3	10	0	0	35	585
6:55 PM	0	0	0	0	1	9	1	0	3	3	6	0	10	12	0	0	45	582

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	12	84	32	0	32	208	216	0	40	376	100	0	1100
Heavy Trucks	0	0	0		0	0	0		0	0	4		0	12	0		16
Buses																	
Pedestrians		20				28				216				80			344
Bicycles	0	4	0		0	4	0		0	0	0		0	0	0		8
Scooters																	

Comments:

Report generated on 11/27/2023 5:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

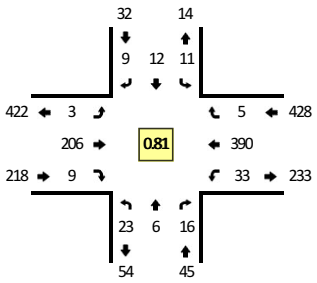
Type of peak hour being reported: Intersection Peak

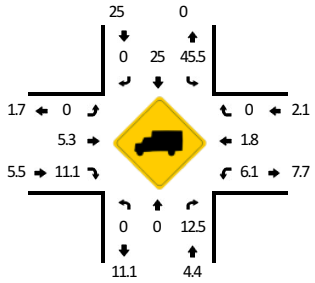
Method for determining peak hour: Total Entering Volume

LOCATION: Sidney Ave -- SR 166
CITY/STATE: Port Orchard, WA

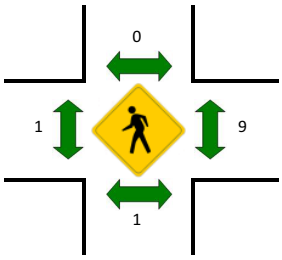
QC JOB #: 16296537
DATE: Wed, Nov 15 2023

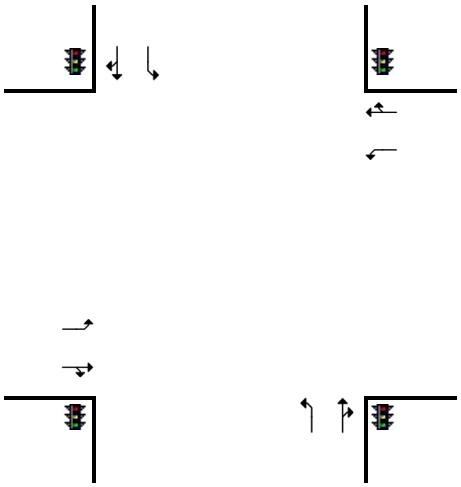
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

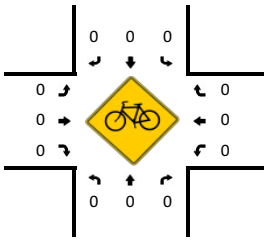


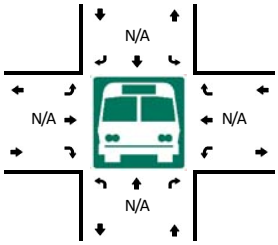


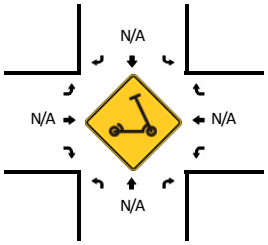
TRUE DATA TO IMPROVE MOBILITY











5-Min Count Period Beginning At	Sidney Ave (Northbound)				Sidney Ave (Southbound)				SR 166 (Eastbound)				SR 166 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	1	0	0	0	1	2	1	0	0	5	1	0	0	16	0	0	27	
6:05 AM	0	0	0	0	0	0	0	0	1	12	0	0	0	31	0	0	44	
6:10 AM	0	0	0	0	0	0	0	0	0	5	0	0	1	26	1	0	33	
6:15 AM	1	0	1	0	2	0	0	0	0	15	0	0	1	29	0	0	49	
6:20 AM	0	2	2	0	1	0	2	0	1	12	0	0	1	25	0	0	46	
6:25 AM	2	0	1	0	1	1	1	0	0	13	0	0	1	27	0	0	47	
6:30 AM	0	0	2	0	1	1	0	0	0	10	0	0	2	26	0	0	42	
6:35 AM	0	0	0	0	0	0	1	0	0	15	0	0	1	23	0	0	40	
6:40 AM	2	0	0	0	0	0	0	0	0	8	0	0	3	34	1	0	48	
6:45 AM	0	0	0	0	0	0	0	0	0	12	0	0	0	30	0	0	42	
6:50 AM	0	0	1	0	3	0	2	0	1	17	0	0	0	29	0	0	53	
6:55 AM	0	1	0	0	0	2	2	0	0	14	0	0	0	36	0	0	55	526
7:00 AM	1	0	2	0	1	1	1	0	1	13	0	0	1	31	0	0	52	551
7:05 AM	3	1	3	0	4	4	2	0	0	11	0	0	1	30	0	0	59	566
7:10 AM	0	0	2	0	0	0	4	0	1	9	0	0	1	20	0	0	37	570
7:15 AM	0	2	1	0	1	3	1	0	0	13	0	0	1	37	0	0	59	580
7:20 AM	4	0	1	0	1	0	0	0	0	15	0	0	2	34	0	0	57	591
7:25 AM	3	1	1	0	1	0	1	0	0	11	0	0	1	30	0	0	49	593
7:30 AM	4	1	2	0	3	2	0	0	0	24	0	0	4	52	1	0	93	644
7:35 AM	3	0	2	0	1	2	1	0	0	18	1	0	3	27	0	0	58	662
7:40 AM	2	0	1	0	0	0	0	0	0	23	2	0	3	40	1	0	72	686
7:45 AM	1	0	2	0	0	1	0	0	1	28	1	0	2	17	0	0	53	697
7:50 AM	2	0	2	0	0	0	1	0	1	14	0	0	4	25	0	0	49	693
7:55 AM	1	1	1	0	0	2	0	0	0	17	0	0	3	32	0	0	57	695
8:00 AM	1	1	0	0	2	1	0	0	0	13	0	0	7	29	0	0	54	697
8:05 AM	2	0	2	0	1	0	3	0	1	16	1	0	2	32	2	0	62	700
8:10 AM	0	0	1	0	1	1	2	0	0	14	4	0	1	35	1	0	60	723
8:15 AM	2	0	1	0	0	0	1	0	1	14	1	0	2	24	0	0	46	710
8:20 AM	2	0	4	0	1	0	0	0	1	17	1	0	1	14	1	0	42	695
8:25 AM	0	0	1	0	0	0	2	0	0	23	1	0	3	19	0	0	49	695
8:30 AM	0	0	4	0	4	2	1	0	0	6	0	0	1	26	0	0	44	646
8:35 AM	2	0	1	0	5	1	0	0	2	17	1	0	5	19	1	0	54	642
8:40 AM	0	2	3	0	2	1	2	0	3	15	0	0	0	32	1	0	61	631
8:45 AM	4	1	1	0	1	0	2	0	0	14	1	0	1	16	0	0	41	619
8:50 AM	1	2	1	0	3	2	0	0	1	13	1	0	5	22	1	0	52	622
8:55 AM	1	2	2	0	0	2	3	0	0	13	1	0	4	18	0	0	46	611

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	36	4	20	0	16	16	4	0	0	260	12	0	40	476	8	0	892
Heavy Trucks	0	0	0		8	4	0		0	12	4		0	12	0		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

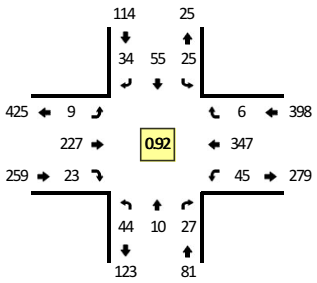
Type of peak hour being reported: Intersection Peak

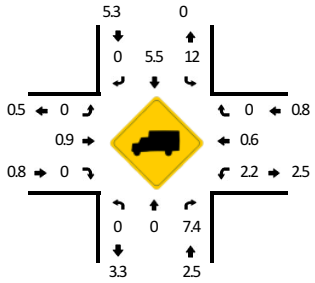
Method for determining peak hour: Total Entering Volume

LOCATION: Sidney Ave -- SR 166
CITY/STATE: Port Orchard, WA

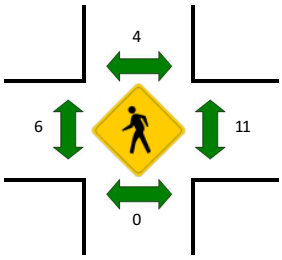
QC JOB #: 16296538
DATE: Wed, Nov 15 2023

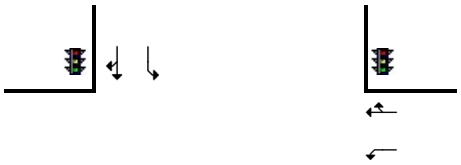
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

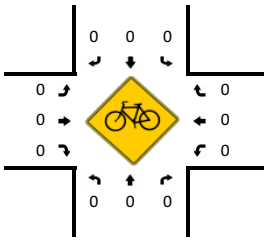


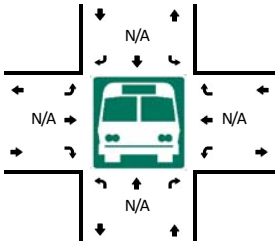


TRUE DATA TO IMPROVE MOBILITY

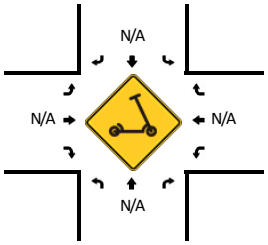












5-Min Count Period Beginning At	Sidney Ave (Northbound)				Sidney Ave (Southbound)				SR 166 (Eastbound)				SR 166 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	4	2	4	0	5	8	8	0	2	18	3	0	4	25	1	0	84	
4:05 PM	3	2	2	0	3	5	4	0	0	16	3	0	5	29	1	0	73	
4:10 PM	4	3	0	0	0	4	6	0	3	16	2	0	0	27	1	0	66	
4:15 PM	5	2	3	0	1	1	3	0	0	10	0	0	2	22	1	0	50	
4:20 PM	2	0	3	0	2	1	3	0	0	12	1	0	1	26	2	0	53	
4:25 PM	4	2	6	0	3	2	3	0	0	15	0	0	4	30	2	0	71	
4:30 PM	8	0	3	0	4	11	6	0	0	29	1	0	3	18	0	0	83	
4:35 PM	14	2	2	0	2	8	2	0	0	17	1	0	5	27	2	0	82	
4:40 PM	4	0	1	0	0	0	1	0	0	25	2	0	2	32	0	0	67	
4:45 PM	5	2	5	0	1	4	2	0	1	19	1	0	4	21	0	0	65	
4:50 PM	2	2	2	0	3	2	1	0	0	14	3	0	5	34	0	0	68	
4:55 PM	2	0	2	0	1	6	2	0	1	22	2	0	4	38	1	0	81	843
5:00 PM	2	0	4	0	5	7	2	0	2	19	0	0	5	35	0	0	81	840
5:05 PM	0	0	0	0	2	5	4	0	1	15	3	0	4	31	0	0	65	832
5:10 PM	2	2	2	0	2	3	4	0	2	17	1	0	5	25	1	0	66	832
5:15 PM	2	0	2	0	2	1	6	0	2	14	2	0	3	26	1	0	61	843
5:20 PM	0	2	1	0	0	2	1	0	0	18	3	0	2	24	1	0	54	844
5:25 PM	3	0	3	0	3	6	3	0	0	18	4	0	3	36	0	0	79	852
5:30 PM	2	1	0	0	2	5	4	0	3	9	1	0	8	25	1	0	61	830
5:35 PM	2	1	1	0	2	2	3	0	0	17	1	0	2	25	0	0	56	804
5:40 PM	1	1	2	0	1	3	1	0	0	22	2	0	2	24	0	0	59	796
5:45 PM	4	2	2	0	1	1	2	0	0	19	0	0	1	21	1	0	54	785
5:50 PM	0	3	1	0	0	1	4	0	0	14	1	0	4	19	1	0	48	765
5:55 PM	2	3	0	0	0	1	1	0	0	19	1	0	2	24	1	0	54	738
6:00 PM	2	1	2	0	2	3	4	0	0	16	1	0	2	30	2	0	65	722
6:05 PM	2	0	0	0	1	0	2	0	0	15	2	0	2	26	1	0	51	708
6:10 PM	2	0	1	0	0	1	4	0	0	10	0	0	1	23	0	0	42	684
6:15 PM	2	2	3	0	1	3	3	0	1	11	2	0	1	28	0	0	57	680
6:20 PM	2	0	3	0	0	1	1	0	1	19	0	0	3	18	4	0	52	678
6:25 PM	0	1	1	0	3	3	5	0	1	16	1	0	0	19	1	0	51	650
6:30 PM	3	0	2	0	2	3	4	0	0	20	1	0	1	23	0	0	59	648
6:35 PM	0	0	1	0	4	3	0	0	2	7	1	0	1	17	0	0	36	628
6:40 PM	0	0	3	0	2	2	2	0	0	11	0	0	1	13	1	0	35	604
6:45 PM	0	1	3	0	0	2	1	0	2	13	1	0	1	20	1	0	45	595
6:50 PM	1	1	2	0	0	3	0	0	1	15	0	0	3	15	0	0	41	588
6:55 PM	0	0	0	0	4	1	1	0	0	20	0	0	3	10	1	0	40	574

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	104	8	24	0	24	76	36	0	0	284	16	0	40	308	8	0	928
Heavy Trucks	0	0	0		4	4	0		0	0	0		0	0	0		8
Buses																	
Pedestrians		0				12				4				20			36
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

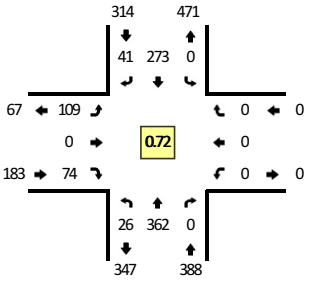
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

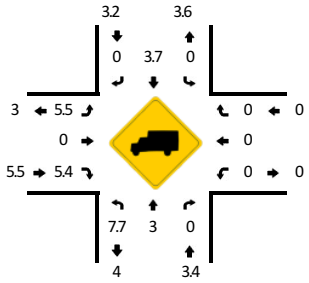
LOCATION: Fauntleroy Wy SW -- Barton St
CITY/STATE: Seattle, WA

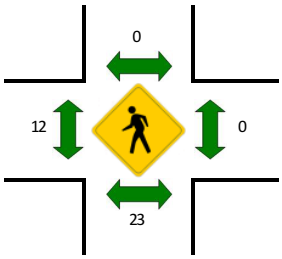
QC JOB #: 16296533
DATE: Wed, Nov 15 2023

Peak-Hour: 7:50 AM -- 8:50 AM
Peak 15-Min: 8:15 AM -- 8:30 AM

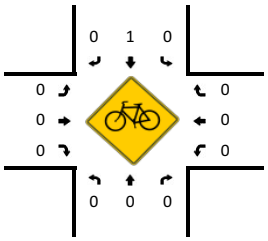


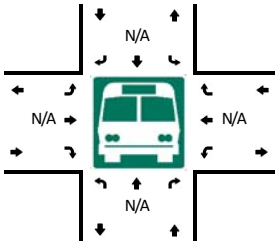




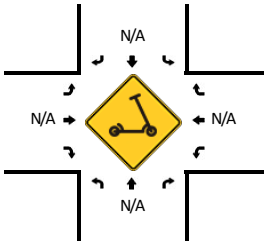












5-Min Count Period Beginning At	Fauntleroy Wy SW (Northbound)				Fauntleroy Wy SW (Southbound)				Barton St (Eastbound)				Barton St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	5	0	0	0	1	1	0	0	0	0	0	0	0	0	0	7	
6:05 AM	1	5	0	0	0	5	3	0	0	0	0	0	0	0	0	0	14	
6:10 AM	2	3	0	0	0	3	2	0	0	0	0	0	0	0	0	0	10	
6:15 AM	3	6	0	0	0	5	2	0	1	0	0	0	0	0	0	0	17	
6:20 AM	2	7	0	0	0	8	0	0	1	0	3	0	0	0	0	0	21	
6:25 AM	4	8	0	0	0	6	3	0	2	0	1	0	0	0	0	0	24	
6:30 AM	5	5	0	0	0	4	2	0	13	0	12	0	0	0	0	0	41	
6:35 AM	2	8	0	0	0	3	4	0	67	0	42	0	0	0	0	0	126	
6:40 AM	0	6	0	0	0	9	6	0	2	0	0	0	0	0	0	0	23	
6:45 AM	0	7	0	0	0	4	4	0	0	0	0	0	0	0	0	0	15	
6:50 AM	0	5	0	0	0	5	2	0	0	0	0	0	0	0	0	0	12	
6:55 AM	0	15	0	0	0	6	1	0	0	0	0	0	0	0	0	0	22	332
7:00 AM	2	13	0	0	0	5	2	0	0	0	2	0	0	0	0	0	24	349
7:05 AM	3	10	0	0	0	9	0	0	2	0	4	0	0	0	0	0	28	363
7:10 AM	3	15	0	0	0	16	3	0	3	0	7	0	0	0	0	0	47	400
7:15 AM	3	15	0	0	0	14	7	0	4	0	7	0	0	0	0	0	50	433
7:20 AM	2	13	0	0	0	23	5	0	41	0	21	0	0	0	0	0	105	517
7:25 AM	9	18	0	0	0	22	9	0	36	0	38	0	0	0	0	0	132	625
7:30 AM	4	14	0	0	0	26	10	0	5	0	3	0	0	0	0	0	62	646
7:35 AM	6	15	0	0	0	21	12	0	1	0	1	0	0	0	0	0	56	576
7:40 AM	1	26	0	0	0	19	2	0	3	0	1	0	0	0	0	0	52	605
7:45 AM	0	20	0	0	0	17	3	0	0	0	0	0	0	0	0	0	40	630
7:50 AM	1	18	0	0	0	10	3	0	39	0	23	0	0	0	0	0	94	712
7:55 AM	1	19	0	0	0	23	1	0	17	0	9	0	0	0	0	0	70	760
8:00 AM	3	19	0	0	0	14	0	0	0	0	0	0	0	0	0	0	36	772
8:05 AM	3	35	0	0	0	35	3	0	0	0	1	0	0	0	0	0	77	821
8:10 AM	3	32	0	0	0	31	5	0	0	0	0	0	0	0	0	0	71	845
8:15 AM	5	37	0	0	0	37	4	0	2	0	1	0	0	0	0	0	86	881
8:20 AM	1	35	0	0	0	24	9	0	10	0	6	0	0	0	0	0	85	861
8:25 AM	2	34	0	0	0	24	4	0	41	0	31	0	0	0	0	0	136	865
8:30 AM	3	51	0	0	0	16	1	0	0	0	0	0	0	0	0	0	71	874
8:35 AM	1	31	0	0	0	19	2	0	0	0	2	0	0	0	0	0	55	873
8:40 AM	3	27	0	0	0	22	2	0	0	0	1	0	0	0	0	0	55	876
8:45 AM	0	24	0	0	0	18	7	0	0	0	0	0	0	0	0	0	49	885
8:50 AM	4	22	0	0	0	30	5	0	0	0	1	0	0	0	0	0	62	853
8:55 AM	5	19	0	0	0	20	2	0	0	0	0	0	0	0	0	0	46	829

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	32	424	0	0	0	340	68	0	212	0	152	0	0	0	0	0	1228
Heavy Trucks	4	8	0		0	8	0		12	0	8		0	0	0		40
Buses																	
Pedestrians		44				0				24				0			68
Bicycles	0	0	0		0	4	0		0	0	0		0	0	0		4
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

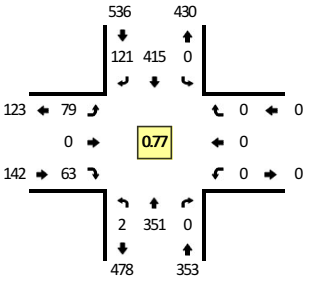
Type of peak hour being reported: Intersection Peak

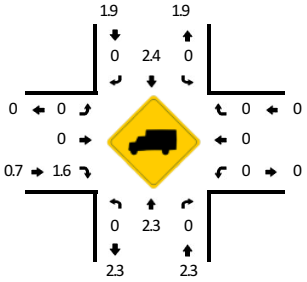
Method for determining peak hour: Total Entering Volume

LOCATION: Fauntleroy Wy SW -- Barton St
CITY/STATE: Seattle, WA

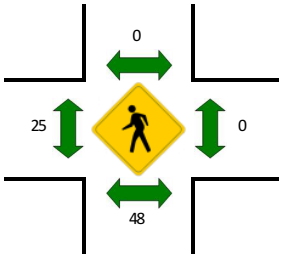
QC JOB #: 16296534
DATE: Wed, Nov 15 2023

Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 4:20 PM -- 4:35 PM

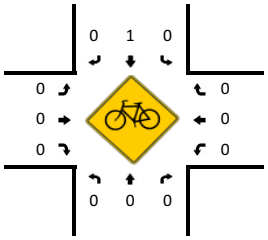


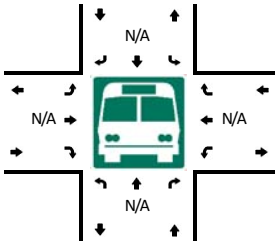


TRUE DATA TO IMPROVE MOBILITY

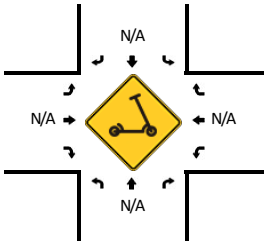












5-Min Count Period Beginning At	Fauntleroy Wy SW (Northbound)				Fauntleroy Wy SW (Southbound)				Barton St (Eastbound)				Barton St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	32	0	0	0	29	43	0	0	0	0	0	0	0	0	0	104	
4:05 PM	0	32	0	0	0	24	27	0	0	0	2	0	0	0	0	0	85	
4:10 PM	0	23	0	0	0	22	0	0	0	0	1	0	0	0	0	0	46	
4:15 PM	0	36	0	0	0	22	0	0	14	0	5	0	0	0	0	0	77	
4:20 PM	0	37	0	0	0	32	18	0	24	0	11	0	0	0	0	0	122	
4:25 PM	0	34	0	0	0	32	44	0	1	0	3	0	0	0	0	0	114	
4:30 PM	0	36	0	0	0	30	31	0	0	0	1	0	0	0	0	0	98	
4:35 PM	0	23	0	0	0	47	22	0	0	0	1	0	0	0	0	0	93	
4:40 PM	1	25	0	0	0	37	0	0	2	0	0	0	0	0	0	0	65	
4:45 PM	0	26	0	0	0	34	1	0	1	0	1	0	0	0	0	0	63	
4:50 PM	0	24	0	0	0	25	0	0	0	0	0	0	0	0	0	0	49	
4:55 PM	0	25	0	0	0	27	1	0	0	0	1	0	0	0	0	0	54	970
5:00 PM	0	25	0	0	0	40	2	0	0	0	1	0	0	0	0	0	68	934
5:05 PM	1	23	0	0	0	44	2	0	1	0	0	0	0	0	0	0	71	920
5:10 PM	0	43	0	0	0	38	0	0	15	0	9	0	0	0	0	0	105	979
5:15 PM	0	30	0	0	0	29	0	0	35	0	35	0	0	0	0	0	129	1031
5:20 PM	0	20	0	0	0	33	22	0	5	0	9	0	0	0	0	0	89	998
5:25 PM	1	26	0	0	0	26	39	0	0	0	0	0	0	0	0	0	92	976
5:30 PM	0	27	0	0	0	20	33	0	0	0	1	0	0	0	0	0	81	959
5:35 PM	0	19	0	0	0	33	9	0	1	0	1	0	0	0	0	0	63	929
5:40 PM	0	22	0	0	0	27	0	0	1	0	0	0	0	0	0	0	50	914
5:45 PM	0	22	0	0	0	32	0	0	0	0	1	0	0	0	0	0	55	906
5:50 PM	0	14	0	0	0	19	0	0	0	0	1	0	0	0	0	0	34	891
5:55 PM	0	17	0	0	0	30	1	0	0	0	0	0	0	0	0	0	48	885
6:00 PM	0	25	0	0	0	16	1	0	9	0	3	0	0	0	0	0	54	871
6:05 PM	0	21	0	0	0	26	1	0	29	0	22	0	0	0	0	0	99	899
6:10 PM	0	26	0	0	0	27	43	0	5	0	0	0	0	0	0	0	101	895
6:15 PM	0	23	0	0	0	17	36	0	1	0	1	0	0	0	0	0	78	844
6:20 PM	0	20	0	0	0	12	27	0	1	0	1	0	0	0	0	0	61	816
6:25 PM	0	18	0	0	0	19	1	0	0	0	1	0	0	0	0	0	39	763
6:30 PM	0	19	0	0	0	18	1	0	14	0	6	0	0	0	0	0	58	740
6:35 PM	0	14	0	0	0	25	30	0	0	0	1	0	0	0	0	0	70	747
6:40 PM	3	20	0	0	0	16	1	0	1	0	1	0	0	0	0	0	42	739
6:45 PM	3	10	0	0	0	24	2	0	0	0	4	0	0	0	0	0	43	727
6:50 PM	4	8	0	0	0	14	2	0	1	0	2	0	0	0	0	0	31	724
6:55 PM	1	22	0	0	0	8	3	0	0	0	1	0	0	0	0	0	35	711

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	428	0	0	0	376	372	0	100	0	60	0	0	0	0	0	1336
Heavy Trucks	0	4	0		0	20	0		0	0	0		0	0	0		24
Buses																	
Pedestrians		36				0				40				0			76
Bicycles	0	0	0		0	4	0		0	0	0		0	0	0		4
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

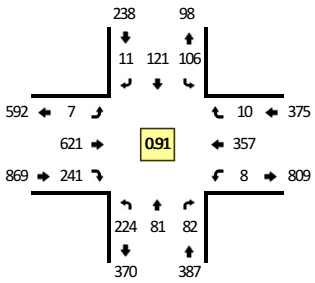
Type of peak hour being reported: Intersection Peak

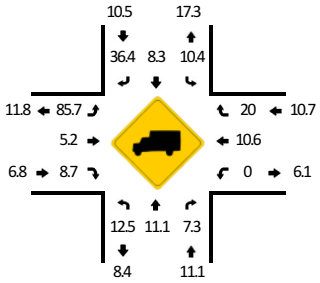
Method for determining peak hour: Total Entering Volume

LOCATION: W Sam Christopherson Ave/SR 16/W Frontage Rd -- SR 3
CITY/STATE: Gorst, WA

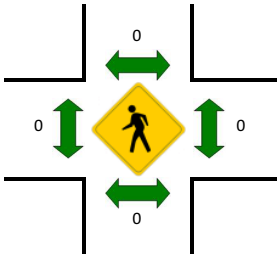
QC JOB #: 16296543
DATE: Wed, Nov 15 2023

Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

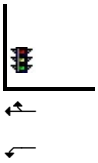


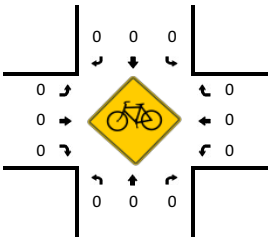


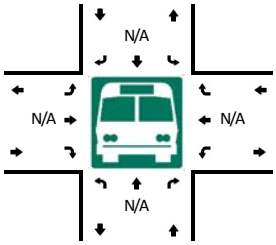
TRUE DATA TO IMPROVE MOBILITY

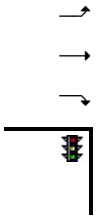


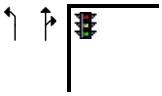


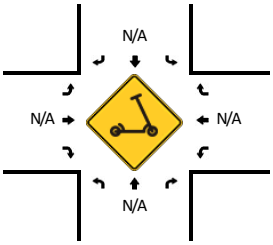












5-Min Count Period Beginning At	W Sam Christopherson Ave/SR 16/W Frontage Rd (Northbound)				W Sam Christopherson Ave/SR 16/W Frontage Rd (Southbound)				SR 3 (Eastbound)				SR 3 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	8	2	4	0	7	4	1	0	0	57	13	0	0	21	0	0	117	
6:05 AM	8	2	1	0	9	2	1	0	0	57	13	0	0	16	0	0	109	
6:10 AM	8	3	4	0	5	4	1	0	1	67	17	0	0	28	0	0	138	
6:15 AM	18	1	3	0	17	7	2	0	0	35	18	0	0	17	0	0	118	
6:20 AM	9	2	4	0	8	3	1	0	0	75	12	0	0	14	1	0	129	
6:25 AM	13	2	2	0	6	5	1	0	0	67	17	0	0	19	0	0	132	
6:30 AM	23	6	3	0	8	4	0	0	0	58	11	0	0	19	1	0	133	
6:35 AM	15	5	3	0	6	7	1	0	0	65	17	0	0	22	0	0	141	
6:40 AM	13	4	2	0	6	6	1	0	0	69	13	0	0	30	2	0	146	
6:45 AM	15	8	10	0	14	8	1	0	1	61	24	0	1	18	1	0	162	
6:50 AM	28	8	2	0	9	3	2	0	0	57	17	0	1	40	2	0	169	
6:55 AM	15	4	3	0	15	9	1	0	2	53	16	0	0	27	2	0	147	1641
7:00 AM	12	7	6	0	7	5	1	0	1	49	15	0	0	32	2	0	137	1661
7:05 AM	16	6	5	0	8	4	0	0	0	56	20	0	2	23	0	0	140	1692
7:10 AM	18	4	2	0	8	8	0	0	0	49	15	0	1	17	0	0	122	1676
7:15 AM	18	10	11	0	10	8	1	0	1	44	20	0	2	22	1	0	148	1706
7:20 AM	12	4	6	0	17	10	0	0	0	57	13	0	0	24	0	0	143	1720
7:25 AM	15	1	5	0	6	6	0	0	1	59	14	0	0	28	0	0	135	1723
7:30 AM	17	8	10	0	6	18	1	0	1	53	22	0	1	41	2	0	180	1770
7:35 AM	21	6	6	0	7	9	0	0	0	53	22	0	2	24	1	0	151	1780
7:40 AM	18	10	8	0	3	14	0	0	1	52	16	0	0	36	1	0	159	1793
7:45 AM	16	4	4	0	17	15	3	0	2	52	16	0	1	29	0	0	159	1790
7:50 AM	32	7	7	0	14	2	2	0	0	57	29	0	1	45	1	0	197	1818
7:55 AM	16	9	8	0	9	14	2	0	0	56	14	0	1	25	0	0	154	1825
8:00 AM	19	7	6	0	3	7	1	0	0	57	37	0	0	25	0	0	162	1850
8:05 AM	24	11	7	0	4	10	0	0	1	30	20	0	0	26	3	0	136	1846
8:10 AM	16	4	4	0	10	8	1	0	0	51	18	0	0	32	1	0	145	1869
8:15 AM	19	11	2	0	7	6	2	0	0	37	34	0	1	20	0	0	139	1860
8:20 AM	17	6	4	0	3	5	2	0	1	47	24	0	0	37	2	0	148	1865
8:25 AM	39	5	3	0	14	5	1	0	3	32	14	0	2	20	0	0	138	1868
8:30 AM	15	7	5	0	3	10	1	0	0	51	22	0	1	27	4	0	146	1834
8:35 AM	22	2	8	0	13	6	2	0	0	41	26	0	0	25	0	0	145	1828
8:40 AM	18	5	4	0	1	17	0	0	0	45	26	0	0	23	2	0	141	1810
8:45 AM	21	5	6	0	10	5	4	0	0	47	22	0	0	21	0	0	141	1792
8:50 AM	19	5	4	0	8	10	0	0	0	45	20	0	4	44	0	0	159	1754
8:55 AM	23	9	2	0	4	9	2	0	1	31	21	0	0	25	3	0	130	1730

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	264	84	76	0	136	124	20	0	12	644	244	0	8	440	8	0	2060
Heavy Trucks	40	4	8		4	12	4		8	44	20		0	48	0		192
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

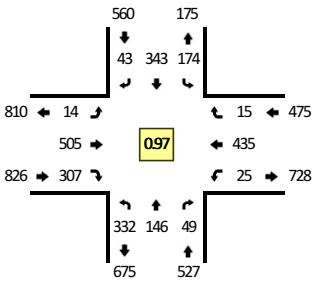
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: W Sam Christopherson Ave/SR 16/W Frontage Rd -- SR 3
CITY/STATE: Gorst, WA

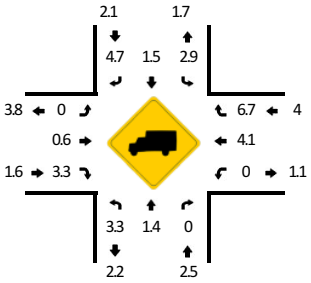
QC JOB #: 16296544
DATE: Wed, Nov 15 2023

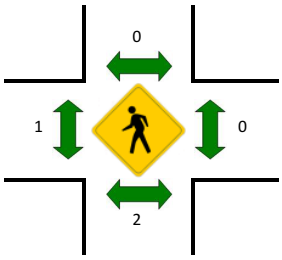
Peak-Hour: 4:25 PM -- 5:25 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

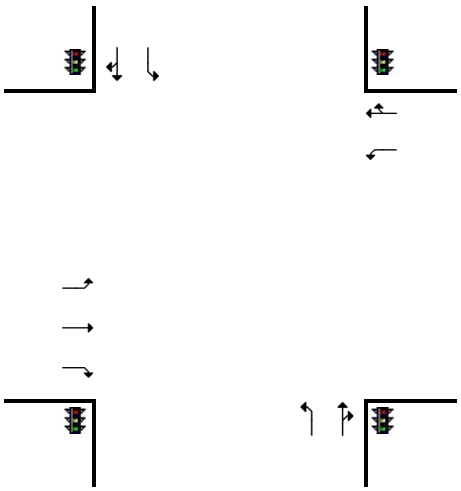


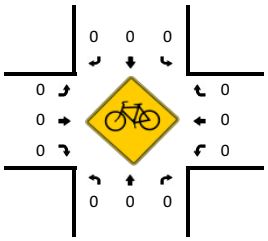


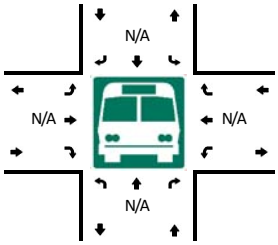
TRUE DATA TO IMPROVE MOBILITY

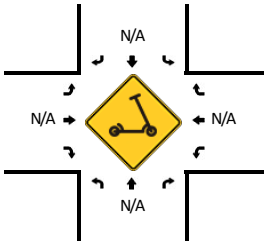












5-Min Count Period Beginning At	W Sam Christopherson Ave/SR 16/W Frontage Rd (Northbound)				W Sam Christopherson Ave/SR 16/W Frontage Rd (Southbound)				SR 3 (Eastbound)				SR 3 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	29	14	6	0	13	38	5	0	0	35	23	0	3	32	1	0	199	
4:05 PM	22	18	2	0	14	32	5	0	1	27	14	0	0	20	0	0	155	
4:10 PM	21	11	4	0	15	23	4	0	1	28	29	0	1	37	4	0	178	
4:15 PM	21	24	4	0	12	32	4	0	5	22	19	0	3	32	1	0	179	
4:20 PM	24	12	1	0	2	33	3	0	2	31	29	0	0	32	0	0	169	
4:25 PM	28	8	6	0	21	25	1	0	3	45	27	0	1	42	3	0	210	
4:30 PM	26	14	4	0	20	30	2	0	1	45	18	0	2	25	0	0	187	
4:35 PM	28	13	1	0	21	30	3	0	1	46	17	0	2	33	0	0	195	
4:40 PM	26	11	6	0	18	30	5	0	0	41	23	0	2	40	2	0	204	
4:45 PM	27	14	4	0	12	21	6	0	0	52	23	0	3	39	4	0	205	
4:50 PM	25	11	5	0	12	28	1	0	1	48	26	0	3	27	0	0	187	
4:55 PM	28	10	3	0	12	27	5	0	0	45	40	0	3	34	2	0	209	2277
5:00 PM	28	7	4	0	18	27	1	0	2	46	25	0	2	33	1	0	194	2272
5:05 PM	24	16	5	0	8	37	4	0	1	40	23	0	2	41	1	0	202	2319
5:10 PM	31	15	2	0	9	30	2	0	2	32	34	0	2	45	0	0	204	2345
5:15 PM	34	16	5	0	11	29	9	0	1	35	36	0	2	33	1	0	212	2378
5:20 PM	27	11	4	0	12	29	4	0	2	30	15	0	1	43	1	0	179	2388
5:25 PM	32	9	5	0	11	23	7	0	0	32	14	0	1	41	1	0	176	2354
5:30 PM	23	5	3	0	6	22	3	0	0	37	21	0	2	44	1	0	167	2334
5:35 PM	24	17	8	0	9	25	3	0	1	32	21	0	6	45	0	0	191	2330
5:40 PM	22	6	3	0	4	25	5	0	0	30	13	0	2	37	1	0	148	2274
5:45 PM	30	12	4	0	4	21	6	0	1	27	20	0	3	42	3	0	173	2242
5:50 PM	36	8	2	0	12	17	3	0	0	24	22	0	5	51	1	0	181	2236
5:55 PM	17	10	1	0	3	22	4	0	0	20	10	0	1	42	0	0	130	2157
6:00 PM	26	6	1	0	3	4	2	0	1	23	13	0	4	53	0	0	136	2099
6:05 PM	14	9	5	0	1	9	1	0	0	21	11	0	7	54	2	0	134	2031
6:10 PM	21	11	4	0	3	2	1	0	1	21	12	0	2	48	0	0	126	1953
6:15 PM	25	8	5	0	4	9	3	0	1	26	12	0	0	31	0	0	124	1865
6:20 PM	17	17	3	0	2	7	0	0	0	18	15	0	0	32	1	0	112	1798
6:25 PM	21	5	3	0	3	6	1	0	2	30	9	0	1	23	0	0	104	1726
6:30 PM	16	6	0	0	4	8	1	0	0	21	16	0	3	46	1	0	122	1681
6:35 PM	23	13	1	0	1	4	0	0	0	21	9	0	2	25	2	0	101	1591
6:40 PM	27	15	2	0	2	4	0	0	0	18	22	0	0	31	1	0	122	1565
6:45 PM	24	11	3	0	2	4	2	0	0	22	13	0	1	42	1	0	125	1517
6:50 PM	13	7	0	0	1	2	0	0	0	14	7	0	1	35	1	0	81	1417
6:55 PM	15	7	4	0	1	4	2	0	1	14	14	0	0	28	0	0	90	1377

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	356	188	48	0	112	384	60	0	16	428	372	0	24	476	8	0	2472
Heavy Trucks	24	0	0		0	0	0		0	0	4		0	12	0		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	
Comments:																	

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

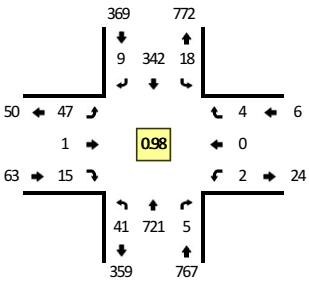
Type of peak hour being reported: Intersection Peak

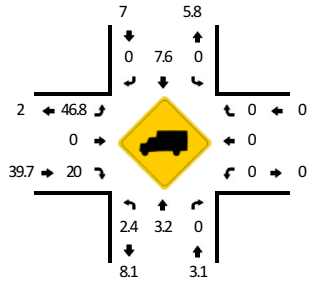
Method for determining peak hour: Total Entering Volume

LOCATION: SR 3 -- Imperial Wy
CITY/STATE: Bremerton, WA

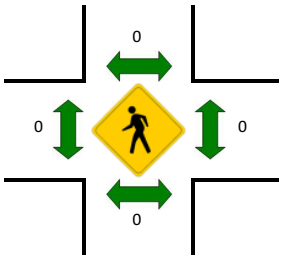
QC JOB #: 16296535
DATE: Wed, Nov 15 2023

Peak-Hour: 6:50 AM -- 7:50 AM
Peak 15-Min: 6:50 AM -- 7:05 AM

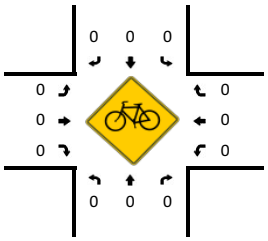


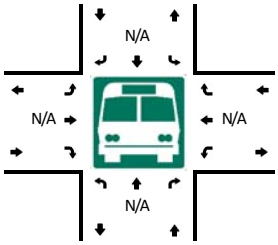


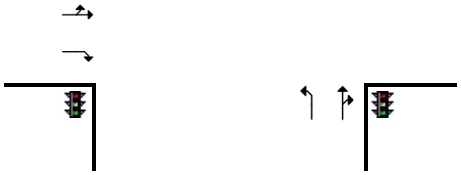
TRUE DATA TO IMPROVE MOBILITY

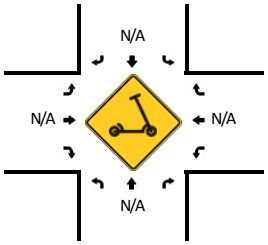












5-Min Count Period Beginning At	SR 3 (Northbound)				SR 3 (Southbound)				Imperial Wy (Eastbound)				Imperial Wy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	4	53	0	0	0	19	3	0	2	0	2	0	0	0	0	0	83	
6:05 AM	3	64	0	0	0	12	1	0	0	0	0	0	0	0	0	0	80	
6:10 AM	6	56	0	0	1	16	0	0	2	0	0	0	0	0	0	0	81	
6:15 AM	2	74	0	0	0	10	0	0	4	0	1	0	0	0	0	0	91	
6:20 AM	1	59	0	0	1	16	5	0	2	0	0	0	0	0	0	0	84	
6:25 AM	1	59	0	0	1	18	0	0	1	0	1	0	0	0	0	0	81	
6:30 AM	4	73	1	0	0	20	1	0	4	0	0	0	1	0	0	0	104	
6:35 AM	6	64	0	0	0	32	2	0	2	0	2	0	0	0	0	0	108	
6:40 AM	1	53	0	0	0	29	1	0	1	0	0	0	0	0	0	0	85	
6:45 AM	5	48	0	0	0	22	1	0	3	0	0	0	0	0	0	0	79	
6:50 AM	6	66	0	0	1	22	0	0	3	0	3	0	0	0	0	0	101	
6:55 AM	4	63	0	0	3	32	1	0	2	0	1	0	0	0	0	0	106	1083
7:00 AM	3	55	1	0	1	25	3	0	7	0	2	0	1	0	1	0	99	1099
7:05 AM	2	44	0	0	3	33	1	0	9	0	3	0	0	0	0	0	95	1114
7:10 AM	2	70	0	0	1	30	0	0	2	0	0	0	0	0	1	0	106	1139
7:15 AM	3	61	0	0	0	23	1	0	7	0	2	0	0	0	0	0	97	1145
7:20 AM	2	51	0	0	1	34	0	0	4	0	0	0	0	0	0	0	92	1153
7:25 AM	7	71	0	0	0	22	0	0	2	0	1	0	0	0	0	0	103	1175
7:30 AM	1	61	1	0	0	32	0	0	4	0	0	0	1	0	1	0	101	1172
7:35 AM	4	54	0	0	2	32	1	0	4	0	1	0	0	0	0	0	98	1162
7:40 AM	3	60	2	0	0	23	1	0	2	1	2	0	0	0	0	0	94	1171
7:45 AM	4	65	1	0	6	34	1	0	1	0	0	0	0	0	1	0	113	1205
7:50 AM	2	53	0	0	2	33	0	0	1	0	1	0	0	1	1	0	94	1198
7:55 AM	4	59	0	0	2	44	0	0	4	0	0	0	0	0	0	0	113	1205
8:00 AM	0	50	1	0	1	27	1	0	2	1	2	0	0	0	0	0	85	1191
8:05 AM	2	56	0	0	2	30	0	0	1	0	0	0	0	0	0	0	91	1187
8:10 AM	1	51	0	0	2	29	0	0	3	0	0	0	0	0	0	0	86	1167
8:15 AM	0	40	0	0	2	38	0	0	6	0	1	0	0	0	0	0	87	1157
8:20 AM	0	48	0	0	1	21	0	0	7	0	2	0	1	0	0	0	80	1145
8:25 AM	2	58	1	0	1	43	0	0	8	0	2	0	0	0	0	0	115	1157
8:30 AM	2	60	1	0	2	32	0	0	4	1	0	0	0	1	0	0	103	1159
8:35 AM	1	48	1	0	0	29	0	0	1	0	2	0	0	1	0	0	83	1144
8:40 AM	1	48	0	0	0	34	1	0	2	2	0	0	0	0	0	0	88	1138
8:45 AM	0	48	1	0	1	28	0	0	7	0	1	0	0	1	2	0	89	1114
8:50 AM	0	44	1	0	1	32	0	0	6	0	2	0	1	0	0	0	87	1107
8:55 AM	1	42	1	0	2	32	0	0	3	1	1	0	0	0	0	0	83	1077

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	52	736	4	0	20	316	16	0	48	0	24	0	4	0	4	0	1224
Heavy Trucks	4	16	0		0	24	0		24	0	4		0	0	0		72
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

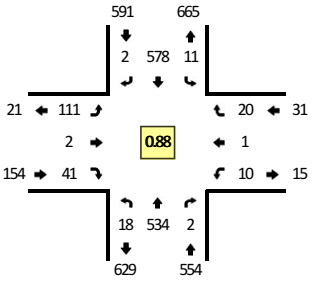
Type of peak hour being reported: Intersection Peak

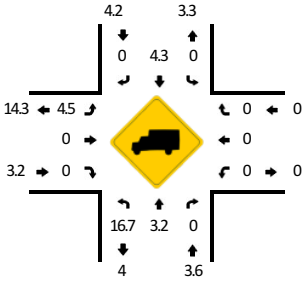
Method for determining peak hour: Total Entering Volume

LOCATION: SR 3 -- Imperial Wy
CITY/STATE: Bremerton, WA

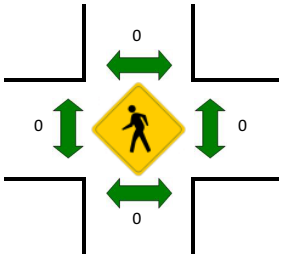
QC JOB #: 16296536
DATE: Wed, Nov 15 2023

Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:00 PM -- 4:15 PM

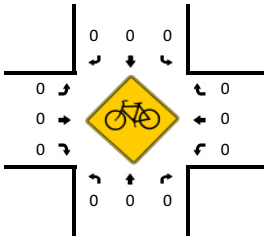


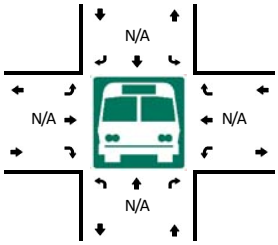


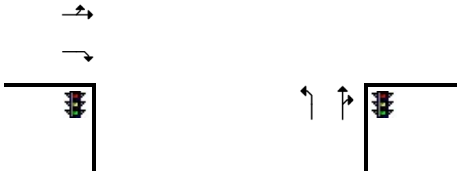
TRUE DATA TO IMPROVE MOBILITY

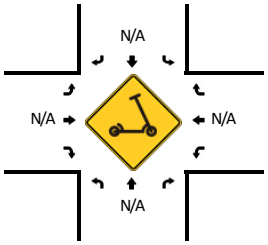












5-Min Count Period Beginning At	SR 3 (Northbound)				SR 3 (Southbound)				Imperial Wy (Eastbound)				Imperial Wy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	51	0	0	3	48	1	0	32	0	8	0	2	0	3	0	151	
4:05 PM	1	47	1	0	2	53	0	0	14	0	5	0	0	0	0	0	123	
4:10 PM	3	57	0	0	0	33	0	0	8	0	1	0	0	0	2	0	104	
4:15 PM	0	43	0	0	1	49	0	0	4	1	5	0	0	1	1	0	105	
4:20 PM	1	29	1	0	1	44	0	0	7	0	1	0	2	0	2	0	88	
4:25 PM	2	47	0	0	0	51	0	0	3	0	1	0	1	0	2	0	107	
4:30 PM	1	37	0	0	1	54	1	0	3	0	3	0	2	0	3	0	105	
4:35 PM	1	46	0	0	1	46	0	0	11	0	3	0	0	0	2	0	110	
4:40 PM	2	40	0	0	1	42	0	0	5	0	4	0	0	0	1	0	95	
4:45 PM	3	49	0	0	0	57	0	0	7	0	4	0	0	0	0	0	120	
4:50 PM	0	43	0	0	1	56	0	0	9	0	0	0	0	0	2	0	111	
4:55 PM	1	45	0	0	0	45	0	0	8	1	6	0	3	0	2	0	111	1330
5:00 PM	0	26	0	0	2	42	1	0	12	0	5	0	0	1	3	0	92	1271
5:05 PM	0	55	0	0	0	44	0	0	6	0	3	0	1	0	0	0	109	1257
5:10 PM	1	58	0	0	0	56	0	0	9	0	4	0	1	0	2	0	131	1284
5:15 PM	0	19	0	0	1	61	0	0	6	0	3	0	1	0	0	0	91	1270
5:20 PM	0	36	0	0	2	63	1	0	1	0	0	0	0	0	4	0	107	1289
5:25 PM	2	37	0	0	1	59	0	0	4	0	6	0	0	0	0	0	109	1291
5:30 PM	1	48	2	0	0	56	0	0	1	0	0	0	0	0	2	0	110	1296
5:35 PM	0	31	1	0	0	57	0	0	2	0	2	0	0	0	5	0	98	1284
5:40 PM	1	28	1	0	0	57	0	0	3	0	3	0	0	0	1	0	94	1283
5:45 PM	0	32	1	0	0	58	0	0	3	0	2	0	1	0	2	0	99	1262
5:50 PM	0	22	0	0	0	58	0	0	2	0	1	0	0	0	0	0	83	1234
5:55 PM	1	17	1	0	0	63	1	0	4	0	2	0	0	0	0	0	89	1212
6:00 PM	0	23	1	0	0	57	0	0	1	0	2	0	0	0	3	0	87	1207
6:05 PM	0	22	0	0	1	52	1	0	4	0	0	0	1	0	0	0	81	1179
6:10 PM	0	23	0	0	0	62	0	0	0	0	0	0	0	0	3	0	88	1136
6:15 PM	0	30	0	0	2	41	0	0	1	0	1	0	3	0	4	0	82	1127
6:20 PM	0	24	0	0	0	41	1	0	4	0	0	0	0	0	3	0	73	1093
6:25 PM	0	30	0	0	1	44	0	0	1	0	0	0	0	0	2	0	78	1062
6:30 PM	0	21	0	0	1	32	0	0	2	0	0	0	0	0	0	0	56	1008
6:35 PM	0	22	2	0	0	40	1	0	0	0	1	0	1	0	4	0	71	981
6:40 PM	0	21	0	0	0	31	1	0	0	0	1	0	0	0	1	0	55	942
6:45 PM	0	16	0	0	0	38	1	0	3	0	0	0	0	0	0	0	58	901
6:50 PM	0	19	0	0	0	52	0	0	1	0	0	0	0	0	1	0	73	891
6:55 PM	0	17	1	0	0	26	0	0	0	0	0	0	0	0	1	0	45	847

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	28	620	4	0	20	536	4	0	216	0	56	0	8	0	20	0	1512
Heavy Trucks	8	32	0		0	24	0		8	0	0		0	0	0		72
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: SE Spring Creek Rd/Hwy 16 Park and Ride Access -- SE Mullenix Rd

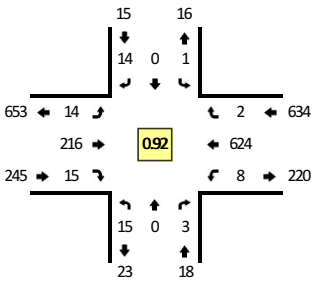
CITY/STATE: Bethel, WA

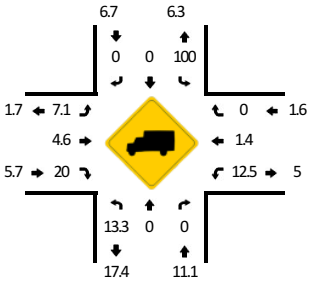
QC JOB #: 16296541

DATE: Wed, Nov 15 2023

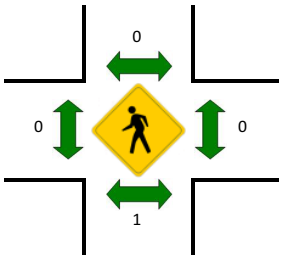
Peak-Hour: 7:10 AM -- 8:10 AM

Peak 15-Min: 7:35 AM -- 7:50 AM

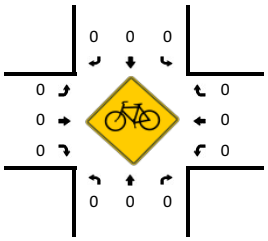


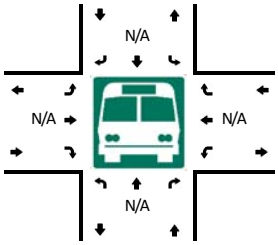


TRUE DATA TO IMPROVE MOBILITY

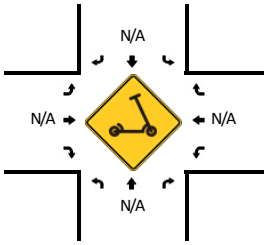












5-Min Count Period Beginning At	SE Spring Creek Rd/Hwy 16 Park and Ride Access (Northbound)				SE Spring Creek Rd/Hwy 16 Park and Ride Access (Southbound)				SE Mullenix Rd (Eastbound)				SE Mullenix Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	1	1	0	0	1	0	0	0	0	4	4	0	3	25	2	0	41	
6:05 AM	0	0	0	0	0	0	3	0	4	10	3	0	0	28	1	0	49	
6:10 AM	1	2	0	0	0	0	1	0	0	5	1	0	2	41	0	0	53	
6:15 AM	1	0	2	0	0	0	0	0	0	7	2	0	0	49	0	0	61	
6:20 AM	0	0	0	0	0	0	1	0	3	8	1	0	0	40	0	0	53	
6:25 AM	0	0	0	0	0	0	0	0	3	6	0	0	0	27	0	0	36	
6:30 AM	0	0	0	0	0	0	1	0	0	11	1	0	0	37	0	0	50	
6:35 AM	1	1	0	0	0	0	0	0	2	11	1	0	0	50	1	0	67	
6:40 AM	0	0	0	0	0	0	0	0	0	15	1	0	0	57	1	0	74	
6:45 AM	0	0	1	0	0	0	1	0	0	15	0	0	1	44	0	0	62	
6:50 AM	0	0	0	0	0	0	0	0	1	13	2	0	0	42	0	0	58	
6:55 AM	0	0	0	0	0	0	1	0	1	15	3	0	1	45	2	0	68	672
7:00 AM	0	0	0	0	0	0	0	0	1	14	0	0	0	38	0	0	53	684
7:05 AM	1	0	0	0	0	0	1	0	2	12	0	0	0	31	0	0	47	682
7:10 AM	0	0	0	0	0	0	0	0	1	11	0	0	1	62	0	0	75	704
7:15 AM	0	0	0	0	0	0	3	0	1	16	1	0	0	49	0	0	70	713
7:20 AM	0	0	0	0	0	0	1	0	0	19	0	0	0	53	0	0	73	733
7:25 AM	0	0	0	0	0	0	1	0	0	26	3	0	0	53	0	0	83	780
7:30 AM	1	0	0	0	0	0	1	0	2	18	1	0	0	56	0	0	79	809
7:35 AM	1	0	0	0	0	0	1	0	0	8	1	0	2	71	0	0	84	826
7:40 AM	2	0	0	0	0	0	0	0	2	13	2	0	2	60	0	0	81	833
7:45 AM	3	0	1	0	0	0	1	0	1	25	3	0	1	48	0	0	83	854
7:50 AM	2	0	1	0	0	0	2	0	2	23	1	0	0	47	0	0	78	874
7:55 AM	3	0	1	0	0	0	0	0	1	20	1	0	0	45	0	0	71	877
8:00 AM	0	0	0	0	1	0	3	0	4	23	2	0	0	29	2	0	64	888
8:05 AM	3	0	0	0	0	0	1	0	0	14	0	0	2	51	0	0	71	912
8:10 AM	0	0	1	0	0	0	1	0	2	18	0	0	0	45	1	0	68	905
8:15 AM	0	0	0	0	0	0	0	0	2	21	0	0	0	37	0	0	60	895
8:20 AM	1	0	0	0	0	0	4	0	4	11	1	0	1	46	0	0	68	890
8:25 AM	1	0	0	0	0	0	0	0	1	20	1	0	0	29	0	0	52	859
8:30 AM	1	0	0	0	0	0	2	0	6	16	0	0	2	41	1	0	69	849
8:35 AM	2	0	0	0	0	0	1	0	1	33	0	0	0	31	0	0	68	833
8:40 AM	0	0	0	0	0	0	1	0	0	20	2	0	0	43	1	0	67	819
8:45 AM	0	0	0	0	0	0	1	0	4	18	0	0	1	37	0	0	61	797
8:50 AM	2	0	0	0	0	0	1	0	1	22	2	0	0	38	0	0	66	785
8:55 AM	2	0	1	0	1	0	0	0	1	27	1	0	0	31	0	0	64	778

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	24	0	4	0	0	0	8	0	12	184	24	0	20	716	0	0	992
Heavy Trucks	4	0	0		0	0	0		0	8	4		0	4	0		20
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: SE Spring Creek Rd/Hwy 16 Park and Ride Access -- SE Mullenix Rd

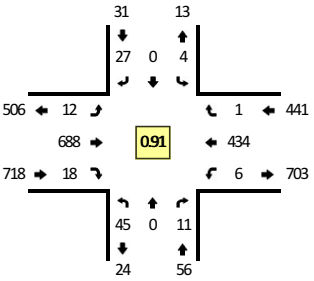
CITY/STATE: Bethel, WA

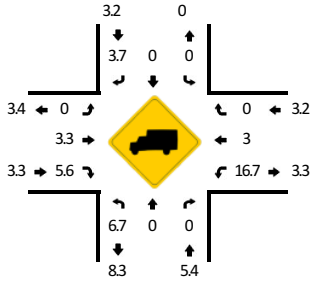
QC JOB #: 16296542

DATE: Wed, Nov 15 2023

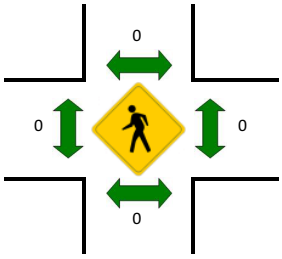
Peak-Hour: 4:00 PM -- 5:00 PM

Peak 15-Min: 4:40 PM -- 4:55 PM

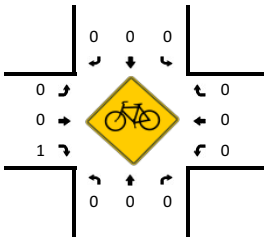


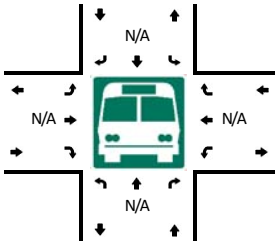


TRUE DATA TO IMPROVE MOBILITY

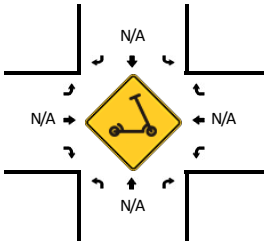












5-Min Count Period Beginning At	SE Spring Creek Rd/Hwy 16 Park and Ride Access (Northbound)				SE Spring Creek Rd/Hwy 16 Park and Ride Access (Southbound)				SE Mullenix Rd (Eastbound)				SE Mullenix Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	7	0	2	0	1	0	2	0	2	49	3	0	1	32	0	0	99	
4:05 PM	2	0	1	0	0	0	3	0	2	67	0	0	0	26	0	0	101	
4:10 PM	1	0	1	0	0	0	0	0	2	51	1	0	0	35	0	0	91	
4:15 PM	0	0	0	0	0	0	1	0	1	51	1	0	1	37	0	0	92	
4:20 PM	1	0	3	0	0	0	1	0	2	66	3	0	0	39	0	0	115	
4:25 PM	5	0	1	0	0	0	0	0	1	61	0	0	0	31	0	0	99	
4:30 PM	0	0	0	0	2	0	6	0	0	47	2	0	0	47	1	0	105	
4:35 PM	0	0	0	0	0	0	5	0	0	59	1	0	0	30	0	0	95	
4:40 PM	10	0	1	0	0	0	4	0	0	52	1	0	1	42	0	0	111	
4:45 PM	8	0	1	0	0	0	2	0	2	59	3	0	0	40	0	0	115	
4:50 PM	8	0	1	0	1	0	0	0	0	69	2	0	2	35	0	0	118	
4:55 PM	3	0	0	0	0	0	3	0	0	57	1	0	1	40	0	0	105	1246
5:00 PM	7	0	2	0	0	0	2	0	0	50	0	0	0	30	1	0	92	1239
5:05 PM	0	0	0	0	0	0	0	0	2	59	0	0	0	24	0	0	85	1223
5:10 PM	3	0	0	0	2	0	1	0	2	62	5	0	1	36	0	0	112	1244
5:15 PM	1	0	0	0	0	0	1	0	0	39	3	0	0	32	2	0	78	1230
5:20 PM	0	0	0	0	0	0	0	0	1	61	3	0	0	26	1	0	92	1207
5:25 PM	0	0	2	0	0	0	1	0	0	63	6	0	0	29	0	0	101	1209
5:30 PM	3	0	0	0	0	0	1	0	1	44	4	0	1	31	0	0	85	1189
5:35 PM	2	1	0	0	0	0	2	0	0	52	2	0	0	37	1	0	97	1191
5:40 PM	1	0	0	0	0	0	2	0	0	67	4	0	1	24	0	0	99	1179
5:45 PM	0	0	1	0	0	0	2	0	2	49	1	0	1	29	2	0	87	1151
5:50 PM	0	0	0	0	0	0	0	0	1	39	2	0	1	22	1	0	66	1099
5:55 PM	2	0	2	0	0	0	2	0	2	56	3	0	1	28	0	0	96	1090
6:00 PM	0	0	1	0	0	0	1	0	1	53	1	0	0	22	0	0	79	1077
6:05 PM	0	0	1	0	0	0	3	0	0	52	1	0	0	28	0	0	85	1077
6:10 PM	3	0	1	0	0	0	0	0	1	49	4	0	0	18	0	0	76	1041
6:15 PM	0	0	0	0	0	0	2	0	0	48	1	0	0	27	1	0	79	1042
6:20 PM	0	0	1	0	0	0	0	0	0	57	1	0	1	20	1	0	81	1031
6:25 PM	0	0	0	0	0	0	0	0	1	33	3	0	1	17	0	0	55	985
6:30 PM	1	0	0	0	0	0	0	0	1	28	0	0	0	14	1	0	45	945
6:35 PM	0	0	0	0	0	0	1	0	0	26	3	0	0	27	0	0	57	905
6:40 PM	2	0	0	0	0	0	3	0	2	30	0	0	0	16	2	0	55	861
6:45 PM	0	0	0	0	0	0	1	0	0	29	0	0	0	16	1	0	47	821
6:50 PM	0	1	0	0	0	0	1	0	0	20	1	0	0	8	0	0	31	786
6:55 PM	0	0	0	0	0	0	1	0	2	40	1	0	0	9	2	0	55	745

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	104	0	12	0	4	0	24	0	8	720	24	0	12	468	0	0	1376
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	8	0		28
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/27/2023 5:06 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Attachment B
Growth Rates and Volume Development

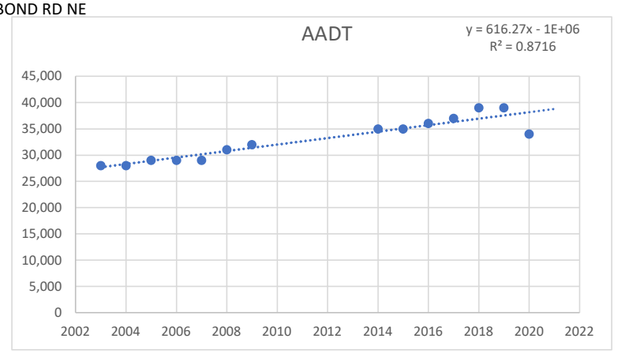
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SR 305 at wof SR 307

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
305	305			Bothways	12.81				34,000	2020
305	305			Bothways	12.81				39,000	2019
305	305			Bothways	12.81				39,000	2018
305	305			Bothways	12.81				37,000	2017
305	305			Bothways	12.81				36,000	2016
305	305			Bothways	12.81				35,000	2015
305	305			Bothways	12.81				35,000	2014
305	305			Bothways	12.81				32,000	2009
305	305			Bothways	12.81				31,000	2008
305	305			Bothways	12.81				29,000	2007
305	305			Bothways	12.81				29,000	2006
305	305			Bothways	12.81				29,000	2005
305	305			Bothways	12.81				28,000	2004
305	305			Bothways	12.81				28,000	2003
305	305			Bothways	12.81					

Location

After Milepost 12.82 A: RIGHT INTERSECTION SR 307-BOND RD NE, LEFT INTERSECTION BOND RD NE



2020	34,000	
2009	32,000	0.55%

2009 - 2020
1.86%

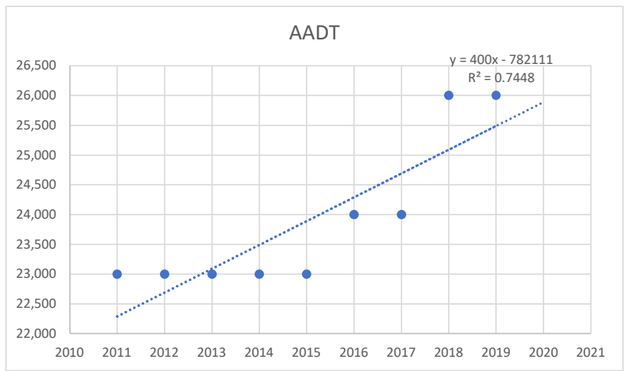
Avg 1.05%
Use 1.0% <<<

SR 305 at undercrossing of SR 3

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
305	305			Bothways	13.5				26,000	2019
305	305			Bothways	13.5				26,000	2018
305	305			Bothways	13.5				24,000	2017
305	305			Bothways	13.5				24,000	2016
305	305			Bothways	13.5				23,000	2015
305	305			Bothways	13.5				23,000	2014
305	305			Bothways	13.5				23,000	2013
305	305			Bothways	13.5				23,000	2012
305	305			Bothways	13.5				23,000	2011
305	305			Bothways	13.5					
305	305			Bothways	13.5					
305	305			Bothways	13.5					
305	305			Bothways	13.5					
305	305			Bothways	13.5					
305	305			Bothways	13.5					
305	305			Bothways	13.5					

Location

At Milepost 13.52 A: BOTHWAYS UNDERCROSSING SR 3 S BND, END ROUTE



2019	26,000	
2011	23,000	1.54%

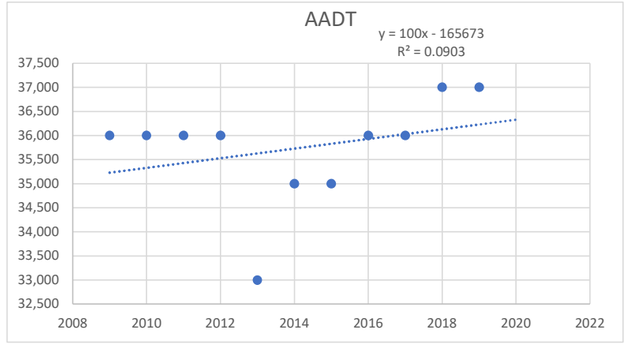
2011- 2019
1.69%

SR 303 at McWilliams Rd

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
303	303			Bothways	3.90				37,000	2019
303	303			Bothways	3.90				37,000	2018
303	303			Bothways	3.90				36,000	2017
303	303			Bothways	3.90				36,000	2016
303	303			Bothways	3.90				35,000	2015
303	303			Bothways	3.90				35,000	2014
303	303			Bothways	3.90				33,000	2013
303	303			Bothways	3.90				36,000	2012
303	303			Bothways	3.90				36,000	2011
303	303			Bothways	3.90				36,000	2010
303	303			Bothways	3.90				36,000	2009
303	303			Bothways	3.90					

Location

Before Milepost 3.75 A: BOTHWAYS INTERSECTION MC WILLIAMS RD



2019	37,000	
2009	36,000	0.27%

2009 - 2019
0.28%

Avg 0.28%

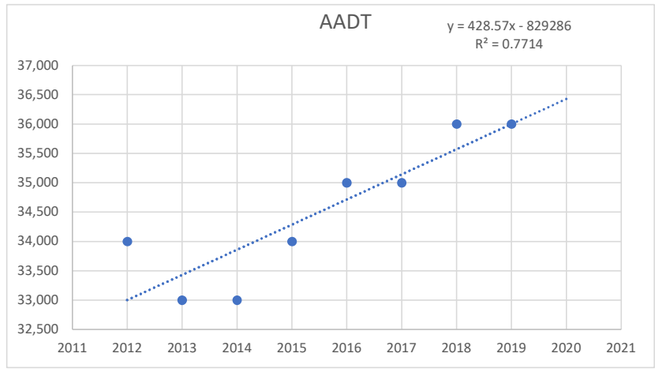
Use 0.5% <<<

SR 303 at McWilliams Rd

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
016	016			Bothways	3.92				36,000	2019
016	016			Bothways	3.92				36,000	2018
016	016			Bothways	3.92				35,000	2017
016	016			Bothways	3.92				35,000	2016
016	016			Bothways	3.92				34,000	2015
016	016			Bothways	3.92				33,000	2014
016	016			Bothways	3.92				33,000	2013
016	016			Bothways	3.92				34,000	2012
016	016			Bothways	3.92				35,000	2011
016	016			Bothways	3.92				35,000	2010
016	016			Bothways	3.92				35,000	2009
016	016			Bothways	3.92					

Location

After Milepost 3.75 A: BOTHWAYS INTERSECTION MC WILLIAMS RD



2019	36,000	
2009	35,000	0.28%

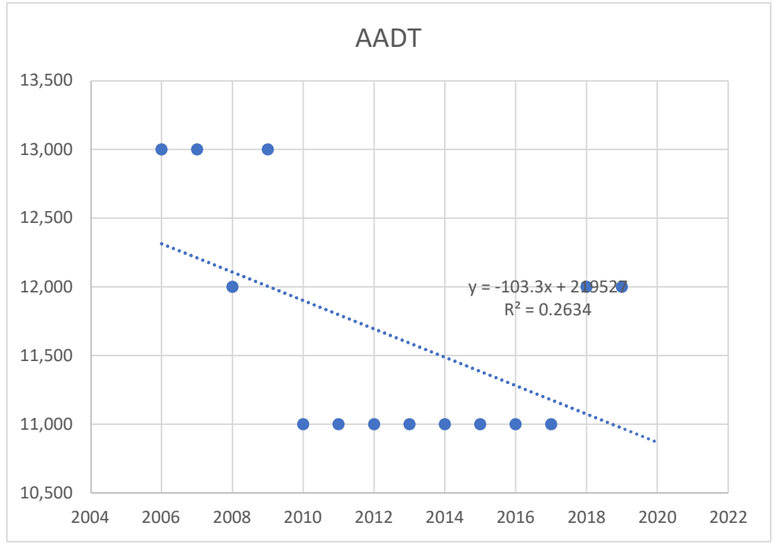
2009- 2019
0.32%

Alaskan Way at Yesler Way

Route ID	State Route	Related Route	Related Route	Travel Direction	Accumulated	Single Unit	Double Unit	Triple Unit	AADT	Year
519	519			Bothways	1.08					
519	519			Bothways	1.08				12,000	2019
519	519			Bothways	1.08				12,000	2018
519	519			Bothways	1.08				11,000	2017
519	519			Bothways	1.08				11,000	2016
519	519			Bothways	1.08				11,000	2015
519	519			Bothways	1.08				11,000	2014
519	519			Bothways	1.08				11,000	2013
519	519			Bothways	1.08				11,000	2012
519	519			Bothways	1.08				11,000	2011
519	519			Bothways	1.08				11,000	2010
519	519			Bothways	1.08				13,000	2009
519	519			Bothways	1.08				12,000	2008
519	519			Bothways	1.08				13,000	2007
519	519			Bothways	1.08				13,000	2006
519	519			Bothways	1.08					

Location

Before Milepost 1.14 A: RIGHT INTERSECTION YESLER WAY, LEFT ENTRANCE/EXIT FERRY TERM-TO TOLL BOOTH, END ROUTE



2019	12,000	
2009	13,000	-0.80%

2009 - 2019
-0.08%

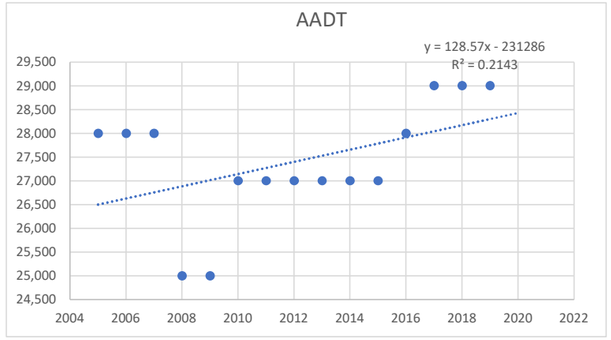
Use 0.5% <<<

SR 304 at Callow

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
304	304			Bothways	1.64				29,000	2019
304	304			Bothways	1.64				29,000	2018
304	304			Bothways	1.64				29,000	2017
304	304			Bothways	1.64				28,000	2016
304	304			Bothways	1.64				27,000	2015
304	304			Bothways	1.64				27,000	2014
304	304			Bothways	1.64				27,000	2013
304	304			Bothways	1.64				27,000	2012
304	304			Bothways	1.64				27,000	2011
304	304			Bothways	1.64				27,000	2010
304	304			Bothways	1.64				25,000	2009
304	304			Bothways	1.64				25,000	2008
304	304			Bothways	1.64				28,000	2007
304	304			Bothways	1.64				28,000	2006
304	304			Bothways	1.64				28,000	2005

Location

Before Milepost 1.66 A: RIGHT WYE CONNECTION SR 304



2019	29,000	
2009	25,000	1.50%

2009 - 2019
1.20%

Avg 1.50%

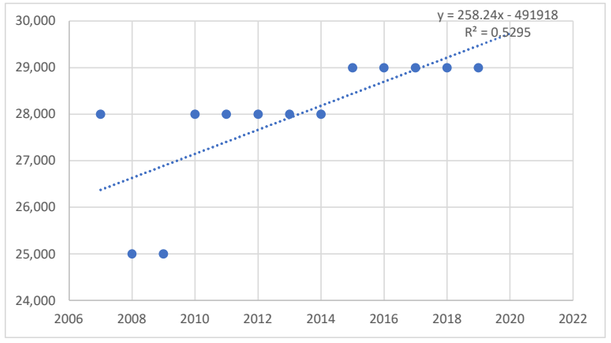
Use 1.5% <<<

SR 304 at Callow

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
304	304			Bothways	1.15					
304	304			Bothways	1.15				29,000	2019
304	304			Bothways	1.15				29,000	2018
304	304			Bothways	1.15				29,000	2017
304	304			Bothways	1.15				29,000	2016
304	304			Bothways	1.15				29,000	2015
304	304			Bothways	1.15				28,000	2014
304	304			Bothways	1.15				28,000	2013
304	304			Bothways	1.15				28,000	2012
304	304			Bothways	1.15				28,000	2011
304	304			Bothways	1.15				28,000	2010
304	304			Bothways	1.15				25,000	2009
304	304			Bothways	1.15				25,000	2008
304	304			Bothways	1.15				28,000	2007
304	304			Bothways	1.15					
304	304			Bothways	1.15					

Location

Before Milepost 1.11 A: RIGHT WYE CONNECTION FARRAGUT ST (OLD SR 304)



2019	29,000	
2009	25,000	1.50%

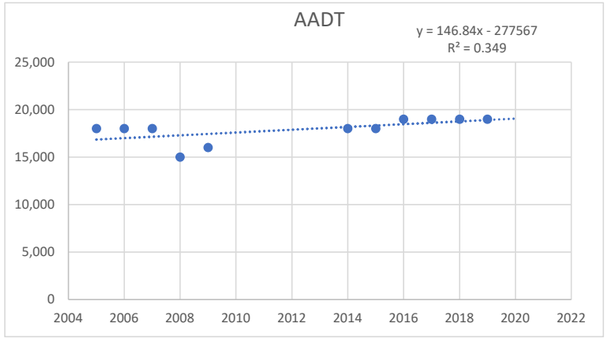
2009-2019
0.97%

SR 304 at SR 303

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
304	304			Bothways	2.61				19,000	2019
304	304			Bothways	2.61				19,000	2018
304	304			Bothways	2.61				19,000	2017
304	304			Bothways	2.61				19,000	2016
304	304			Bothways	2.61				18,000	2015
304	304			Bothways	2.61				18,000	2014
304	304			Bothways	2.61				16,000	2009
304	304			Bothways	2.61				15,000	2008
304	304			Bothways	2.61				18,000	2007
304	304			Bothways	2.61				18,000	2006
304	304			Bothways	2.61				18,000	2005
304	304			Bothways	2.61					
304	304			Bothways	2.61					
304	304			Bothways	2.61					
304	304			Bothways	2.61					

Location

Before Milepost 2.63 A: RIGHT INTERSECTION WARREN AVE, LEFT INTERSECTION SR 303



2019	19,000	
2008	15,000	2.17%

2008 - 2019
0.83%

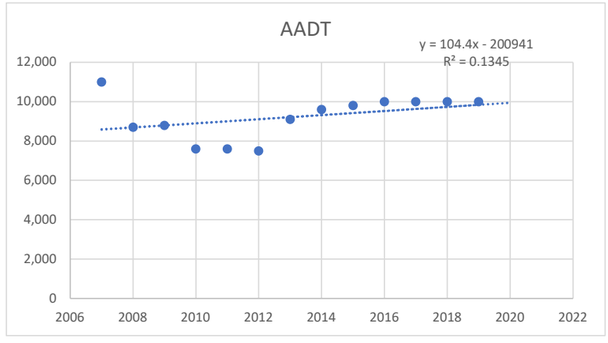
Avg 1.72%
Use 1.5% <<<

SR 304 at East of Warren Ave

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
304	304			Bothways	2.63				10,000	2019
304	304			Bothways	2.63				10,000	2018
304	304			Bothways	2.63				10,000	2017
304	304			Bothways	2.63				10,000	2016
304	304			Bothways	2.63				9,800	2015
304	304			Bothways	2.63				9,600	2014
304	304			Bothways	2.63				9,100	2013
304	304			Bothways	2.63				7,500	2012
304	304			Bothways	2.63				7,600	2011
304	304			Bothways	2.63				7,600	2010
304	304			Bothways	2.63				8,800	2009
304	304			Bothways	2.63				8,700	2008
304	304			Bothways	2.63				11,000	2007
304	304			Bothways	2.63					
304	304			Bothways	2.63					

Location

After Milepost 2.63 A: RIGHT INTERSECTION WARREN AVE, LEFT INTERSECTION SR 303



2019	10,000	
2008	8,700	1.27%

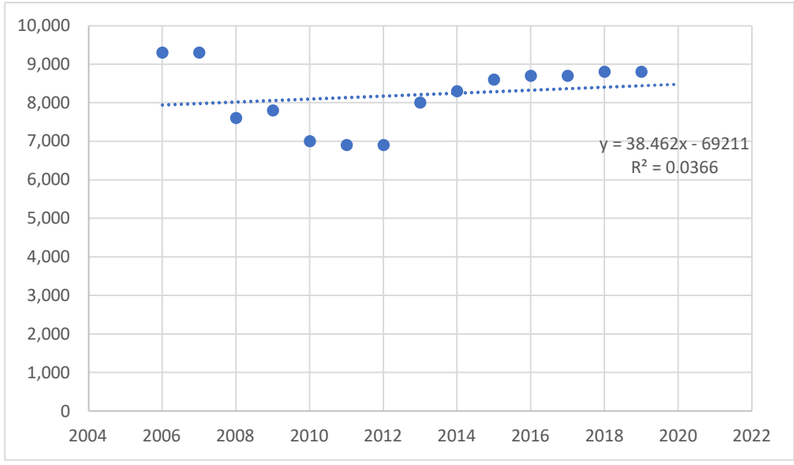
2009-2019
2.91%

SR 304 at Pacific

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
304	304			Bothways	2.75					
304	304			Bothways	2.75				8,800	2019
304	304			Bothways	2.75				8,800	2018
304	304			Bothways	2.75				8,700	2017
304	304			Bothways	2.75				8,700	2016
304	304			Bothways	2.75				8,600	2015
304	304			Bothways	2.75				8,300	2014
304	304			Bothways	2.75				8,000	2013
304	304			Bothways	2.75				6,900	2012
304	304			Bothways	2.75				6,900	2011
304	304			Bothways	2.75				7,000	2010
304	304			Bothways	2.75				7,800	2009
304	304			Bothways	2.75				7,600	2008
304	304			Bothways	2.75				9,300	2007
304	304			Bothways	2.75				9,300	2006
304	304			Bothways	2.75					

Location

On SR 304, E/O Park Ave Intersection



2019	8,800	
2008	7,600	1.34%

2008 - 2019
2.51%

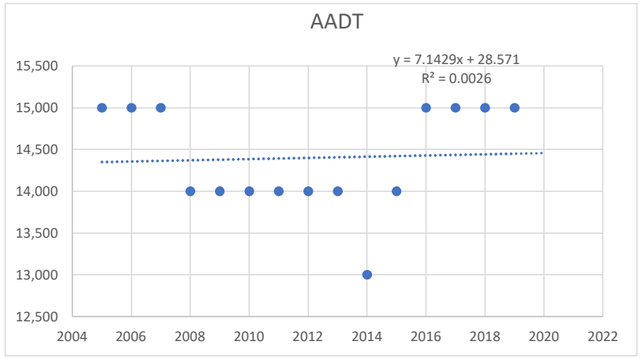
Use 1.0% <<<

SR 166 (Bay St) at Sidney Ave

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
166	166			Bothways	2.87				15,000	2019
166	166			Bothways	2.87				15,000	2018
166	166			Bothways	2.87				15,000	2017
166	166			Bothways	2.87				15,000	2016
166	166			Bothways	2.87				14,000	2015
166	166			Bothways	2.87				13,000	2014
166	166			Bothways	2.87				14,000	2013
166	166			Bothways	2.87				14,000	2012
166	166			Bothways	2.87				14,000	2011
166	166			Bothways	2.87				14,000	2010
166	166			Bothways	2.87				14,000	2009
									14,000	2008
									15,000	2007
									15,000	2006
									15,000	2005

Location

Before Milepost 2.90 A: BOTHWAYS INTERSECTION SIDNEY AVE



2019	15,000	
2008	14,000	0.63%

2008 - 2019
0.05%

Average 0.59%

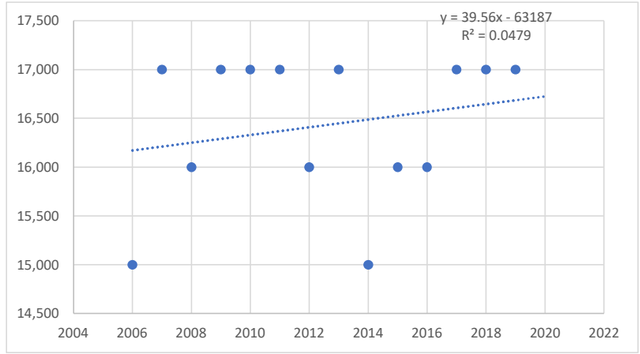
Use 0.5% <<<

SR 166 (Bay St) at Sidney Ave

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
166	166			Bothways	2.89				17,000	2019
166	166			Bothways	2.89				17,000	2018
166	166			Bothways	2.89				17,000	2017
166	166			Bothways	2.89				16,000	2016
166	166			Bothways	2.89				16,000	2015
166	166			Bothways	2.89				15,000	2014
166	166			Bothways	2.89				17,000	2013
166	166			Bothways	2.89				16,000	2012
166	166			Bothways	2.89				17,000	2011
166	166			Bothways	2.89				17,000	2010
166	166			Bothways	2.89				17,000	2009
									16,000	2008
									17,000	2007
									15,000	2006
									15,000	2005

Location

After Milepost 2.90 A: BOTHWAYS INTERSECTION SIDNEY AVE



2019	17,000	
2008	16,000	0.55%

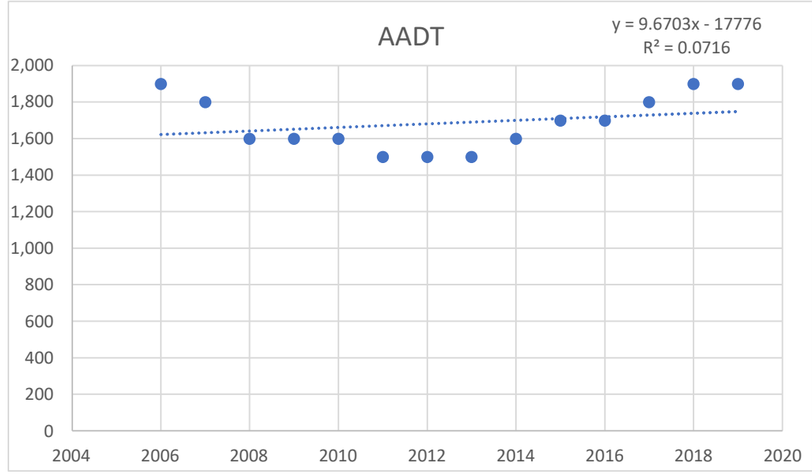
2008- 2019
0.42%

Flauntleroy Way at Barton St

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Accumulated Route Mile	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
160	160			Bothways	7.47					
160	160			Bothways	7.47				1,900	2019
160	160			Bothways	7.47				1,900	2018
160	160			Bothways	7.47				1,800	2017
160	160			Bothways	7.47				1,700	2016
160	160			Bothways	7.47				1,700	2015
160	160			Bothways	7.47				1,600	2014
160	160			Bothways	7.47				1,500	2013
160	160			Bothways	7.47				1,500	2012
160	160			Bothways	7.47				1,500	2011
160	160			Bothways	7.47				1,600	2010
160	160			Bothways	7.47				1,600	2009
160	160			Bothways	7.47				1,600	2008
160	160			Bothways	7.47				1,800	2007
160	160			Bothways	7.47				1,900	2006
160	160			Bothways	7.47					

Location

At Milepost 7.47 A: END ROUTE



2019	1,900	
2009	1,600	1.73%

2009 - 2019
0.58%

Use 2.0% <<<

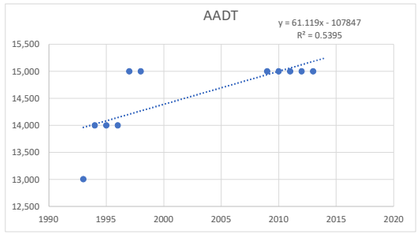
SR 3 at Sam Christopherson Ave

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
003	003	15000	2013	Bothways	34.24				15,000	2013
003	003	15000	2012	Bothways	34.24				15,000	2012
003	003	15000	2011	Bothways	34.24				15,000	2011
003	003	15000	2010	Bothways	34.24				15,000	2010
003	003	15000	2009	Bothways	34.24				15,000	2009
003	003	15000	1998	Bothways	34.24				15,000	1998
003	003	15000	1997	Bothways	34.24				15,000	1997
003	003	14000	1996	Bothways	34.24				14,000	1996
003	003	14000	1995	Bothways	34.24				14,000	1995
003	003	14000	1994	Bothways	34.24				14,000	1994
003	003	13000	1993	Bothways	34.24				13,000	1993

Too Old

Location

After Milepost 34.26 A: RIGHT INTERSECTION SR 16 SPGORST (SPUR), LEFT INTERSECTION SAM CHRISTOPHERSON AVE W



2013	15,000	
1993	13,000	0.72%

1993 - 2013
0.42%

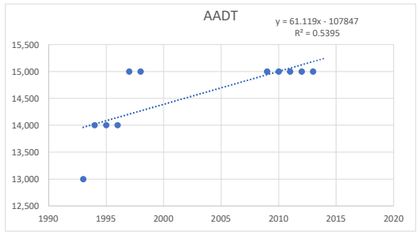
SR 3 at wof Pleasant St

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
003	003	Spot		Bothways	33.78				16,000	1995
003	003			Bothways	33.78				16,000	1994
003	003			Bothways	33.78				15,000	1993
003	003			Bothways	33.78				14,000	1992
003	003			Bothways	33.78				14,000	1991
003	003			Bothways	33.78				13,000	1990
003	003			Bothways	33.78				12,000	1989
003	003			Bothways	33.78				13,000	1988
003	003			Bothways	33.78				12,000	1987
003	003			Bothways	33.80					
003	003			Bothways	33.80					
003	003			Bothways	33.80					
003	003			Bothways	33.80					
003	003			Bothways	33.80					

Too Old

Location

Before Milepost 33.82 A: RIGHT INTERSECTION W PLEASANT ST, LEFT INTERSECTION DIVISION AVE W



1995	16,000	
1987	12,000	3.66%

1987- 1995
3.95%

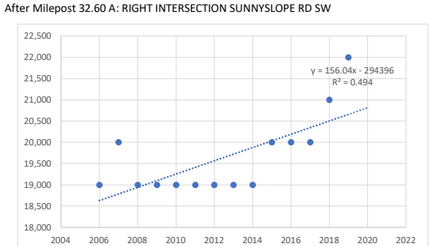
SR 3 at Sunnyslope

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
003	003			Bothways	32.58				22,000	2019
003	003			Bothways	32.58				21,000	2018
003	003			Bothways	32.58				20,000	2017
003	003			Bothways	32.58				20,000	2016
003	003			Bothways	32.58				20,000	2015
003	003			Bothways	32.58				19,000	2014
003	003			Bothways	32.58				19,000	2013
003	003			Bothways	32.58				19,000	2012
003	003			Bothways	32.58				19,000	2011
003	003			Bothways	32.58				19,000	2010
003	003			Bothways	32.58				19,000	2009
003	003			Bothways	32.58				19,000	2008
003	003			Bothways	32.58				20,000	2007
									19,000	2006

Good

#DIV/0! **Location**

After Milepost 32.60 A: RIGHT INTERSECTION SUNNYSLOPE RD SW



2019	22,000	
2008	19,000	1.34%

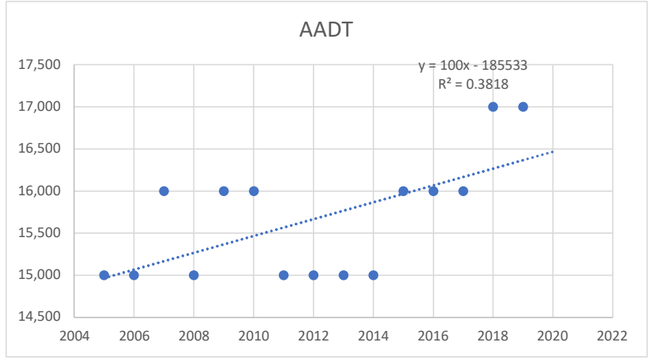
2008- 2019
0.7983%
Use 1.0% <<<

303 at Imperial (Sof)

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
003	003			Bothways	30.47					
003	003	0	0	Bothways	30.47				17,000	2019
003	003	0	0	Bothways	30.47				17,000	2018
003	003	0	0	Bothways	30.47				16,000	2017
003	003	0	0	Bothways	30.47				16,000	2016
003	003	0	0	Bothways	30.47				16,000	2015
003	003	0	0	Bothways	30.47				15,000	2014
003	003	0	0	Bothways	30.47				15,000	2013
003	003	0	0	Bothways	30.47				15,000	2012
003	003	0	0	Bothways	30.47				15,000	2011
003	003	0	0	Bothways	30.47				16,000	2010
003	003	0	0	Bothways	30.47				16,000	2009
003	003	0	0	Bothways	30.47				15,000	2008
003	003	0	0	Bothways	30.47				16,000	2007
003	003	0	0	Bothways	30.47				15,000	2006
003	003	0	0	Bothways	30.47				15,000	2005

Location

Before Milepost 30.51 A: BOTHWAYS INTERSECTION IMPERIAL WAY



2019	17,000	
2005	15,000	0.90%

2005 - 2019
0.87%

Avg 0.87%

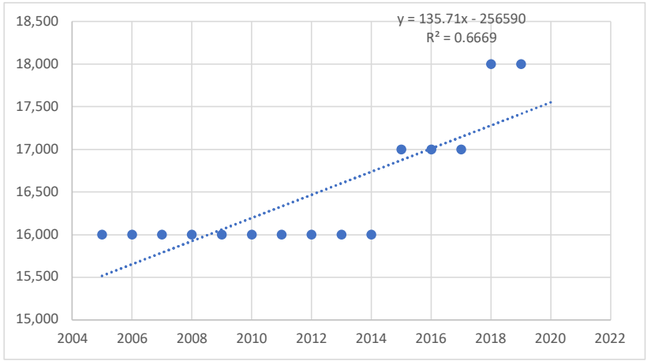
Use 1.0% <<<

303 at Imperial (Nof)

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
003	003			Bothways	30.49					
003	003	0	0	Bothways	30.49				18,000	2019
003	003	0	0	Bothways	30.49				18,000	2018
003	003	0	0	Bothways	30.49				17,000	2017
003	003	0	0	Bothways	30.49				17,000	2016
003	003	0	0	Bothways	30.49				17,000	2015
003	003	0	0	Bothways	30.49				16,000	2014
003	003	0	0	Bothways	30.49				16,000	2013
003	003	0	0	Bothways	30.49				16,000	2012
003	003	0	0	Bothways	30.49				16,000	2011
003	003	0	0	Bothways	30.49				16,000	2010
003	003	0	0	Bothways	30.49				16,000	2009
003	003	0	0	Bothways	30.49				16,000	2008
003	003	0	0	Bothways	30.49				16,000	2007
003	003	0	0	Bothways	30.49				16,000	2006
003	003	0	0	Bothways	30.49				16,000	2005

Location

After Milepost 30.51 A: BOTHWAYS INTERSECTION IMPERIAL WAY



2019	18,000	
2005	16,000	0.84%

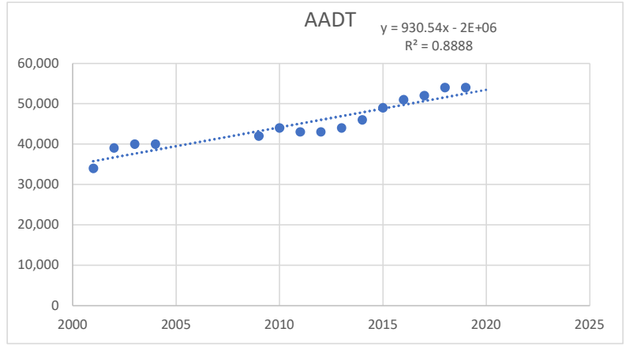
2005 - 2019
1.32%

SR 16 at Mullenix Rd

Route ID	State Route	Related Route	Related Route	Travel Direction	Milepost	Single Unit	Double Unit	Triple Unit	AADT	Year
016	016			Bothways	20.00					
016	016	0	0	Bothways	20.00				54,000	2019
016	016	0	0	Bothways	20.00				54,000	2018
016	016	0	0	Bothways	20.00				52,000	2017
016	016	0	0	Bothways	20.00				51,000	2016
016	016	0	0	Bothways	20.00				49,000	2015
016	016	0	0	Bothways	20.00				46,000	2014
016	016	0	0	Bothways	20.00				44,000	2013
016	016	0	0	Bothways	20.00				43,000	2012
016	016	0	0	Bothways	20.00				43,000	2011
016	016	0	0	Bothways	20.00				44,000	2010
									42,000	2009
									40,000	2004
									40,000	2003
									39,000	2002
									34,000	2001

Location

Before Milepost 22.09 A: LEFT ON RAMP MULLENIX RD



2019	54,000	
2009	42,000	2.54%

2009 - 2019
2.16%

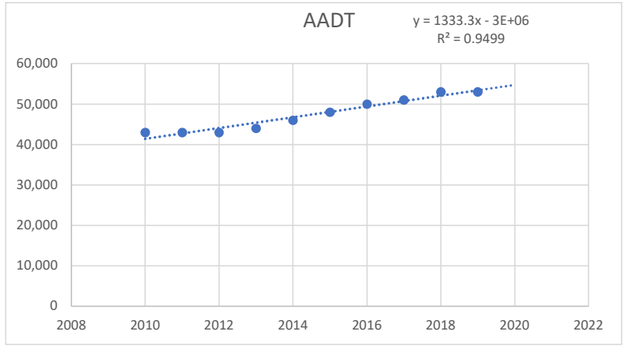
Average 2.45%
Use 2.0% <<<

SR 16 at Mullenix Rd

Route ID	State Route Number	Related Route Type	Related Route Qualifier	Travel Direction	Milepost	Single Unit Truck Percent	Double Unit Truck Percent	Triple Unit Truck Percent	AADT	Year
016	016			Bothways	21.01					
016	016			Bothways	21.01				53,000	2019
016	016			Bothways	21.01				53,000	2018
016	016			Bothways	21.01				51,000	2017
016	016			Bothways	21.01				50,000	2016
016	016			Bothways	21.01				48,000	2015
016	016			Bothways	21.01				46,000	2014
016	016			Bothways	21.01				44,000	2013
016	016			Bothways	21.01				43,000	2012
016	016			Bothways	21.01				43,000	2011
016	016			Bothways	21.01				43,000	2010
									41,000	2009
									41,000	2008
									42,000	2007
									43,000	2006
									43,000	2005

Location

After Milepost 23.08 A: RIGHT ON RAMP MULLENIX RD



2019	53,000	
2008	41,000	2.36%

2008- 2019
1.90%

BREMERTON EIS AM TRAFFIC VOLUME DEVELOPMENT - Shift 1

#	Intersection	Growth Rate (%)	Growth Factor
1	Viking Ave NW and SR 305	1.0	1.072
2	SR 303 NE and NE McWilliams Road	0.5	1.036
3	Alaskan Way and Yesler Way	0.5	1.036
4	Callow Avenue and Charleston Boulevard	1.5	1.110
5	Warren Avenue and Burwell Street	1.5	1.110
6	Pacific Avenue and Burwell Street	1.0	1.072
7	Sidney Ave and SR 166/Bay St	0.5	1.036
8	Fauntleroy Way and SW Barton Street	2.0	1.149
9	SR 3 W and W Sam Christopherson Ave	1.0	1.072
10	SR 3 SW and Imperial Way	1.0	1.072
11	SE Spring Creek Road and Mullenix Road	2.0	1.149

Exact location TBD, based on location of proposed parking / laydown area.

2023 Existing AM - Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	3	76	3	3	60	2	2	1	6	4	1	5
2	SR 303 NE and NE McWilliams Road	6	2	5	7	3	7	6	35	3	3	40	4
3	Alaskan Way and Yesler Way	0	0	8	0	0	0	4	48	16	0	23	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	50	0	0	43	0
5	Warren Avenue and Burwell Street	26	13	0	0	9	1	0	0	0	4	0	18
6	Pacific Avenue and Burwell Street	0	6	13	3	7	0	0	0	0	1	5	1
7	Sidney Ave and SR 166/Bay St	0	10	0	2	20	0	1	0	1	1	1	0
8	Fauntleroy Way and SW Barton Street	5	0	4	0	0	0	1	18	0	0	14	2
9	SR 3 W and W Sam Christopherson Ave	0	31	12	0	18	1	11	4	4	5	6	1
10	SR 3 SW and Imperial Way	2	0	1	0	0	0	2	36	0	1	17	0
11	SE Spring Creek Road and Mullenix Road	1	11	1	0	31	0	1	0	0	0	0	1

2030 No Build AM Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	3	81	3	3	64	2	2	1	6	4	1	5
2	SR 303 NE and NE McWilliams Road	6	2	5	7	3	7	6	36	3	3	41	4
3	Alaskan Way and Yesler Way	0	0	8	0	0	0	4	50	17	0	24	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	55	0	0	48	0
5	Warren Avenue and Burwell Street	29	14	0	0	10	1	0	0	0	4	0	20
6	Pacific Avenue and Burwell Street	0	6	14	3	8	0	0	0	0	1	5	1
7	Sidney Ave and SR 166/Bay St	0	10	0	2	21	0	1	0	1	1	1	0
8	Fauntleroy Way and SW Barton Street	6	0	5	0	0	0	1	21	0	0	16	2
9	SR 3 W and W Sam Christopherson Ave	0	33	13	0	19	1	12	4	4	5	6	1
10	SR 3 SW and Imperial Way	2	0	1	0	0	0	2	39	0	1	18	0
11	SE Spring Creek Road and Mullenix Road	1	13	1	0	36	0	1	0	0	0	0	1

2030 Project Only - AM Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	0	0	0	0	0	0	0	0	0	0	0	0
2	SR 303 NE and NE McWilliams Road	0	0	0	0	0	0	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	0	0	0	0	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	50	0	0	0	0
5	Warren Avenue and Burwell Street	0	0	0	0	15	0	0	0	0	6	0	29
6	Pacific Avenue and Burwell Street	0	43	0	0	0	0	0	0	0	7	0	0
7	Sidney Ave and SR 166/Bay St	25	0	0	0	0	51	0	64	0	0	0	0
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	0	0	0	0	0	0
9	SR 3 W and W Sam Christopherson Ave	0	0	2	0	434	0	268	0	0	0	0	0
10	SR 3 SW and Imperial Way	2	0	0	0	0	0	0	0	0	140	0	562
11	SE Spring Creek Road and Mullenix Road	0	0	0	0	0	0	0	0	0	0	0	0

2030 Build AM Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	3	81	3	3	64	2	2	1	6	4	1	5
2	SR 303 NE and NE McWilliams Road	6	2	5	7	3	7	6	36	3	3	41	4
3	Alaskan Way and Yesler Way	0	0	8	0	0	0	4	50	17	0	24	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	105	0	0	48	0
5	Warren Avenue and Burwell Street	29	14	0	0	25	1	0	0	0	10	0	49
6	Pacific Avenue and Burwell Street	0	49	14	3	8	0	0	0	0	8	5	1
7	Sidney Ave and SR 166/Bay St	25	10	0	2	21	51	1	64	1	1	1	0
8	Fauntleroy Way and SW Barton Street	6	0	5	0	0	0	1	21	0	0	16	2
9	SR 3 W and W Sam Christopherson Ave	0	33	15	0	453	1	280	4	4	5	6	1
10	SR 3 SW and Imperial Way	4	0	1	0	0	0	2	39	0	141	18	562
11	SE Spring Creek Road and Mullenix Road	1	13	1	0	36	0	1	0	0	0	0	1

BREMERTON EIS AM TRAFFIC VOLUME PROPORTIONS - Shift 1

2023 Existing AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	3	76	3	3	60	2	2	1	6	4	1	5
2	SR 303 NE and NE McWilliams Road	6	2	5	7	3	7	6	35	3	3	40	4
3	Alaskan Way and Yesler Way	0	0	8	0	0	0	4	48	16	0	23	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	50	0	0	43	0
5	Warren Avenue and Burwell Street	26	13	0	0	9	1	0	0	0	4	0	18
6	Pacific Avenue and Burwell Street	0	6	13	3	7	0	0	0	0	1	5	1
7	Sidney Ave and SR 166/Bay St	0	10	0	2	20	0	1	0	1	1	1	0
8	Fauntleroy Way and SW Barton Street	5	0	4	0	0	0	1	18	0	0	14	2
9	SR 3 W and W Sam Christopherson Ave	0	31	12	0	18	1	11	4	4	5	6	1
10	SR 3 SW and Imperial Way	2	0	1	0	0	0	2	36	0	1	17	0
11	SE Spring Creek Road and Mullenix Road	1	11	1	0	31	0	1	0	0	0	0	1

2023 Existing Proportion AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Coming In
1	Viking Ave NW and SR 305	50%					33%		17%					6
2	SR 303 NE and NE McWilliams Road		25%							38%	38%			8
3	Alaskan Way and Yesler Way								68%			32%		71
4	Callow Avenue and Charleston Boulevard								100%	0%				50
5	Warren Avenue and Burwell Street					29%					13%		58%	31
6	Pacific Avenue and Burwell Street		86%								14%			7
7	Sidney Ave and SR 166/Bay St	18%					36%		45%					11
8	Fauntleroy Way and SW Barton Street							33%					67%	3
9	SR 3 W and W Sam Christopherson Ave					62%		38%						29
10	SR 3 SW and Imperial Way										100%		0%	1
11	SE Spring Creek Road and Mullenix Road			100%	0%									1

Project Distribution

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Check Int
1	Viking Ave NW and SR 305	50%	%	%	%	%	33%	%	17%	%	%	%	%	100%
2	SR 303 NE and NE McWilliams Road	%	25%	%	%	%	%	%	%	38%	38%	%	%	100%
3	Alaskan Way and Yesler Way	%	%	%	%	%	%	%	68%	%	%	32%	%	100%
4	Callow Avenue and Charleston Boulevard	%	%	%	%	%	%	%	100%	%	%	%	%	100%
5	Warren Avenue and Burwell Street	%	%	%	%	29%	%	%	%	%	13%	%	58%	100%
6	Pacific Avenue and Burwell Street	%	86%	%	%	%	%	%	%	%	14%	%	%	100%
7	Sidney Ave and SR 166/Bay St	18%	%	%	%	%	36%	%	45%	%	%	%	%	100%
8	Fauntleroy Way and SW Barton Street	%	%	%	%	%	%	33%	%	%	%	%	67%	100%
9	SR 3 W and W Sam Christopherson Ave	%	%	%	%	62%	%	38%	%	%	%	%	%	100%
10	SR 3 SW and Imperial Way	%	%	%	%	%	%	%	%	%	20%	%	80%	100%
11	SE Spring Creek Road and Mullenix Road	%	%	100%	%	%	%	%	%	%	%	%	%	100%

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	*	Check Int
1	Viking Ave NW and SR 305	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	SR 303 NE and NE McWilliams Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	50	0	0	0	0	50	50
5	Warren Avenue and Burwell Street	0	0	0	0	15	0	0	0	0	6	0	29	50	50
6	Pacific Avenue and Burwell Street	0	43	0	0	0	0	0	0	0	7	0	0	50	50
7	Sidney Ave and SR 166/Bay St	25	0	0	0	0	51	0	64	0	0	0	0	140	140
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	SR 3 W and W Sam Christopherson Ave	0	0	0	0	434	0	266	0	0	0	0	0	700	700
10	SR 3 SW and Imperial Way	0	0	0	0	0	0	0	0	0	140	0	560	700	700
11	SE Spring Creek Road and Mullenix Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Daily Peak Hour AM inbound and PM outbound from the *Transportation Work Plan Addendum* document.

Contruction Trucks (25 per day)

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305												
2	SR 303 NE and NE McWilliams Road												
3	Alaskan Way and Yesler Way												
4	Callow Avenue and Charleston Boulevard												
5	Warren Avenue and Burwell Street												
6	Pacific Avenue and Burwell Street												
7	Sidney Ave and SR 166/Bay St												
8	Fauntleroy Way and SW Barton Street												
9	SR 3 W and W Sam Christopherson Ave			2				2					
10	SR 3 SW and Imperial Way	2											2
11	SE Spring Creek Road and Mullenix Road												

2

Total Project Trips (Vehicle + Crew Bus + Contruction Trucks)

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	0	0	0	0	0	0	0	0	0	0	0	0
2	SR 303 NE and NE McWilliams Road	0	0	0	0	0	0	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	0	0	0	0	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	50	0	0	0	0
5	Warren Avenue and Burwell Street	0	0	0	0	15	0	0	0	0	6	0	29
6	Pacific Avenue and Burwell Street	0	43	0	0	0	0	0	0	0	7	0	0
7	Sidney Ave and SR 166/Bay St	25	0	0	0	0	51	0	64	0	0	0	0
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	0	0	0	0	0	0
9	SR 3 W and W Sam Christopherson Ave	0	0	2	0	434	0	268	0	0	0	0	0
10	SR 3 SW and Imperial Way	2	0	0	0	0	0	0	0	0	140	0	562
11	SE Spring Creek Road and Mullenix Road	0	0	0	0	0	0	0	0	0	0	0	0

BREMERTON EIS PM TRAFFIC VOLUME DEVELOPMENT - Shift 1

#	Intersection	Growth Rate (%)	Growth Factor
1	Viking Ave NW and SR 305	1.0	1.072
2	SR 303 NE and NE McWilliams Road	0.5	1.036
3	Alaskan Way and Yesler Way	0.5	1.036
4	Callow Avenue and Charleston Boulevard	1.5	1.110
5	Warren Avenue and Burwell Street	1.5	1.110
6	Pacific Avenue and Burwell Street	1.0	1.072
7	Sidney Ave and SR 166/Bay St	0.5	1.036
8	Fauntleroy Way and SW Barton Street	2.0	1.149
9	SR 3 W and W Sam Christopherson Ave	1.0	1.072
10	SR 3 SW and Imperial Way	1.0	1.072
11	SE Spring Creek Road and Mullenix Road	2.0	1.149

2023 Existing PM - Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	73	1374	105	120	1471	87	86	47	97	41	38	92
2	SR 303 NE and NE McWilliams Road	155	125	162	159	86	112	247	1078	257	160	1137	206
3	Alaskan Way and Yesler Way	0	0	80	0	0	0	220	838	175	0	1102	24
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	967	4	0	1138	0
5	Warren Avenue and Burwell Street	448	291	1	0	355	81	6	5	2	89	1	363
6	Pacific Avenue and Burwell Street	23	190	146	47	279	42	0	0	0	16	59	30
7	Sidney Ave and SR 166/Bay St	9	227	23	45	347	6	44	10	27	25	55	34
8	Fauntleroy Way and SW Barton Street	79	0	63	0	0	0	2	351	0	0	415	121
9	SR 3 W and W Sam Christopherson Ave	14	505	307	25	435	15	332	146	49	174	343	43
10	SR 3 SW and Imperial Way	111	2	41	10	1	20	18	534	2	11	578	2
11	SE Spring Creek Road and Mullenix Road	12	688	18	6	434	1	45	0	11	4	0	27

2030 No Build PM Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	78	1473	113	129	1577	93	92	50	104	44	41	99
2	SR 303 NE and NE McWilliams Road	161	129	168	165	89	116	256	1116	266	166	1177	213
3	Alaskan Way and Yesler Way	0	0	83	0	0	0	228	868	181	0	1141	25
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	1073	4	0	1263	0
5	Warren Avenue and Burwell Street	497	323	1	0	394	90	7	6	2	99	1	403
6	Pacific Avenue and Burwell Street	25	204	157	50	299	45	0	0	0	17	63	32
7	Sidney Ave and SR 166/Bay St	9	235	24	47	359	6	46	10	28	26	57	35
8	Fauntleroy Way and SW Barton Street	91	0	72	0	0	0	2	403	0	0	477	139
9	SR 3 W and W Sam Christopherson Ave	15	541	329	27	466	16	356	157	53	187	368	46
10	SR 3 SW and Imperial Way	119	2	44	11	1	21	19	573	2	12	620	2
11	SE Spring Creek Road and Mullenix Road	14	790	21	7	499	1	52	0	13	5	0	31

2030 Project Only - PM Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	0	0	0	0	0	0	0	0	0	0	0	0
2	SR 303 NE and NE McWilliams Road	0	0	0	0	0	0	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	0	0	0	0	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	0	0	0	50	0
5	Warren Avenue and Burwell Street	29	15	0	0	0	6	0	0	0	0	0	0
6	Pacific Avenue and Burwell Street	0	0	0	0	43	7	0	0	0	0	0	0
7	Sidney Ave and SR 166/Bay St	0	0	0	0	0	0	0	0	0	51	64	25
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	0	0	0	0	0	0
9	SR 3 W and W Sam Christopherson Ave	0	434	268	0	0	0	2	0	0	0	0	0
10	SR 3 SW and Imperial Way	562	0	0	0	0	140	0	0	0	0	0	2
11	SE Spring Creek Road and Mullenix Road	0	0	0	0	0	0	0	0	0	0	0	0

2030 Build PM Shift 1

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	78	1473	113	129	1577	93	92	50	104	44	41	99
2	SR 303 NE and NE McWilliams Road	161	129	168	165	89	116	256	1116	266	166	1177	213
3	Alaskan Way and Yesler Way	0	0	83	0	0	0	228	868	181	0	1141	25
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	1073	4	0	1313	0
5	Warren Avenue and Burwell Street	526	338	1	0	394	96	7	6	2	99	1	403
6	Pacific Avenue and Burwell Street	25	204	157	50	342	52	0	0	0	17	63	32
7	Sidney Ave and SR 166/Bay St	9	235	24	47	359	6	46	10	28	77	121	60
8	Fauntleroy Way and SW Barton Street	91	0	72	0	0	0	2	403	0	0	477	139
9	SR 3 W and W Sam Christopherson Ave	15	975	597	27	466	16	358	157	53	187	368	46
10	SR 3 SW and Imperial Way	681	2	44	11	1	161	19	573	2	12	620	4
11	SE Spring Creek Road and Mullenix Road	14	790	21	7	499	1	52	0	13	5	0	31

BREMERTON EIS PM TRAFFIC VOLUME PROPORTIONS - Shift 1

2023 Existing PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	SR 305 and Viking Avenue	73	1374	105	120	1471	87	86	47	97	41	38	92
2	SR 303 and NE McWilliams Road	155	125	162	159	86	112	247	1078	257	160	1137	206
3	Alaskan Way and Yesler Way	0	0	80	0	0	0	220	838	175	0	1102	24
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	967	4	0	1138	0
5	Warren Avenue and Burwell Street	448	291	1	0	355	81	6	5	2	89	1	363
6	Pacific Avenue and Burwell Street	23	190	146	47	279	42	0	0	0	16	59	30
7	SR 166 and Sidney Avenue	9	227	23	45	347	6	44	10	27	25	55	34
8	Fauntleroy Way and Barton Street	79	0	63	0	0	0	2	351	0	0	415	121
9	SR 3 and W Sam Christopherson Avenue	14	505	307	25	435	15	332	146	49	174	343	43
10	Imperial Way and SR 3	111	2	41	10	1	20	18	534	2	11	578	2
11	Mullenix Road and SE Spring Creek Road	12	688	18	6	434	1	45	0	11	4	0	27

Project Distribution

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Check Int
1	SR 305 and Viking Avenue	%	%	%	%	%	%	%	%	%	%	%	%	0%
2	SR 303 and NE McWilliams Road	%	%	%	%	%	%	%	%	%	%	%	%	0%
3	Alaskan Way and Yesler Way	%	%	%	%	%	%	%	%	%	%	%	%	0%
4	Callow Avenue and Charleston Boulevard	%	%	%	%	%	%	%	%	%	%	100%	%	100%
5	Warren Avenue and Burwell Street	58%	30%	%	%	%	12%	%	%	%	%	%	%	100%
6	Pacific Avenue and Burwell Street	%	%	%	%	86%	14%	%	%	%	%	%	%	100%
7	SR 166 and Sidney Avenue	%	%	%	%	%	%	%	%	%	36%	46%	18%	100%
8	Fauntleroy Way and Barton Street	%	%	%	%	%	%	%	%	%	%	%	%	0%
9	SR 3 and W Sam Christopherson Avenue	%	62%	38%	%	%	%	%	%	%	%	%	%	100%
10	Imperial Way and SR 3	80%	%	%	%	%	20%	%	%	%	%	%	%	100%
11	Mullenix Road and SE Spring Creek Road	%	%	%	%	%	%	%	%	%	%	%	%	0%

2030 Project Only Volumes PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	*	Check Int
1	SR 305 and Viking Avenue										0	0	0	0	0
2	SR 303 and NE McWilliams Road				0	0	0							0	0
3	Alaskan Way and Yesler Way								0			0		0	0
4	Callow Avenue and Charleston Boulevard						0					50		50	50
5	Warren Avenue and Burwell Street	29	15				6							50	50
6	Pacific Avenue and Burwell Street					43	7							50	50
7	SR 166 and Sidney Avenue										51	64	25	140	140
8	Fauntleroy Way and Barton Street	0		0										0	0
9	SR 3 and W Sam Christopherson Avenue		434	266										700	700
10	Imperial Way and SR 3	560					140							700	700
11	Mullenix Road and SE Spring Creek Road							0		0				0	0

*Daily Peak Hour AM inbound and PM outbound from the *Transportation Work Plan Addendum* document.

Contruction Trucks (25 per day)

2030 Project Only Volumes PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	SR 305 and Viking Avenue												
2	SR 303 and NE McWilliams Road												
3	Alaskan Way and Yesler Way												
4	Callow Avenue and Charleston Boulevard												
5	Warren Avenue and Burwell Street												
6	Pacific Avenue and Burwell Street												
7	SR 166 and Sidney Avenue												
8	Fauntleroy Way and Barton Street												
9	SR 3 and W Sam Christopherson Avenue			2				2					
10	Imperial Way and SR 3	2											2
11	Mullenix Road and SE Spring Creek Road												

2

Total Project Trips (Vehicle + Crew Bus + Contruction Trucks)

2030 Project Only Volumes PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	SR 305 and Viking Avenue	0	0	0	0	0	0	0	0	0	0	0	0
2	SR 303 and NE McWilliams Road	0	0	0	0	0	0	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	0	0	0	0	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	0	0	0	50	0
5	Warren Avenue and Burwell Street	29	15	0	0	0	6	0	0	0	0	0	0
6	Pacific Avenue and Burwell Street	0	0	0	0	43	7	0	0	0	0	0	0
7	SR 166 and Sidney Avenue	0	0	0	0	0	0	0	0	0	51	64	25
8	Fauntleroy Way and Barton Street	0	0	0	0	0	0	0	0	0	0	0	0
9	SR 3 and W Sam Christopherson Avenue	0	434	268	0	0	0	2	0	0	0	0	0
10	Imperial Way and SR 3	562	0	0	0	0	140	0	0	0	0	0	2
11	Mullenix Road and SE Spring Creek Road	0	0	0	0	0	0	0	0	0	0	0	0

BREMERTON EIS AM TRAFFIC VOLUME DEVELOPMENT - Shift 2

#	Intersection	Growth Rate (%)	Growth Factor
1	Viking Ave NW and SR 305	1.0	1.072
2	SR 303 NE and NE McWilliams Road	0.5	1.036
3	Alaskan Way and Yesler Way	0.5	1.036
4	Callow Avenue and Charleston Boulevard	1.5	1.110
5	Warren Avenue and Burwell Street	1.5	1.110
6	Pacific Avenue and Burwell Street	1.0	1.072
7	Sidney Ave and SR 166/Bay St	0.5	1.036
8	Fauntleroy Way and SW Barton Street	2.0	1.149
9	SR 3 W and W Sam Christopherson Ave	1.0	1.072
10	SR 3 SW and Imperial Way	1.0	1.072
11	SE Spring Creek Road and Mullenix Road	2.0	1.149

Exact location TBD, based on location of proposed parking / laydown area.

2023 Existing AM - Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	43	1218	47	48	964	37	28	23	90	58	22	73
2	SR 303 NE and NE McWilliams Road	102	30	86	112	51	109	99	557	55	42	637	70
3	Alaskan Way and Yesler Way	0	0	134	0	0	0	69	760	257	0	363	6
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	800	6	0	688	0
5	Warren Avenue and Burwell Street	418	212	0	0	139	15	0	1	2	70	2	289
6	Pacific Avenue and Burwell Street	6	92	212	46	110	6	0	0	0	21	86	11
7	Sidney Ave and SR 166/Bay St	2	165	7	26	312	4	18	5	13	9	10	7
8	Fauntleroy Way and SW Barton Street	87	0	59	0	0	0	21	290	0	0	218	33
9	SR 3 W and W Sam Christopherson Ave	6	497	193	6	286	8	179	65	66	85	97	9
10	SR 3 SW and Imperial Way	38	1	12	2	0	3	33	577	4	14	274	7
11	SE Spring Creek Road and Mullenix Road	11	173	12	6	499	2	12	0	2	1	0	11

2030 No Build AM Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	46	1306	50	51	1034	40	30	25	96	62	24	78
2	SR 303 NE and NE McWilliams Road	106	31	89	116	53	113	103	577	57	43	660	72
3	Alaskan Way and Yesler Way	0	0	139	0	0	0	71	787	266	0	376	6
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	888	7	0	764	0
5	Warren Avenue and Burwell Street	464	235	0	0	154	17	0	1	2	78	2	321
6	Pacific Avenue and Burwell Street	6	99	227	49	118	6	0	0	0	23	92	12
7	Sidney Ave and SR 166/Bay St	2	171	7	27	323	4	19	5	13	9	10	7
8	Fauntleroy Way and SW Barton Street	100	0	68	0	0	0	24	333	0	0	250	38
9	SR 3 W and W Sam Christopherson Ave	6	533	207	6	307	9	192	70	71	91	104	10
10	SR 3 SW and Imperial Way	41	1	13	2	0	3	35	619	4	15	294	8
11	SE Spring Creek Road and Mullenix Road	13	199	14	7	573	2	14	0	2	1	0	13

2030 Project Only - AM Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	29	0	0	0	0	25	0	16	0	0	0	0
2	SR 303 NE and NE McWilliams Road	0	2	0	0	0	0	0	0	4	3	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	14	0	0	6	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	43	0	0	10	0
5	Warren Avenue and Burwell Street	0	10	0	0	19	0	0	0	0	5	0	19
6	Pacific Avenue and Burwell Street	0	28	10	0	10	0	0	0	0	6	0	0
7	Sidney Ave and SR 166/Bay St	29	0	0	0	0	58	0	73	0	0	0	0
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	39	0	0	0	0	61
9	SR 3 W and W Sam Christopherson Ave	0	0	12	0	264	0	178	0	0	0	0	0
10	SR 3 SW and Imperial Way	10	0	0	0	0	2	0	0	0	88	0	354
11	SE Spring Creek Road and Mullenix Road	0	0	13	7	0	0	0	0	0	0	0	0

2030 Build AM Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	75	1306	50	51	1034	65	30	41	96	62	24	78
2	SR 303 NE and NE McWilliams Road	106	33	89	116	53	113	103	577	61	46	660	72
3	Alaskan Way and Yesler Way	0	0	139	0	0	0	71	801	266	0	382	6
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	931	7	0	774	0
5	Warren Avenue and Burwell Street	464	245	0	0	173	17	0	1	2	83	2	340
6	Pacific Avenue and Burwell Street	6	127	237	49	128	6	0	0	0	29	92	12
7	Sidney Ave and SR 166/Bay St	31	171	7	27	323	62	19	78	13	9	10	7
8	Fauntleroy Way and SW Barton Street	100	0	68	0	0	0	63	333	0	0	250	99
9	SR 3 W and W Sam Christopherson Ave	6	533	219	6	571	9	370	70	71	91	104	10
10	SR 3 SW and Imperial Way	51	1	13	2	0	5	35	619	4	103	294	362
11	SE Spring Creek Road and Mullenix Road	13	199	27	14	573	2	14	0	2	1	0	13

BREMERTON EIS AM TRAFFIC VOLUME PROPORTIONS - Shift 2

2023 Existing AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	43	1218	47	48	964	37	28	23	90	58	22	73
2	SR 303 NE and NE McWilliams Road	102	30	86	112	51	109	99	557	55	42	637	70
3	Alaskan Way and Yesler Way	0	0	134	0	0	0	69	760	257	0	363	6
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	2	0	800	6	0	688	0
5	Warren Avenue and Burwell Street	418	212	0	0	139	15	0	1	2	70	2	289
6	Pacific Avenue and Burwell Street	6	92	212	46	110	6	0	0	0	21	86	11
7	Sidney Ave and SR 166/Bay St	2	165	7	26	312	4	18	5	13	9	10	7
8	Fauntleroy Way and SW Barton Street	87	0	59	0	0	0	21	290	0	0	218	33
9	SR 3 W and W Sam Christopherson Ave	6	497	193	6	286	8	179	65	66	85	97	9
10	SR 3 SW and Imperial Way	38	1	12	2	0	3	33	577	4	14	274	7
11	SE Spring Creek Road and Mullenix Road	11	173	12	6	499	2	12	0	2	1	0	11

2023 Existing Proportion AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Coming In
1	Viking Ave NW and SR 305	42%					36%		22%					103
2	SR 303 NE and NE McWilliams Road		24%							43%	33%			127
3	Alaskan Way and Yesler Way								68%			32%		1123
4	Callow Avenue and Charleston Boulevard								99%	1%				806
5	Warren Avenue and Burwell Street					28%					14%		58%	498
6	Pacific Avenue and Burwell Street		81%								19%			113
7	Sidney Ave and SR 166/Bay St	18%					36%		45%					11
8	Fauntleroy Way and SW Barton Street							39%					61%	54
9	SR 3 W and W Sam Christopherson Ave					62%		38%						465
10	SR 3 SW and Imperial Way										67%		33%	21
11	SE Spring Creek Road and Mullenix Road			67%	33%									18

Project Distribution

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Check Int
1	Viking Ave NW and SR 305	42%	%	%	%	%	36%	%	22%	%	%	%	%	100%
2	SR 303 NE and NE McWilliams Road	%	24%	%	%	%	%	%	%	43%	33%	%	%	100%
3	Alaskan Way and Yesler Way	%	%	%	%	%	%	%	68%	%	%	32%	%	100%
4	Callow Avenue and Charleston Boulevard	%	%	%	%	%	%	%	99%	1%	%	%	%	100%
5	Warren Avenue and Burwell Street	%	%	%	%	28%	%	%	%	%	14%	%	58%	100%
6	Pacific Avenue and Burwell Street	%	81%	%	%	%	%	%	%	%	19%	%	%	100%
7	Sidney Ave and SR 166/Bay St	18%	%	%	%	%	36%	%	45%	%	%	%	%	100%
8	Fauntleroy Way and SW Barton Street	%	%	%	%	%	%	39%	%	%	%	%	61%	100%
9	SR 3 W and W Sam Christopherson Ave	%	%	%	%	62%	%	38%	%	%	%	%	%	100%
10	SR 3 SW and Imperial Way	%	%	%	%	%	%	%	%	%	20%	%	80%	100%
11	SE Spring Creek Road and Mullenix Road	%	%	67%	33%	%	%	%	%	%	%	%	%	100%

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	*	Check Int
1	Viking Ave NW and SR 305	29	0	0	0	0	25	0	16	0	0	0	0	70	70
2	SR 303 NE and NE McWilliams Road	0	2	0	0	0	0	0	0	4	3	0	0	10	9
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	14	0	0	6	0	20	20
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	33	0	0	0	0	33	33
5	Warren Avenue and Burwell Street	0	0	0	0	9	0	0	0	0	5	0	19	33	33
6	Pacific Avenue and Burwell Street	0	28	0	0	0	0	0	0	0	6	0	0	34	34
7	Sidney Ave and SR 166/Bay St	29	0	0	0	0	58	0	73	0	0	0	0	160	160
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	39	0	0	0	0	61	100	100
9	SR 3 W and W Sam Christopherson Ave	0	0	0	0	264	0	166	0	0	0	0	0	430	430
10	SR 3 SW and Imperial Way	0	0	0	0	0	0	0	0	0	86	0	344	430	430
11	SE Spring Creek Road and Mullenix Road	0	0	13	7	0	0	0	0	0	0	0	0	20	20

*Daily Peak Hour AM inbound and PM outbound from the *Transportation Work Plan Addendum* document.

Crew Buses

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
1	Viking Ave NW and SR 305													
2	SR 303 NE and NE McWilliams Road													
3	Alaskan Way and Yesler Way													
4	Callow Avenue and Charleston Boulevard								10			10		
5	Warren Avenue and Burwell Street		10			10								
6	Pacific Avenue and Burwell Street			10		10								
7	Sidney Ave and SR 166/Bay St													
8	Fauntleroy Way and SW Barton Street													
9	SR 3 W and W Sam Christopherson Ave			10				10						
10	SR 3 SW and Imperial Way	8					2				2		8	10
11	SE Spring Creek Road and Mullenix Road													

Contruction Trucks (25 per day)

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
1	Viking Ave NW and SR 305													
2	SR 303 NE and NE McWilliams Road													
3	Alaskan Way and Yesler Way													
4	Callow Avenue and Charleston Boulevard													
5	Warren Avenue and Burwell Street													
6	Pacific Avenue and Burwell Street													
7	Sidney Ave and SR 166/Bay St													
8	Fauntleroy Way and SW Barton Street													
9	SR 3 W and W Sam Christopherson Ave			2				2						
10	SR 3 SW and Imperial Way	2											2	2
11	SE Spring Creek Road and Mullenix Road													

Total Project Trips (Vehicle + Crew Bus + Contruction Trucks)

2030 Project Only Volumes AM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	29	0	0	0	0	25	0	16	0	0	0	0
2	SR 303 NE and NE McWilliams Road	0	2	0	0	0	0	0	0	4	3	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	14	0	0	6	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	43	0	0	10	0
5	Warren Avenue and Burwell Street	0	10	0	0	19	0	0	0	0	5	0	19
6	Pacific Avenue and Burwell Street	0	28	10	0	10	0	0	0	0	6	0	0
7	Sidney Ave and SR 166/Bay St	29	0	0	0	0	58	0	73	0	0	0	0
8	Fauntleroy Way and SW Barton Street	0	0	0	0	0	0	39	0	0	0	0	61
9	SR 3 W and W Sam Christopherson Ave	0	0	12	0	264	0	178	0	0	0	0	0
10	SR 3 SW and Imperial Way	10	0	0	0	0	2	0	0	0	88	0	354
11	SE Spring Creek Road and Mullenix Road	0	0	13	7	0	0	0	0	0	0	0	0

BREMERTON EIS PM TRAFFIC VOLUME DEVELOPMENT - Shift 2

#	Intersection	Growth Rate (%)	Growth Factor
1	Viking Ave NW and SR 305	1.0	1.072
2	SR 303 NE and NE McWilliams Road	0.5	1.036
3	Alaskan Way and Yesler Way	0.5	1.036
4	Callow Avenue and Charleston Boulevard	1.5	1.110
5	Warren Avenue and Burwell Street	1.5	1.110
6	Pacific Avenue and Burwell Street	1.0	1.072
7	Sidney Ave and SR 166/Bay St	0.5	1.036
8	Fauntleroy Way and SW Barton Street	2.0	1.149
9	SR 3 W and W Sam Christopherson Ave	1.0	1.072
10	SR 3 SW and Imperial Way	1.0	1.072
11	SE Spring Creek Road and Mullenix Road	2.0	1.149

2023 Existing PM - Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	47	893	68	78	956	57	56	31	63	27	25	60
2	SR 303 NE and NE McWilliams Road	101	81	105	103	56	73	161	701	167	104	739	134
3	Alaskan Way and Yesler Way	0	0	52	0	0	0	143	545	114	0	716	16
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	1	0	629	3	0	740	0
5	Warren Avenue and Burwell Street	291	189	1	0	231	53	4	3	1	58	1	236
6	Pacific Avenue and Burwell Street	15	124	95	31	181	27	0	0	0	10	38	20
7	Sidney Ave and SR 166/Bay St	6	148	15	29	226	4	29	7	18	16	36	22
8	Fauntleroy Way and SW Barton Street	51	0	41	0	0	0	1	228	0	0	270	79
9	SR 3 W and W Sam Christopherson Ave	9	328	200	16	283	10	216	95	32	113	223	28
10	SR 3 SW and Imperial Way	72	1	27	7	1	13	12	347	1	7	376	1
11	SE Spring Creek Road and Mullenix Road	8	447	12	4	282	1	29	0	7	3	0	18

2030 No Build PM Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	50	957	73	84	1025	61	60	33	68	29	27	64
2	SR 303 NE and NE McWilliams Road	105	84	109	107	58	76	167	726	173	108	765	139
3	Alaskan Way and Yesler Way	0	0	54	0	0	0	148	564	118	0	741	17
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	1	0	698	3	0	821	0
5	Warren Avenue and Burwell Street	323	210	1	0	256	59	4	3	1	64	1	262
6	Pacific Avenue and Burwell Street	16	133	102	33	194	29	0	0	0	11	41	21
7	Sidney Ave and SR 166/Bay St	6	153	16	30	234	4	30	7	19	17	37	23
8	Fauntleroy Way and SW Barton Street	59	0	47	0	0	0	1	262	0	0	310	91
9	SR 3 W and W Sam Christopherson Ave	10	352	214	17	303	11	232	102	34	121	239	30
10	SR 3 SW and Imperial Way	77	1	29	8	1	14	13	372	1	8	403	1
11	SE Spring Creek Road and Mullenix Road	9	513	14	5	324	1	33	0	8	3	0	21

2030 Project Only - PM Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	0	0	0	0	0	0	0	0	0	25	16	29
2	SR 303 NE and NE McWilliams Road	0	0	0	4	2	3	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	6	0	0	14	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	10	0	0	43	0
5	Warren Avenue and Burwell Street	19	19	0	0	10	5	0	0	0	0	0	0
6	Pacific Avenue and Burwell Street	0	0	10	0	38	6	0	0	0	0	0	0
7	Sidney Ave and SR 166/Bay St	0	0	0	0	0	0	0	0	0	58	73	29
8	Fauntleroy Way and SW Barton Street	61	0	39	0	0	0	0	0	0	0	0	0
9	SR 3 W and W Sam Christopherson Ave	0	264	178	0	0	0	12	0	0	0	0	0
10	SR 3 SW and Imperial Way	354	0	0	0	0	88	0	0	0	2	0	10
11	SE Spring Creek Road and Mullenix Road	0	0	0	0	0	0	13	0	7	0	0	0

2030 Build PM Shift 2

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	Viking Ave NW and SR 305	50	957	73	84	1025	61	60	33	68	54	43	93
2	SR 303 NE and NE McWilliams Road	105	84	109	111	60	79	167	726	173	108	765	139
3	Alaskan Way and Yesler Way	0	0	54	0	0	0	148	570	118	0	755	17
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	1	0	708	3	0	864	0
5	Warren Avenue and Burwell Street	342	229	1	0	266	64	4	3	1	64	1	262
6	Pacific Avenue and Burwell Street	16	133	112	33	232	35	0	0	0	11	41	21
7	Sidney Ave and SR 166/Bay St	6	153	16	30	234	4	30	7	19	75	110	52
8	Fauntleroy Way and SW Barton Street	120	0	86	0	0	0	1	262	0	0	310	91
9	SR 3 W and W Sam Christopherson Ave	10	616	392	17	303	11	244	102	34	121	239	30
10	SR 3 SW and Imperial Way	431	1	29	8	1	102	13	372	1	10	403	11
11	SE Spring Creek Road and Mullenix Road	9	513	14	5	324	1	46	0	15	3	0	21

Attachment C
2023 Existing Conditions Synchro Reports

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BREMERTON EIS PM TRAFFIC VOLUME PROPORTIONS - Shift 2

2023 Existing PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	SR 305 and Viking Avenue	47	893	68	78	956	57	56	31	63	27	25	60
2	SR 303 and NE McWilliams Road	101	81	105	103	56	73	161	701	167	104	739	134
3	Alaskan Way and Yesler Way	0	0	52	0	0	0	143	545	114	0	716	16
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	1	0	629	3	0	740	0
5	Warren Avenue and Burwell Street	291	189	1	0	231	53	4	3	1	58	1	236
6	Pacific Avenue and Burwell Street	15	124	95	31	181	27	0	0	0	10	38	20
7	SR 166 and Sidney Avenue	6	148	15	29	226	4	29	7	18	16	36	22
8	Fauntleroy Way and Barton Street	51	0	41	0	0	0	1	228	0	0	270	79
9	SR 3 and W Sam Christopherson Avenue	9	328	200	16	283	10	216	95	32	113	223	28
10	Imperial Way and SR 3	72	1	27	7	1	13	12	347	1	7	376	1
11	Mullenix Road and SE Spring Creek Road	8	447	12	4	282	1	29	0	7	3	0	18

Project Distribution

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Check Int
1	SR 305 and Viking Avenue	%	%	%	%	%	%	%	%	%	36%	23%	41%	100%
2	SR 303 and NE McWilliams Road	%	%	%	44%	22%	33%	%	%	%	%	%	%	100%
3	Alaskan Way and Yesler Way	%	%	%	%	%	%	%	30%	%	%	70%	%	100%
4	Callow Avenue and Charleston Boulevard	%	%	%	%	%	%	%	%	%	%	100%	%	100%
5	Warren Avenue and Burwell Street	58%	27%	%	%	%	15%	%	%	%	%	%	%	100%
6	Pacific Avenue and Burwell Street	%	%	%	%	82%	18%	%	%	%	%	%	%	100%
7	SR 166 and Sidney Avenue	%	%	%	%	%	%	%	%	%	36%	46%	18%	100%
8	Fauntleroy Way and Barton Street	61%	%	39%	%	%	%	%	%	%	%	%	%	100%
9	SR 3 and W Sam Christopherson Avenue	%	61%	39%	%	%	%	%	%	%	%	%	%	100%
10	Imperial Way and SR 3	80%	%	%	%	%	20%	%	%	%	%	%	%	100%
11	Mullenix Road and SE Spring Creek Road	%	%	%	%	%	%	65%	%	35%	%	%	%	100%

2030 Project Only Volumes PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	*	Check Int
1	SR 305 and Viking Avenue										25	16	29	70	70
2	SR 303 and NE McWilliams Road				4	2	3							9	9
3	Alaskan Way and Yesler Way								6			14		20	20
4	Callow Avenue and Charleston Boulevard						0					33		33	33
5	Warren Avenue and Burwell Street	19	9				5							33	33
6	Pacific Avenue and Burwell Street					28	6							34	34
7	SR 166 and Sidney Avenue										58	73	29	160	160
8	Fauntleroy Way and Barton Street	61		39										100	100
9	SR 3 and W Sam Christopherson Avenue		264	166										430	430
10	Imperial Way and SR 3	344					86							430	430
11	Mullenix Road and SE Spring Creek Road							13		7				20	20

*Daily Peak Hour AM inbound and PM outbound from the *Transportation Work Plan Addendum* document.

Crew Buses

2030 Project Only Volumes PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
1	SR 305 and Viking Avenue	0	0	0	0	0	0	0	0	0	0	0	0	
2	SR 303 and NE McWilliams Road	0	0	0	0	0	0	0	0	0	0	0	0	
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	0	0	0	0	0	
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	10	0	0	10	0	
5	Warren Avenue and Burwell Street	0	10	0	0	10	0	0	0	0	0	0	0	
6	Pacific Avenue and Burwell Street	0	0	10	0	10	0	0	0	0	0	0	0	
7	SR 166 and Sidney Avenue	0	0	0	0	0	0	0	0	0	0	0	0	
8	Fauntleroy Way and Barton Street	0	0	0	0	0	0	0	0	0	0	0	0	
9	SR 3 and W Sam Christopherson Avenue	0	0	10	0	0	0	10	0	0	0	0	0	
10	Imperial Way and SR 3	8	0	0	0	0	2	0	0	0	2	0	8	10
11	Mullenix Road and SE Spring Creek Road	0	0	0	0	0	0	0	0	0	0	0	0	

Contruction Trucks (25 per day)

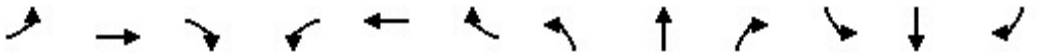
2030 Project Only Volumes PM Peak

#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
1	SR 305 and Viking Avenue													
2	SR 303 and NE McWilliams Road													
3	Alaskan Way and Yesler Way													
4	Callow Avenue and Charleston Boulevard													
5	Warren Avenue and Burwell Street													
6	Pacific Avenue and Burwell Street													
7	SR 166 and Sidney Avenue													
8	Fauntleroy Way and Barton Street													
9	SR 3 and W Sam Christopherson Avenue			2				2						
10	Imperial Way and SR 3	2											2	2
11	Mullenix Road and SE Spring Creek Road													

Total Project Trips (Vehicle + Crew Bus + Contruction Trucks)

2030 Project Only Volumes PM Peak

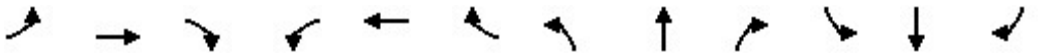
#	Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
1	SR 305 and Viking Avenue	0	0	0	0	0	0	0	0	0	25	16	29
2	SR 303 and NE McWilliams Road	0	0	0	4	2	3	0	0	0	0	0	0
3	Alaskan Way and Yesler Way	0	0	0	0	0	0	0	6	0	0	14	0
4	Callow Avenue and Charleston Boulevard	0	0	0	0	0	0	0	10	0	0	43	0
5	Warren Avenue and Burwell Street	19	19	0	0	10	5	0	0	0	0	0	0
6	Pacific Avenue and Burwell Street	0	0	10	0	38	6	0	0	0	0	0	0
7	SR 166 and Sidney Avenue	0	0	0	0	0	0	0	0	0	58	73	29
8	Fauntleroy Way and Barton Street	61	0	39	0	0	0	0	0	0	0	0	0
9	SR 3 and W Sam Christopherson Avenue	0	264	178	0	0	0	12	0	0	0	0	0
10	Imperial Way and SR 3	354	0	0	0	0	88	0	0	0	2	0	10
11	Mullenix Road and SE Spring Creek Road	0	0	0	0	0	0	13	0	7	0	0	0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	76	3	3	60	2	2	1	6	4	1	5
Future Volume (vph)	3	76	3	3	60	2	2	1	6	4	1	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3523		1681	1726	1583	1770	1630	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3523		1681	1726	1583	1770	1630	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	3	79	3	3	62	2	2	1	6	4	1	5
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	6	0	5	0
Lane Group Flow (vph)	3	79	2	3	65	0	1	2	0	4	1	0
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	1.2	105.2	107.6	1.2	105.2		2.4	2.4	2.4	2.5	2.5	
Effective Green, g (s)	1.2	105.2	107.6	1.2	105.2		2.4	2.4	2.4	2.5	2.5	
Actuated g/C Ratio	0.01	0.81	0.83	0.01	0.81		0.02	0.02	0.02	0.02	0.02	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	16	2863	1310	16	2850		31	31	29	34	31	
v/s Ratio Prot	c0.00	c0.02	0.00	0.00	0.02		0.00	c0.00		c0.00	0.00	
v/s Ratio Perm			0.00						0.00			
v/c Ratio	0.19	0.03	0.00	0.19	0.02		0.03	0.06	0.00	0.12	0.04	
Uniform Delay, d1	63.9	2.4	1.9	63.9	2.4		62.7	62.7	62.6	62.7	62.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	0.0	0.0	4.1	0.0		0.3	0.6	0.0	1.1	0.3	
Delay (s)	68.0	2.4	1.9	68.0	2.4		63.0	63.3	62.7	63.8	62.9	
Level of Service	E	A	A	E	A		E	E	E	E	E	
Approach Delay (s)		4.7			5.3			62.8			63.3	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

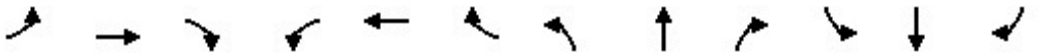
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	2	5	7	3	7	6	35	3	3	40	4
Future Volume (veh/h)	6	2	5	7	3	7	6	35	3	3	40	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	2	5	7	3	7	6	36	3	3	42	4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	16	49	41	18	51	43	16	2894	1291	8	2879	1284
Arrive On Green	0.01	0.03	0.03	0.01	0.03	0.03	0.01	0.81	0.81	0.00	0.81	0.81
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	6	2	5	7	3	7	6	36	3	3	42	4
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.4	0.1	0.4	0.5	0.2	0.6	0.4	0.2	0.0	0.2	0.3	0.1
Cycle Q Clear(g_c), s	0.4	0.1	0.4	0.5	0.2	0.6	0.4	0.2	0.0	0.2	0.3	0.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	16	49	41	18	51	43	16	2894	1291	8	2879	1284
V/C Ratio(X)	0.37	0.04	0.12	0.38	0.06	0.16	0.37	0.01	0.00	0.36	0.01	0.00
Avail Cap(c_a), veh/h	170	524	444	170	524	444	252	2894	1291	184	2879	1284
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.1	61.7	61.9	63.9	61.6	61.8	64.1	2.3	2.2	64.5	2.4	2.4
Incr Delay (d2), s/veh	13.9	0.3	1.1	12.5	0.4	1.5	13.9	0.0	0.0	23.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.1	0.2	0.3	0.1	0.2	0.3	0.1	0.0	0.2	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.9	62.0	63.0	76.4	62.0	63.2	77.9	2.3	2.2	88.0	2.4	2.4
LnGrp LOS	E	E	E	E	E	E	E	A	A	F	A	A
Approach Vol, veh/h		13			17			45			49	
Approach Delay, s/veh		69.7			68.4			12.4			7.6	
Approach LOS		E			E			B			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.2	110.9	5.9	8.0	5.8	110.3	5.8	8.2
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	2.2	2.2	2.5	2.4	2.4	2.3	2.4	2.6
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	24.2
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	8	0	0	0	4	48	16	0	23	0
Future Volume (vph)	0	0	8	0	0	0	4	48	16	0	23	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2787				3433	3539	1583		3539	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2787				3433	3539	1583		3539	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	8	0	0	0	4	50	17	0	24	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	5	0	0	0
Lane Group Flow (vph)	0	0	8	0	0	0	4	50	12	0	24	0
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			1.5				1.5	25.6	25.6		25.6	
Effective Green, g (s)			3.5				1.5	25.6	25.6		27.6	
Actuated g/C Ratio			0.10				0.04	0.71	0.71		0.76	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			270				142	2509	1122		2705	
v/s Ratio Prot			c0.00				0.00	c0.01			0.01	
v/s Ratio Perm									0.01			
v/c Ratio			0.03				0.03	0.02	0.01		0.01	
Uniform Delay, d1			14.8				16.6	1.5	1.5		1.0	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.0				0.1	0.0	0.0		0.0	
Delay (s)			14.8				16.7	1.6	1.5		1.0	
Level of Service			B				B	A	A		A	
Approach Delay (s)		14.8			0.0			2.4			1.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.02		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

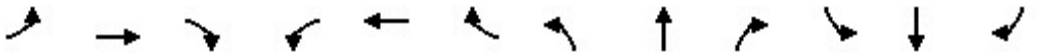
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	50	0	0	43
Future Vol, veh/h	0	0	50	0	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	52	0	0	45

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	26	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	1044	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	1044	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

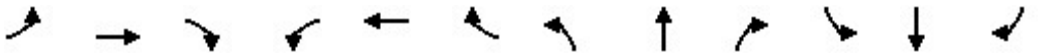
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	13	0	0	9	1	0	0	0	4	0	18
Future Volume (veh/h)	26	13	0	0	9	1	0	0	0	4	0	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	27	14	0	0	9	1	0	0	0	4	0	19
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2	2	2	2
Cap, veh/h	1464	1460	0	0	27	23	0	2	0	49	0	1346
Arrive On Green	0.82	0.82	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.03	0.00	0.03
Sat Flow, veh/h	1781	1870	0	0	1870	1585	0	1870	0	1781	0	1585
Grp Volume(v), veh/h	27	14	0	0	9	1	0	0	0	4	0	19
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1870	1585	0	1870	0	1781	0	1585
Q Serve(g_s), s	0.3	0.2	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.2	0.0	0.2
Cycle Q Clear(g_c), s	0.3	0.2	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.2	0.0	0.2
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	1464	1460	0	0	27	23	0	2	0	49	0	1346
V/C Ratio(X)	0.02	0.01	0.00	0.00	0.34	0.04	0.00	0.00	0.00	0.08	0.00	0.01
Avail Cap(c_a), veh/h	1464	1460	0	0	459	389	0	408	0	275	0	1547
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	1.8	1.8	0.0	0.0	53.7	53.5	0.0	0.0	0.0	52.1	0.0	1.3
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	8.6	0.9	0.0	0.0	0.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	1.8	1.8	0.0	0.0	62.3	54.4	0.0	0.0	0.0	53.0	0.0	1.3
LnGrp LOS	A	A	A	A	E	D	A	A	A	D	A	A
Approach Vol, veh/h		41			10			0			23	
Approach Delay, s/veh		1.8			61.5			0.0			10.3	
Approach LOS		A			E						B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		95.4		8.0		6.6		0.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		2.3		2.2		2.5		0.0				
Green Ext Time (p_c), s		0.1		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			12.5									
HCM 6th LOS			B									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	6	13	3	7	0	0	0	0	1	5	1
Future Volume (veh/h)	0	6	13	3	7	0	0	0	0	1	5	1
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870				1870	1870	1870
Adj Flow Rate, veh/h	0	6	14	3	7	0				1	5	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2				2	2	2
Cap, veh/h	0	792	671	436	651	0				3	15	3
Arrive On Green	0.00	0.42	0.42	0.42	0.42	0.00				0.01	0.01	0.01
Sat Flow, veh/h	0	1870	1585	249	1536	0				259	1293	259
Grp Volume(v), veh/h	0	6	14	10	0	0				7	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	1585	1785	0	0				1811	0	0
Q Serve(g_s), s	0.0	0.0	0.1	0.0	0.0	0.0				0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.1	0.0	0.0	0.0				0.1	0.0	0.0
Prop In Lane	0.00		1.00	0.30		0.00				0.14		0.14
Lane Grp Cap(c), veh/h	0	792	671	1087	0	0				21	0	0
V/C Ratio(X)	0.00	0.01	0.02	0.01	0.00	0.00				0.34	0.00	0.00
Avail Cap(c_a), veh/h	0	6735	5708	6474	0	0				3964	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	2.4	2.4	2.4	0.0	0.0				6.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				19.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0				0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.4	2.4	2.4	0.0	0.0				25.9	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				C	A	A
Approach Vol, veh/h		20			10						7	
Approach Delay, s/veh		2.4			2.4						25.9	
Approach LOS		A			A						C	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		10.0		4.2		10.0						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		51.0		31.0		51.0						
Max Q Clear Time (g_c+I1), s		2.1		2.1		2.0						
Green Ext Time (p_c), s		0.1		0.0		0.1						

Intersection Summary												
HCM 6th Ctrl Delay			6.8									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	10	0	2	20	0	1	0	1	1	1	0
Future Volume (veh/h)	0	10	0	2	20	0	1	0	1	1	1	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	10	0	2	21	0	1	0	1	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	6	661	0	6	965	0	6	0	8	6	9	0
Arrive On Green	0.00	0.35	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1781	1870	0	1781	1870	0	1781	0	1585	1781	1870	0
Grp Volume(v), veh/h	0	10	0	2	21	0	1	0	1	1	1	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	1870	0	1781	0	1585	1781	1870	0
Q Serve(g_s), s	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	6	661	0	6	965	0	6	0	8	6	9	0
V/C Ratio(X)	0.00	0.02	0.00	0.32	0.02	0.00	0.16	0.00	0.13	0.16	0.11	0.00
Avail Cap(c_a), veh/h	409	3604	0	535	3737	0	472	0	1261	409	1422	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	5.9	0.0	14.1	3.3	0.0	14.1	0.0	14.0	14.1	14.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	20.0	0.0	0.0	8.5	0.0	5.3	8.5	3.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	5.9	0.0	34.1	3.4	0.0	22.5	0.0	19.3	22.5	17.8	0.0
LnGrp LOS	A	A	A	C	A	A	C	A	B	C	B	A
Approach Vol, veh/h		10			23			2			2	
Approach Delay, s/veh		5.9			6.0			20.9			20.1	
Approach LOS		A			A			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.6	14.5	4.5	4.6	0.0	19.1	4.5	4.6
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	54.5	7.5	21.5	6.5	56.5	6.5	22.5
Max Q Clear Time (g_c+I1), s	2.0	2.1	2.0	2.0	0.0	2.2	2.0	2.0
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	7.6
HCM 6th LOS	A

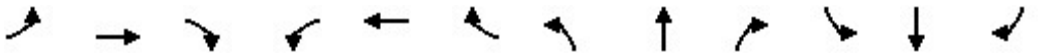
Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	4	1	18	14	2
Future Vol, veh/h	5	4	1	18	14	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	4	1	19	15	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	37	16	17	0	-	0
Stage 1	16	-	-	-	-	-
Stage 2	21	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	975	1063	1600	-	-	-
Stage 1	1007	-	-	-	-	-
Stage 2	1002	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	974	1063	1600	-	-	-
Mov Cap-2 Maneuver	974	-	-	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	1002	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1600	-	974	1063	-	-
HCM Lane V/C Ratio	0.001	-	0.005	0.004	-	-
HCM Control Delay (s)	7.3	0	8.7	8.4	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	31	12	0	18	1	11	4	4	5	6	1
Future Volume (veh/h)	0	31	12	0	18	1	11	4	4	5	6	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	32	0	0	19	1	11	4	4	5	6	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	7	694		7	653	34	26	28	28	12	56	9
Arrive On Green	0.00	0.37	0.00	0.00	0.37	0.37	0.01	0.03	0.03	0.01	0.04	0.04
Sat Flow, veh/h	1781	1870	1585	1781	1761	93	1781	858	858	1781	1563	260
Grp Volume(v), veh/h	0	32	0	0	0	20	11	0	8	5	0	7
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1854	1781	0	1716	1781	0	1823
Q Serve(g_s), s	0.0	0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.0	0.1
Cycle Q Clear(g_c), s	0.0	0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.05	1.00		0.50	1.00		0.14
Lane Grp Cap(c), veh/h	7	694		7	0	687	26	0	56	12	0	66
V/C Ratio(X)	0.00	0.05		0.00	0.00	0.03	0.42	0.00	0.14	0.41	0.00	0.11
Avail Cap(c_a), veh/h	330	3530		330	0	3512	654	0	1406	773	0	1623
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	5.4	0.0	0.0	0.0	5.4	13.2	0.0	12.7	13.3	0.0	12.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	13.7	0.0	0.8	19.0	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	5.5	0.0	0.0	0.0	5.4	26.9	0.0	13.5	32.3	0.0	13.1
LnGrp LOS	A	A		A	A	A	C	A	B	C	A	B
Approach Vol, veh/h		32			20			19			12	
Approach Delay, s/veh		5.5			5.4			21.3			21.1	
Approach LOS		A			A			C			C	

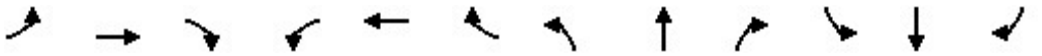
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	15.4	5.5	6.1	0.0	15.4	5.6	6.0
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	4.9	* 5.4	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	50.9	9.9	24.0	5.0	* 51	11.7	* 22
Max Q Clear Time (g_c+I1), s	0.0	2.3	2.2	2.1	0.0	2.2	2.1	2.1
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	11.3
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	1	0	0	0	2	36	0	1	17	0
Future Volume (veh/h)	2	0	1	0	0	0	2	36	0	1	17	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	2	0	1	0	0	0	2	38	0	1	18	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	293	0	8	0	9	0	7	745	0	7	742	629
Arrive On Green	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.40	0.00
Sat Flow, veh/h	1417	0	1585	0	1870	0	1781	1870	0	1781	1870	1585
Grp Volume(v), veh/h	2	0	1	0	0	0	2	38	0	1	18	0
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1870	0	1781	1870	0	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	293	0	8	0	9	0	7	745	0	7	742	629
V/C Ratio(X)	0.01	0.00	0.13	0.00	0.00	0.00	0.28	0.05	0.00	0.14	0.02	0.00
Avail Cap(c_a), veh/h	1805	0	1699	0	2004	0	481	4677	0	354	4543	3850
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	0.0	12.5	0.0	0.0	0.0	12.5	4.7	0.0	12.5	4.6	0.0
Incr Delay (d2), s/veh	0.0	0.0	7.1	0.0	0.0	0.0	20.4	0.0	0.0	8.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.5	0.0	19.6	0.0	0.0	0.0	32.9	4.7	0.0	21.4	4.6	0.0
LnGrp LOS	B	A	B	A	A	A	C	A	A	C	A	A
Approach Vol, veh/h		3			0			40			19	
Approach Delay, s/veh		14.9			0.0			6.1			5.5	
Approach LOS		B						A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.5	16.0		4.6	4.6	16.0		4.6				
Change Period (Y+Rc), s	4.5	6.0		4.5	4.5	6.0		4.5				
Max Green Setting (Gmax), s	5.0	63.0		27.0	6.8	61.2		27.0				
Max Q Clear Time (g_c+I1), s	2.0	2.3		2.0	2.0	2.1		0.0				
Green Ext Time (p_c), s	0.0	0.1		0.0	0.0	0.1		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		6.3	
HCM 6th LOS		A	

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	11	1	0	31	0	1	0	0	0	0	1
Future Vol, veh/h	1	11	1	0	31	0	1	0	0	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	11	1	0	32	0	1	0	0	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	32	0	0	12	0	0	47	46	12	46	46	32
Stage 1	-	-	-	-	-	-	14	14	-	32	32	-
Stage 2	-	-	-	-	-	-	33	32	-	14	14	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1580	-	-	1607	-	-	954	846	1069	955	846	1042
Stage 1	-	-	-	-	-	-	1006	884	-	984	868	-
Stage 2	-	-	-	-	-	-	983	868	-	1006	884	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1580	-	-	1607	-	-	953	845	1069	955	845	1042
Mov Cap-2 Maneuver	-	-	-	-	-	-	953	845	-	955	845	-
Stage 1	-	-	-	-	-	-	1005	883	-	983	868	-
Stage 2	-	-	-	-	-	-	982	868	-	1005	883	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0	8.8	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	953	1580	-	-	1607	-	-	1042
HCM Lane V/C Ratio	0.001	0.001	-	-	-	-	-	0.001
HCM Control Delay (s)	8.8	7.3	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	1374	105	120	1471	87	86	47	97	41	38	92
Future Volume (vph)	73	1374	105	120	1471	87	86	47	97	41	38	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1626	3539	1568	1770	3419		1649	1732	1575	1719	1586	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1626	3539	1568	1770	3419		1649	1732	1575	1719	1586	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	76	1431	109	125	1532	91	90	49	101	43	40	96
RTOR Reduction (vph)	0	0	36	0	2	0	0	0	93	0	67	0
Lane Group Flow (vph)	76	1431	73	125	1621	0	68	71	8	43	69	0
Confl. Peds. (#/hr)			1			1			3	3		
Heavy Vehicles (%)	11%	2%	1%	2%	4%	14%	4%	2%	1%	5%	5%	8%
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	9.7	76.4	86.9	15.3	82.0		10.5	10.5	10.5	9.1	9.1	
Effective Green, g (s)	9.7	76.4	86.9	15.3	82.0		10.5	10.5	10.5	9.1	9.1	
Actuated g/C Ratio	0.07	0.59	0.67	0.12	0.63		0.08	0.08	0.08	0.07	0.07	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	121	2079	1048	208	2156		133	139	127	120	111	
v/s Ratio Prot	0.05	0.40	0.01	c0.07	c0.47		c0.04	0.04		0.03	c0.04	
v/s Ratio Perm			0.04						0.01			
v/c Ratio	0.63	0.69	0.07	0.60	0.75		0.51	0.51	0.06	0.36	0.62	
Uniform Delay, d1	58.4	18.6	7.5	54.5	16.9		57.3	57.3	55.2	57.7	58.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.5	1.9	0.0	4.1	2.5		2.5	2.4	0.2	1.3	9.0	
Delay (s)	66.9	20.4	7.5	58.5	19.3		59.8	59.6	55.4	59.0	67.8	
Level of Service	E	C	A	E	B		E	E	E	E	E	
Approach Delay (s)		21.8			22.1			57.9			65.7	
Approach LOS		C			C			E			E	

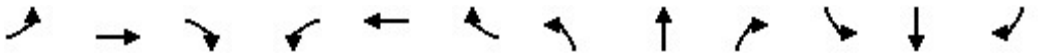
Intersection Summary			
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	125	162	159	86	112	247	1078	257	160	1137	206
Future Volume (veh/h)	155	125	162	159	86	112	247	1078	257	160	1137	206
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1870	1856	1870	1841	1885	1885	1856	1885	1870	1870
Adj Flow Rate, veh/h	161	130	169	166	90	117	257	1123	268	167	1184	215
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	2	3	2	4	1	1	3	1	2	2
Cap, veh/h	173	281	231	169	279	231	254	1819	796	185	1668	724
Arrive On Green	0.10	0.15	0.15	0.10	0.15	0.15	0.14	0.51	0.51	0.10	0.47	0.47
Sat Flow, veh/h	1810	1885	1548	1767	1870	1547	1795	3582	1568	1795	3554	1542
Grp Volume(v), veh/h	161	130	169	166	90	117	257	1123	268	167	1184	215
Grp Sat Flow(s),veh/h/ln	1810	1885	1548	1767	1870	1547	1795	1791	1568	1795	1777	1542
Q Serve(g_s), s	11.5	8.2	13.6	12.2	5.6	9.0	18.4	29.2	13.2	12.0	34.5	11.2
Cycle Q Clear(g_c), s	11.5	8.2	13.6	12.2	5.6	9.0	18.4	29.2	13.2	12.0	34.5	11.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	173	281	231	169	279	231	254	1819	796	185	1668	724
V/C Ratio(X)	0.93	0.46	0.73	0.98	0.32	0.51	1.01	0.62	0.34	0.90	0.71	0.30
Avail Cap(c_a), veh/h	173	528	433	169	524	433	254	1819	796	185	1668	724
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.4	50.5	52.8	58.7	49.4	50.9	55.8	22.9	19.0	57.7	27.5	21.3
Incr Delay (d2), s/veh	49.3	1.0	3.8	64.6	0.6	1.5	59.4	1.6	1.1	39.9	2.6	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	3.9	5.5	8.4	2.7	3.6	12.5	12.6	5.0	7.5	15.0	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	107.6	51.5	56.6	123.3	50.0	52.4	115.2	24.5	20.1	97.6	30.0	22.3
LnGrp LOS	F	D	E	F	D	D	F	C	C	F	C	C
Approach Vol, veh/h		460			373			1648			1566	
Approach Delay, s/veh		73.0			83.4			38.0			36.2	
Approach LOS		E			F			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.0	71.0	17.0	24.0	23.0	66.0	17.0	24.0
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	14.0	31.2	14.2	15.6	20.4	36.5	13.5	11.0
Green Ext Time (p_c), s	0.0	8.0	0.0	1.0	0.0	4.7	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	45.4
HCM 6th LOS	D



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	80	0	0	0	220	838	175	0	1102	24
Future Volume (vph)	0	0	80	0	0	0	220	838	175	0	1102	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2814				3467	3505	1487		3494	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2814				3467	3505	1487		3494	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	83	0	0	0	229	873	182	0	1148	25
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	81	0	3	0
Lane Group Flow (vph)	0	0	83	0	0	0	229	873	101	0	1170	0
Confl. Peds. (#/hr)									36			39
Confl. Bikes (#/hr)												13
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	1%	3%	3%	0%	3%	0%
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			10.2				10.2	24.1	24.1		24.1	
Effective Green, g (s)			12.2				10.2	24.1	24.1		26.1	
Actuated g/C Ratio			0.28				0.24	0.56	0.56		0.60	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			792				816	1950	827		2106	
v/s Ratio Prot			0.03				c0.07	0.25			c0.33	
v/s Ratio Perm									0.07			
v/c Ratio			0.10				0.28	0.45	0.12		0.56	
Uniform Delay, d1			11.5				13.5	5.7	4.6		5.1	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.1				0.2	0.2	0.1		0.3	
Delay (s)			11.6				13.7	5.8	4.6		5.5	
Level of Service			B				B	A	A		A	
Approach Delay (s)		11.6			0.0			7.1			5.5	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	43.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

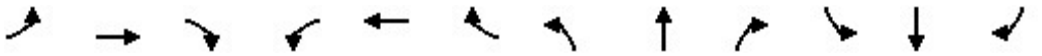
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	967	4	0	1138
Future Vol, veh/h	0	2	967	4	0	1138
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	25	0	2
Mvmt Flow	0	2	1007	4	0	1185

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	506	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	517	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	517	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	0
HCM LOS	B		

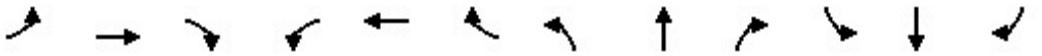
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	517	-
HCM Lane V/C Ratio	-	-	0.004	-
HCM Control Delay (s)	-	-	12	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	448	291	1	0	355	81	6	5	2	89	1	363
Future Volume (veh/h)	448	291	1	0	355	81	6	5	2	89	1	363
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1900	0	1885	1900	1900	1900	1900	1767	1900	1856
Adj Flow Rate, veh/h	467	303	1	0	370	84	6	5	2	93	1	378
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	0	0	1	0	0	0	0	9	0	3
Cap, veh/h	754	788	3	0	413	352	19	16	6	274	3	906
Arrive On Green	0.42	0.42	0.42	0.00	0.22	0.22	0.02	0.02	0.02	0.15	0.15	0.15
Sat Flow, veh/h	1781	1863	6	0	1885	1606	833	694	278	1791	19	1572
Grp Volume(v), veh/h	467	0	304	0	370	84	13	0	0	94	0	378
Grp Sat Flow(s),veh/h/ln	1781	0	1869	0	1885	1606	1805	0	0	1810	0	1572
Q Serve(g_s), s	22.5	0.0	12.3	0.0	21.0	4.7	0.8	0.0	0.0	5.1	0.0	14.8
Cycle Q Clear(g_c), s	22.5	0.0	12.3	0.0	21.0	4.7	0.8	0.0	0.0	5.1	0.0	14.8
Prop In Lane	1.00		0.00	0.00		1.00	0.46		0.15	0.99		1.00
Lane Grp Cap(c), veh/h	754	0	791	0	413	352	42	0	0	277	0	906
V/C Ratio(X)	0.62	0.00	0.38	0.00	0.90	0.24	0.31	0.00	0.00	0.34	0.00	0.42
Avail Cap(c_a), veh/h	754	0	791	0	463	394	394	0	0	280	0	908
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.8	0.0	21.9	0.0	41.8	35.4	52.9	0.0	0.0	41.6	0.0	13.0
Incr Delay (d2), s/veh	3.8	0.0	1.4	0.0	18.9	0.4	5.0	0.0	0.0	0.9	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	0.0	5.7	0.0	11.8	1.9	0.4	0.0	0.0	2.3	0.0	10.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.6	0.0	23.3	0.0	60.7	35.8	57.8	0.0	0.0	42.5	0.0	13.4
LnGrp LOS	C	A	C	A	E	D	E	A	A	D	A	B
Approach Vol, veh/h		771			454			13			472	
Approach Delay, s/veh		26.5			56.1			57.8			19.2	
Approach LOS		C			E			E			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		51.5		21.8		29.1		7.6				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		24.5		16.8		23.0		2.8				
Green Ext Time (p_c), s		0.0		0.1		1.1		0.0				

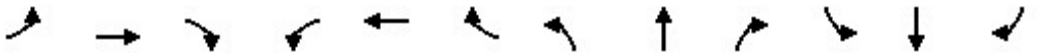
Intersection Summary												
HCM 6th Ctrl Delay			32.6									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	190	146	47	279	42	0	0	0	16	59	30
Future Volume (veh/h)	23	190	146	47	279	42	0	0	0	16	59	30
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.96				1.00		0.83
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1900	1900	1767	1737	1870	1900				1900	1900	1900
Adj Flow Rate, veh/h	24	198	152	49	291	44				17	61	31
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	0	9	11	2	0				0	0	0
Cap, veh/h	171	780	655	191	628	88				74	264	134
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44				0.28	0.28	0.28
Sat Flow, veh/h	74	1766	1482	113	1420	198				262	942	479
Grp Volume(v), veh/h	222	0	152	384	0	0				109	0	0
Grp Sat Flow(s),veh/h/ln	1840	0	1482	1732	0	0				1683	0	0
Q Serve(g_s), s	0.0	0.0	1.8	0.0	0.0	0.0				1.4	0.0	0.0
Cycle Q Clear(g_c), s	2.1	0.0	1.8	4.3	0.0	0.0				1.4	0.0	0.0
Prop In Lane	0.11		1.00	0.13		0.11				0.16		0.28
Lane Grp Cap(c), veh/h	952	0	655	906	0	0				472	0	0
V/C Ratio(X)	0.23	0.00	0.23	0.42	0.00	0.00				0.23	0.00	0.00
Avail Cap(c_a), veh/h	3695	0	2981	3501	0	0				1401	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	5.1	0.0	5.0	5.7	0.0	0.0				8.0	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.4	0.7	0.0	0.0				0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.3	0.9	0.0	0.0				0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.3	0.0	5.4	6.4	0.0	0.0				8.5	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		374			384						109	
Approach Delay, s/veh		5.4			6.4						8.5	
Approach LOS		A			A						A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		16.7		12.1		16.7						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		58.0		24.0		58.0						
Max Q Clear Time (g_c+I1), s		4.1		3.4		6.3						
Green Ext Time (p_c), s		4.4		1.0		5.8						

Intersection Summary												
HCM 6th Ctrl Delay			6.2									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	227	23	45	347	6	44	10	27	25	55	34
Future Volume (veh/h)	9	227	23	45	347	6	44	10	27	25	55	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1900	1870	1885	1900	1900	1900	1796	1722	1811	1900
Adj Flow Rate, veh/h	9	236	24	47	361	6	46	10	28	26	57	35
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	2	1	0	0	0	7	12	6	0
Cap, veh/h	26	438	45	109	567	9	109	72	201	91	168	103
Arrive On Green	0.01	0.26	0.26	0.06	0.31	0.31	0.06	0.17	0.17	0.06	0.16	0.16
Sat Flow, veh/h	1810	1683	171	1781	1849	31	1810	430	1204	1640	1042	640
Grp Volume(v), veh/h	9	0	260	47	0	367	46	0	38	26	0	92
Grp Sat Flow(s),veh/h/ln	1810	0	1854	1781	0	1879	1810	0	1635	1640	0	1682
Q Serve(g_s), s	0.2	0.0	4.8	1.0	0.0	6.6	1.0	0.0	0.8	0.6	0.0	1.9
Cycle Q Clear(g_c), s	0.2	0.0	4.8	1.0	0.0	6.6	1.0	0.0	0.8	0.6	0.0	1.9
Prop In Lane	1.00		0.09	1.00		0.02	1.00		0.74	1.00		0.38
Lane Grp Cap(c), veh/h	26	0	482	109	0	577	109	0	272	91	0	272
V/C Ratio(X)	0.35	0.00	0.54	0.43	0.00	0.64	0.42	0.00	0.14	0.29	0.00	0.34
Avail Cap(c_a), veh/h	344	0	1859	430	0	1980	436	0	1017	354	0	1003
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.2	0.0	12.5	17.8	0.0	11.8	17.9	0.0	14.0	17.9	0.0	14.6
Incr Delay (d2), s/veh	5.8	0.0	0.7	2.0	0.0	0.9	1.9	0.0	0.2	1.3	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	1.7	0.4	0.0	2.3	0.4	0.0	0.3	0.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.1	0.0	13.2	19.8	0.0	12.6	19.8	0.0	14.2	19.1	0.0	15.2
LnGrp LOS	C	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		269			414			84			118	
Approach Delay, s/veh		13.6			13.4			17.2			16.1	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.9	14.7	6.9	10.9	5.1	16.6	6.7	11.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	9.5	39.5	9.5	23.5	7.5	41.5	8.5	24.5
Max Q Clear Time (g_c+I1), s	3.0	6.8	3.0	3.9	2.2	8.6	2.6	2.8
Green Ext Time (p_c), s	0.0	1.3	0.0	0.3	0.0	1.9	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	14.2
HCM 6th LOS	B

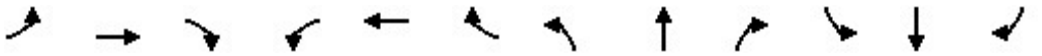
Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	79	63	2	351	415	121
Future Vol, veh/h	79	63	2	351	415	121
Conflicting Peds, #/hr	0	48	25	0	0	25
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	2	0	2	2	0
Mvmt Flow	82	66	2	366	432	126

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	890	568	583	0	-	0
Stage 1	520	-	-	-	-	-
Stage 2	370	-	-	-	-	-
Critical Hdwy	6.4	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	316	522	1001	-	-	-
Stage 1	601	-	-	-	-	-
Stage 2	703	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	300	486	977	-	-	-
Mov Cap-2 Maneuver	300	-	-	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	977	-	300	486	-	-
HCM Lane V/C Ratio	0.002	-	0.274	0.135	-	-
HCM Control Delay (s)	8.7	0	21.5	13.6	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0	-	1.1	0.5	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	505	307	25	435	15	332	146	49	174	343	43
Future Volume (veh/h)	14	505	307	25	435	15	332	146	49	174	343	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1856	1900	1841	1796	1856	1885	1900	1856	1870	1826
Adj Flow Rate, veh/h	15	526	0	26	453	16	346	152	51	181	357	45
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	3	0	4	7	3	1	0	3	2	5
Cap, veh/h	60	622		50	567	20	244	349	117	221	405	51
Arrive On Green	0.03	0.33	0.00	0.03	0.32	0.32	0.14	0.26	0.26	0.12	0.25	0.25
Sat Flow, veh/h	1810	1885	1572	1810	1767	62	1767	1350	453	1767	1628	205
Grp Volume(v), veh/h	15	526	0	26	0	469	346	0	203	181	0	402
Grp Sat Flow(s),veh/h/ln	1810	1885	1572	1810	0	1829	1767	0	1804	1767	0	1833
Q Serve(g_s), s	0.6	20.5	0.0	1.1	0.0	18.5	10.9	0.0	7.4	7.9	0.0	16.7
Cycle Q Clear(g_c), s	0.6	20.5	0.0	1.1	0.0	18.5	10.9	0.0	7.4	7.9	0.0	16.7
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.25	1.00		0.11
Lane Grp Cap(c), veh/h	60	622		50	0	587	244	0	466	221	0	457
V/C Ratio(X)	0.25	0.85		0.52	0.00	0.80	1.42	0.00	0.44	0.82	0.00	0.88
Avail Cap(c_a), veh/h	114	951		114	0	928	244	0	468	320	0	556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.3	24.6	0.0	37.9	0.0	24.5	34.1	0.0	24.5	33.7	0.0	28.6
Incr Delay (d2), s/veh	1.6	5.0	0.0	6.2	0.0	5.0	211.5	0.0	0.5	10.0	0.0	12.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	9.2	0.0	0.6	0.0	8.1	18.8	0.0	3.1	3.9	0.0	8.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	29.6	0.0	44.1	0.0	29.5	245.6	0.0	25.0	43.8	0.0	41.1
LnGrp LOS	D	C		D	A	C	F	A	C	D	A	D
Approach Vol, veh/h		541			495			549			583	
Approach Delay, s/veh		29.9			30.3			164.0			41.9	
Approach LOS		C			C			F			D	

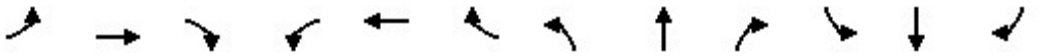
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.8	31.5	16.0	24.8	8.0	30.3	15.3	25.5
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	5.4	* 4.9	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	39.9	10.9	24.0	5.0	* 40	14.3	* 21
Max Q Clear Time (g_c+I1), s	3.1	22.5	12.9	18.7	2.6	20.5	9.9	9.4
Green Ext Time (p_c), s	0.0	3.5	0.0	1.0	0.0	4.8	0.2	0.7

Intersection Summary	
HCM 6th Ctrl Delay	67.2
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	111	2	41	10	1	20	18	534	2	11	578	2
Future Volume (veh/h)	111	2	41	10	1	20	18	534	2	11	578	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1900	1900	1900	1900	1900	1648	1856	1900	1900	1841	1900
Adj Flow Rate, veh/h	116	2	43	10	1	21	19	556	2	11	602	2
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	0	0	0	0	0	17	3	0	0	4	0
Cap, veh/h	393	4	216	156	37	139	37	866	3	26	775	678
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.02	0.47	0.47	0.01	0.42	0.42
Sat Flow, veh/h	1568	27	1610	265	277	1034	1570	1848	7	1810	1841	1610
Grp Volume(v), veh/h	118	0	43	32	0	0	19	0	558	11	602	2
Grp Sat Flow(s),veh/h/ln	1595	0	1610	1575	0	0	1570	0	1854	1810	1841	1610
Q Serve(g_s), s	0.0	0.0	0.9	0.0	0.0	0.0	0.5	0.0	9.0	0.2	11.0	0.0
Cycle Q Clear(g_c), s	2.4	0.0	0.9	2.4	0.0	0.0	0.5	0.0	9.0	0.2	11.0	0.0
Prop In Lane	0.98		1.00	0.31		0.66	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	396	0	216	332	0	0	37	0	869	26	775	678
V/C Ratio(X)	0.30	0.00	0.20	0.10	0.00	0.00	0.51	0.00	0.64	0.42	0.78	0.00
Avail Cap(c_a), veh/h	1182	0	1109	1185	0	0	244	0	2507	231	2437	2132
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.7	0.0	15.1	15.0	0.0	0.0	18.9	0.0	7.9	19.2	9.8	6.6
Incr Delay (d2), s/veh	0.4	0.0	0.4	0.1	0.0	0.0	10.2	0.0	0.7	10.5	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.3	0.2	0.0	0.0	0.2	0.0	1.8	0.2	2.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.1	0.0	15.5	15.1	0.0	0.0	29.2	0.0	8.6	29.6	11.3	6.6
LnGrp LOS	B	A	B	B	A	A	C	A	A	C	B	A
Approach Vol, veh/h		161			32			577			615	
Approach Delay, s/veh		16.0			15.1			9.3			11.6	
Approach LOS		B			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	24.4		9.8	6.9	22.5		9.8				
Change Period (Y+Rc), s	4.5	6.0		4.5	6.0	* 6		4.5				
Max Green Setting (Gmax), s	5.0	53.0		27.0	6.1	* 52		27.0				
Max Q Clear Time (g_c+I1), s	2.2	11.0		4.4	2.5	13.0		4.4				
Green Ext Time (p_c), s	0.0	3.1		0.8	0.0	3.5		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		11.3
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	688	18	6	434	1	45	0	11	4	0	27
Future Vol, veh/h	12	688	18	6	434	1	45	0	11	4	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	3	6	17	3	0	7	0	0	0	0	4
Mvmt Flow	13	717	19	6	452	1	47	0	11	4	0	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	453	0	0	736	0	0	1232	1218	727	1223	1227	453
Stage 1	-	-	-	-	-	-	753	753	-	465	465	-
Stage 2	-	-	-	-	-	-	479	465	-	758	762	-
Critical Hdwy	4.1	-	-	4.27	-	-	7.17	6.5	6.2	7.1	6.5	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.353	-	-	3.563	4	3.3	3.5	4	3.336
Pot Cap-1 Maneuver	1118	-	-	805	-	-	150	182	427	158	180	603
Stage 1	-	-	-	-	-	-	394	420	-	581	566	-
Stage 2	-	-	-	-	-	-	558	566	-	402	416	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1118	-	-	805	-	-	141	179	427	152	177	603
Mov Cap-2 Maneuver	-	-	-	-	-	-	141	179	-	152	177	-
Stage 1	-	-	-	-	-	-	389	415	-	574	562	-
Stage 2	-	-	-	-	-	-	528	562	-	387	411	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	39.2	13.9
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	162	1118	-	-	805	-	-	436
HCM Lane V/C Ratio	0.36	0.011	-	-	0.008	-	-	0.074
HCM Control Delay (s)	39.2	8.3	-	-	9.5	-	-	13.9
HCM Lane LOS	E	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	1.5	0	-	-	0	-	-	0.2

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
1	**Viking Ave NW & SR 305 (Signalized)[1]**							
	EB (SR 305)	L	0.19	68	E	0.63	66.9	E
	EB (SR 305)	T	0.03	2.4	A	0.69	20.4	C
	EB (SR 305)	R	0	1.9	A	0.07	7.5	A
	EB Overall (SR 305)			**4.7**	**A**		**21.8**	**C**
	WB (SR 305)	L	0.19	68	E	0.6	58.5	E
	WB (SR 305)	TR	0.02	2.4	A	0.75	19.3	B
	WB Overall (SR 305)			**5.3**	**A**		**22.1**	**C**
	NB (Viking Ave NW)	L	0.03	63	E	0.51	59.8	E
	NB (Viking Ave NW)	TL	0.06	63.3	E	0.51	59.6	E
	NB (Viking Ave NW)	R	0	62.7	E	0.06	55.4	E
	NB Overall (Viking Ave NW)			**62.8**	**E**		**57.9**	**E**
	SB (Viking Ave NW)	L	0.12	63.8	E	0.36	59	E
	SB (Viking Ave NW)	TR	0.04	62.9	E	0.62	67.8	E
	SB Overall (Viking Ave NW)			**63.3**	**E**		**65.7**	**E**
	Overall			**11.4**	**B**		**26.3**	**C**
2	**SR 303 & NE McWilliams Rd (Signalized)**							
	EB (NE McWilliams Rd)	L	0.37	77.9	E	0.93	107.6	F
	EB (NE McWilliams Rd)	T	0.04	62	E	0.46	51.5	D
	EB (NE McWilliams Rd)	R	0.12	63	E	0.73	56.6	E
	EB Overall (NE McWilliams Rd)			**69.7**	**E**		**73**	**E**
	WB (NE McWilliams Rd)	L	0.38	76.4	E	0.98	123.3	F
	WB (NE McWilliams Rd)	T	0.06	62	E	0.32	50	D
	WB (NE McWilliams Rd)	R	0.16	63.2	E	0.51	52.4	D
	WB Overall (NE McWilliams Rd)			**68.4**	**E**		**83.4**	**F**
	NB (SR 303)	L	0.37	77.9	E	1.01	115.2	F
	NB (SR 303)	T	0.01	2.3	A	0.62	24.5	C
	NB (SR 303)	R	0	2.2	A	0.34	20.1	C
	NB Overall (SR 303)			**12.4**	**B**		**38**	**D**
	SB (SR 303)	L	0.36	88	F	0.9	97.6	F
	SB (SR 303)	T	0.01	2.4	A	0.71	30	C
	SB (SR 303)	R	0	2.4	A	0.3	22.3	C
	SB Overall (SR 303)			**7.6**	**A**		**36.2**	**D**
	Overall			**24.2**	**C**		**45.4**	**D**
3	**Alaskan Way & Yesler Way (Signalized)[1]**							
	EB (Yesler Way)	R	0.03	14.8	B	0.1	11.6	B
	EB Overall (Yesler Way)			**14.8**	**B**		**11.6**	**B**
	NB (Alaskan Way)	L	0.03	16.7	B	0.28	13.7	B
	NB (Alaskan Way)	T	0.02	1.6	A	0.45	5.8	A
	NB (Alaskan Way)	R	0.01	1.5	A	0.12	4.6	A
	NB Overall (Alaskan Way)			**2.4**	**A**		**7.1**	**A**
	SB (Alaskan Way)	T/TR	0.01	1	A	0.56	5.5	A
	SB Overall (Alaskan Way)			**1**	**A**		**5.5**	**A**
	Overall			**3**	**A**		**6.5**	**A**
4	**Charleston Blvd & S Callow Ave (TWSC)[2]**							
	WB (Charleston Blvd)	R	-	0	A	0.004	12	B
	WB Overall (Charleston Blvd)			**0**	**A**		**12**	**B**
	NB (S Callow Ave)	TR						
	NB (S Callow Ave)	R						
	NB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	SB (S Callow Ave)	T						
	SB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	Overall			**0**	**A**		**12**	**B**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
5	**Burwell St & Warren Ave (Signalized)**							
	EB (Burwell St)	TL/T	0.01	1.8	A	0	0	A
	EB Overall (Burwell St)			**1.8**	**A**		**26.5**	**C**
	WB (Burwell St)	T	0.34	62.3	E	0.9	60.7	E
	WB (Burwell St)	R	0.04	54.4	D	0.24	35.8	D
	WB Overall (Burwell St)			**61.5**	**E**		**56.1**	**E**
	NB (Warren Ave)	LTR	0	0	A	0	0	A
	NB Overall (Warren Ave)			**0**	**0**		**57.8**	**E**
	SB (Warren Ave)	TL	0	0	A	0	0	A
	SB (Warren Ave)	R	0.01	1.3	A	0.42	13.4	B
	SB Overall (Warren Ave)			**10.3**	**B**		**19.2**	**B**
	Overall			**12.5**	**B**		**32.6**	**C**
6	**Burwell St & Pacific Ave (Signalized)**							
	EB (Pacific Ave)	TL	0.01	2.4	A	0	0	A
	EB (Pacific Ave)	R	0.02	2.4	A	0.23	5.4	A
	EB Overall (Pacific Ave)			**2.4**	**A**		**5.4**	**A**
	WB (Pacific Ave	LTR	0	0	A	0	0	A
	WB Overall (Pacific Ave)			**2.4**	**A**		**6.4**	**A**
	SB (SR 303)	LTR	0	0	A	0	0	A
	SB Overall (SR 303)			**25.9**	**C**		**8.5**	**A**
	Overall			**6.8**	**A**		**6.2**	**A**
7	**SR 166 & Sidney Ave (Signalized)**							
	EB (SR 166)	L	0	0	A	0.35	25.1	C
	EB (SR 166)	TR	0.02	5.9	A	0	0	A
	EB Overall (SR 166)			**5.9**	**A**		**13.6**	**B**
	WB (SR 166)	L	0.32	34.1	C	0.43	19.8	B
	WB (SR 166)	TR	0.02	3.4	A	0	0	A
	WB Overall (SR 166)			**6**	**A**		**13.4**	**B**
	NB (Sidney Ave)	L	0.16	22.5	C	0.42	19.8	B
	NB (Sidney Ave)	TR	0	0	A	0	0	A
	NB Overall (Sidney Ave)			**20.9**	**C**		**17.2**	**B**
	SB (Sidney Ave)	L	0.16	22.5	C	0.29	19.1	B
	SB (Sidney Ave)	TR	0.11	17.8	B	0	0	A
	SB Overall (Sidney Ave)			**20.1**	**C**		**16.1**	**B**
	Overall			**7.6**	**A**		**14.2**	**B**
8	**SW Barton St & Fauntleroy Way (TWSC)[2]**							
	EB (SW Barton St)	L	0.005	8.7	A	0.274	21.5	C
	EB (SW Barton St)	R	0.004	8.4	A	0.135	13.6	B
	EB Overall (SW Barton St)			**8.6**	**A**		**18**	**C**
	NB (Fauntleroy Way)	T	-	0	A	-	0	A
	NB Overall (Fauntleroy Way)			**0.4**	**0**		**0**	**0**
	SB (Fauntleroy Way)	TR	-	-	-	-	-	-
	SB Overall (Fauntleroy Way)			**0**	**0**		**0**	**0**
	Overall			**8.7**	**A**		**21.5**	**C**
9	**Sam Christopherson Ave & SR 3 W (Signalized)**							
	EB (SR 3 W)	L	0	0	A	0.25	38.9	D
	EB (SR 3 W)	T	0.05	5.5	A	0.85	29.6	C
	EB Overall (SR 3 W)			**5.5**	**A**		**29.9**	**C**
	WB (SR 3 W)	L	0	0	A	0.52	44.1	D
	WB (SR 3 W)	T	0	0	A	0	0	A
	WB Overall (SR 3 W)			**5.4**	**A**		**30.3**	**C**
	NB (SR 16)	L	0.42	26.9	C	1.42	245.6	F
	NB (SR 16)	T	0	0	A	0	0	A
	NB (SR 16)	R	0.14	13.5	B	0.44	25	C
	NB Overall (SR 16)			**21.3**	**C**		**164**	**F**
	SB (Sam Christopherson Ave)	L	0.41	32.3	C	0.82	43.8	D
	SB (Sam Christopherson Ave)	T	0	0	A	0	0	A
	SB Overall (SR 16)			**21.1**	**C**		**41.9**	**D**
	Overall			**11.3**	**B**		**67.2**	**E**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
10	**Imperial Way & SR 3 W (Signalized)**							
	EB (Imperial Way)	TL	0	0	A	0	0	A
	EB (Imperial Way)	R	0.13	19.6	B	0.2	15.5	B
	EB Overall (Imperial Way)			**14.9**	**B**		**16**	**B**
	WB (Imperial Way)	LTR	0	0	A	0	0	A
	WB Overall (Imperial Way)			**0**	**0**		**15.1**	**B**
	NB (SR 3 W)	L	0.28	32.9	C	0.51	29.2	C
	NB (SR 3 W)	TR	0.05	4.7	A	0	0	A
	NB Overall (SR 3 W)			**6.1**	**A**		**9.3**	**A**
	SB (SR 3 W)	L	0.14	21.4	C	0.42	29.6	C
	SB (SR 3 W)	T	0.02	4.6	A	0.78	11.3	B
	SB (SR 3 W)	R	0	0	A	0	6.6	A
	SB Overall (SR 3 W)			**5.5**	**A**		**11.6**	**B**
	Overall			**6.3**	**A**		**11.3**	**B**
11	**SE Spring Creek Rd & SE Mullenix Rd (TWSC)[2]**							
	EB (SE Spring Creek Rd)	L	0.001	7.3	A	0.011	8.3	A
	EB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	EB Overall (SE Spring Creek Rd)			**0.6**	**0**		**0.1**	**0**
	WB (SE Spring Creek Rd)	L	-	0	A	0.008	9.5	A
	WB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	WB Overall (SE Spring Creek Rd)			**0**	**0**		**0.1**	**0**
	NB (SE Mullenix Rd)	LTR	0.001	8.8	A	0.36	39.2	E
	NB Overall (SE Mullenix Rd)			**8.8**	**A**		**39.2**	**E**
	SB (SE Mullenix Rd)	LTR	0.001	8.5	A	0.074	13.9	B
	SB Overall (SE Mullenix Rd)			**8.5**	**A**		**13.9**	**B**
	Overall			**8.8**	**A**		**39.2**	**E**

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left/thru/right lanes

LOS = Level of Service

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

V/C = Volume to capacity ratio

Delay is Measured in Seconds Per Vehicle (sec/veh)

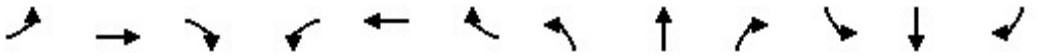
Red cells denote approaches and lane groups operating at unacceptable conditions.

1 - HCM 2000 Analysis

2 - The worst movement delay is reported for LOS.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	1218	47	48	964	37	28	23	90	58	22	73
Future Volume (vph)	43	1218	47	48	964	37	28	23	90	58	22	73
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1570	3406	1482	1719	3407		1573	1582	1553	1492	1559	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1570	3406	1482	1719	3407		1573	1582	1553	1492	1559	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	45	1269	49	50	1004	39	29	24	94	60	23	76
RTOR Reduction (vph)	0	0	13	0	1	0	0	0	89	0	71	0
Lane Group Flow (vph)	45	1269	36	50	1042	0	26	27	5	60	28	0
Heavy Vehicles (%)	15%	6%	9%	5%	5%	15%	9%	14%	4%	21%	4%	9%
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	7.6	86.7	94.3	7.6	86.7		7.6	7.6	7.6	9.4	9.4	
Effective Green, g (s)	7.6	86.7	94.3	7.6	86.7		7.6	7.6	7.6	9.4	9.4	
Actuated g/C Ratio	0.06	0.67	0.73	0.06	0.67		0.06	0.06	0.06	0.07	0.07	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	91	2271	1075	100	2272		91	92	90	107	112	
v/s Ratio Prot	0.03	c0.37	0.00	c0.03	0.31		0.02	c0.02		c0.04	0.02	
v/s Ratio Perm			0.02						0.00			
v/c Ratio	0.49	0.56	0.03	0.50	0.46		0.29	0.29	0.06	0.56	0.25	
Uniform Delay, d1	59.3	11.5	5.0	59.4	10.4		58.6	58.6	57.8	58.3	57.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.1	1.0	0.0	2.8	0.7		1.3	1.3	0.2	5.4	0.9	
Delay (s)	62.4	12.5	5.0	62.2	11.1		59.9	59.9	58.0	63.7	57.9	
Level of Service	E	B	A	E	B		E	E	E	E	E	
Approach Delay (s)		13.9			13.4			58.7			60.0	
Approach LOS		B			B			E			E	

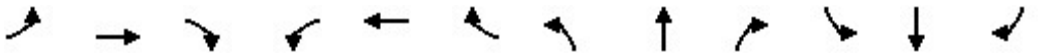
Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	102	30	86	112	51	109	99	557	55	42	637	70
Future Volume (veh/h)	102	30	86	112	51	109	99	557	55	42	637	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1856	1811	1841	1856	1841	1841	1856	1796	1781	1856	1900
Adj Flow Rate, veh/h	106	31	90	117	53	114	103	580	57	44	664	73
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	3	6	4	3	4	4	3	7	8	3	0
Cap, veh/h	129	197	162	141	208	172	127	2229	962	62	2103	958
Arrive On Green	0.07	0.11	0.11	0.08	0.11	0.11	0.07	0.63	0.63	0.04	0.60	0.60
Sat Flow, veh/h	1739	1856	1530	1753	1856	1535	1753	3526	1521	1697	3526	1606
Grp Volume(v), veh/h	106	31	90	117	53	114	103	580	57	44	664	73
Grp Sat Flow(s),veh/h/ln	1739	1856	1530	1753	1856	1535	1753	1763	1521	1697	1763	1606
Q Serve(g_s), s	7.8	2.0	7.3	8.6	3.4	9.3	7.5	9.4	1.9	3.3	12.2	2.5
Cycle Q Clear(g_c), s	7.8	2.0	7.3	8.6	3.4	9.3	7.5	9.4	1.9	3.3	12.2	2.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	129	197	162	141	208	172	127	2229	962	62	2103	958
V/C Ratio(X)	0.82	0.16	0.55	0.83	0.25	0.66	0.81	0.26	0.06	0.71	0.32	0.08
Avail Cap(c_a), veh/h	166	520	429	167	520	430	248	2229	962	175	2103	958
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.3	52.8	55.2	58.9	52.7	55.3	59.4	10.5	9.1	61.9	13.0	11.1
Incr Delay (d2), s/veh	21.9	0.3	2.5	25.0	0.5	3.7	11.5	0.3	0.1	13.6	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	0.9	2.9	4.8	1.6	3.7	3.8	3.7	0.6	1.7	4.9	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.2	53.1	57.7	84.0	53.3	59.0	70.9	10.8	9.3	75.5	13.4	11.2
LnGrp LOS	F	D	E	F	D	E	E	B	A	E	B	B
Approach Vol, veh/h		227			284			740			781	
Approach Delay, s/veh		68.0			68.2			19.0			16.7	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.4	87.2	15.0	18.4	14.0	82.5	14.2	19.2
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	5.3	11.4	10.6	9.3	9.5	14.2	9.8	11.3
Green Ext Time (p_c), s	0.0	4.1	0.0	0.3	0.1	4.7	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	30.5
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	134	0	0	0	69	760	257	0	363	6
Future Volume (vph)	0	0	134	0	0	0	69	760	257	0	363	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2733				3367	3406	1511		3295	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2733				3367	3406	1511		3295	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	140	0	0	0	72	792	268	0	378	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	121	0	2	0
Lane Group Flow (vph)	0	0	140	0	0	0	72	792	147	0	382	0
Confl. Peds. (#/hr)			1						27			58
Confl. Bikes (#/hr)			2						8			2
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	4%	6%	2%	0%	9%	25%
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			7.8				7.8	20.4	20.4		20.4	
Effective Green, g (s)			9.8				7.8	20.4	20.4		22.4	
Actuated g/C Ratio			0.26				0.21	0.55	0.55		0.60	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			719				705	1867	828		1984	
v/s Ratio Prot			c0.05				0.02	c0.23			0.12	
v/s Ratio Perm									0.10			
v/c Ratio			0.19				0.10	0.42	0.18		0.19	
Uniform Delay, d1			10.6				11.9	4.9	4.2		3.3	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.1				0.1	0.2	0.1		0.0	
Delay (s)			10.8				11.9	5.1	4.3		3.4	
Level of Service			B				B	A	A		A	
Approach Delay (s)		10.8			0.0			5.3			3.4	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	37.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

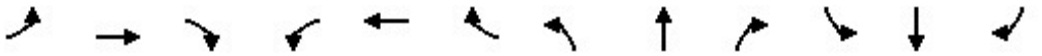
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	800	6	0	688
Future Vol, veh/h	0	2	800	6	0	688
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	100	2	71	0	4
Mvmt Flow	0	2	833	6	0	717

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	420	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	8.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.3	-	-	-	-
Pot Cap-1 Maneuver	0	377	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	377	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	0
HCM LOS	B		

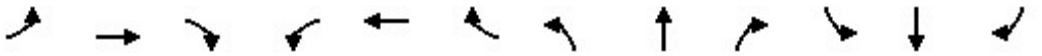
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	377	-
HCM Lane V/C Ratio	-	-	0.006	-
HCM Control Delay (s)	-	-	14.6	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	418	212	0	0	139	15	0	1	2	70	2	289
Future Volume (veh/h)	418	212	0	0	139	15	0	1	2	70	2	289
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.96	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1870	0	0	1781	1826	1900	1900	1900	1752	1900	1841
Adj Flow Rate, veh/h	435	221	0	0	145	16	0	1	2	73	2	301
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	2	0	0	8	5	0	0	0	10	0	4
Cap, veh/h	1040	1037	0	0	192	165	0	13	26	181	5	1071
Arrive On Green	0.58	0.58	0.00	0.00	0.11	0.11	0.00	0.02	0.02	0.10	0.10	0.10
Sat Flow, veh/h	1781	1870	0	0	1781	1526	0	550	1100	1764	48	1560
Grp Volume(v), veh/h	435	221	0	0	145	16	0	0	3	75	0	301
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1781	1526	0	0	1650	1812	0	1560
Q Serve(g_s), s	14.8	6.5	0.0	0.0	8.7	1.0	0.0	0.0	0.2	4.3	0.0	8.2
Cycle Q Clear(g_c), s	14.8	6.5	0.0	0.0	8.7	1.0	0.0	0.0	0.2	4.3	0.0	8.2
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.67	0.97		1.00
Lane Grp Cap(c), veh/h	1040	1037	0	0	192	165	0	0	40	186	0	1071
V/C Ratio(X)	0.42	0.21	0.00	0.00	0.75	0.10	0.00	0.00	0.08	0.40	0.00	0.28
Avail Cap(c_a), veh/h	1040	1037	0	0	437	375	0	0	360	280	0	1152
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.6	10.9	0.0	0.0	47.7	44.2	0.0	0.0	52.5	46.2	0.0	6.7
Incr Delay (d2), s/veh	1.2	0.5	0.0	0.0	7.1	0.3	0.0	0.0	1.0	1.7	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	2.6	0.0	0.0	4.2	0.4	0.0	0.0	0.1	2.0	0.0	8.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.8	11.4	0.0	0.0	54.7	44.5	0.0	0.0	53.5	47.9	0.0	6.9
LnGrp LOS	B	B	A	A	D	D	A	A	D	D	A	A
Approach Vol, veh/h		656			161			3			376	
Approach Delay, s/veh		13.0			53.7			53.5			15.1	
Approach LOS		B			D			D			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		69.2		16.3		16.9		7.6				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		16.8		10.2		10.7		2.2				
Green Ext Time (p_c), s		2.1		1.0		0.8		0.0				

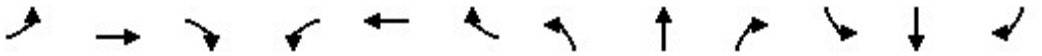
Intersection Summary		
HCM 6th Ctrl Delay		19.2
HCM 6th LOS		B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	92	212	46	110	6	0	0	0	21	86	11
Future Volume (veh/h)	6	92	212	46	110	6	0	0	0	21	86	11
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.96				1.00		0.78
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1707	1870	1693	1559	1870	1900				1900	1796	1900
Adj Flow Rate, veh/h	6	96	221	48	115	6				22	90	11
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	13	2	14	23	2	0				0	7	0
Cap, veh/h	146	621	477	249	461	20				115	469	57
Arrive On Green	0.34	0.34	0.34	0.34	0.34	0.34				0.38	0.38	0.38
Sat Flow, veh/h	32	1822	1400	252	1352	59				305	1247	152
Grp Volume(v), veh/h	102	0	221	169	0	0				123	0	0
Grp Sat Flow(s),veh/h/ln	1854	0	1400	1663	0	0				1704	0	0
Q Serve(g_s), s	0.0	0.0	3.5	0.0	0.0	0.0				1.4	0.0	0.0
Cycle Q Clear(g_c), s	1.1	0.0	3.5	1.9	0.0	0.0				1.4	0.0	0.0
Prop In Lane	0.06		1.00	0.28		0.04				0.18		0.09
Lane Grp Cap(c), veh/h	767	0	477	730	0	0				640	0	0
V/C Ratio(X)	0.13	0.00	0.46	0.23	0.00	0.00				0.19	0.00	0.00
Avail Cap(c_a), veh/h	3431	0	2530	2964	0	0				1871	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	6.5	0.0	7.3	6.7	0.0	0.0				5.9	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.5	0.3	0.0	0.0				0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.8	0.5	0.0	0.0				0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.7	0.0	8.8	7.1	0.0	0.0				6.2	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		323			169						123	
Approach Delay, s/veh		8.1			7.1						6.2	
Approach LOS		A			A						A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		13.6		14.6		13.6						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		51.0		31.0		51.0						
Max Q Clear Time (g_c+I1), s		5.5		3.4		3.9						
Green Ext Time (p_c), s		3.3		1.3		2.2						

Intersection Summary												
HCM 6th Ctrl Delay			7.5									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	165	7	26	312	4	18	5	13	9	10	7
Future Volume (veh/h)	2	165	7	26	312	4	18	5	13	9	10	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1826	1737	1811	1870	1900	1900	1900	1707	1218	1530	1900
Adj Flow Rate, veh/h	2	172	7	27	325	4	19	5	14	9	10	7
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	5	11	6	2	0	0	0	13	46	25	0
Cap, veh/h	6	527	21	69	625	8	53	44	124	17	73	51
Arrive On Green	0.00	0.30	0.30	0.04	0.34	0.34	0.03	0.10	0.10	0.01	0.09	0.09
Sat Flow, veh/h	1810	1742	71	1725	1844	23	1810	433	1212	1160	837	586
Grp Volume(v), veh/h	2	0	179	27	0	329	19	0	19	9	0	17
Grp Sat Flow(s),veh/h/ln	1810	0	1813	1725	0	1866	1810	0	1645	1160	0	1422
Q Serve(g_s), s	0.0	0.0	2.5	0.5	0.0	4.7	0.3	0.0	0.3	0.3	0.0	0.4
Cycle Q Clear(g_c), s	0.0	0.0	2.5	0.5	0.0	4.7	0.3	0.0	0.3	0.3	0.0	0.4
Prop In Lane	1.00		0.04	1.00		0.01	1.00		0.74	1.00		0.41
Lane Grp Cap(c), veh/h	6	0	548	69	0	632	53	0	168	17	0	125
V/C Ratio(X)	0.33	0.00	0.33	0.39	0.00	0.52	0.36	0.00	0.11	0.54	0.00	0.14
Avail Cap(c_a), veh/h	354	0	2971	441	0	3171	408	0	1113	227	0	919
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.5	0.0	9.0	15.6	0.0	8.8	15.8	0.0	13.6	16.3	0.0	14.0
Incr Delay (d2), s/veh	22.6	0.0	0.3	2.7	0.0	0.5	3.1	0.0	0.2	18.5	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.7	0.2	0.0	1.4	0.2	0.0	0.1	0.1	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.1	0.0	9.2	18.3	0.0	9.3	18.9	0.0	13.8	34.8	0.0	14.4
LnGrp LOS	D	A	A	B	A	A	B	A	B	C	A	B
Approach Vol, veh/h		181			356			38			26	
Approach Delay, s/veh		9.6			10.0			16.3			21.5	
Approach LOS		A			A			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.8	14.6	5.5	7.4	4.6	15.8	5.0	7.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	54.5	7.5	21.5	6.5	56.5	6.5	22.5
Max Q Clear Time (g_c+I1), s	2.5	4.5	2.3	2.4	2.0	6.7	2.3	2.3
Green Ext Time (p_c), s	0.0	0.9	0.0	0.0	0.0	1.8	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

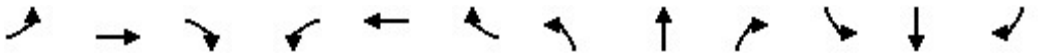
Intersection	
Int Delay, s/veh	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	87	59	21	290	218	33
Future Vol, veh/h	87	59	21	290	218	33
Conflicting Peds, #/hr	0	23	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	6	5	8	3	4	0
Mvmt Flow	91	61	22	302	227	34

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	602	279	273	0	-	0
Stage 1	256	-	-	-	-	-
Stage 2	346	-	-	-	-	-
Critical Hdwy	6.46	6.25	4.18	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	2.272	-	-	-
Pot Cap-1 Maneuver	456	753	1256	-	-	-
Stage 1	777	-	-	-	-	-
Stage 2	708	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	437	728	1242	-	-	-
Mov Cap-2 Maneuver	437	-	-	-	-	-
Stage 1	752	-	-	-	-	-
Stage 2	700	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.4	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1242	-	437	728	-	-
HCM Lane V/C Ratio	0.018	-	0.207	0.084	-	-
HCM Control Delay (s)	8	0	15.4	10.4	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.8	0.3	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	497	193	6	286	8	179	65	66	85	97	9
Future Volume (veh/h)	6	497	193	6	286	8	179	65	66	85	97	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	625	1826	1767	1900	1737	1604	1707	1737	1796	1752	1781	1366
Adj Flow Rate, veh/h	6	518	0	6	298	8	186	68	69	89	101	9
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	86	5	9	0	11	20	13	11	7	10	8	36
Cap, veh/h	5	671		14	609	16	230	135	137	115	168	15
Arrive On Green	0.01	0.37	0.00	0.01	0.36	0.36	0.14	0.17	0.17	0.07	0.10	0.10
Sat Flow, veh/h	596	1826	1497	1810	1684	45	1626	790	802	1668	1612	144
Grp Volume(v), veh/h	6	518	0	6	0	306	186	0	137	89	0	110
Grp Sat Flow(s),veh/h/ln	596	1826	1497	1810	0	1729	1626	0	1593	1668	0	1756
Q Serve(g_s), s	0.4	13.3	0.0	0.2	0.0	7.3	5.9	0.0	4.2	2.8	0.0	3.2
Cycle Q Clear(g_c), s	0.4	13.3	0.0	0.2	0.0	7.3	5.9	0.0	4.2	2.8	0.0	3.2
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.50	1.00		0.08
Lane Grp Cap(c), veh/h	5	671		14	0	625	230	0	272	115	0	183
V/C Ratio(X)	1.26	0.77		0.42	0.00	0.49	0.81	0.00	0.50	0.78	0.00	0.60
Avail Cap(c_a), veh/h	56	1745		170	0	1659	302	0	661	367	0	791
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.4	14.9	0.0	26.3	0.0	13.2	22.2	0.0	20.0	24.4	0.0	22.8
Incr Delay (d2), s/veh	254.2	2.3	0.0	13.5	0.0	1.2	13.0	0.0	1.1	9.7	0.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	4.8	0.0	0.1	0.0	2.5	2.9	0.0	1.5	1.3	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	280.6	17.2	0.0	39.8	0.0	14.3	35.2	0.0	21.1	34.1	0.0	25.2
LnGrp LOS	F	B		D	A	B	D	A	C	C	A	C
Approach Vol, veh/h		524			312			323			199	
Approach Delay, s/veh		20.2			14.8			29.2			29.2	
Approach LOS		C			B			C			C	

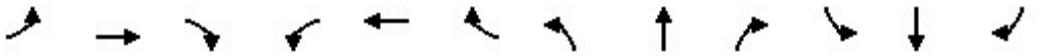
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.0	25.0	12.6	10.6	5.3	24.7	9.1	14.2
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	4.9	* 5.4	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	50.9	9.9	24.0	5.0	* 51	11.7	* 22
Max Q Clear Time (g_c+I1), s	2.2	15.3	7.9	5.2	2.4	9.3	4.8	6.2
Green Ext Time (p_c), s	0.0	4.2	0.1	0.4	0.0	3.6	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	22.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	12	2	0	3	33	577	4	14	274	7
Future Volume (veh/h)	38	1	12	2	0	3	33	577	4	14	274	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1203	1900	1604	1900	1900	1900	1870	1856	1900	1900	1781	1900
Adj Flow Rate, veh/h	40	1	12	2	0	3	34	601	4	15	285	7
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	47	0	20	0	0	0	2	3	0	0	8	0
Cap, veh/h	334	3	102	189	6	58	72	813	5	35	749	677
Arrive On Green	0.08	0.08	0.08	0.08	0.00	0.08	0.04	0.44	0.44	0.02	0.42	0.42
Sat Flow, veh/h	1511	38	1359	438	78	773	1781	1841	12	1810	1781	1610
Grp Volume(v), veh/h	41	0	12	5	0	0	34	0	605	15	285	7
Grp Sat Flow(s),veh/h/ln	1549	0	1359	1289	0	0	1781	0	1853	1810	1781	1610
Q Serve(g_s), s	0.0	0.0	0.3	0.0	0.0	0.0	0.6	0.0	8.8	0.3	3.6	0.1
Cycle Q Clear(g_c), s	0.7	0.0	0.3	0.7	0.0	0.0	0.6	0.0	8.8	0.3	3.6	0.1
Prop In Lane	0.98		1.00	0.40		0.60	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	337	0	102	253	0	0	72	0	818	35	749	677
V/C Ratio(X)	0.12	0.00	0.12	0.02	0.00	0.00	0.47	0.00	0.74	0.43	0.38	0.01
Avail Cap(c_a), veh/h	1434	0	1134	1414	0	0	374	0	3609	280	3370	3046
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	0.0	14.0	13.9	0.0	0.0	15.2	0.0	7.5	15.7	6.5	5.5
Incr Delay (d2), s/veh	0.2	0.0	0.5	0.0	0.0	0.0	4.7	0.0	1.2	7.9	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.1	0.0	0.0	0.0	0.3	0.0	1.4	0.2	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.3	0.0	14.5	13.9	0.0	0.0	19.8	0.0	8.7	23.6	6.8	5.5
LnGrp LOS	B	A	B	B	A	A	B	A	A	C	A	A
Approach Vol, veh/h		53			5			639			307	
Approach Delay, s/veh		14.3			13.9			9.3			7.6	
Approach LOS		B			B			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	20.3		6.9	5.8	19.6		6.9				
Change Period (Y+Rc), s	4.5	6.0		4.5	4.5	6.0		4.5				
Max Green Setting (Gmax), s	5.0	63.0		27.0	6.8	61.2		27.0				
Max Q Clear Time (g_c+I1), s	2.3	10.8		2.7	2.6	5.6		2.7				
Green Ext Time (p_c), s	0.0	3.5		0.2	0.0	1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			9.1									
HCM 6th LOS			A									

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	173	12	6	499	2	12	0	2	1	0	11
Future Vol, veh/h	11	173	12	6	499	2	12	0	2	1	0	11
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	7	5	20	13	1	0	13	0	0	100	0	0
Mvmt Flow	11	180	13	6	520	2	13	0	2	1	0	11

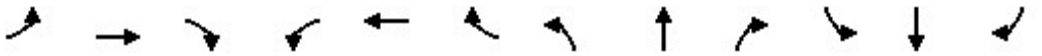
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	522	0	0	194	0	0	749	744	188	743	749	521
Stage 1	-	-	-	-	-	-	210	210	-	533	533	-
Stage 2	-	-	-	-	-	-	539	534	-	210	216	-
Critical Hdwy	4.17	-	-	4.23	-	-	7.23	6.5	6.2	8.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.23	5.5	-	7.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.23	5.5	-	7.1	5.5	-
Follow-up Hdwy	2.263	-	-	2.317	-	-	3.617	4	3.3	4.4	4	3.3
Pot Cap-1 Maneuver	1019	-	-	1316	-	-	315	345	859	234	343	559
Stage 1	-	-	-	-	-	-	768	732	-	389	528	-
Stage 2	-	-	-	-	-	-	507	528	-	613	728	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1019	-	-	1315	-	-	305	339	858	231	337	559
Mov Cap-2 Maneuver	-	-	-	-	-	-	305	339	-	231	337	-
Stage 1	-	-	-	-	-	-	759	723	-	385	525	-
Stage 2	-	-	-	-	-	-	494	525	-	605	719	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.1	16.2	12.4
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	336	1019	-	-	1315	-	-	500
HCM Lane V/C Ratio	0.043	0.011	-	-	0.005	-	-	0.025
HCM Control Delay (s)	16.2	8.6	-	-	7.8	-	-	12.4
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	893	68	78	956	57	56	31	63	27	25	60
Future Volume (vph)	47	893	68	78	956	57	56	31	63	27	25	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1552	1770	3505		1681	1743	1559	1770	1665	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1552	1770	3505		1681	1743	1559	1770	1665	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	49	930	71	81	996	59	58	32	66	28	26	62
RTOR Reduction (vph)	0	0	21	0	2	0	0	0	62	0	59	0
Lane Group Flow (vph)	49	930	50	81	1053	0	44	46	4	28	30	0
Confl. Peds. (#/hr)			1			1			3	3		
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	7.5	83.9	92.4	10.8	87.2		8.5	8.5	8.5	8.1	8.1	
Effective Green, g (s)	7.5	83.9	92.4	10.8	87.2		8.5	8.5	8.5	8.1	8.1	
Actuated g/C Ratio	0.06	0.65	0.71	0.08	0.67		0.07	0.07	0.07	0.06	0.06	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	102	2284	1103	147	2351		109	113	101	110	103	
v/s Ratio Prot	0.03	0.26	0.00	c0.05	c0.30		0.03	c0.03		0.02	c0.02	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	0.48	0.41	0.05	0.55	0.45		0.40	0.41	0.04	0.25	0.29	
Uniform Delay, d1	59.4	11.1	5.6	57.3	10.1		58.3	58.3	56.9	58.1	58.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.6	0.5	0.0	3.5	0.6		1.8	1.7	0.1	0.9	1.1	
Delay (s)	61.9	11.6	5.6	60.8	10.7		60.1	60.1	57.1	59.0	59.3	
Level of Service	E	B	A	E	B		E	E	E	E	E	
Approach Delay (s)		13.6			14.3			58.8			59.3	
Approach LOS		B			B			E			E	

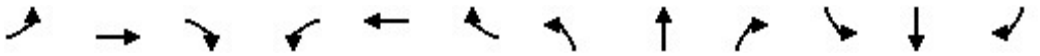
Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	101	81	105	103	56	73	161	701	167	104	739	134
Future Volume (veh/h)	101	81	105	103	56	73	161	701	167	104	739	134
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.99	1.00		1.00	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	105	84	109	107	58	76	168	730	174	108	770	140
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	129	216	178	131	218	183	194	2105	937	132	1981	861
Arrive On Green	0.07	0.12	0.12	0.07	0.12	0.12	0.11	0.59	0.59	0.07	0.56	0.56
Sat Flow, veh/h	1781	1870	1543	1781	1870	1569	1781	3554	1581	1781	3554	1544
Grp Volume(v), veh/h	105	84	109	107	58	76	168	730	174	108	770	140
Grp Sat Flow(s),veh/h/ln	1781	1870	1543	1781	1870	1569	1781	1777	1581	1781	1777	1544
Q Serve(g_s), s	7.6	5.4	8.7	7.7	3.7	5.8	12.1	13.7	6.6	7.8	15.9	5.7
Cycle Q Clear(g_c), s	7.6	5.4	8.7	7.7	3.7	5.8	12.1	13.7	6.6	7.8	15.9	5.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	129	216	178	131	218	183	194	2105	937	132	1981	861
V/C Ratio(X)	0.82	0.39	0.61	0.82	0.27	0.42	0.86	0.35	0.19	0.82	0.39	0.16
Avail Cap(c_a), veh/h	170	524	432	170	524	439	252	2105	937	184	1981	861
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.5	53.3	54.7	59.4	52.3	53.3	57.0	13.6	12.1	59.3	16.3	14.0
Incr Delay (d2), s/veh	20.0	1.0	2.9	20.7	0.6	1.3	20.9	0.5	0.4	17.8	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	2.6	3.5	4.2	1.8	2.4	6.6	5.6	2.4	4.2	6.6	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.5	54.2	57.6	80.1	52.9	54.6	77.9	14.0	12.6	77.1	16.8	14.4
LnGrp LOS	E	D	E	F	D	D	E	B	B	E	B	B
Approach Vol, veh/h		298			241			1072			1018	
Approach Delay, s/veh		64.4			65.5			23.8			22.9	
Approach LOS		E			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.2	82.0	14.1	19.6	18.8	77.5	14.0	19.8
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	9.8	15.7	9.7	10.7	14.1	17.9	9.6	7.8
Green Ext Time (p_c), s	0.1	5.7	0.1	0.7	0.2	5.7	0.1	0.4

Intersection Summary	
HCM 6th Ctrl Delay	31.9
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	52	0	0	0	143	545	114	0	716	16
Future Volume (vph)	0	0	52	0	0	0	143	545	114	0	716	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2787				3433	3539	1512		3526	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2787				3433	3539	1512		3526	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	54	0	0	0	149	568	119	0	746	17
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	58	0	3	0
Lane Group Flow (vph)	0	0	54	0	0	0	149	568	61	0	760	0
Confl. Peds. (#/hr)									36			39
Confl. Bikes (#/hr)												13
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			7.8				7.8	17.6	17.6		17.6	
Effective Green, g (s)			9.8				7.8	17.6	17.6		19.6	
Actuated g/C Ratio			0.28				0.23	0.51	0.51		0.57	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			793				778	1810	773		2009	
v/s Ratio Prot			0.02				c0.04	0.16			c0.22	
v/s Ratio Perm									0.04			
v/c Ratio			0.07				0.19	0.31	0.08		0.38	
Uniform Delay, d1			9.0				10.8	4.9	4.3		4.1	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.0				0.1	0.1	0.0		0.1	
Delay (s)			9.0				10.9	5.0	4.3		4.2	
Level of Service			A				B	A	A		A	
Approach Delay (s)		9.0			0.0			5.9			4.2	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	34.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

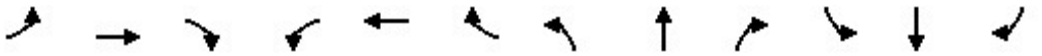
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	629	3	0	740
Future Vol, veh/h	0	1	629	3	0	740
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1	655	3	0	771

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	329	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	667	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	667	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	0
HCM LOS	B		

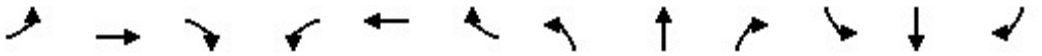
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	667	-
HCM Lane V/C Ratio	-	-	0.002	-
HCM Control Delay (s)	-	-	10.4	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	291	189	1	0	231	53	4	3	1	58	1	236
Future Volume (veh/h)	291	189	1	0	231	53	4	3	1	58	1	236
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	303	197	1	0	241	55	4	3	1	60	1	246
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	986	1029	5	0	292	246	15	12	4	160	3	1022
Arrive On Green	0.55	0.55	0.55	0.00	0.16	0.16	0.02	0.02	0.02	0.09	0.09	0.09
Sat Flow, veh/h	1781	1859	9	0	1870	1580	891	669	223	1753	29	1585
Grp Volume(v), veh/h	303	0	198	0	241	55	8	0	0	61	0	246
Grp Sat Flow(s),veh/h/ln	1781	0	1869	0	1870	1580	1783	0	0	1783	0	1585
Q Serve(g_s), s	10.1	0.0	5.8	0.0	13.7	3.3	0.5	0.0	0.0	3.5	0.0	7.2
Cycle Q Clear(g_c), s	10.1	0.0	5.8	0.0	13.7	3.3	0.5	0.0	0.0	3.5	0.0	7.2
Prop In Lane	1.00		0.01	0.00		1.00	0.50		0.12	0.98		1.00
Lane Grp Cap(c), veh/h	986	0	1034	0	292	246	31	0	0	163	0	1022
V/C Ratio(X)	0.31	0.00	0.19	0.00	0.83	0.22	0.26	0.00	0.00	0.37	0.00	0.24
Avail Cap(c_a), veh/h	986	0	1034	0	459	388	389	0	0	276	0	1122
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	0.0	12.3	0.0	45.0	40.6	53.4	0.0	0.0	47.0	0.0	8.2
Incr Delay (d2), s/veh	0.8	0.0	0.4	0.0	7.9	0.5	5.2	0.0	0.0	1.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	0.0	2.5	0.0	7.0	1.3	0.3	0.0	0.0	1.6	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.0	0.0	12.7	0.0	52.9	41.1	58.6	0.0	0.0	48.7	0.0	8.4
LnGrp LOS	B	A	B	A	D	D	E	A	A	D	A	A
Approach Vol, veh/h		501			296			8			307	
Approach Delay, s/veh		13.5			50.7			58.6			16.4	
Approach LOS		B			D			E			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		65.9		15.1		22.2		6.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		12.1		9.2		15.7		2.5				
Green Ext Time (p_c), s		2.5		0.9		1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			24.5									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	124	95	31	181	27	0	0	0	10	38	20
Future Volume (veh/h)	15	124	95	31	181	27	0	0	0	10	38	20
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.96				1.00		0.82
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870				1870	1870	1870
Adj Flow Rate, veh/h	16	129	99	32	189	28				10	40	21
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2				2	2	2
Cap, veh/h	203	658	590	219	546	74				64	254	134
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38				0.27	0.27	0.27
Sat Flow, veh/h	75	1748	1566	109	1449	197				232	929	487
Grp Volume(v), veh/h	145	0	99	249	0	0				71	0	0
Grp Sat Flow(s),veh/h/ln	1823	0	1566	1755	0	0				1648	0	0
Q Serve(g_s), s	0.0	0.0	1.0	0.0	0.0	0.0				0.7	0.0	0.0
Cycle Q Clear(g_c), s	1.2	0.0	1.0	2.3	0.0	0.0				0.7	0.0	0.0
Prop In Lane	0.11		1.00	0.13		0.11				0.14		0.30
Lane Grp Cap(c), veh/h	861	0	590	838	0	0				452	0	0
V/C Ratio(X)	0.17	0.00	0.17	0.30	0.00	0.00				0.16	0.00	0.00
Avail Cap(c_a), veh/h	4633	0	3967	4479	0	0				1727	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	4.8	0.0	4.7	5.2	0.0	0.0				6.3	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.4	0.0	0.0				0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.2	0.4	0.0	0.0				0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.0	0.0	5.0	5.6	0.0	0.0				6.6	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		244			249						71	
Approach Delay, s/veh		5.0			5.6						6.6	
Approach LOS		A			A						A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		12.6		10.3		12.6						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		58.0		24.0		58.0						
Max Q Clear Time (g_c+I1), s		3.2		2.7		4.3						
Green Ext Time (p_c), s		2.7		0.6		3.4						

Intersection Summary												
HCM 6th Ctrl Delay			5.5									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	148	15	29	226	4	29	7	18	16	36	22
Future Volume (veh/h)	6	148	15	29	226	4	29	7	18	16	36	22
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	154	16	30	235	4	30	7	19	17	38	23
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	17	463	48	77	571	10	77	66	179	65	158	96
Arrive On Green	0.01	0.28	0.28	0.04	0.31	0.31	0.04	0.15	0.15	0.04	0.15	0.15
Sat Flow, veh/h	1781	1666	173	1781	1833	31	1781	433	1177	1781	1083	655
Grp Volume(v), veh/h	6	0	170	30	0	239	30	0	26	17	0	61
Grp Sat Flow(s),veh/h/ln	1781	0	1839	1781	0	1865	1781	0	1610	1781	0	1738
Q Serve(g_s), s	0.1	0.0	2.7	0.6	0.0	3.7	0.6	0.0	0.5	0.3	0.0	1.1
Cycle Q Clear(g_c), s	0.1	0.0	2.7	0.6	0.0	3.7	0.6	0.0	0.5	0.3	0.0	1.1
Prop In Lane	1.00		0.09	1.00		0.02	1.00		0.73	1.00		0.38
Lane Grp Cap(c), veh/h	17	0	512	77	0	581	77	0	246	65	0	254
V/C Ratio(X)	0.35	0.00	0.33	0.39	0.00	0.41	0.39	0.00	0.11	0.26	0.00	0.24
Avail Cap(c_a), veh/h	412	0	1826	509	0	1952	509	0	1117	460	0	1158
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.1	0.0	10.6	17.1	0.0	10.0	17.1	0.0	13.4	17.2	0.0	13.9
Incr Delay (d2), s/veh	8.6	0.0	0.3	2.4	0.0	0.3	2.4	0.0	0.1	1.5	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.9	0.3	0.0	1.2	0.3	0.0	0.2	0.1	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.7	0.0	10.8	19.5	0.0	10.3	19.5	0.0	13.6	18.8	0.0	14.2
LnGrp LOS	C	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		176			269			56			78	
Approach Delay, s/veh		11.4			11.4			16.8			15.2	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.1	14.7	6.1	9.9	4.9	16.0	5.8	10.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	10.5	36.5	10.5	24.5	8.5	38.5	9.5	25.5
Max Q Clear Time (g_c+I1), s	2.6	4.7	2.6	3.1	2.1	5.7	2.3	2.5
Green Ext Time (p_c), s	0.0	0.8	0.0	0.2	0.0	1.2	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	12.4
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	51	41	1	228	270	79
Future Vol, veh/h	51	41	1	228	270	79
Conflicting Peds, #/hr	0	48	25	0	0	25
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	53	43	1	238	281	82

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	587	395	388	0	-	0
Stage 1	347	-	-	-	-	-
Stage 2	240	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	472	654	1170	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	800	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	449	609	1142	-	-	-
Mov Cap-2 Maneuver	449	-	-	-	-	-
Stage 1	698	-	-	-	-	-
Stage 2	781	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1142	-	449	609	-	-
HCM Lane V/C Ratio	0.001	-	0.118	0.07	-	-
HCM Control Delay (s)	8.2	0	14.1	11.4	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0	-	0.4	0.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	328	200	16	283	10	216	95	32	113	223	28
Future Volume (veh/h)	9	328	200	16	283	10	216	95	32	113	223	28
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	9	342	0	17	295	10	225	99	33	118	232	29
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	34	475		37	450	15	280	346	115	155	314	39
Arrive On Green	0.02	0.25	0.00	0.02	0.25	0.25	0.16	0.26	0.26	0.09	0.19	0.19
Sat Flow, veh/h	1781	1870	1585	1781	1798	61	1781	1342	447	1781	1629	204
Grp Volume(v), veh/h	9	342	0	17	0	305	225	0	132	118	0	261
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1859	1781	0	1790	1781	0	1833
Q Serve(g_s), s	0.3	9.0	0.0	0.5	0.0	7.9	6.6	0.0	3.2	3.5	0.0	7.2
Cycle Q Clear(g_c), s	0.3	9.0	0.0	0.5	0.0	7.9	6.6	0.0	3.2	3.5	0.0	7.2
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.25	1.00		0.11
Lane Grp Cap(c), veh/h	34	475		37	0	465	280	0	461	155	0	353
V/C Ratio(X)	0.27	0.72		0.46	0.00	0.66	0.80	0.00	0.29	0.76	0.00	0.74
Avail Cap(c_a), veh/h	166	1388		166	0	1387	361	0	682	474	0	818
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.0	18.3	0.0	26.0	0.0	18.1	21.9	0.0	16.0	24.0	0.0	20.4
Incr Delay (d2), s/veh	3.1	2.5	0.0	6.4	0.0	3.0	10.8	0.0	0.3	6.9	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	3.6	0.0	0.3	0.0	3.3	3.3	0.0	1.2	1.7	0.0	3.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.1	20.8	0.0	32.4	0.0	21.1	32.7	0.0	16.3	30.9	0.0	22.7
LnGrp LOS	C	C		C	A	C	C	A	B	C	A	C
Approach Vol, veh/h		351			322			357			379	
Approach Delay, s/veh		21.0			21.7			26.6			25.3	
Approach LOS		C			C			C			C	

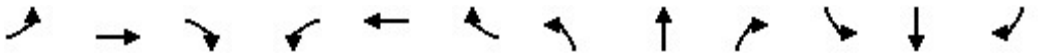
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.7	19.0	13.6	15.4	6.4	18.4	10.1	18.9
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	5.4	* 4.9	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	39.9	10.9	24.0	5.0	* 40	14.3	* 21
Max Q Clear Time (g_c+I1), s	2.5	11.0	8.6	9.2	2.3	9.9	5.5	5.2
Green Ext Time (p_c), s	0.0	2.4	0.2	1.0	0.0	3.3	0.2	0.4

Intersection Summary	
HCM 6th Ctrl Delay	23.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	1	27	7	1	13	12	347	1	7	376	1
Future Volume (veh/h)	72	1	27	7	1	13	12	347	1	7	376	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	75	1	28	7	1	14	12	361	1	7	392	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	411	4	203	193	34	129	28	704	2	17	604	512
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.02	0.38	0.38	0.01	0.32	0.32
Sat Flow, veh/h	1407	31	1585	310	264	1004	1781	1864	5	1781	1870	1585
Grp Volume(v), veh/h	76	0	28	22	0	0	12	0	362	7	392	1
Grp Sat Flow(s),veh/h/ln	1438	0	1585	1577	0	0	1781	0	1869	1781	1870	1585
Q Serve(g_s), s	1.1	0.0	0.5	0.0	0.0	0.0	0.2	0.0	4.6	0.1	5.6	0.0
Cycle Q Clear(g_c), s	1.4	0.0	0.5	1.4	0.0	0.0	0.2	0.0	4.6	0.1	5.6	0.0
Prop In Lane	0.99		1.00	0.32		0.64	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	415	0	203	355	0	0	28	0	706	17	604	512
V/C Ratio(X)	0.18	0.00	0.14	0.06	0.00	0.00	0.43	0.00	0.51	0.42	0.65	0.00
Avail Cap(c_a), veh/h	1459	0	1382	1489	0	0	351	0	3200	288	3135	2657
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.4	0.0	12.0	11.9	0.0	0.0	15.1	0.0	7.4	15.2	9.0	7.1
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.1	0.0	0.0	9.8	0.0	0.5	15.6	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.8	0.1	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	0.0	12.3	12.0	0.0	0.0	24.9	0.0	8.0	30.8	10.0	7.1
LnGrp LOS	B	A	B	B	A	A	C	A	A	C	B	A
Approach Vol, veh/h		104			22			374			400	
Approach Delay, s/veh		12.5			12.0			8.5			10.4	
Approach LOS		B			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.8	17.7		8.5	6.5	16.0		8.5				
Change Period (Y+Rc), s	4.5	6.0		4.5	6.0	* 6		4.5				
Max Green Setting (Gmax), s	5.0	53.0		27.0	6.1	* 52		27.0				
Max Q Clear Time (g_c+I1), s	2.1	6.6		3.4	2.2	7.6		3.4				
Green Ext Time (p_c), s	0.0	1.8		0.4	0.0	2.0		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		9.9
HCM 6th LOS		A

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	447	12	4	282	1	29	0	7	3	0	18
Future Vol, veh/h	8	447	12	4	282	1	29	0	7	3	0	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	466	13	4	294	1	30	0	7	3	0	19

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	295	0	0	479	0	0	801	792	473	795	798	295
Stage 1	-	-	-	-	-	-	489	489	-	303	303	-
Stage 2	-	-	-	-	-	-	312	303	-	492	495	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1266	-	-	1083	-	-	303	322	591	305	319	744
Stage 1	-	-	-	-	-	-	561	549	-	706	664	-
Stage 2	-	-	-	-	-	-	699	664	-	558	546	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1266	-	-	1083	-	-	293	319	591	299	316	744
Mov Cap-2 Maneuver	-	-	-	-	-	-	293	319	-	299	316	-
Stage 1	-	-	-	-	-	-	558	546	-	702	661	-
Stage 2	-	-	-	-	-	-	679	661	-	548	543	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	17.5	11.1
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	325	1266	-	-	1083	-	-	614
HCM Lane V/C Ratio	0.115	0.007	-	-	0.004	-	-	0.036
HCM Control Delay (s)	17.5	7.9	-	-	8.3	-	-	11.1
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.1

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
1	**Viking Ave NW & SR 305 (Signalized)[1]**							
	EB (SR 305)	L	0.49	62.4	E	0.48	61.9	E
	EB (SR 305)	T	0.56	12.5	B	0.41	11.6	B
	EB (SR 305)	R	0.03	5	A	0.05	5.6	A
	EB Overall (SR 305)			**13.9**	**B**		**13.6**	**B**
	WB (SR 305)	L	0.5	62.2	E	0.55	60.8	E
	WB (SR 305)	TR	0.46	11.1	B	0.45	10.7	B
	WB Overall (SR 305)			**13.4**	**B**		**14.3**	**B**
	NB (Viking Ave NW)	L	0.29	59.9	E	0.4	60.1	E
	NB (Viking Ave NW)	TL	0.29	59.9	E	0.41	60.1	E
	NB (Viking Ave NW)	R	0.06	58	E	0.04	57.1	E
	NB Overall (Viking Ave NW)			**58.7**	**E**		**58.8**	**E**
	SB (Viking Ave NW)	L	0.56	63.7	E	0.25	59	E
	SB (Viking Ave NW)	TR	0.25	57.9	E	0.29	59.3	E
	SB Overall (Viking Ave NW)			**60**	**E**		**59.3**	**E**
	Overall			**18.7**	**B**		**18.9**	**B**
2	**SR 303 & NE McWilliams Rd (Signalized)**							
	EB (NE McWilliams Rd)	L	0.82	81.2	F	0.82	79.5	E
	EB (NE McWilliams Rd)	T	0.16	53.1	D	0.39	54.2	D
	EB (NE McWilliams Rd)	R	0.55	57.7	E	0.61	57.6	E
	EB Overall (NE McWilliams Rd)			**68**	**E**		**64.4**	**E**
	WB (NE McWilliams Rd)	L	0.83	84	F	0.82	80.1	F
	WB (NE McWilliams Rd)	T	0.25	53.3	D	0.27	52.9	D
	WB (NE McWilliams Rd)	R	0.66	59	E	0.42	54.6	D
	WB Overall (NE McWilliams Rd)			**68.2**	**E**		**65.5**	**E**
	NB (SR 303)	L	0.81	70.9	E	0.86	77.9	E
	NB (SR 303)	T	0.26	10.8	B	0.35	14	B
	NB (SR 303)	R	0.06	9.3	A	0.19	12.6	B
	NB Overall (SR 303)			**19**	**B**		**23.8**	**C**
	SB (SR 303)	L	0.71	75.5	E	0.82	77.1	E
	SB (SR 303)	T	0.32	13.4	B	0.39	16.8	B
	SB (SR 303)	R	0.08	11.2	B	0.16	14.4	B
	SB Overall (SR 303)			**16.7**	**B**		**22.9**	**C**
	Overall			**30.5**	**C**		**31.9**	**C**
3	**Alaskan Way & Yesler Way (Signalized)[1]**							
	EB (Yesler Way)	R	0.19	10.8	B	0.07	9	A
	EB Overall (Yesler Way)			**10.8**	**B**		**9**	**A**
	NB (Alaskan Way)	L	0.1	11.9	B	0.19	10.9	B
	NB (Alaskan Way)	T	0.42	5.1	A	0.31	5	A
	NB (Alaskan Way)	R	0.18	4.3	A	0.08	4.3	A
	NB Overall (Alaskan Way)			**5.3**	**A**		**5.9**	**A**
	SB (Alaskan Way)	T/TR	0.19	3.4	A	0.38	4.2	A
	SB Overall (Alaskan Way)			**3.4**	**A**		**4.2**	**A**
	Overall			**5.3**	**A**		**5.2**	**A**
4	**Charleston Blvd & S Callow Ave (TWSC)[2]**							
	WB (Charleston Blvd)	R	0.006	14.6	B	0.002	10.4	B
	WB Overall (Charleston Blvd)			**14.6**	**B**		**10.4**	**B**
	NB (S Callow Ave)	TR						
	NB (S Callow Ave)	R						
	NB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	SB (S Callow Ave)	T						
	SB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	Overall			**14.6**	**B**		**10.4**	**B**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
5	**Burwell St & Warren Ave (Signalized)**							
	EB (Burwell St)	TL/T	0.21	11.4	B	0	0	A
	EB Overall (Burwell St)			**13**	**B**		**13.5**	**B**
	WB (Burwell St)	T	0.75	54.7	D	0.83	52.9	D
	WB (Burwell St)	R	0.1	44.5	D	0.22	41.1	D
	WB Overall (Burwell St)			**53.7**	**D**		**50.7**	**D**
	NB (Warren Ave)	LTR	0	0	A	0	0	A
	NB Overall (Warren Ave)			**53.5**	**D**		**58.6**	**E**
	SB (Warren Ave)	TL	0	0	A	0	0	A
	SB (Warren Ave)	R	0.28	6.9	A	0.24	8.4	A
	SB Overall (Warren Ave)			**15.1**	**B**		**16.4**	**B**
	Overall			**19.2**	**B**		**24.5**	**C**
6	**Burwell St & Pacific Ave (Signalized)**							
	EB (Pacific Ave)	TL	0	0	A	0	0	A
	EB (Pacific Ave)	R	0.46	8.8	A	0.17	5	A
	EB Overall (Pacific Ave)			**8.1**	**A**		**5**	**A**
	WB (Pacific Ave	LTR	0	0	A	0	0	A
	WB Overall (Pacific Ave)			**7.1**	**A**		**5.6**	**A**
	SB (SR 303)	LTR	0	0	A	0	0	A
	SB Overall (SR 303)			**6.2**	**A**		**6.6**	**A**
	Overall			**7.5**	**A**		**5.5**	**A**
7	**SR 166 & Sidney Ave (Signalized)**							
	EB (SR 166)	L	0.33	39.1	D	0.35	26.7	C
	EB (SR 166)	TR	0	0	A	0	0	A
	EB Overall (SR 166)			**9.6**	**A**		**11.4**	**B**
	WB (SR 166)	L	0.39	18.3	B	0.39	19.5	B
	WB (SR 166)	TR	0	0	A	0	0	A
	WB Overall (SR 166)			**10**	**A**		**11.4**	**B**
	NB (Sidney Ave)	L	0.36	18.9	B	0.39	19.5	B
	NB (Sidney Ave)	TR	0	0	A	0	0	A
	NB Overall (Sidney Ave)			**16.3**	**B**		**16.8**	**B**
	SB (Sidney Ave)	L	0.54	34.8	C	0.26	18.8	B
	SB (Sidney Ave)	TR	0	0	A	0	0	A
	SB Overall (Sidney Ave)			**21.5**	**C**		**15.2**	**B**
	Overall			**10.8**	**B**		**12.4**	**B**
8	**SW Barton St & Fauntleroy Way (TWSC)[2]**							
	EB (SW Barton St)	L	0.207	15.4	C	0.118	14.1	B
	EB (SW Barton St)	R	0.084	10.4	B	0.07	11.4	B
	EB Overall (SW Barton St)			**13.4**	**B**		**12.9**	**B**
	NB (Fauntleroy Way)	T	-	0	A	-	0	A
	NB Overall (Fauntleroy Way)			**0.5**	**0**		**0**	**0**
	SB (Fauntleroy Way)	TR	-	-	-	-	-	-
	SB Overall (Fauntleroy Way)			**0**	**0**		**0**	**0**
	Overall			**15.4**	**C**		**14.1**	**B**
9	**Sam Christopherson Ave & SR 3 W (Signalized)**							
	EB (SR 3 W)	L	1.26	280.6	F	0.27	29.1	C
	EB (SR 3 W)	T	0.77	17.2	B	0.72	20.8	C
	EB Overall (SR 3 W)			**20.2**	**C**		**21**	**C**
	WB (SR 3 W)	L	0.42	39.8	D	0.46	32.4	C
	WB (SR 3 W)	T	0	0	A	0	0	A
	WB Overall (SR 3 W)			**14.8**	**B**		**21.7**	**C**
	NB (SR 16)	L	0.81	35.2	D	0.8	32.7	C
	NB (SR 16)	T	0	0	A	0	0	A
	NB (SR 16)	R	0.5	21.1	C	0.29	16.3	B
	NB Overall (SR 16)			**29.2**	**C**		**26.6**	**C**
	SB (Sam Christopherson Ave)	L	0.78	34.1	C	0.76	30.9	C
	SB (Sam Christopherson Ave)	T	0	0	A	0	0	A
	SB Overall (SR 16)			**29.2**	**C**		**25.3**	**C**
	Overall			**22.4**	**C**		**23.7**	**C**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
10	**Imperial Way & SR 3 W (Signalized)**							
	EB (Imperial Way)	TL	0	0	A	0	0	A
	EB (Imperial Way)	R	0.12	14.5	B	0.14	12.3	B
	EB Overall (Imperial Way)			**14.3**	**B**		**12.5**	**B**
	WB (Imperial Way)	LTR	0	0	A	0	0	A
	WB Overall (Imperial Way)			**13.9**	**B**		**12**	**B**
	NB (SR 3 W)	L	0.47	19.8	B	0.43	24.9	C
	NB (SR 3 W)	TR	0	0	A	0	0	A
	NB Overall (SR 3 W)			**9.3**	**A**		**8.5**	**A**
	SB (SR 3 W)	L	0.43	23.6	C	0.42	30.8	C
	SB (SR 3 W)	T	0.38	6.8	A	0.65	10	B
	SB (SR 3 W)	R	0.01	5.5	A	0	7.1	A
	SB Overall (SR 3 W)			**7.6**	**A**		**10.4**	**B**
	Overall			**9.1**	**A**		**9.9**	**A**
11	**SE Spring Creek Rd & SE Mullenix Rd (TWSC)[2]**							
	EB (SE Spring Creek Rd)	L	0.011	8.6	A	0.007	7.9	A
	EB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	EB Overall (SE Spring Creek Rd)			**0.5**	**0**		**0.1**	**0**
	WB (SE Spring Creek Rd)	L	0.005	7.8	A	0.004	8.3	A
	WB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	WB Overall (SE Spring Creek Rd)			**0.1**	**0**		**0.1**	**0**
	NB (SE Mullenix Rd)	LTR	0.043	16.2	C	0.115	17.5	C
	NB Overall (SE Mullenix Rd)			**16.2**	**C**		**17.5**	**C**
	SB (SE Mullenix Rd)	LTR	0.025	12.4	B	0.036	11.1	B
	SB Overall (SE Mullenix Rd)			**12.4**	**B**		**11.1**	**B**
	Overall			**16.2**	**C**		**17.5**	**C**

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left/thru/right lanes

LOS = Level of Service

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

V/C = Volume to capacity ratio

Delay is Measured in Seconds Per Vehicle (sec/veh)

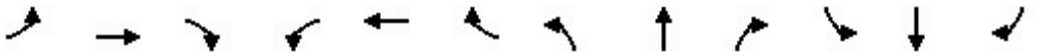
Red cells denote approaches and lane groups operating at unacceptable conditions.

1 - HCM 2000 Analysis

2 - The worst movement delay is reported for LOS.

Attachment D
2030 No Build Synchro Reports

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	81	3	3	64	2	2	1	6	4	1	5
Future Volume (vph)	3	81	3	3	64	2	2	1	6	4	1	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3524		1681	1726	1583	1770	1630	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3524		1681	1726	1583	1770	1630	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	3	84	3	3	67	2	2	1	6	4	1	5
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	6	0	5	0
Lane Group Flow (vph)	3	84	2	3	69	0	1	2	0	4	1	0
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	1.2	105.2	107.6	1.2	105.2		2.4	2.4	2.4	2.5	2.5	
Effective Green, g (s)	1.2	105.2	107.6	1.2	105.2		2.4	2.4	2.4	2.5	2.5	
Actuated g/C Ratio	0.01	0.81	0.83	0.01	0.81		0.02	0.02	0.02	0.02	0.02	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	16	2863	1310	16	2851		31	31	29	34	31	
v/s Ratio Prot	c0.00	c0.02	0.00	0.00	0.02		0.00	c0.00		c0.00	0.00	
v/s Ratio Perm			0.00						0.00			
v/c Ratio	0.19	0.03	0.00	0.19	0.02		0.03	0.06	0.00	0.12	0.04	
Uniform Delay, d1	63.9	2.4	1.9	63.9	2.4		62.7	62.7	62.6	62.7	62.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	0.0	0.0	4.1	0.0		0.3	0.6	0.0	1.1	0.3	
Delay (s)	68.0	2.4	1.9	68.0	2.4		63.0	63.3	62.7	63.8	62.9	
Level of Service	E	A	A	E	A		E	E	E	E	E	
Approach Delay (s)		4.6			5.2			62.8			63.3	
Approach LOS		A			A			E			E	

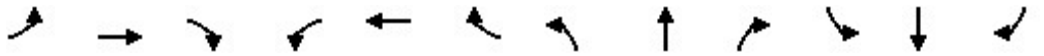
Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	2	5	7	3	7	6	36	3	3	41	4
Future Volume (veh/h)	6	2	5	7	3	7	6	36	3	3	41	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	2	5	7	3	7	6	38	3	3	43	4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	16	49	41	18	51	43	16	2894	1291	8	2879	1284
Arrive On Green	0.01	0.03	0.03	0.01	0.03	0.03	0.01	0.81	0.81	0.00	0.81	0.81
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	6	2	5	7	3	7	6	38	3	3	43	4
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.4	0.1	0.4	0.5	0.2	0.6	0.4	0.3	0.0	0.2	0.3	0.1
Cycle Q Clear(g_c), s	0.4	0.1	0.4	0.5	0.2	0.6	0.4	0.3	0.0	0.2	0.3	0.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	16	49	41	18	51	43	16	2894	1291	8	2879	1284
V/C Ratio(X)	0.37	0.04	0.12	0.38	0.06	0.16	0.37	0.01	0.00	0.36	0.01	0.00
Avail Cap(c_a), veh/h	170	524	444	170	524	444	252	2894	1291	184	2879	1284
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.1	61.7	61.9	63.9	61.6	61.8	64.1	2.3	2.2	64.5	2.4	2.4
Incr Delay (d2), s/veh	13.9	0.3	1.1	12.5	0.4	1.5	13.9	0.0	0.0	23.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.1	0.2	0.3	0.1	0.2	0.3	0.1	0.0	0.2	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.9	62.0	63.0	76.4	62.0	63.2	77.9	2.3	2.2	88.0	2.4	2.4
LnGrp LOS	E	E	E	E	E	E	E	A	A	F	A	A
Approach Vol, veh/h		13			17			47			50	
Approach Delay, s/veh		69.7			68.4			11.9			7.5	
Approach LOS		E			E			B			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.2	110.9	5.9	8.0	5.8	110.3	5.8	8.2
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	2.2	2.3	2.5	2.4	2.4	2.3	2.4	2.6
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.7
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	8	0	0	0	4	50	17	0	24	0
Future Volume (vph)	0	0	8	0	0	0	4	50	17	0	24	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2787				3433	3539	1583		3539	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2787				3433	3539	1583		3539	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	8	0	0	0	4	52	18	0	25	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	5	0	0	0
Lane Group Flow (vph)	0	0	8	0	0	0	4	52	13	0	25	0
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			1.5				1.5	25.6	25.6		25.6	
Effective Green, g (s)			3.5				1.5	25.6	25.6		27.6	
Actuated g/C Ratio			0.10				0.04	0.71	0.71		0.76	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			270				142	2509	1122		2705	
v/s Ratio Prot			c0.00				0.00	c0.01			0.01	
v/s Ratio Perm									0.01			
v/c Ratio			0.03				0.03	0.02	0.01		0.01	
Uniform Delay, d1			14.8				16.6	1.5	1.5		1.0	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.0				0.1	0.0	0.0		0.0	
Delay (s)			14.8				16.7	1.6	1.5		1.0	
Level of Service			B				B	A	A		A	
Approach Delay (s)		14.8			0.0			2.4			1.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.02		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

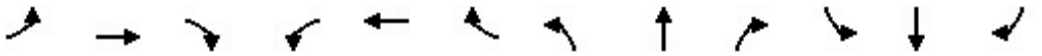
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	55	0	0	48
Future Vol, veh/h	0	0	55	0	0	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	57	0	0	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	29	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	1039	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	1039	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

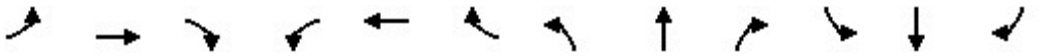
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	14	0	0	10	1	0	0	0	4	0	20
Future Volume (veh/h)	29	14	0	0	10	1	0	0	0	4	0	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	30	15	0	0	10	1	0	0	0	4	0	21
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2	2	2	2
Cap, veh/h	1459	1455	0	0	29	25	0	2	0	52	0	1344
Arrive On Green	0.82	0.82	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.03	0.00	0.03
Sat Flow, veh/h	1781	1870	0	0	1870	1585	0	1870	0	1781	0	1585
Grp Volume(v), veh/h	30	15	0	0	10	1	0	0	0	4	0	21
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1870	1585	0	1870	0	1781	0	1585
Q Serve(g_s), s	0.3	0.2	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.2	0.0	0.2
Cycle Q Clear(g_c), s	0.3	0.2	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.2	0.0	0.2
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	1459	1455	0	0	29	25	0	2	0	52	0	1344
V/C Ratio(X)	0.02	0.01	0.00	0.00	0.34	0.04	0.00	0.00	0.00	0.08	0.00	0.02
Avail Cap(c_a), veh/h	1459	1455	0	0	459	389	0	408	0	275	0	1543
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	1.8	1.8	0.0	0.0	53.6	53.3	0.0	0.0	0.0	52.0	0.0	1.3
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	8.2	0.8	0.0	0.0	0.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	1.9	1.8	0.0	0.0	61.8	54.1	0.0	0.0	0.0	52.7	0.0	1.3
LnGrp LOS	A	A	A	A	E	D	A	A	A	D	A	A
Approach Vol, veh/h		45			11			0			25	
Approach Delay, s/veh		1.9			61.1			0.0			9.5	
Approach LOS		A			E						A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		95.1		8.2		6.7		0.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		2.3		2.2		2.6		0.0				
Green Ext Time (p_c), s		0.2		0.0		0.0		0.0				

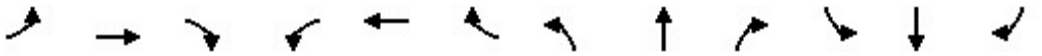
Intersection Summary												
HCM 6th Ctrl Delay		12.3										
HCM 6th LOS		B										



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	6	14	3	8	0	0	0	0	1	5	1
Future Volume (veh/h)	0	6	14	3	8	0	0	0	0	1	5	1
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870				1870	1870	1870
Adj Flow Rate, veh/h	0	6	15	3	8	0				1	5	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2				2	2	2
Cap, veh/h	0	792	671	413	672	0				3	15	3
Arrive On Green	0.00	0.42	0.42	0.42	0.42	0.00				0.01	0.01	0.01
Sat Flow, veh/h	0	1870	1585	211	1586	0				259	1293	259
Grp Volume(v), veh/h	0	6	15	11	0	0				7	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	1585	1798	0	0				1811	0	0
Q Serve(g_s), s	0.0	0.0	0.1	0.0	0.0	0.0				0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.1	0.0	0.0	0.0				0.1	0.0	0.0
Prop In Lane	0.00		1.00	0.27		0.00				0.14		0.14
Lane Grp Cap(c), veh/h	0	792	671	1085	0	0				21	0	0
V/C Ratio(X)	0.00	0.01	0.02	0.01	0.00	0.00				0.34	0.00	0.00
Avail Cap(c_a), veh/h	0	6735	5708	6517	0	0				3964	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	2.4	2.4	2.4	0.0	0.0				6.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				19.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0				0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.4	2.4	2.4	0.0	0.0				25.9	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				C	A	A
Approach Vol, veh/h		21			11						7	
Approach Delay, s/veh		2.4			2.4						25.9	
Approach LOS		A			A						C	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		10.0		4.2		10.0						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		51.0		31.0		51.0						
Max Q Clear Time (g_c+I1), s		2.1		2.1		2.0						
Green Ext Time (p_c), s		0.1		0.0		0.1						

Intersection Summary												
HCM 6th Ctrl Delay			6.6									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	10	0	2	21	0	1	0	1	1	1	0
Future Volume (veh/h)	0	10	0	2	21	0	1	0	1	1	1	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	10	0	2	22	0	1	0	1	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	6	661	0	6	965	0	6	0	8	6	9	0
Arrive On Green	0.00	0.35	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sat Flow, veh/h	1781	1870	0	1781	1870	0	1781	0	1585	1781	1870	0
Grp Volume(v), veh/h	0	10	0	2	22	0	1	0	1	1	1	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	1870	0	1781	0	1585	1781	1870	0
Q Serve(g_s), s	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	6	661	0	6	965	0	6	0	8	6	9	0
V/C Ratio(X)	0.00	0.02	0.00	0.32	0.02	0.00	0.16	0.00	0.13	0.16	0.11	0.00
Avail Cap(c_a), veh/h	409	3604	0	535	3737	0	472	0	1261	409	1422	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	5.9	0.0	14.1	3.4	0.0	14.1	0.0	14.0	14.1	14.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	20.0	0.0	0.0	8.5	0.0	5.3	8.5	3.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	5.9	0.0	34.1	3.4	0.0	22.5	0.0	19.3	22.5	17.8	0.0
LnGrp LOS	A	A	A	C	A	A	C	A	B	C	B	A
Approach Vol, veh/h		10			24			2			2	
Approach Delay, s/veh		5.9			5.9			20.9			20.1	
Approach LOS		A			A			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.6	14.5	4.5	4.6	0.0	19.1	4.5	4.6
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	54.5	7.5	21.5	6.5	56.5	6.5	22.5
Max Q Clear Time (g_c+I1), s	2.0	2.1	2.0	2.0	0.0	2.2	2.0	2.0
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	7.5
HCM 6th LOS	A

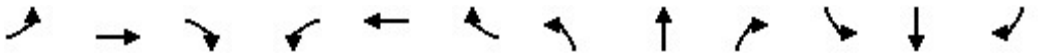
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	5	1	21	16	2
Future Vol, veh/h	6	5	1	21	16	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	5	1	22	17	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	42	18	19	0	-	0
Stage 1	18	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	969	1061	1597	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	968	1061	1597	-	-	-
Mov Cap-2 Maneuver	968	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1597	-	968	1061	-	-
HCM Lane V/C Ratio	0.001	-	0.006	0.005	-	-
HCM Control Delay (s)	7.3	0	8.7	8.4	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	33	13	0	19	1	12	4	4	5	6	1
Future Volume (veh/h)	0	33	13	0	19	1	12	4	4	5	6	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	34	0	0	20	1	12	4	4	5	6	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	7	693		7	654	33	28	29	29	12	56	9
Arrive On Green	0.00	0.37	0.00	0.00	0.37	0.37	0.02	0.03	0.03	0.01	0.04	0.04
Sat Flow, veh/h	1781	1870	1585	1781	1766	88	1781	858	858	1781	1563	260
Grp Volume(v), veh/h	0	34	0	0	0	21	12	0	8	5	0	7
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1854	1781	0	1716	1781	0	1823
Q Serve(g_s), s	0.0	0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.0	0.1
Cycle Q Clear(g_c), s	0.0	0.3	0.0	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.0	0.1
Prop In Lane	1.00		1.00	1.00		0.05	1.00		0.50	1.00		0.14
Lane Grp Cap(c), veh/h	7	693		7	0	687	28	0	58	12	0	66
V/C Ratio(X)	0.00	0.05		0.00	0.00	0.03	0.42	0.00	0.14	0.41	0.00	0.11
Avail Cap(c_a), veh/h	330	3526		330	0	3510	653	0	1404	772	0	1621
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	5.5	0.0	0.0	0.0	5.4	13.2	0.0	12.7	13.4	0.0	12.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	12.7	0.0	0.8	19.0	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	5.5	0.0	0.0	0.0	5.4	25.9	0.0	13.4	32.3	0.0	13.1
LnGrp LOS	A	A		A	A	A	C	A	B	C	A	B
Approach Vol, veh/h		34			21			20			12	
Approach Delay, s/veh		5.5			5.4			20.9			21.1	
Approach LOS		A			A			C			C	

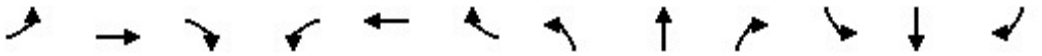
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	15.4	5.5	6.1	0.0	15.4	5.6	6.0
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	4.9	* 5.4	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	50.9	9.9	24.0	5.0	* 51	11.7	* 22
Max Q Clear Time (g_c+I1), s	0.0	2.3	2.2	2.1	0.0	2.2	2.1	2.1
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	11.2
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	0	1	0	0	0	2	39	0	1	18	0
Future Volume (veh/h)	2	0	1	0	0	0	2	39	0	1	18	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	2	0	1	0	0	0	2	41	0	1	19	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	293	0	8	0	9	0	7	745	0	7	742	629
Arrive On Green	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.40	0.00
Sat Flow, veh/h	1417	0	1585	0	1870	0	1781	1870	0	1781	1870	1585
Grp Volume(v), veh/h	2	0	1	0	0	0	2	41	0	1	19	0
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1870	0	1781	1870	0	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.0
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	293	0	8	0	9	0	7	745	0	7	742	629
V/C Ratio(X)	0.01	0.00	0.13	0.00	0.00	0.00	0.28	0.06	0.00	0.14	0.03	0.00
Avail Cap(c_a), veh/h	1805	0	1699	0	2004	0	481	4677	0	354	4543	3850
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	0.0	12.5	0.0	0.0	0.0	12.5	4.7	0.0	12.5	4.6	0.0
Incr Delay (d2), s/veh	0.0	0.0	7.1	0.0	0.0	0.0	20.4	0.0	0.0	8.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.5	0.0	19.6	0.0	0.0	0.0	32.9	4.7	0.0	21.4	4.6	0.0
LnGrp LOS	B	A	B	A	A	A	C	A	A	C	A	A
Approach Vol, veh/h		3			0			43			20	
Approach Delay, s/veh		14.9			0.0			6.0			5.5	
Approach LOS		B						A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.5	16.0		4.6	4.6	16.0		4.6				
Change Period (Y+Rc), s	4.5	6.0		4.5	4.5	6.0		4.5				
Max Green Setting (Gmax), s	5.0	63.0		27.0	6.8	61.2		27.0				
Max Q Clear Time (g_c+I1), s	2.0	2.3		2.0	2.0	2.2		0.0				
Green Ext Time (p_c), s	0.0	0.2		0.0	0.0	0.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	6.2
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	13	1	0	36	0	1	0	0	0	0	1
Future Vol, veh/h	1	13	1	0	36	0	1	0	0	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	14	1	0	38	0	1	0	0	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	38	0	0	15	0	0	56	55	15	55	55	38
Stage 1	-	-	-	-	-	-	17	17	-	38	38	-
Stage 2	-	-	-	-	-	-	39	38	-	17	17	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1572	-	-	1603	-	-	941	836	1065	943	836	1034
Stage 1	-	-	-	-	-	-	1002	881	-	977	863	-
Stage 2	-	-	-	-	-	-	976	863	-	1002	881	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1572	-	-	1603	-	-	940	835	1065	943	835	1034
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	835	-	943	835	-
Stage 1	-	-	-	-	-	-	1001	880	-	976	863	-
Stage 2	-	-	-	-	-	-	975	863	-	1001	880	-

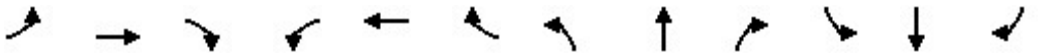
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0	8.8	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	940	1572	-	-	1603	-	-	1034
HCM Lane V/C Ratio	0.001	0.001	-	-	-	-	-	0.001
HCM Control Delay (s)	8.8	7.3	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	1473	113	129	1577	93	92	50	104	44	41	99
Future Volume (vph)	78	1473	113	129	1577	93	92	50	104	44	41	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1626	3539	1569	1770	3420		1649	1732	1575	1719	1586	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1626	3539	1569	1770	3420		1649	1732	1575	1719	1586	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	81	1534	118	134	1643	97	96	52	108	46	43	103
RTOR Reduction (vph)	0	0	40	0	2	0	0	0	99	0	67	0
Lane Group Flow (vph)	81	1534	78	134	1738	0	73	75	9	46	79	0
Confl. Peds. (#/hr)			1			1			3	3		
Heavy Vehicles (%)	11%	2%	1%	2%	4%	14%	4%	2%	1%	5%	5%	8%
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	11.5	74.5	85.4	16.6	79.6		10.9	10.9	10.9	9.3	9.3	
Effective Green, g (s)	11.5	74.5	85.4	16.6	79.6		10.9	10.9	10.9	9.3	9.3	
Actuated g/C Ratio	0.09	0.57	0.66	0.13	0.61		0.08	0.08	0.08	0.07	0.07	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	143	2028	1030	226	2094		138	145	132	122	113	
v/s Ratio Prot	0.05	0.43	0.01	c0.08	c0.51		c0.04	0.04		0.03	c0.05	
v/s Ratio Perm			0.04						0.01			
v/c Ratio	0.57	0.76	0.08	0.59	0.83		0.53	0.52	0.07	0.38	0.70	
Uniform Delay, d1	56.9	20.9	8.0	53.5	19.9		57.1	57.0	54.9	57.6	59.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	2.7	0.0	3.5	4.0		2.8	2.3	0.2	1.4	16.6	
Delay (s)	61.0	23.6	8.1	57.0	23.8		59.9	59.3	55.0	59.0	75.6	
Level of Service	E	C	A	E	C		E	E	E	E	E	
Approach Delay (s)		24.3			26.2			57.7			71.6	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

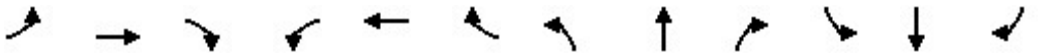
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	161	129	168	165	89	116	256	1116	266	166	1177	213
Future Volume (veh/h)	161	129	168	165	89	116	256	1116	266	166	1177	213
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1870	1856	1870	1841	1885	1885	1856	1885	1870	1870
Adj Flow Rate, veh/h	168	134	175	172	93	121	267	1162	277	173	1226	222
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	2	3	2	4	1	1	3	1	2	2
Cap, veh/h	173	288	236	169	285	236	254	1807	791	185	1656	718
Arrive On Green	0.10	0.15	0.15	0.10	0.15	0.15	0.14	0.50	0.50	0.10	0.47	0.47
Sat Flow, veh/h	1810	1885	1548	1767	1870	1548	1795	3582	1568	1795	3554	1542
Grp Volume(v), veh/h	168	134	175	172	93	121	267	1162	277	173	1226	222
Grp Sat Flow(s),veh/h/ln	1810	1885	1548	1767	1870	1548	1795	1791	1568	1795	1777	1542
Q Serve(g_s), s	12.0	8.4	14.0	12.4	5.8	9.3	18.4	30.9	13.8	12.4	36.6	11.7
Cycle Q Clear(g_c), s	12.0	8.4	14.0	12.4	5.8	9.3	18.4	30.9	13.8	12.4	36.6	11.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	173	288	236	169	285	236	254	1807	791	185	1656	718
V/C Ratio(X)	0.97	0.47	0.74	1.02	0.33	0.51	1.05	0.64	0.35	0.93	0.74	0.31
Avail Cap(c_a), veh/h	173	528	434	169	524	433	254	1807	791	185	1656	718
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.6	50.3	52.6	58.8	49.1	50.6	55.8	23.6	19.4	57.9	28.3	21.7
Incr Delay (d2), s/veh	60.4	1.0	3.9	74.8	0.6	1.5	70.4	1.8	1.2	47.7	3.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.4	4.0	5.7	9.0	2.7	3.7	13.3	13.4	5.2	8.1	16.1	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	119.1	51.3	56.5	133.6	49.7	52.1	126.2	25.4	20.6	105.6	31.3	22.8
LnGrp LOS	F	D	E	F	D	D	F	C	C	F	C	C
Approach Vol, veh/h		477			386			1706			1621	
Approach Delay, s/veh		77.1			87.8			40.4			38.1	
Approach LOS		E			F			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.0	70.6	17.0	24.4	23.0	65.6	17.0	24.4
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	14.4	32.9	14.4	16.0	20.4	38.6	14.0	11.3
Green Ext Time (p_c), s	0.0	7.9	0.0	1.1	0.0	3.7	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	48.0
HCM 6th LOS	D



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	83	0	0	0	228	868	181	0	1141	25
Future Volume (vph)	0	0	83	0	0	0	228	868	181	0	1141	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2814				3467	3505	1485		3494	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2814				3467	3505	1485		3494	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	86	0	0	0	238	904	189	0	1189	26
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	82	0	3	0
Lane Group Flow (vph)	0	0	86	0	0	0	238	904	107	0	1212	0
Confl. Peds. (#/hr)									36			39
Confl. Bikes (#/hr)												13
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	1%	3%	3%	0%	3%	0%
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			10.3				10.3	25.1	25.1		25.1	
Effective Green, g (s)			12.3				10.3	25.1	25.1		27.1	
Actuated g/C Ratio			0.28				0.23	0.57	0.57		0.61	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			779				804	1981	839		2132	
v/s Ratio Prot			0.03				c0.07	0.26			c0.35	
v/s Ratio Perm									0.07			
v/c Ratio			0.11				0.30	0.46	0.13		0.57	
Uniform Delay, d1			12.0				14.1	5.7	4.5		5.2	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.1				0.2	0.2	0.1		0.4	
Delay (s)			12.0				14.3	5.8	4.6		5.5	
Level of Service			B				B	A	A		A	
Approach Delay (s)		12.0			0.0			7.2			5.5	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	44.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

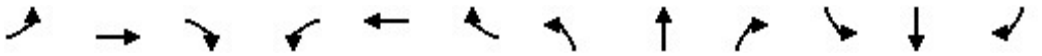
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	1073	4	0	1263
Future Vol, veh/h	0	2	1073	4	0	1263
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	25	0	2
Mvmt Flow	0	2	1118	4	0	1316

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	561	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	476	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	476	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0
HCM LOS	B		

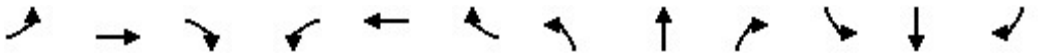
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	476	-
HCM Lane V/C Ratio	-	-	0.004	-
HCM Control Delay (s)	-	-	12.6	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-



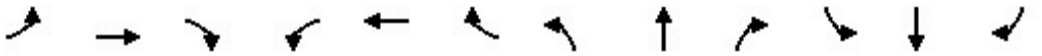
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	497	323	1	0	394	90	7	6	2	99	1	403
Future Volume (veh/h)	497	323	1	0	394	90	7	6	2	99	1	403
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1900	0	1885	1900	1900	1900	1900	1767	1900	1856
Adj Flow Rate, veh/h	518	336	1	0	410	94	7	6	2	103	1	420
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	0	0	1	0	0	0	0	9	0	3
Cap, veh/h	717	750	2	0	444	379	21	18	6	277	3	876
Arrive On Green	0.40	0.40	0.40	0.00	0.24	0.24	0.03	0.03	0.03	0.15	0.15	0.15
Sat Flow, veh/h	1781	1864	6	0	1885	1607	845	724	241	1793	17	1572
Grp Volume(v), veh/h	518	0	337	0	410	94	15	0	0	104	0	420
Grp Sat Flow(s),veh/h/ln	1781	0	1869	0	1885	1607	1811	0	0	1810	0	1572
Q Serve(g_s), s	26.9	0.0	14.5	0.0	23.4	5.2	0.9	0.0	0.0	5.7	0.0	17.0
Cycle Q Clear(g_c), s	26.9	0.0	14.5	0.0	23.4	5.2	0.9	0.0	0.0	5.7	0.0	17.0
Prop In Lane	1.00		0.00	0.00		1.00	0.47		0.13	0.99		1.00
Lane Grp Cap(c), veh/h	717	0	753	0	444	379	46	0	0	280	0	876
V/C Ratio(X)	0.72	0.00	0.45	0.00	0.92	0.25	0.33	0.00	0.00	0.37	0.00	0.48
Avail Cap(c_a), veh/h	717	0	753	0	463	394	395	0	0	280	0	876
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.7	0.0	23.9	0.0	41.1	34.1	52.7	0.0	0.0	41.7	0.0	14.5
Incr Delay (d2), s/veh	6.2	0.0	1.9	0.0	23.9	0.4	4.9	0.0	0.0	1.0	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.5	0.0	6.7	0.0	13.7	2.1	0.5	0.0	0.0	2.6	0.0	11.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.9	0.0	25.9	0.0	64.9	34.5	57.6	0.0	0.0	42.7	0.0	15.0
LnGrp LOS	C	A	C	A	E	C	E	A	A	D	A	B
Approach Vol, veh/h		855			504			15			524	
Approach Delay, s/veh		30.7			59.3			57.6			20.5	
Approach LOS		C			E			E			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		49.3		22.0		30.9		7.8				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		28.9		19.0		25.4		2.9				
Green Ext Time (p_c), s		0.0		0.0		0.6		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			35.7									
HCM 6th LOS			D									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	204	157	50	299	45	0	0	0	17	63	32
Future Volume (veh/h)	25	204	157	50	299	45	0	0	0	17	63	32
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.96				1.00		0.83
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1900	1900	1767	1737	1870	1900				1900	1900	1900
Adj Flow Rate, veh/h	26	212	164	52	311	47				18	66	33
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	0	9	11	2	0				0	0	0
Cap, veh/h	168	798	672	187	642	90				73	266	133
Arrive On Green	0.45	0.45	0.45	0.45	0.45	0.45				0.28	0.28	0.28
Sat Flow, veh/h	76	1759	1482	114	1415	198				259	950	475
Grp Volume(v), veh/h	238	0	164	410	0	0				117	0	0
Grp Sat Flow(s),veh/h/ln	1836	0	1482	1726	0	0				1685	0	0
Q Serve(g_s), s	0.0	0.0	2.0	0.0	0.0	0.0				1.6	0.0	0.0
Cycle Q Clear(g_c), s	2.4	0.0	2.0	4.8	0.0	0.0				1.6	0.0	0.0
Prop In Lane	0.11		1.00	0.13		0.11				0.15		0.28
Lane Grp Cap(c), veh/h	966	0	672	918	0	0				472	0	0
V/C Ratio(X)	0.25	0.00	0.24	0.45	0.00	0.00				0.25	0.00	0.00
Avail Cap(c_a), veh/h	3534	0	2861	3348	0	0				1345	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	5.1	0.0	5.0	5.8	0.0	0.0				8.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.4	0.7	0.0	0.0				0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.4	1.1	0.0	0.0				0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.4	0.0	5.4	6.5	0.0	0.0				8.9	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		402			410						117	
Approach Delay, s/veh		5.4			6.5						8.9	
Approach LOS		A			A						A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		17.6		12.4		17.6						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		58.0		24.0		58.0						
Max Q Clear Time (g_c+I1), s		4.4		3.6		6.8						
Green Ext Time (p_c), s		4.8		1.0		6.3						
Intersection Summary												
HCM 6th Ctrl Delay			6.3									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	235	24	47	359	6	46	10	28	26	57	35
Future Volume (veh/h)	9	235	24	47	359	6	46	10	28	26	57	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1900	1870	1885	1900	1900	1900	1796	1722	1811	1900
Adj Flow Rate, veh/h	9	245	25	49	374	6	48	10	29	27	59	36
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	2	1	0	0	0	7	12	6	0
Cap, veh/h	26	435	44	112	568	9	112	70	203	94	170	104
Arrive On Green	0.01	0.26	0.26	0.06	0.31	0.31	0.06	0.17	0.17	0.06	0.16	0.16
Sat Flow, veh/h	1810	1683	172	1781	1850	30	1810	419	1214	1640	1045	637
Grp Volume(v), veh/h	9	0	270	49	0	380	48	0	39	27	0	95
Grp Sat Flow(s),veh/h/ln	1810	0	1854	1781	0	1880	1810	0	1633	1640	0	1682
Q Serve(g_s), s	0.2	0.0	5.0	1.1	0.0	7.0	1.0	0.0	0.8	0.6	0.0	2.0
Cycle Q Clear(g_c), s	0.2	0.0	5.0	1.1	0.0	7.0	1.0	0.0	0.8	0.6	0.0	2.0
Prop In Lane	1.00		0.09	1.00		0.02	1.00		0.74	1.00		0.38
Lane Grp Cap(c), veh/h	26	0	479	112	0	577	112	0	273	94	0	273
V/C Ratio(X)	0.35	0.00	0.56	0.44	0.00	0.66	0.43	0.00	0.14	0.29	0.00	0.35
Avail Cap(c_a), veh/h	297	0	1988	382	0	2109	388	0	1013	265	0	955
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.4	0.0	12.8	17.9	0.0	11.9	17.9	0.0	14.1	17.9	0.0	14.7
Incr Delay (d2), s/veh	5.9	0.0	0.8	2.0	0.0	1.0	1.9	0.0	0.2	1.2	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	1.8	0.4	0.0	2.4	0.4	0.0	0.3	0.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	0.0	13.5	19.9	0.0	12.9	19.8	0.0	14.3	19.1	0.0	15.3
LnGrp LOS	C	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		279			429			87			122	
Approach Delay, s/veh		13.9			13.7			17.3			16.2	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.0	14.7	7.0	10.9	5.1	16.7	6.8	11.1
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	42.5	8.5	22.5	6.5	44.5	6.4	24.6
Max Q Clear Time (g_c+I1), s	3.1	7.0	3.0	4.0	2.2	9.0	2.6	2.8
Green Ext Time (p_c), s	0.0	1.4	0.0	0.3	0.0	2.0	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	14.4
HCM 6th LOS	B

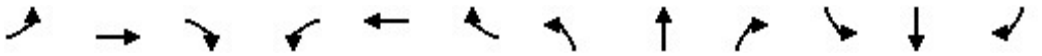
Intersection	
Int Delay, s/veh	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	91	72	2	403	477	139
Future Vol, veh/h	91	72	2	403	477	139
Conflicting Peds, #/hr	0	48	25	0	0	25
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	2	0	2	2	0
Mvmt Flow	95	75	2	420	497	145

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1019	643	667	0	-	0
Stage 1	595	-	-	-	-	-
Stage 2	424	-	-	-	-	-
Critical Hdwy	6.4	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	265	473	932	-	-	-
Stage 1	555	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	252	441	910	-	-	-
Mov Cap-2 Maneuver	252	-	-	-	-	-
Stage 1	540	-	-	-	-	-
Stage 2	648	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	910	-	252	441	-	-
HCM Lane V/C Ratio	0.002	-	0.376	0.17	-	-
HCM Control Delay (s)	9	0	27.7	14.8	-	-
HCM Lane LOS	A	A	D	B	-	-
HCM 95th %tile Q(veh)	0	-	1.7	0.6	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	541	329	27	466	16	356	157	53	187	368	46
Future Volume (veh/h)	15	541	329	27	466	16	356	157	53	187	368	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1856	1900	1841	1796	1856	1885	1900	1856	1870	1826
Adj Flow Rate, veh/h	16	564	0	28	485	17	371	164	55	195	383	48
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	3	0	4	7	3	1	0	3	2	5
Cap, veh/h	67	650		52	588	21	228	341	114	233	422	53
Arrive On Green	0.04	0.34	0.00	0.03	0.33	0.33	0.13	0.25	0.25	0.13	0.26	0.26
Sat Flow, veh/h	1810	1885	1572	1810	1768	62	1767	1351	453	1767	1629	204
Grp Volume(v), veh/h	16	564	0	28	0	502	371	0	219	195	0	431
Grp Sat Flow(s),veh/h/ln	1810	1885	1572	1810	0	1830	1767	0	1804	1767	0	1833
Q Serve(g_s), s	0.7	23.7	0.0	1.3	0.0	21.3	10.9	0.0	8.7	9.1	0.0	19.3
Cycle Q Clear(g_c), s	0.7	23.7	0.0	1.3	0.0	21.3	10.9	0.0	8.7	9.1	0.0	19.3
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.25	1.00		0.11
Lane Grp Cap(c), veh/h	67	650		52	0	609	228	0	456	233	0	475
V/C Ratio(X)	0.24	0.87		0.54	0.00	0.82	1.63	0.00	0.48	0.84	0.00	0.91
Avail Cap(c_a), veh/h	107	889		107	0	867	228	0	456	299	0	520
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	39.6	25.9	0.0	40.6	0.0	26.0	36.9	0.0	26.9	35.9	0.0	30.4
Incr Delay (d2), s/veh	1.3	7.4	0.0	6.4	0.0	6.6	302.4	0.0	0.6	14.7	0.0	18.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	11.0	0.0	0.6	0.0	9.6	23.7	0.0	3.7	4.8	0.0	10.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.9	33.3	0.0	47.0	0.0	32.6	339.3	0.0	27.5	50.6	0.0	48.8
LnGrp LOS	D	C		D	A	C	F	A	C	D	A	D
Approach Vol, veh/h		580			530			590			626	
Approach Delay, s/veh		33.5			33.3			223.5			49.3	
Approach LOS		C			C			F			D	

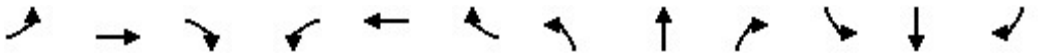
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.0	34.6	16.0	27.0	8.5	33.0	16.5	26.5
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	5.4	* 4.9	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	39.9	10.9	24.0	5.0	* 40	14.3	* 21
Max Q Clear Time (g_c+I1), s	3.3	25.7	12.9	21.3	2.7	23.3	11.1	10.7
Green Ext Time (p_c), s	0.0	3.5	0.0	0.6	0.0	4.8	0.1	0.7

Intersection Summary	
HCM 6th Ctrl Delay	85.9
HCM 6th LOS	F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	119	2	44	11	1	21	19	573	2	12	620	2
Future Volume (veh/h)	119	2	44	11	1	21	19	573	2	12	620	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1900	1900	1900	1900	1900	1648	1856	1900	1900	1841	1900
Adj Flow Rate, veh/h	124	2	46	11	1	22	20	597	2	12	646	2
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	0	0	0	0	0	17	3	0	0	4	0
Cap, veh/h	383	3	212	149	37	128	39	903	3	28	815	713
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.02	0.49	0.49	0.02	0.44	0.44
Sat Flow, veh/h	1586	26	1610	252	277	970	1570	1848	6	1810	1841	1610
Grp Volume(v), veh/h	126	0	46	34	0	0	20	0	599	12	646	2
Grp Sat Flow(s),veh/h/ln	1611	0	1610	1500	0	0	1570	0	1854	1810	1841	1610
Q Serve(g_s), s	0.0	0.0	1.1	0.0	0.0	0.0	0.5	0.0	10.1	0.3	12.4	0.0
Cycle Q Clear(g_c), s	2.7	0.0	1.1	2.7	0.0	0.0	0.5	0.0	10.1	0.3	12.4	0.0
Prop In Lane	0.98		1.00	0.32		0.65	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	386	0	212	313	0	0	39	0	906	28	815	713
V/C Ratio(X)	0.33	0.00	0.22	0.11	0.00	0.00	0.51	0.00	0.66	0.43	0.79	0.00
Avail Cap(c_a), veh/h	1128	0	1056	1117	0	0	232	0	2386	220	2320	2029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	0.0	16.0	15.8	0.0	0.0	19.8	0.0	8.0	20.1	9.9	6.4
Incr Delay (d2), s/veh	0.5	0.0	0.5	0.2	0.0	0.0	10.1	0.0	0.8	9.9	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.4	0.3	0.0	0.0	0.3	0.0	2.0	0.2	2.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	0.0	16.5	16.0	0.0	0.0	29.9	0.0	8.7	29.9	11.5	6.4
LnGrp LOS	B	A	B	B	A	A	C	A	A	C	B	A
Approach Vol, veh/h		172			34			619			660	
Approach Delay, s/veh		17.0			16.0			9.4			11.8	
Approach LOS		B			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	26.1		9.9	7.0	24.2		9.9				
Change Period (Y+Rc), s	4.5	6.0		4.5	6.0	* 6		4.5				
Max Green Setting (Gmax), s	5.0	53.0		27.0	6.1	* 52		27.0				
Max Q Clear Time (g_c+I1), s	2.3	12.1		4.7	2.5	14.4		4.7				
Green Ext Time (p_c), s	0.0	3.4		0.8	0.0	3.8		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	11.5
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	790	21	7	499	1	52	0	13	5	0	31
Future Vol, veh/h	14	790	21	7	499	1	52	0	13	5	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	3	6	17	3	0	7	0	0	0	0	4
Mvmt Flow	15	823	22	7	520	1	54	0	14	5	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	521	0	0	845	0	0	1415	1399	834	1406	1410	521
Stage 1	-	-	-	-	-	-	864	864	-	535	535	-
Stage 2	-	-	-	-	-	-	551	535	-	871	875	-
Critical Hdwy	4.1	-	-	4.27	-	-	7.17	6.5	6.2	7.1	6.5	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.353	-	-	3.563	4	3.3	3.5	4	3.336
Pot Cap-1 Maneuver	1056	-	-	731	-	-	112	142	371	118	140	551
Stage 1	-	-	-	-	-	-	342	374	-	533	527	-
Stage 2	-	-	-	-	-	-	510	527	-	349	370	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1056	-	-	731	-	-	103	139	371	112	137	551
Mov Cap-2 Maneuver	-	-	-	-	-	-	103	139	-	112	137	-
Stage 1	-	-	-	-	-	-	337	369	-	526	522	-
Stage 2	-	-	-	-	-	-	476	522	-	331	365	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	68.2	16.3
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	120	1056	-	-	731	-	-	357
HCM Lane V/C Ratio	0.564	0.014	-	-	0.01	-	-	0.105
HCM Control Delay (s)	68.2	8.5	-	-	10	-	-	16.3
HCM Lane LOS	F	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	2.7	0	-	-	0	-	-	0.3

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
1	**Viking Ave NW & SR 305 (Signalized)[1]**							
	EB (SR 305)	L	0.19	68	E	0.57	61	E
	EB (SR 305)	T	0.03	2.4	A	0.76	23.6	C
	EB (SR 305)	R	0	1.9	A	0.08	8.1	A
	EB Overall (SR 305)			**4.6**	**A**		**24.3**	**C**
	WB (SR 305)	L	0.19	68	E	0.59	57	E
	WB (SR 305)	TR	0.02	2.4	A	0.83	23.8	C
	WB Overall (SR 305)			**5.2**	**A**		**26.2**	**C**
	NB (Viking Ave NW)	L	0.03	63	E	0.53	59.9	E
	NB (Viking Ave NW)	TL	0.06	63.3	E	0.52	59.3	E
	NB (Viking Ave NW)	R	0	62.7	E	0.07	55	E
	NB Overall (Viking Ave NW)			**62.8**	**E**		**57.7**	**E**
	SB (Viking Ave NW)	L	0.12	63.8	E	0.38	59	E
	SB (Viking Ave NW)	TR	0.04	62.9	E	0.7	75.6	E
	SB Overall (Viking Ave NW)			**63.3**	**E**		**71.6**	**E**
	Overall			**11**	**B**		**29.5**	**C**
2	**SR 303 & NE McWilliams Rd (Signalized)**							
	EB (NE McWilliams Rd)	L	0.37	77.9	E	0.97	119.1	F
	EB (NE McWilliams Rd)	T	0.04	62	E	0.47	51.3	D
	EB (NE McWilliams Rd)	R	0.12	63	E	0.74	56.5	E
	EB Overall (NE McWilliams Rd)			**69.7**	**E**		**77.1**	**E**
	WB (NE McWilliams Rd)	L	0.38	76.4	E	1.02	133.6	F
	WB (NE McWilliams Rd)	T	0.06	62	E	0.33	49.7	D
	WB (NE McWilliams Rd)	R	0.16	63.2	E	0.51	52.1	D
	WB Overall (NE McWilliams Rd)			**68.4**	**E**		**87.8**	**F**
	NB (SR 303)	L	0.37	77.9	E	1.05	126.2	F
	NB (SR 303)	T	0.01	2.3	A	0.64	25.4	C
	NB (SR 303)	R	0	2.2	A	0.35	20.6	C
	NB Overall (SR 303)			**11.9**	**B**		**40.4**	**D**
	SB (SR 303)	L	0.36	88	F	0.93	105.6	F
	SB (SR 303)	T	0.01	2.4	A	0.74	31.3	C
	SB (SR 303)	R	0	2.4	A	0.31	22.8	C
	SB Overall (SR 303)			**7.5**	**A**		**38.1**	**D**
	Overall			**23.7**	**C**		**48**	**D**
3	**Alaskan Way & Yesler Way (Signalized)[1]**							
	EB (Yesler Way)	R	0.03	14.8	B	0.11	12	B
	EB Overall (Yesler Way)			**14.8**	**B**		**12**	**B**
	NB (Alaskan Way)	L	0.03	16.7	B	0.3	14.3	B
	NB (Alaskan Way)	T	0.02	1.6	A	0.46	5.8	A
	NB (Alaskan Way)	R	0.01	1.5	A	0.13	4.6	A
	NB Overall (Alaskan Way)			**2.4**	**A**		**7.2**	**A**
	SB (Alaskan Way)	T/TR	0.01	1	A	0.57	5.5	A
	SB Overall (Alaskan Way)			**1**	**A**		**5.5**	**A**
	Overall			**3**	**A**		**6.6**	**A**
4	**Charleston Blvd & S Callow Ave (TWSC)[2]**							
	WB (Charleston Blvd)	R	-	0	A	0.004	12.6	B
	WB Overall (Charleston Blvd)			**0**	**A**		**12.6**	**B**
	NB (S Callow Ave)	TR						
	NB (S Callow Ave)	R						
	NB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	SB (S Callow Ave)	T						
	SB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	Overall			**0**	**A**		**12.6**	**B**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
5	**Burwell St & Warren Ave (Signalized)**							
	EB (Burwell St)	TL/T	0.01	1.8	A	0	0	A
	EB Overall (Burwell St)			**1.9**	**A**		**30.7**	**C**
	WB (Burwell St)	T	0.34	61.8	E	0.92	64.9	E
	WB (Burwell St)	R	0.04	54.1	D	0.25	34.5	C
	WB Overall (Burwell St)			**61.1**	**E**		**59.3**	**E**
	NB (Warren Ave)	LTR	0	0	A	0	0	A
	NB Overall (Warren Ave)			**0**	**0**		**57.6**	**E**
	SB (Warren Ave)	TL	0	0	A	0	0	A
	SB (Warren Ave)	R	0.02	1.3	A	0.48	15	B
	SB Overall (Warren Ave)			**9.5**	**A**		**20.5**	**C**
	Overall			**12.3**	**B**		**35.7**	**D**
6	**Burwell St & Pacific Ave (Signalized)**							
	EB (Pacific Ave)	TL	0.01	2.4	A	0	0	A
	EB (Pacific Ave)	R	0.02	2.4	A	0.24	5.4	A
	EB Overall (Pacific Ave)			**2.4**	**A**		**5.4**	**A**
	WB (Pacific Ave	LTR	0	0	A	0	0	A
	WB Overall (Pacific Ave)			**2.4**	**A**		**6.5**	**A**
	SB (SR 303)	LTR	0	0	A	0	0	A
	SB Overall (SR 303)			**25.9**	**C**		**8.9**	**A**
	Overall			**6.6**	**A**		**6.3**	**A**
7	**SR 166 & Sidney Ave (Signalized)**							
	EB (SR 166)	L	0	0	A	0.35	25.2	C
	EB (SR 166)	TR	0.02	5.9	A	0	0	A
	EB Overall (SR 166)			**5.9**	**A**		**13.9**	**B**
	WB (SR 166)	L	0.32	34.1	C	0.44	19.9	B
	WB (SR 166)	TR	0.02	3.4	A	0	0	A
	WB Overall (SR 166)			**5.9**	**A**		**13.7**	**B**
	NB (Sidney Ave)	L	0.16	22.5	C	0.43	19.8	B
	NB (Sidney Ave)	TR	0	0	A	0	0	A
	NB Overall (Sidney Ave)			**20.9**	**C**		**17.3**	**B**
	SB (Sidney Ave)	L	0.16	22.5	C	0.29	19.1	B
	SB (Sidney Ave)	TR	0.11	17.8	B	0	0	A
	SB Overall (Sidney Ave)			**20.1**	**C**		**16.2**	**B**
	Overall			**7.5**	**A**		**14.4**	**B**
8	**SW Barton St & Fauntleroy Way (TWSC)[2]**							
	EB (SW Barton St)	L	0.006	8.7	A	0.376	27.7	D
	EB (SW Barton St)	R	0.005	8.4	A	0.17	14.8	B
	EB Overall (SW Barton St)			**8.6**	**A**		**22**	**C**
	NB (Fauntleroy Way)	T	-	0	A	-	0	A
	NB Overall (Fauntleroy Way)			**0.3**	**0**		**0**	**0**
	SB (Fauntleroy Way)	TR	-	-	-	-	-	-
	SB Overall (Fauntleroy Way)			**0**	**0**		**0**	**0**
	Overall			**8.7**	**A**		**27.7**	**D**
9	**Sam Christopherson Ave & SR 3 W (Signalized)**							
	EB (SR 3 W)	L	0	0	A	0.24	40.9	D
	EB (SR 3 W)	T	0.05	5.5	A	0.87	33.3	C
	EB Overall (SR 3 W)			**5.5**	**A**		**33.5**	**C**
	WB (SR 3 W)	L	0	0	A	0.54	47	D
	WB (SR 3 W)	T	0	0	A	0	0	A
	WB Overall (SR 3 W)			**5.4**	**A**		**33.3**	**C**
	NB (SR 16)	L	0.42	25.9	C	1.63	339.3	F
	NB (SR 16)	T	0	0	A	0	0	A
	NB (SR 16)	R	0.14	13.4	B	0.48	27.5	C
	NB Overall (SR 16)			**20.9**	**C**		**223.5**	**F**
	SB (Sam Christopherson Ave)	L	0.41	32.3	C	0.84	50.6	D
	SB (Sam Christopherson Ave)	T	0	0	A	0	0	A
	SB Overall (SR 16)			**21.1**	**C**		**49.3**	**D**
	Overall			**11.2**	**B**		**85.9**	**F**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
10	**Imperial Way & SR 3 W (Signalized)**							
	EB (Imperial Way)	TL	0	0	A	0	0	A
	EB (Imperial Way)	R	0.13	19.6	B	0.22	16.5	B
	EB Overall (Imperial Way)			**14.9**	**B**		**17**	**B**
	WB (Imperial Way)	LTR	0	0	A	0	0	A
	WB Overall (Imperial Way)			**0**	**0**		**16**	**B**
	NB (SR 3 W)	L	0.28	32.9	C	0.51	29.9	C
	NB (SR 3 W)	TR	0.06	4.7	A	0	0	A
	NB Overall (SR 3 W)			**6**	**A**		**9.4**	**A**
	SB (SR 3 W)	L	0.14	21.4	C	0.43	29.9	C
	SB (SR 3 W)	T	0.03	4.6	A	0.79	11.5	B
	SB (SR 3 W)	R	0	0	A	0	6.4	A
	SB Overall (SR 3 W)			**5.5**	**A**		**11.8**	**B**
	Overall			**6.2**	**A**		**11.5**	**B**
11	**SE Spring Creek Rd & SE Mullenix Rd (TWSC)[2]**							
	EB (SE Spring Creek Rd)	L	0.001	7.3	A	0.014	8.5	A
	EB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	EB Overall (SE Spring Creek Rd)			**0.5**	**0**		**0.1**	**0**
	WB (SE Spring Creek Rd)	L	-	0	A	0.01	10	A
	WB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	WB Overall (SE Spring Creek Rd)			**0**	**0**		**0.1**	**0**
	NB (SE Mullenix Rd)	LTR	0.001	8.8	A	0.564	68.2	F
	NB Overall (SE Mullenix Rd)			**8.8**	**A**		**68.2**	**F**
	SB (SE Mullenix Rd)	LTR	0.001	8.5	A	0.105	16.3	C
	SB Overall (SE Mullenix Rd)			**8.5**	**A**		**16.3**	**C**
	Overall			**8.8**	**A**		**68.2**	**F**

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left/thru/right lanes

LOS = Level of Service

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

V/C = Volume to capacity ratio

Delay is Measured in Seconds Per Vehicle (sec/veh)

Red cells denote approaches and lane groups operating at unacceptable conditions.

1 - HCM 2000 Analysis

2 - The worst movement delay is reported for LOS.

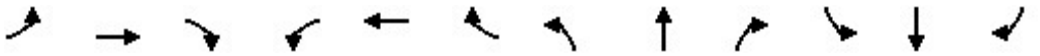
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	1306	50	51	1034	40	30	25	96	62	24	78
Future Volume (vph)	46	1306	50	51	1034	40	30	25	96	62	24	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1570	3406	1482	1719	3407		1573	1582	1553	1492	1560	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1570	3406	1482	1719	3407		1573	1582	1553	1492	1560	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	48	1360	52	53	1077	42	31	26	100	65	25	81
RTOR Reduction (vph)	0	0	14	0	1	0	0	0	94	0	75	0
Lane Group Flow (vph)	48	1360	38	53	1118	0	28	29	6	65	31	0
Heavy Vehicles (%)	15%	6%	9%	5%	5%	15%	9%	14%	4%	21%	4%	9%
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	7.9	86.2	94.0	7.8	86.1		7.8	7.8	7.8	9.5	9.5	
Effective Green, g (s)	7.9	86.2	94.0	7.8	86.1		7.8	7.8	7.8	9.5	9.5	
Actuated g/C Ratio	0.06	0.66	0.72	0.06	0.66		0.06	0.06	0.06	0.07	0.07	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	95	2258	1071	103	2256		94	94	93	109	114	
v/s Ratio Prot	0.03	c0.40	0.00	c0.03	0.33		0.02	c0.02		c0.04	0.02	
v/s Ratio Perm			0.02						0.00			
v/c Ratio	0.51	0.60	0.04	0.51	0.50		0.30	0.31	0.06	0.60	0.27	
Uniform Delay, d1	59.2	12.3	5.1	59.3	11.0		58.5	58.5	57.7	58.4	57.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.1	1.2	0.0	3.2	0.8		1.3	1.4	0.2	7.1	0.9	
Delay (s)	62.2	13.5	5.1	62.5	11.8		59.8	59.9	57.9	65.5	57.9	
Level of Service	E	B	A	E	B		E	E	E	E	E	
Approach Delay (s)		14.8			14.1			58.6			60.8	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	31	89	116	53	113	103	577	57	43	660	72
Future Volume (veh/h)	106	31	89	116	53	113	103	577	57	43	660	72
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1856	1811	1841	1856	1841	1841	1856	1796	1781	1856	1900
Adj Flow Rate, veh/h	110	32	93	121	55	118	107	601	59	45	688	75
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	3	6	4	3	4	4	3	7	8	3	0
Cap, veh/h	133	201	166	145	212	176	132	2211	954	63	2077	946
Arrive On Green	0.08	0.11	0.11	0.08	0.11	0.11	0.08	0.63	0.63	0.04	0.59	0.59
Sat Flow, veh/h	1739	1856	1531	1753	1856	1535	1753	3526	1521	1697	3526	1606
Grp Volume(v), veh/h	110	32	93	121	55	118	107	601	59	45	688	75
Grp Sat Flow(s),veh/h/ln	1739	1856	1531	1753	1856	1535	1753	1763	1521	1697	1763	1606
Q Serve(g_s), s	8.1	2.0	7.5	8.8	3.5	9.6	7.8	10.0	2.0	3.4	12.9	2.6
Cycle Q Clear(g_c), s	8.1	2.0	7.5	8.8	3.5	9.6	7.8	10.0	2.0	3.4	12.9	2.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	133	201	166	145	212	176	132	2211	954	63	2077	946
V/C Ratio(X)	0.83	0.16	0.56	0.84	0.26	0.67	0.81	0.27	0.06	0.72	0.33	0.08
Avail Cap(c_a), veh/h	166	520	429	167	520	430	248	2211	954	175	2077	946
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.2	52.6	55.0	58.8	52.5	55.2	59.2	10.9	9.4	61.9	13.6	11.5
Incr Delay (d2), s/veh	23.2	0.3	2.5	26.3	0.5	3.8	11.4	0.3	0.1	14.0	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	1.0	3.0	5.0	1.7	3.9	3.9	3.9	0.7	1.7	5.2	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.4	52.9	57.5	85.1	53.1	59.0	70.6	11.2	9.5	75.9	14.1	11.7
LnGrp LOS	F	D	E	F	D	E	E	B	A	E	B	B
Approach Vol, veh/h		235			294			767			808	
Approach Delay, s/veh		68.5			68.6			19.4			17.3	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.4	86.5	15.3	18.7	14.4	81.6	14.6	19.5
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	5.4	12.0	10.8	9.5	9.8	14.9	10.1	11.6
Green Ext Time (p_c), s	0.0	4.3	0.0	0.4	0.1	4.9	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	30.9
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	139	0	0	0	71	787	266	0	376	6
Future Volume (vph)	0	0	139	0	0	0	71	787	266	0	376	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2733				3367	3406	1510		3296	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2733				3367	3406	1510		3296	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	145	0	0	0	74	820	277	0	392	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	123	0	2	0
Lane Group Flow (vph)	0	0	145	0	0	0	74	820	154	0	396	0
Confl. Peds. (#/hr)			1						27			58
Confl. Bikes (#/hr)			2						8			2
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	4%	6%	2%	0%	9%	25%
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			7.8				7.8	21.0	21.0		21.0	
Effective Green, g (s)			9.8				7.8	21.0	21.0		23.0	
Actuated g/C Ratio			0.26				0.21	0.56	0.56		0.61	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			708				694	1892	838		2005	
v/s Ratio Prot			c0.05				0.02	c0.24			0.12	
v/s Ratio Perm									0.10			
v/c Ratio			0.20				0.11	0.43	0.18		0.20	
Uniform Delay, d1			11.0				12.2	4.9	4.2		3.3	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.1				0.1	0.2	0.1		0.0	
Delay (s)			11.1				12.2	5.1	4.3		3.3	
Level of Service			B				B	A	A		A	
Approach Delay (s)		11.1			0.0			5.3			3.3	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	37.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

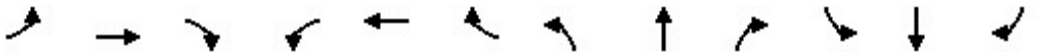
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	888	7	0	764
Future Vol, veh/h	0	2	888	7	0	764
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	100	2	71	0	4
Mvmt Flow	0	2	925	7	0	796

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	466	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	8.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.3	-	-	-	-
Pot Cap-1 Maneuver	0	345	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	345	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.5	0	0
HCM LOS	C		

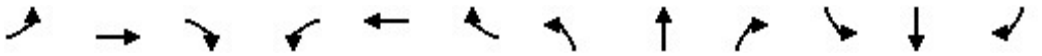
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	345	-
HCM Lane V/C Ratio	-	-	0.006	-
HCM Control Delay (s)	-	-	15.5	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	0	-



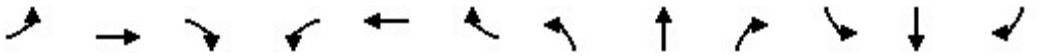
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	464	235	0	0	154	17	0	1	2	78	2	321
Future Volume (veh/h)	464	235	0	0	154	17	0	1	2	78	2	321
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.96	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1870	0	0	1781	1826	1900	1900	1900	1752	1900	1841
Adj Flow Rate, veh/h	483	245	0	0	160	18	0	1	2	81	2	334
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	2	0	0	8	5	0	0	0	10	0	4
Cap, veh/h	1002	1000	0	0	208	178	0	13	26	203	5	1057
Arrive On Green	0.56	0.56	0.00	0.00	0.12	0.12	0.00	0.02	0.02	0.12	0.12	0.12
Sat Flow, veh/h	1781	1870	0	0	1781	1527	0	550	1100	1768	44	1560
Grp Volume(v), veh/h	483	245	0	0	160	18	0	0	3	83	0	334
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1781	1527	0	0	1650	1812	0	1560
Q Serve(g_s), s	17.9	7.7	0.0	0.0	9.6	1.2	0.0	0.0	0.2	4.7	0.0	9.7
Cycle Q Clear(g_c), s	17.9	7.7	0.0	0.0	9.6	1.2	0.0	0.0	0.2	4.7	0.0	9.7
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.67	0.98		1.00
Lane Grp Cap(c), veh/h	1002	1000	0	0	208	178	0	0	40	208	0	1057
V/C Ratio(X)	0.48	0.25	0.00	0.00	0.77	0.10	0.00	0.00	0.08	0.40	0.00	0.32
Avail Cap(c_a), veh/h	1002	1000	0	0	437	375	0	0	360	280	0	1119
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.4	12.2	0.0	0.0	47.2	43.4	0.0	0.0	52.5	45.1	0.0	7.3
Incr Delay (d2), s/veh	1.7	0.6	0.0	0.0	7.1	0.3	0.0	0.0	1.0	1.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	3.1	0.0	0.0	4.6	0.5	0.0	0.0	0.1	2.2	0.0	9.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.1	12.8	0.0	0.0	54.3	43.7	0.0	0.0	53.5	46.6	0.0	7.5
LnGrp LOS	B	B	A	A	D	D	A	A	D	D	A	A
Approach Vol, veh/h		728			178			3			417	
Approach Delay, s/veh		15.0			53.2			53.5			15.3	
Approach LOS		B			D			D			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		66.9		17.7		17.8		7.6				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		19.9		11.7		11.6		2.2				
Green Ext Time (p_c), s		1.1		1.0		0.9		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			20.3									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	99	227	49	118	6	0	0	0	23	92	12
Future Volume (veh/h)	6	99	227	49	118	6	0	0	0	23	92	12
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.96				1.00		0.78
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1707	1870	1693	1559	1870	1900				1900	1796	1900
Adj Flow Rate, veh/h	6	103	236	51	123	6				24	96	12
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	13	2	14	23	2	0				0	7	0
Cap, veh/h	141	640	491	248	470	19				116	463	58
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35				0.37	0.37	0.37
Sat Flow, veh/h	29	1826	1401	255	1343	55				310	1238	155
Grp Volume(v), veh/h	109	0	236	180	0	0				132	0	0
Grp Sat Flow(s),veh/h/ln	1856	0	1401	1652	0	0				1702	0	0
Q Serve(g_s), s	0.0	0.0	3.8	0.0	0.0	0.0				1.5	0.0	0.0
Cycle Q Clear(g_c), s	1.2	0.0	3.8	2.0	0.0	0.0				1.5	0.0	0.0
Prop In Lane	0.06		1.00	0.28		0.03				0.18		0.09
Lane Grp Cap(c), veh/h	781	0	491	738	0	0				637	0	0
V/C Ratio(X)	0.14	0.00	0.48	0.24	0.00	0.00				0.21	0.00	0.00
Avail Cap(c_a), veh/h	3338	0	2459	2864	0	0				1817	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	6.5	0.0	7.4	6.8	0.0	0.0				6.2	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.6	0.4	0.0	0.0				0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.9	0.5	0.0	0.0				0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.7	0.0	8.9	7.2	0.0	0.0				6.5	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		345			180						132	
Approach Delay, s/veh		8.2			7.2						6.5	
Approach LOS		A			A						A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		14.2		14.9		14.2						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		51.0		31.0		51.0						
Max Q Clear Time (g_c+I1), s		5.8		3.5		4.0						
Green Ext Time (p_c), s		3.5		1.4		2.4						
Intersection Summary												
HCM 6th Ctrl Delay			7.6									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	171	7	27	323	4	19	5	13	9	10	7
Future Volume (veh/h)	2	171	7	27	323	4	19	5	13	9	10	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1826	1737	1811	1870	1900	1900	1900	1707	1218	1530	1900
Adj Flow Rate, veh/h	2	178	7	28	336	4	20	5	14	9	10	7
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	5	11	6	2	0	0	0	13	46	25	0
Cap, veh/h	6	526	21	71	626	7	55	45	126	17	73	51
Arrive On Green	0.00	0.30	0.30	0.04	0.34	0.34	0.03	0.10	0.10	0.01	0.09	0.09
Sat Flow, veh/h	1810	1745	69	1725	1844	22	1810	433	1212	1160	837	586
Grp Volume(v), veh/h	2	0	185	28	0	340	20	0	19	9	0	17
Grp Sat Flow(s),veh/h/ln	1810	0	1813	1725	0	1866	1810	0	1645	1160	0	1422
Q Serve(g_s), s	0.0	0.0	2.6	0.5	0.0	4.9	0.4	0.0	0.3	0.3	0.0	0.4
Cycle Q Clear(g_c), s	0.0	0.0	2.6	0.5	0.0	4.9	0.4	0.0	0.3	0.3	0.0	0.4
Prop In Lane	1.00		0.04	1.00		0.01	1.00		0.74	1.00		0.41
Lane Grp Cap(c), veh/h	6	0	546	71	0	633	55	0	170	17	0	125
V/C Ratio(X)	0.33	0.00	0.34	0.39	0.00	0.54	0.36	0.00	0.11	0.54	0.00	0.14
Avail Cap(c_a), veh/h	353	0	2963	439	0	3161	407	0	1110	226	0	917
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.6	0.0	9.1	15.6	0.0	8.9	15.9	0.0	13.6	16.3	0.0	14.1
Incr Delay (d2), s/veh	22.6	0.0	0.3	2.6	0.0	0.5	3.0	0.0	0.2	18.5	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.8	0.2	0.0	1.4	0.2	0.0	0.1	0.1	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.2	0.0	9.3	18.2	0.0	9.4	18.8	0.0	13.8	34.9	0.0	14.4
LnGrp LOS	D	A	A	B	A	A	B	A	B	C	A	B
Approach Vol, veh/h		187			368			39			26	
Approach Delay, s/veh		9.7			10.1			16.4			21.5	
Approach LOS		A			B			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.9	14.6	5.5	7.4	4.6	15.8	5.0	8.0
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	54.5	7.5	21.5	6.5	56.5	6.5	22.5
Max Q Clear Time (g_c+I1), s	2.5	4.6	2.4	2.4	2.0	6.9	2.3	2.3
Green Ext Time (p_c), s	0.0	0.9	0.0	0.0	0.0	1.8	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

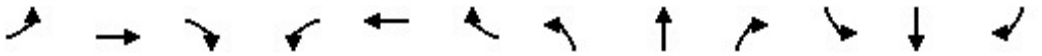
Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	100	68	24	333	250	38
Future Vol, veh/h	100	68	24	333	250	38
Conflicting Peds, #/hr	0	23	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	6	5	8	3	4	0
Mvmt Flow	104	71	25	347	260	40

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	689	315	312	0	-	0
Stage 1	292	-	-	-	-	-
Stage 2	397	-	-	-	-	-
Critical Hdwy	6.46	6.25	4.18	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	2.272	-	-	-
Pot Cap-1 Maneuver	406	718	1215	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	671	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	387	694	1201	-	-	-
Mov Cap-2 Maneuver	387	-	-	-	-	-
Stage 1	721	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.9	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1201	-	387	694	-	-
HCM Lane V/C Ratio	0.021	-	0.269	0.102	-	-
HCM Control Delay (s)	8.1	0	17.7	10.8	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	1.1	0.3	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	533	207	6	307	9	192	70	71	91	104	10
Future Volume (veh/h)	6	533	207	6	307	9	192	70	71	91	104	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	625	1826	1767	1900	1737	1604	1707	1737	1796	1752	1781	1366
Adj Flow Rate, veh/h	6	555	0	6	320	9	200	73	74	95	108	10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	86	5	9	0	11	20	13	11	7	10	8	36
Cap, veh/h	5	701		14	637	18	243	141	143	120	171	16
Arrive On Green	0.01	0.38	0.00	0.01	0.38	0.38	0.15	0.18	0.18	0.07	0.11	0.11
Sat Flow, veh/h	596	1826	1497	1810	1681	47	1626	791	802	1668	1606	149
Grp Volume(v), veh/h	6	555	0	6	0	329	200	0	147	95	0	118
Grp Sat Flow(s),veh/h/ln	596	1826	1497	1810	0	1728	1626	0	1593	1668	0	1755
Q Serve(g_s), s	0.5	15.4	0.0	0.2	0.0	8.4	6.8	0.0	4.8	3.2	0.0	3.7
Cycle Q Clear(g_c), s	0.5	15.4	0.0	0.2	0.0	8.4	6.8	0.0	4.8	3.2	0.0	3.7
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.50	1.00		0.08
Lane Grp Cap(c), veh/h	5	701		14	0	655	243	0	284	120	0	187
V/C Ratio(X)	1.27	0.79		0.42	0.00	0.50	0.82	0.00	0.52	0.79	0.00	0.63
Avail Cap(c_a), veh/h	52	1622		158	0	1541	281	0	614	341	0	735
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.4	15.6	0.0	28.3	0.0	13.7	23.6	0.0	21.3	26.2	0.0	24.5
Incr Delay (d2), s/veh	256.0	2.5	0.0	13.7	0.0	1.2	16.9	0.0	1.1	10.0	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	5.6	0.0	0.1	0.0	2.9	3.6	0.0	1.7	1.5	0.0	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	284.5	18.1	0.0	41.9	0.0	14.8	40.5	0.0	22.4	36.1	0.0	27.2
LnGrp LOS	F	B		D	A	B	D	A	C	D	A	C
Approach Vol, veh/h		561			335			347			213	
Approach Delay, s/veh		21.0			15.3			32.8			31.2	
Approach LOS		C			B			C			C	

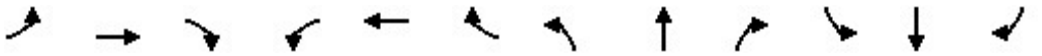
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.1	27.4	13.7	11.2	5.4	27.1	9.5	15.3
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	4.9	* 5.4	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	50.9	9.9	24.0	5.0	* 51	11.7	* 22
Max Q Clear Time (g_c+I1), s	2.2	17.4	8.8	5.7	2.5	10.4	5.2	6.8
Green Ext Time (p_c), s	0.0	4.6	0.1	0.4	0.0	3.9	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	24.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	1	13	2	0	3	35	619	4	15	294	8
Future Volume (veh/h)	41	1	13	2	0	3	35	619	4	15	294	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1203	1900	1604	1900	1900	1900	1870	1856	1900	1900	1781	1900
Adj Flow Rate, veh/h	43	1	14	2	0	3	36	645	4	16	306	8
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	47	0	20	0	0	0	2	3	0	0	8	0
Cap, veh/h	328	3	107	182	10	67	75	851	5	37	784	709
Arrive On Green	0.08	0.08	0.08	0.08	0.00	0.08	0.04	0.46	0.46	0.02	0.44	0.44
Sat Flow, veh/h	1516	35	1359	434	131	848	1781	1842	11	1810	1781	1610
Grp Volume(v), veh/h	44	0	14	5	0	0	36	0	649	16	306	8
Grp Sat Flow(s),veh/h/ln	1551	0	1359	1413	0	0	1781	0	1853	1810	1781	1610
Q Serve(g_s), s	0.0	0.0	0.3	0.0	0.0	0.0	0.7	0.0	9.9	0.3	4.0	0.1
Cycle Q Clear(g_c), s	0.8	0.0	0.3	0.8	0.0	0.0	0.7	0.0	9.9	0.3	4.0	0.1
Prop In Lane	0.98		1.00	0.40		0.60	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	331	0	107	259	0	0	75	0	856	37	784	709
V/C Ratio(X)	0.13	0.00	0.13	0.02	0.00	0.00	0.48	0.00	0.76	0.43	0.39	0.01
Avail Cap(c_a), veh/h	1356	0	1072	1344	0	0	354	0	3412	264	3186	2879
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.9	0.0	14.7	14.6	0.0	0.0	16.0	0.0	7.6	16.6	6.5	5.4
Incr Delay (d2), s/veh	0.2	0.0	0.5	0.0	0.0	0.0	4.6	0.0	1.3	7.6	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.1	0.0	0.0	0.0	0.3	0.0	1.6	0.2	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.1	0.0	15.2	14.6	0.0	0.0	20.6	0.0	8.9	24.2	6.8	5.4
LnGrp LOS	B	A	B	B	A	A	C	A	A	C	A	A
Approach Vol, veh/h		58			5			685			330	
Approach Delay, s/veh		15.1			14.6			9.5			7.6	
Approach LOS		B			B			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.2	21.8		7.2	5.9	21.1		7.2				
Change Period (Y+Rc), s	4.5	6.0		4.5	4.5	6.0		4.5				
Max Green Setting (Gmax), s	5.0	63.0		27.0	6.8	61.2		27.0				
Max Q Clear Time (g_c+I1), s	2.3	11.9		2.8	2.7	6.0		2.8				
Green Ext Time (p_c), s	0.0	3.9		0.2	0.0	1.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		9.2	
HCM 6th LOS		A	

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	199	14	7	573	2	14	0	2	1	0	13
Future Vol, veh/h	13	199	14	7	573	2	14	0	2	1	0	13
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	7	5	20	13	1	0	13	0	0	100	0	0
Mvmt Flow	14	207	15	7	597	2	15	0	2	1	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	599	0	0	223	0	0	863	857	216	856	863	598
Stage 1	-	-	-	-	-	-	244	244	-	612	612	-
Stage 2	-	-	-	-	-	-	619	613	-	244	251	-
Critical Hdwy	4.17	-	-	4.23	-	-	7.23	6.5	6.2	8.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.23	5.5	-	7.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.23	5.5	-	7.1	5.5	-
Follow-up Hdwy	2.263	-	-	2.317	-	-	3.617	4	3.3	4.4	4	3.3
Pot Cap-1 Maneuver	954	-	-	1283	-	-	263	297	829	192	295	506
Stage 1	-	-	-	-	-	-	736	708	-	348	487	-
Stage 2	-	-	-	-	-	-	458	486	-	585	703	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	954	-	-	1282	-	-	252	291	828	189	289	506
Mov Cap-2 Maneuver	-	-	-	-	-	-	252	291	-	189	289	-
Stage 1	-	-	-	-	-	-	724	697	-	343	485	-
Stage 2	-	-	-	-	-	-	443	484	-	575	692	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.1	18.9	13.2
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	276	954	-	-	1282	-	-	452
HCM Lane V/C Ratio	0.06	0.014	-	-	0.006	-	-	0.032
HCM Control Delay (s)	18.9	8.8	-	-	7.8	-	-	13.2
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	957	73	84	1025	61	60	33	68	29	27	64
Future Volume (vph)	50	957	73	84	1025	61	60	33	68	29	27	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1552	1770	3505		1681	1743	1559	1770	1666	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1552	1770	3505		1681	1743	1559	1770	1666	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	52	997	76	88	1068	64	62	34	71	30	28	67
RTOR Reduction (vph)	0	0	22	0	2	0	0	0	66	0	63	0
Lane Group Flow (vph)	52	997	54	88	1130	0	48	49	5	30	32	0
Confl. Peds. (#/hr)			1			1			3	3		
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	7.7	82.9	91.7	11.4	86.6		8.8	8.8	8.8	8.2	8.2	
Effective Green, g (s)	7.7	82.9	91.7	11.4	86.6		8.8	8.8	8.8	8.2	8.2	
Actuated g/C Ratio	0.06	0.64	0.71	0.09	0.67		0.07	0.07	0.07	0.06	0.06	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	104	2256	1094	155	2334		113	117	105	111	105	
v/s Ratio Prot	0.03	0.28	0.00	c0.05	c0.32		c0.03	0.03		0.02	c0.02	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	0.50	0.44	0.05	0.57	0.48		0.42	0.42	0.05	0.27	0.31	
Uniform Delay, d1	59.3	11.9	5.8	56.9	10.7		58.2	58.1	56.7	58.0	58.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.7	0.6	0.0	3.8	0.7		1.9	1.8	0.1	1.0	1.2	
Delay (s)	62.0	12.5	5.9	60.8	11.4		60.0	59.9	56.8	59.0	59.4	
Level of Service	E	B	A	E	B		E	E	E	E	E	
Approach Delay (s)		14.3			15.0			58.6			59.3	
Approach LOS		B			B			E			E	

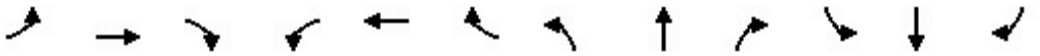
Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	84	109	107	58	76	167	726	173	108	765	139
Future Volume (veh/h)	105	84	109	107	58	76	167	726	173	108	765	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.99	1.00		1.00	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	109	88	114	111	60	79	174	756	180	112	797	145
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	133	221	182	135	223	187	200	2078	925	136	1951	847
Arrive On Green	0.07	0.12	0.12	0.08	0.12	0.12	0.11	0.58	0.58	0.08	0.55	0.55
Sat Flow, veh/h	1781	1870	1543	1781	1870	1569	1781	3554	1581	1781	3554	1544
Grp Volume(v), veh/h	109	88	114	111	60	79	174	756	180	112	797	145
Grp Sat Flow(s),veh/h/ln	1781	1870	1543	1781	1870	1569	1781	1777	1581	1781	1777	1544
Q Serve(g_s), s	7.8	5.7	9.1	8.0	3.8	6.1	12.5	14.6	6.9	8.1	17.0	6.1
Cycle Q Clear(g_c), s	7.8	5.7	9.1	8.0	3.8	6.1	12.5	14.6	6.9	8.1	17.0	6.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	133	221	182	135	223	187	200	2078	925	136	1951	847
V/C Ratio(X)	0.82	0.40	0.62	0.82	0.27	0.42	0.87	0.36	0.19	0.82	0.41	0.17
Avail Cap(c_a), veh/h	170	524	432	170	524	439	252	2078	925	184	1951	847
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.3	53.0	54.6	59.2	52.1	53.1	56.7	14.2	12.6	59.2	17.1	14.6
Incr Delay (d2), s/veh	21.4	1.0	3.0	22.0	0.5	1.3	22.2	0.5	0.5	19.1	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	2.7	3.7	4.4	1.8	2.5	6.9	5.9	2.5	4.4	7.1	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.7	54.0	57.5	81.3	52.6	54.4	78.9	14.7	13.1	78.2	17.7	15.0
LnGrp LOS	F	D	E	F	D	D	E	B	B	E	B	B
Approach Vol, veh/h		311			250			1110			1054	
Approach Delay, s/veh		64.7			65.9			24.5			23.8	
Approach LOS		E			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.5	81.0	14.5	20.0	19.2	76.4	14.3	20.1
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	10.1	16.6	10.0	11.1	14.5	19.0	9.8	8.1
Green Ext Time (p_c), s	0.1	6.0	0.1	0.7	0.2	5.9	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	32.6
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	54	0	0	0	148	564	118	0	741	17
Future Volume (vph)	0	0	54	0	0	0	148	564	118	0	741	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2787				3433	3539	1511		3525	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2787				3433	3539	1511		3525	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	56	0	0	0	154	588	123	0	772	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	59	0	3	0
Lane Group Flow (vph)	0	0	56	0	0	0	154	588	64	0	787	0
Confl. Peds. (#/hr)									36			39
Confl. Bikes (#/hr)												13
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			7.8				7.8	18.0	18.0		18.0	
Effective Green, g (s)			9.8				7.8	18.0	18.0		20.0	
Actuated g/C Ratio			0.28				0.22	0.52	0.52		0.57	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			784				769	1830	781		2025	
v/s Ratio Prot			0.02				c0.04	0.17			c0.22	
v/s Ratio Perm									0.04			
v/c Ratio			0.07				0.20	0.32	0.08		0.39	
Uniform Delay, d1			9.2				11.0	4.9	4.2		4.1	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.0				0.1	0.1	0.0		0.1	
Delay (s)			9.2				11.1	5.0	4.3		4.2	
Level of Service			A				B	A	A		A	
Approach Delay (s)		9.2			0.0			6.0			4.2	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	34.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	698	3	0	821
Future Vol, veh/h	0	1	698	3	0	821
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1	727	3	0	855

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	365	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	632	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	632	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

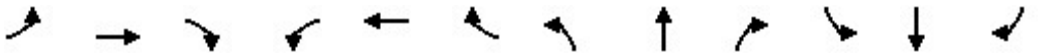
Approach	WB	NB	SB
HCM Control Delay, s	10.7	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	632	-
HCM Lane V/C Ratio	-	-	0.002	-
HCM Control Delay (s)	-	-	10.7	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	323	210	1	0	256	59	4	3	1	64	1	262
Future Volume (veh/h)	323	210	1	0	256	59	4	3	1	64	1	262
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	336	219	1	0	267	61	4	3	1	67	1	273
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	941	983	4	0	317	268	15	12	4	181	3	1000
Arrive On Green	0.53	0.53	0.53	0.00	0.17	0.17	0.02	0.02	0.02	0.10	0.10	0.10
Sat Flow, veh/h	1781	1860	8	0	1870	1580	891	669	223	1756	26	1585
Grp Volume(v), veh/h	336	0	220	0	267	61	8	0	0	68	0	273
Grp Sat Flow(s),veh/h/ln	1781	0	1869	0	1870	1580	1783	0	0	1783	0	1585
Q Serve(g_s), s	12.1	0.0	6.9	0.0	15.2	3.7	0.5	0.0	0.0	3.9	0.0	8.4
Cycle Q Clear(g_c), s	12.1	0.0	6.9	0.0	15.2	3.7	0.5	0.0	0.0	3.9	0.0	8.4
Prop In Lane	1.00		0.00	0.00		1.00	0.50		0.12	0.99		1.00
Lane Grp Cap(c), veh/h	941	0	987	0	317	268	31	0	0	184	0	1000
V/C Ratio(X)	0.36	0.00	0.22	0.00	0.84	0.23	0.26	0.00	0.00	0.37	0.00	0.27
Avail Cap(c_a), veh/h	941	0	987	0	459	388	389	0	0	275	0	1082
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.1	0.0	13.9	0.0	44.2	39.4	53.4	0.0	0.0	46.0	0.0	9.0
Incr Delay (d2), s/veh	1.1	0.0	0.5	0.0	10.1	0.5	5.2	0.0	0.0	1.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	0.0	3.0	0.0	7.9	1.5	0.3	0.0	0.0	1.8	0.0	7.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.2	0.0	14.4	0.0	54.3	40.0	58.6	0.0	0.0	47.5	0.0	9.2
LnGrp LOS	B	A	B	A	D	D	E	A	A	D	A	A
Approach Vol, veh/h		556			328			8			341	
Approach Delay, s/veh		15.5			51.6			58.6			16.8	
Approach LOS		B			D			E			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		63.1		16.3		23.7		6.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		14.1		10.4		17.2		2.5				
Green Ext Time (p_c), s		2.4		0.9		1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			25.7									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	133	102	33	194	29	0	0	0	11	41	21
Future Volume (veh/h)	16	133	102	33	194	29	0	0	0	11	41	21
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.96				1.00		0.83
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870				1870	1870	1870
Adj Flow Rate, veh/h	17	139	106	34	202	30				11	43	22
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2				2	2	2
Cap, veh/h	197	674	604	214	557	76				66	258	132
Arrive On Green	0.39	0.39	0.39	0.39	0.39	0.39				0.28	0.28	0.28
Sat Flow, veh/h	74	1749	1567	109	1447	198				239	935	478
Grp Volume(v), veh/h	156	0	106	266	0	0				76	0	0
Grp Sat Flow(s),veh/h/ln	1823	0	1567	1753	0	0				1653	0	0
Q Serve(g_s), s	0.0	0.0	1.1	0.0	0.0	0.0				0.8	0.0	0.0
Cycle Q Clear(g_c), s	1.3	0.0	1.1	2.5	0.0	0.0				0.8	0.0	0.0
Prop In Lane	0.11		1.00	0.13		0.11				0.14		0.29
Lane Grp Cap(c), veh/h	871	0	604	847	0	0				456	0	0
V/C Ratio(X)	0.18	0.00	0.18	0.31	0.00	0.00				0.17	0.00	0.00
Avail Cap(c_a), veh/h	4488	0	3847	4334	0	0				1679	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	4.9	0.0	4.8	5.2	0.0	0.0				6.5	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.4	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.2	0.5	0.0	0.0				0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.1	0.0	5.1	5.7	0.0	0.0				6.9	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		262			266						76	
Approach Delay, s/veh		5.1			5.7						6.9	
Approach LOS		A			A						A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		13.1		10.5		13.1						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		58.0		24.0		58.0						
Max Q Clear Time (g_c+I1), s		3.3		2.8		4.5						
Green Ext Time (p_c), s		2.9		0.6		3.7						

Intersection Summary												
HCM 6th Ctrl Delay			5.6									
HCM 6th LOS			A									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	153	16	30	234	4	30	7	19	17	37	23
Future Volume (veh/h)	6	153	16	30	234	4	30	7	19	17	37	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	159	17	31	244	4	31	7	20	18	39	24
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	17	460	49	79	571	9	79	64	183	68	159	98
Arrive On Green	0.01	0.28	0.28	0.04	0.31	0.31	0.04	0.15	0.15	0.04	0.15	0.15
Sat Flow, veh/h	1781	1661	178	1781	1835	30	1781	417	1190	1781	1075	662
Grp Volume(v), veh/h	6	0	176	31	0	248	31	0	27	18	0	63
Grp Sat Flow(s),veh/h/ln	1781	0	1838	1781	0	1865	1781	0	1607	1781	0	1737
Q Serve(g_s), s	0.1	0.0	2.8	0.6	0.0	3.9	0.6	0.0	0.5	0.4	0.0	1.2
Cycle Q Clear(g_c), s	0.1	0.0	2.8	0.6	0.0	3.9	0.6	0.0	0.5	0.4	0.0	1.2
Prop In Lane	1.00		0.10	1.00		0.02	1.00		0.74	1.00		0.38
Lane Grp Cap(c), veh/h	17	0	509	79	0	580	79	0	247	68	0	257
V/C Ratio(X)	0.35	0.00	0.35	0.39	0.00	0.43	0.39	0.00	0.11	0.27	0.00	0.25
Avail Cap(c_a), veh/h	313	0	2114	410	0	2245	410	0	1069	308	0	1057
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.2	0.0	10.7	17.2	0.0	10.1	17.2	0.0	13.5	17.3	0.0	13.9
Incr Delay (d2), s/veh	8.6	0.0	0.3	2.4	0.0	0.4	2.4	0.0	0.1	1.5	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.9	0.3	0.0	1.3	0.3	0.0	0.2	0.2	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.8	0.0	11.0	19.5	0.0	10.5	19.5	0.0	13.6	18.8	0.0	14.3
LnGrp LOS	C	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		182			279			58			81	
Approach Delay, s/veh		11.5			11.5			16.8			15.3	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.1	14.7	6.1	10.0	4.9	16.0	5.9	10.2
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	42.5	8.5	22.5	6.5	44.5	6.4	24.6
Max Q Clear Time (g_c+I1), s	2.6	4.8	2.6	3.2	2.1	5.9	2.4	2.5
Green Ext Time (p_c), s	0.0	0.9	0.0	0.2	0.0	1.3	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	12.5
HCM 6th LOS	B

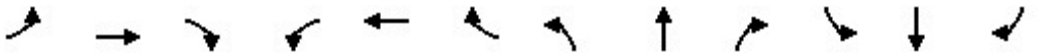
Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	59	47	1	262	310	91
Future Vol, veh/h	59	47	1	262	310	91
Conflicting Peds, #/hr	0	48	25	0	0	25
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	61	49	1	273	323	95

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	671	444	443	0	-	0
Stage 1	396	-	-	-	-	-
Stage 2	275	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	422	614	1117	-	-	-
Stage 1	680	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	402	572	1090	-	-	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	752	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1090	-	402	572	-	-
HCM Lane V/C Ratio	0.001	-	0.153	0.086	-	-
HCM Control Delay (s)	8.3	0	15.6	11.9	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0	-	0.5	0.3	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	352	214	17	303	11	232	102	34	121	239	30
Future Volume (veh/h)	10	352	214	17	303	11	232	102	34	121	239	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	367	0	18	316	11	242	106	35	126	249	31
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	39	493		39	464	16	294	359	119	165	326	41
Arrive On Green	0.02	0.26	0.00	0.02	0.26	0.26	0.16	0.27	0.27	0.09	0.20	0.20
Sat Flow, veh/h	1781	1870	1585	1781	1797	63	1781	1346	444	1781	1630	203
Grp Volume(v), veh/h	10	367	0	18	0	327	242	0	141	126	0	280
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1859	1781	0	1790	1781	0	1833
Q Serve(g_s), s	0.3	10.4	0.0	0.6	0.0	9.1	7.6	0.0	3.6	4.0	0.0	8.3
Cycle Q Clear(g_c), s	0.3	10.4	0.0	0.6	0.0	9.1	7.6	0.0	3.6	4.0	0.0	8.3
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.25	1.00		0.11
Lane Grp Cap(c), veh/h	39	493		39	0	480	294	0	478	165	0	366
V/C Ratio(X)	0.26	0.74		0.47	0.00	0.68	0.82	0.00	0.29	0.77	0.00	0.76
Avail Cap(c_a), veh/h	154	1293		154	0	1292	336	0	636	441	0	762
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.8	19.5	0.0	27.9	0.0	19.3	23.3	0.0	16.8	25.6	0.0	21.8
Incr Delay (d2), s/veh	2.6	2.7	0.0	6.3	0.0	3.3	14.6	0.0	0.3	6.6	0.0	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	4.2	0.0	0.3	0.0	3.8	4.1	0.0	1.4	1.9	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	22.2	0.0	34.2	0.0	22.5	37.8	0.0	17.1	32.2	0.0	24.3
LnGrp LOS	C	C		C	A	C	D	A	B	C	A	C
Approach Vol, veh/h		377			345			383			406	
Approach Delay, s/veh		22.4			23.2			30.2			26.8	
Approach LOS		C			C			C			C	

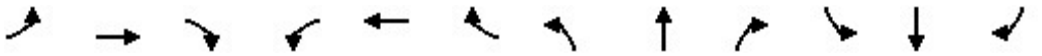
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.9	20.6	14.6	16.6	6.7	19.8	10.7	20.5
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	5.4	* 4.9	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	39.9	10.9	24.0	5.0	* 40	14.3	* 21
Max Q Clear Time (g_c+I1), s	2.6	12.4	9.6	10.3	2.3	11.1	6.0	5.6
Green Ext Time (p_c), s	0.0	2.6	0.1	1.1	0.0	3.5	0.2	0.5

Intersection Summary	
HCM 6th Ctrl Delay	25.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	1	29	8	1	14	13	372	1	8	403	1
Future Volume (veh/h)	77	1	29	8	1	14	13	372	1	8	403	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	1	30	8	1	15	14	388	1	8	420	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	418	4	209	194	36	130	33	713	2	19	612	519
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.02	0.38	0.38	0.01	0.33	0.33
Sat Flow, veh/h	1449	29	1585	319	273	987	1781	1865	5	1781	1870	1585
Grp Volume(v), veh/h	81	0	30	24	0	0	14	0	389	8	420	1
Grp Sat Flow(s),veh/h/ln	1478	0	1585	1579	0	0	1781	0	1869	1781	1870	1585
Q Serve(g_s), s	0.6	0.0	0.5	0.0	0.0	0.0	0.2	0.0	5.1	0.1	6.2	0.0
Cycle Q Clear(g_c), s	1.4	0.0	0.5	0.4	0.0	0.0	0.2	0.0	5.1	0.1	6.2	0.0
Prop In Lane	0.99		1.00	0.33		0.62	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	422	0	209	360	0	0	33	0	715	19	612	519
V/C Ratio(X)	0.19	0.00	0.14	0.07	0.00	0.00	0.43	0.00	0.54	0.42	0.69	0.00
Avail Cap(c_a), veh/h	1435	0	1355	1459	0	0	344	0	3138	282	3074	2605
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.5	0.0	12.1	12.1	0.0	0.0	15.3	0.0	7.6	15.5	9.2	7.1
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.1	0.0	0.0	8.7	0.0	0.6	13.9	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.9	0.1	1.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.7	0.0	12.4	12.1	0.0	0.0	24.0	0.0	8.2	29.4	10.5	7.2
LnGrp LOS	B	A	B	B	A	A	C	A	A	C	B	A
Approach Vol, veh/h		111			24			403			429	
Approach Delay, s/veh		12.6			12.1			8.7			10.8	
Approach LOS		B			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.8	18.1		8.7	6.6	16.3		8.7				
Change Period (Y+Rc), s	4.5	6.0		4.5	6.0	* 6		4.5				
Max Green Setting (Gmax), s	5.0	53.0		27.0	6.1	* 52		27.0				
Max Q Clear Time (g_c+I1), s	2.1	7.1		3.4	2.2	8.2		2.4				
Green Ext Time (p_c), s	0.0	2.0		0.5	0.0	2.2		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		10.2
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	513	14	5	324	1	33	0	8	3	0	21
Future Vol, veh/h	9	513	14	5	324	1	33	0	8	3	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	534	15	5	338	1	34	0	8	3	0	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	549	0	0	920	909	542	913	916	339
Stage 1	-	-	-	-	-	-	560	560	-	349	349	-
Stage 2	-	-	-	-	-	-	360	349	-	564	567	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1220	-	-	1021	-	-	251	275	540	254	272	703
Stage 1	-	-	-	-	-	-	513	511	-	667	633	-
Stage 2	-	-	-	-	-	-	658	633	-	510	507	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1220	-	-	1021	-	-	241	272	540	248	269	703
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	272	-	248	269	-
Stage 1	-	-	-	-	-	-	509	507	-	662	630	-
Stage 2	-	-	-	-	-	-	634	630	-	498	503	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	20.8	11.6
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	270	1220	-	-	1021	-	-	572
HCM Lane V/C Ratio	0.158	0.008	-	-	0.005	-	-	0.044
HCM Control Delay (s)	20.8	8	-	-	8.5	-	-	11.6
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.1

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
1	**Viking Ave NW & SR 305 (Signalized)[1]**							
	EB (SR 305)	L	0.51	62.2	E	0.5	62	E
	EB (SR 305)	T	0.6	13.5	B	0.44	12.5	B
	EB (SR 305)	R	0.04	5.1	A	0.05	5.9	A
	EB Overall (SR 305)			**14.8**	**B**		**14.3**	**B**
	WB (SR 305)	L	0.51	62.5	E	0.57	60.8	E
	WB (SR 305)	TR	0.5	11.8	B	0.48	11.4	B
	WB Overall (SR 305)			**14.1**	**B**		**15**	**B**
	NB (Viking Ave NW)	L	0.3	59.8	E	0.42	60	E
	NB (Viking Ave NW)	TL	0.31	59.9	E	0.42	59.9	E
	NB (Viking Ave NW)	R	0.06	57.9	E	0.05	56.8	E
	NB Overall (Viking Ave NW)			**58.6**	**E**		**58.6**	**E**
	SB (Viking Ave NW)	L	0.6	65.5	E	0.27	59	E
	SB (Viking Ave NW)	TR	0.27	57.9	E	0.31	59.4	E
	SB Overall (Viking Ave NW)			**60.8**	**E**		**59.3**	**E**
	Overall			**19.5**	**B**		**19.6**	**B**
2	**SR 303 & NE McWilliams Rd (Signalized)**							
	EB (NE McWilliams Rd)	L	0.83	82.4	F	0.82	80.7	F
	EB (NE McWilliams Rd)	T	0.16	52.9	D	0.4	54	D
	EB (NE McWilliams Rd)	R	0.56	57.5	E	0.62	57.5	E
	EB Overall (NE McWilliams Rd)			**68.5**	**E**		**64.7**	**E**
	WB (NE McWilliams Rd)	L	0.84	85.1	F	0.82	81.3	F
	WB (NE McWilliams Rd)	T	0.26	53.1	D	0.27	52.6	D
	WB (NE McWilliams Rd)	R	0.67	59	E	0.42	54.4	D
	WB Overall (NE McWilliams Rd)			**68.6**	**E**		**65.9**	**E**
	NB (SR 303)	L	0.81	70.6	E	0.87	78.9	E
	NB (SR 303)	T	0.27	11.2	B	0.36	14.7	B
	NB (SR 303)	R	0.06	9.5	A	0.19	13.1	B
	NB Overall (SR 303)			**19.4**	**B**		**24.5**	**C**
	SB (SR 303)	L	0.72	75.9	E	0.82	78.2	E
	SB (SR 303)	T	0.33	14.1	B	0.41	17.7	B
	SB (SR 303)	R	0.08	11.7	B	0.17	15	B
	SB Overall (SR 303)			**17.3**	**B**		**23.8**	**C**
	Overall			**30.9**	**C**		**32.6**	**C**
3	**Alaskan Way & Yesler Way (Signalized)[1]**							
	EB (Yesler Way)	R	0.2	11.1	B	0.07	9.2	A
	EB Overall (Yesler Way)			**11.1**	**B**		**9.2**	**A**
	NB (Alaskan Way)	L	0.11	12.2	B	0.2	11.1	B
	NB (Alaskan Way)	T	0.43	5.1	A	0.32	5	A
	NB (Alaskan Way)	R	0.18	4.3	A	0.08	4.3	A
	NB Overall (Alaskan Way)			**5.3**	**A**		**6**	**A**
	SB (Alaskan Way)	T/TR	0.2	3.3	A	0.39	4.2	A
	SB Overall (Alaskan Way)			**3.3**	**A**		**4.2**	**A**
	Overall			**5.4**	**A**		**5.2**	**A**
4	**Charleston Blvd & S Callow Ave (TWSC)[2]**							
	WB (Charleston Blvd)	R	0.006	15.5	C	0.002	10.7	B
	WB Overall (Charleston Blvd)			**15.5**	**C**		**10.7**	**B**
	NB (S Callow Ave)	TR						
	NB (S Callow Ave)	R						
	NB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	SB (S Callow Ave)	T						
	SB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	Overall			**15.5**	**C**		**10.7**	**B**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
5	**Burwell St & Warren Ave (Signalized)**							
	EB (Burwell St)	TL/T	0.25	12.8	B	0	0	A
	EB Overall (Burwell St)			**15**	**B**		**15.5**	**B**
	WB (Burwell St)	T	0.77	54.3	D	0.84	54.3	D
	WB (Burwell St)	R	0.1	43.7	D	0.23	40	D
	WB Overall (Burwell St)			**53.2**	**D**		**51.6**	**D**
	NB (Warren Ave)	LTR	0	0	A	0	0	A
	NB Overall (Warren Ave)			**53.5**	**D**		**58.6**	**E**
	SB (Warren Ave)	TL	0	0	A	0	0	A
	SB (Warren Ave)	R	0.32	7.5	A	0.27	9.2	A
	SB Overall (Warren Ave)			**15.3**	**B**		**16.8**	**B**
	Overall			**20.3**	**C**		**25.7**	**C**
6	**Burwell St & Pacific Ave (Signalized)**							
	EB (Pacific Ave)	TL	0	0	A	0	0	A
	EB (Pacific Ave)	R	0.48	8.9	A	0.18	5.1	A
	EB Overall (Pacific Ave)			**8.2**	**A**		**5.1**	**A**
	WB (Pacific Ave	LTR	0	0	A	0	0	A
	WB Overall (Pacific Ave)			**7.2**	**A**		**5.7**	**A**
	SB (SR 303)	LTR	0	0	A	0	0	A
	SB Overall (SR 303)			**6.5**	**A**		**6.9**	**A**
	Overall			**7.6**	**A**		**5.6**	**A**
7	**SR 166 & Sidney Ave (Signalized)**							
	EB (SR 166)	L	0.33	39.2	D	0.35	26.8	C
	EB (SR 166)	TR	0	0	A	0	0	A
	EB Overall (SR 166)			**9.7**	**A**		**11.5**	**B**
	WB (SR 166)	L	0.39	18.2	B	0.39	19.5	B
	WB (SR 166)	TR	0	0	A	0	0	A
	WB Overall (SR 166)			**10.1**	**B**		**11.5**	**B**
	NB (Sidney Ave)	L	0.36	18.8	B	0.39	19.5	B
	NB (Sidney Ave)	TR	0	0	A	0	0	A
	NB Overall (Sidney Ave)			**16.4**	**B**		**16.8**	**B**
	SB (Sidney Ave)	L	0.54	34.9	C	0.27	18.8	B
	SB (Sidney Ave)	TR	0	0	A	0	0	A
	SB Overall (Sidney Ave)			**21.5**	**C**		**15.3**	**B**
	Overall			**10.8**	**B**		**12.5**	**B**
8	**SW Barton St & Fauntleroy Way (TWSC)[2]**							
	EB (SW Barton St)	L	0.269	17.7	C	0.153	15.6	C
	EB (SW Barton St)	R	0.102	10.8	B	0.086	11.9	B
	EB Overall (SW Barton St)			**14.9**	**B**		**14**	**B**
	NB (Fauntleroy Way)	T	-	0	A	-	0	A
	NB Overall (Fauntleroy Way)			**0.5**	**0**		**0**	**0**
	SB (Fauntleroy Way)	TR	-	-	-	-	-	-
	SB Overall (Fauntleroy Way)			**0**	**0**		**0**	**0**
	Overall			**17.7**	**C**		**15.6**	**C**
9	**Sam Christopherson Ave & SR 3 W (Signalized)**							
	EB (SR 3 W)	L	1.27	284.5	F	0.26	30.3	C
	EB (SR 3 W)	T	0.79	18.1	B	0.74	22.2	C
	EB Overall (SR 3 W)			**21**	**C**		**22.4**	**C**
	WB (SR 3 W)	L	0.42	41.9	D	0.47	34.2	C
	WB (SR 3 W)	T	0	0	A	0	0	A
	WB Overall (SR 3 W)			**15.3**	**B**		**23.2**	**C**
	NB (SR 16)	L	0.82	40.5	D	0.82	37.8	D
	NB (SR 16)	T	0	0	A	0	0	A
	NB (SR 16)	R	0.52	22.4	C	0.29	17.1	B
	NB Overall (SR 16)			**32.8**	**C**		**30.2**	**C**
	SB (Sam Christopherson Ave)	L	0.79	36.1	D	0.77	32.2	C
	SB (Sam Christopherson Ave)	T	0	0	A	0	0	A
	SB Overall (SR 16)			**31.2**	**C**		**26.8**	**C**
	Overall			**24**	**C**		**25.7**	**C**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
10	**Imperial Way & SR 3 W (Signalized)**							
	EB (Imperial Way)	TL	0	0	A	0	0	A
	EB (Imperial Way)	R	0.13	15.2	B	0.14	12.4	B
	EB Overall (Imperial Way)			**15.1**	**B**		**12.6**	**B**
	WB (Imperial Way)	LTR	0	0	A	0	0	A
	WB Overall (Imperial Way)			**14.6**	**B**		**12.1**	**B**
	NB (SR 3 W)	L	0.48	20.6	C	0.43	24	C
	NB (SR 3 W)	TR	0	0	A	0	0	A
	NB Overall (SR 3 W)			**9.5**	**A**		**8.7**	**A**
	SB (SR 3 W)	L	0.43	24.2	C	0.42	29.4	C
	SB (SR 3 W)	T	0.39	6.8	A	0.69	10.5	B
	SB (SR 3 W)	R	0.01	5.4	A	0	7.2	A
	SB Overall (SR 3 W)			**7.6**	**A**		**10.8**	**B**
	Overall			**9.2**	**A**		**10.2**	**B**
11	**SE Spring Creek Rd & SE Mullenix Rd (TWSC)[2]**							
	EB (SE Spring Creek Rd)	L	0.014	8.8	A	0.008	8	A
	EB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	EB Overall (SE Spring Creek Rd)			**0.5**	**0**		**0.1**	**0**
	WB (SE Spring Creek Rd)	L	0.006	7.8	A	0.005	8.5	A
	WB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	WB Overall (SE Spring Creek Rd)			**0.1**	**0**		**0.1**	**0**
	NB (SE Mullenix Rd)	LTR	0.06	18.9	C	0.158	20.8	C
	NB Overall (SE Mullenix Rd)			**18.9**	**C**		**20.8**	**C**
	SB (SE Mullenix Rd)	LTR	0.032	13.2	B	0.044	11.6	B
	SB Overall (SE Mullenix Rd)			**13.2**	**B**		**11.6**	**B**
	Overall			**18.9**	**C**		**20.8**	**C**

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left/thru/right lanes

LOS = Level of Service

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

V/C = Volume to capacity ratio

Delay is Measured in Seconds Per Vehicle (sec/veh)

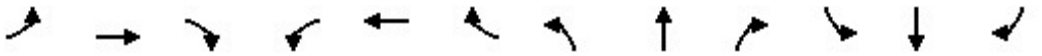
Red cells denote approaches and lane groups operating at unacceptable conditions.

1 - HCM 2000 Analysis

2 - The worst movement delay is reported for LOS.

Attachment E
2030 Build Synchro Reports

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	81	3	3	64	2	2	1	6	4	1	5
Future Volume (vph)	3	81	3	3	64	2	2	1	6	4	1	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3524		1681	1726	1583	1770	1630	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3524		1681	1726	1583	1770	1630	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	3	84	3	3	67	2	2	1	6	4	1	5
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	6	0	5	0
Lane Group Flow (vph)	3	84	2	3	69	0	1	2	0	4	1	0
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	1.2	105.2	107.6	1.2	105.2		2.4	2.4	2.4	2.5	2.5	
Effective Green, g (s)	1.2	105.2	107.6	1.2	105.2		2.4	2.4	2.4	2.5	2.5	
Actuated g/C Ratio	0.01	0.81	0.83	0.01	0.81		0.02	0.02	0.02	0.02	0.02	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	16	2863	1310	16	2851		31	31	29	34	31	
v/s Ratio Prot	c0.00	c0.02	0.00	0.00	0.02		0.00	c0.00		c0.00	0.00	
v/s Ratio Perm			0.00						0.00			
v/c Ratio	0.19	0.03	0.00	0.19	0.02		0.03	0.06	0.00	0.12	0.04	
Uniform Delay, d1	63.9	2.4	1.9	63.9	2.4		62.7	62.7	62.6	62.7	62.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	0.0	0.0	4.1	0.0		0.3	0.6	0.0	1.1	0.3	
Delay (s)	68.0	2.4	1.9	68.0	2.4		63.0	63.3	62.7	63.8	62.9	
Level of Service	E	A	A	E	A		E	E	E	E	E	
Approach Delay (s)		4.6			5.2			62.8			63.3	
Approach LOS		A			A			E			E	

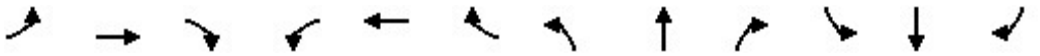
Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.03		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	2	5	7	3	7	6	36	3	3	41	4
Future Volume (veh/h)	6	2	5	7	3	7	6	36	3	3	41	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	2	5	7	3	7	6	38	3	3	43	4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	16	49	41	18	51	43	16	2894	1291	8	2879	1284
Arrive On Green	0.01	0.03	0.03	0.01	0.03	0.03	0.01	0.81	0.81	0.00	0.81	0.81
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3554	1585	1781	3554	1585
Grp Volume(v), veh/h	6	2	5	7	3	7	6	38	3	3	43	4
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1585	1781	1777	1585
Q Serve(g_s), s	0.4	0.1	0.4	0.5	0.2	0.6	0.4	0.3	0.0	0.2	0.3	0.1
Cycle Q Clear(g_c), s	0.4	0.1	0.4	0.5	0.2	0.6	0.4	0.3	0.0	0.2	0.3	0.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	16	49	41	18	51	43	16	2894	1291	8	2879	1284
V/C Ratio(X)	0.37	0.04	0.12	0.38	0.06	0.16	0.37	0.01	0.00	0.36	0.01	0.00
Avail Cap(c_a), veh/h	170	524	444	170	524	444	252	2894	1291	184	2879	1284
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.1	61.7	61.9	63.9	61.6	61.8	64.1	2.3	2.2	64.5	2.4	2.4
Incr Delay (d2), s/veh	13.9	0.3	1.1	12.5	0.4	1.5	13.9	0.0	0.0	23.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.1	0.2	0.3	0.1	0.2	0.3	0.1	0.0	0.2	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.9	62.0	63.0	76.4	62.0	63.2	77.9	2.3	2.2	88.0	2.4	2.4
LnGrp LOS	E	E	E	E	E	E	E	A	A	F	A	A
Approach Vol, veh/h		13			17			47			50	
Approach Delay, s/veh		69.7			68.4			11.9			7.5	
Approach LOS		E			E			B			A	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.2	110.9	5.9	8.0	5.8	110.3	5.8	8.2
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	2.2	2.3	2.5	2.4	2.4	2.3	2.4	2.6
Green Ext Time (p_c), s	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	23.7
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	8	0	0	0	4	50	17	0	24	0
Future Volume (vph)	0	0	8	0	0	0	4	50	17	0	24	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2787				3433	3539	1583		3539	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2787				3433	3539	1583		3539	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	8	0	0	0	4	52	18	0	25	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	5	0	0	0
Lane Group Flow (vph)	0	0	8	0	0	0	4	52	13	0	25	0
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			1.5				1.5	25.6	25.6		25.6	
Effective Green, g (s)			3.5				1.5	25.6	25.6		27.6	
Actuated g/C Ratio			0.10				0.04	0.71	0.71		0.76	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			270				142	2509	1122		2705	
v/s Ratio Prot			c0.00				0.00	c0.01			0.01	
v/s Ratio Perm									0.01			
v/c Ratio			0.03				0.03	0.02	0.01		0.01	
Uniform Delay, d1			14.8				16.6	1.5	1.5		1.0	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.0				0.1	0.0	0.0		0.0	
Delay (s)			14.8				16.7	1.6	1.5		1.0	
Level of Service			B				B	A	A		A	
Approach Delay (s)		14.8			0.0			2.4			1.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.02		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	23.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

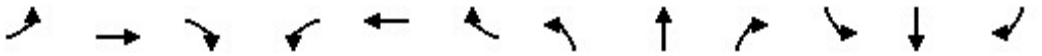
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	105	0	0	48
Future Vol, veh/h	0	0	105	0	0	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	109	0	0	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	55	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	1000	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	1000	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	-	0	-
HCM Lane LOS	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	14	0	0	25	1	0	0	0	10	0	49
Future Volume (veh/h)	29	14	0	0	25	1	0	0	0	10	0	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	30	15	0	0	26	1	0	0	0	10	0	51
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2	2	2	2
Cap, veh/h	1402	1398	0	0	57	49	0	2	0	82	0	1320
Arrive On Green	0.79	0.79	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.05	0.00	0.05
Sat Flow, veh/h	1781	1870	0	0	1870	1585	0	1870	0	1781	0	1585
Grp Volume(v), veh/h	30	15	0	0	26	1	0	0	0	10	0	51
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1870	1585	0	1870	0	1781	0	1585
Q Serve(g_s), s	0.4	0.2	0.0	0.0	1.5	0.1	0.0	0.0	0.0	0.6	0.0	0.6
Cycle Q Clear(g_c), s	0.4	0.2	0.0	0.0	1.5	0.1	0.0	0.0	0.0	0.6	0.0	0.6
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	1402	1398	0	0	57	49	0	2	0	82	0	1320
V/C Ratio(X)	0.02	0.01	0.00	0.00	0.45	0.02	0.00	0.00	0.00	0.12	0.00	0.04
Avail Cap(c_a), veh/h	1402	1398	0	0	459	389	0	408	0	275	0	1492
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	2.5	2.5	0.0	0.0	52.4	51.7	0.0	0.0	0.0	50.3	0.0	1.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	6.6	0.2	0.0	0.0	0.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.3	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	2.6	2.5	0.0	0.0	59.0	51.9	0.0	0.0	0.0	51.1	0.0	1.6
LnGrp LOS	A	A	A	A	E	D	A	A	A	D	A	A
Approach Vol, veh/h		45			27			0			61	
Approach Delay, s/veh		2.6			58.8			0.0			9.7	
Approach LOS		A			E						A	

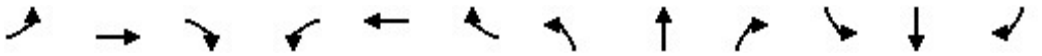
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		91.6		10.1		8.4		0.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		2.4		2.6		3.5		0.0				
Green Ext Time (p_c), s		0.2		0.1		0.1		0.0				

Intersection Summary												
HCM 6th Ctrl Delay		17.3										
HCM 6th LOS		B										

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	49	14	3	8	0	0	0	0	8	5	1
Future Volume (veh/h)	0	49	14	3	8	0	0	0	0	8	5	1
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870				1870	1870	1870
Adj Flow Rate, veh/h	0	51	15	3	8	0				8	5	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2				2	2	2
Cap, veh/h	0	783	664	407	661	0				23	15	3
Arrive On Green	0.00	0.42	0.42	0.42	0.42	0.00				0.02	0.02	0.02
Sat Flow, veh/h	0	1870	1585	208	1579	0				1026	641	128
Grp Volume(v), veh/h	0	51	15	11	0	0				14	0	0
Grp Sat Flow(s),veh/h/ln	0	1870	1585	1787	0	0				1796	0	0
Q Serve(g_s), s	0.0	0.2	0.1	0.0	0.0	0.0				0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.2	0.1	0.0	0.0	0.0				0.1	0.0	0.0
Prop In Lane	0.00		1.00	0.27		0.00				0.57		0.07
Lane Grp Cap(c), veh/h	0	783	664	1068	0	0				41	0	0
V/C Ratio(X)	0.00	0.07	0.02	0.01	0.00	0.00				0.34	0.00	0.00
Avail Cap(c_a), veh/h	0	6659	5643	6365	0	0				3887	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	2.5	2.4	2.4	0.0	0.0				6.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.0				10.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0				0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	2.6	2.5	2.4	0.0	0.0				17.2	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				B	A	A
Approach Vol, veh/h		66			11						14	
Approach Delay, s/veh		2.5			2.4						17.2	
Approach LOS		A			A						B	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		10.0		4.3		10.0						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		51.0		31.0		51.0						
Max Q Clear Time (g_c+I1), s		2.2		2.1		2.0						
Green Ext Time (p_c), s		0.6		0.1		0.1						

Intersection Summary		
HCM 6th Ctrl Delay		4.8
HCM 6th LOS		A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	10	0	2	21	51	1	64	1	1	1	0
Future Volume (veh/h)	25	10	0	2	21	51	1	64	1	1	1	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	26	10	0	2	22	53	1	67	1	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	69	649	0	6	152	366	6	160	2	6	162	0
Arrive On Green	0.04	0.35	0.00	0.00	0.31	0.31	0.00	0.09	0.09	0.00	0.09	0.00
Sat Flow, veh/h	1781	1870	0	1781	487	1173	1781	1838	27	1781	1870	0
Grp Volume(v), veh/h	26	10	0	2	0	75	1	0	68	1	1	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	0	1659	1781	0	1865	1781	1870	0
Q Serve(g_s), s	0.5	0.1	0.0	0.0	0.0	1.0	0.0	0.0	1.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.5	0.1	0.0	0.0	0.0	1.0	0.0	0.0	1.1	0.0	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.71	1.00		0.01	1.00		0.00
Lane Grp Cap(c), veh/h	69	649	0	6	0	517	6	0	162	6	162	0
V/C Ratio(X)	0.38	0.02	0.00	0.34	0.00	0.14	0.18	0.00	0.42	0.18	0.01	0.00
Avail Cap(c_a), veh/h	361	3178	0	472	0	2923	416	0	1308	361	1254	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	15.0	6.9	0.0	16.0	0.0	8.0	16.0	0.0	13.9	16.0	13.4	0.0
Incr Delay (d2), s/veh	2.5	0.0	0.0	23.4	0.0	0.1	11.1	0.0	1.3	11.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.4	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.6	6.9	0.0	39.3	0.0	8.1	27.1	0.0	15.2	27.1	13.4	0.0
LnGrp LOS	B	A	A	D	A	A	C	A	B	C	B	A
Approach Vol, veh/h		36			77			69			2	
Approach Delay, s/veh		14.6			8.9			15.3			20.2	
Approach LOS		B			A			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.6	15.6	4.6	7.3	5.7	14.5	4.6	7.3
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	54.5	7.5	21.5	6.5	56.5	6.5	22.5
Max Q Clear Time (g_c+I1), s	2.0	2.1	2.0	2.0	2.5	3.0	2.0	3.1
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	12.5
HCM 6th LOS	B

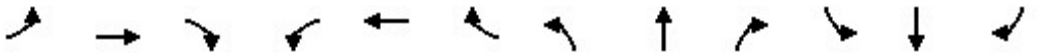
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	5	1	21	16	2
Future Vol, veh/h	6	5	1	21	16	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	5	1	22	17	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	42	18	19	0	-	0
Stage 1	18	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	969	1061	1597	-	-	-
Stage 1	1005	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	968	1061	1597	-	-	-
Mov Cap-2 Maneuver	968	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	999	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	0.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1597	-	968	1061	-	-
HCM Lane V/C Ratio	0.001	-	0.006	0.005	-	-
HCM Control Delay (s)	7.3	0	8.7	8.4	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	33	15	0	453	1	280	4	4	5	6	1
Future Volume (veh/h)	0	33	15	0	453	1	280	4	4	5	6	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	0	34	0	0	472	1	292	4	4	5	6	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	4	744		4	742	2	360	183	183	12	39	6
Arrive On Green	0.00	0.40	0.00	0.00	0.40	0.40	0.20	0.21	0.21	0.01	0.02	0.02
Sat Flow, veh/h	1781	1870	1585	1781	1866	4	1781	858	858	1781	1563	260
Grp Volume(v), veh/h	0	34	0	0	0	473	292	0	8	5	0	7
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1870	1781	0	1716	1781	0	1823
Q Serve(g_s), s	0.0	0.5	0.0	0.0	0.0	8.5	6.5	0.0	0.2	0.1	0.0	0.2
Cycle Q Clear(g_c), s	0.0	0.5	0.0	0.0	0.0	8.5	6.5	0.0	0.2	0.1	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.50	1.00		0.14
Lane Grp Cap(c), veh/h	4	744		4	0	744	360	0	365	12	0	45
V/C Ratio(X)	0.00	0.05		0.00	0.00	0.64	0.81	0.00	0.02	0.42	0.00	0.15
Avail Cap(c_a), veh/h	214	2292		214	0	2300	425	0	913	502	0	1054
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	7.7	0.0	0.0	0.0	10.1	15.8	0.0	12.9	20.5	0.0	19.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	1.8	10.6	0.0	0.0	19.4	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.0	0.0	0.0	2.7	3.3	0.0	0.1	0.1	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	7.7	0.0	0.0	0.0	11.9	26.5	0.0	12.9	40.0	0.0	21.0
LnGrp LOS	A	A		A	A	B	C	A	B	D	A	C
Approach Vol, veh/h		34			473			300			12	
Approach Delay, s/veh		7.7			11.9			26.1			28.9	
Approach LOS		A			B			C			C	

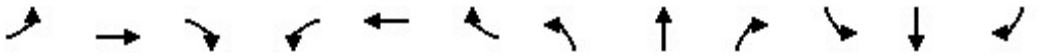
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	21.9	13.5	6.1	0.0	21.9	5.7	13.9
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	4.9	* 5.4	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	50.9	9.9	24.0	5.0	* 51	11.7	* 22
Max Q Clear Time (g_c+I1), s	0.0	2.5	8.5	2.2	0.0	10.5	2.1	2.2
Green Ext Time (p_c), s	0.0	0.2	0.2	0.0	0.0	6.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	17.1
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	0	1	0	0	0	2	39	0	141	18	562
Future Volume (veh/h)	4	0	1	0	0	0	2	39	0	141	18	562
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	4	0	1	0	0	0	2	41	0	147	19	585
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	263	0	13	0	15	0	6	652	0	214	872	739
Arrive On Green	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.35	0.00	0.12	0.47	0.47
Sat Flow, veh/h	1417	0	1585	0	1870	0	1781	1870	0	1781	1870	1585
Grp Volume(v), veh/h	4	0	1	0	0	0	2	41	0	147	19	585
Grp Sat Flow(s),veh/h/ln	1418	0	1585	0	1870	0	1781	1870	0	1781	1870	1585
Q Serve(g_s), s	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	2.3	0.2	9.0
Cycle Q Clear(g_c), s	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	2.3	0.2	9.0
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	263	0	13	0	15	0	6	652	0	214	872	739
V/C Ratio(X)	0.02	0.00	0.08	0.00	0.00	0.00	0.32	0.06	0.00	0.69	0.02	0.79
Avail Cap(c_a), veh/h	1585	0	1492	0	1761	0	422	4108	0	310	3991	3382
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	0.0	14.1	0.0	0.0	0.0	14.3	6.2	0.0	12.1	4.1	6.5
Incr Delay (d2), s/veh	0.0	0.0	2.5	0.0	0.0	0.0	27.3	0.0	0.0	3.9	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.7	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.2	0.0	16.6	0.0	0.0	0.0	41.6	6.3	0.0	16.0	4.1	8.3
LnGrp LOS	B	A	B	A	A	A	D	A	A	B	A	A
Approach Vol, veh/h		5			0			43			751	
Approach Delay, s/veh		14.7			0.0			7.9			9.7	
Approach LOS		B						A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	16.0		4.7	4.6	19.4		4.7				
Change Period (Y+Rc), s	4.5	6.0		4.5	4.5	6.0		4.5				
Max Green Setting (Gmax), s	5.0	63.0		27.0	6.8	61.2		27.0				
Max Q Clear Time (g_c+I1), s	4.3	2.4		2.1	2.0	11.0		0.0				
Green Ext Time (p_c), s	0.0	0.2		0.0	0.0	2.1		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		9.6	
HCM 6th LOS		A	

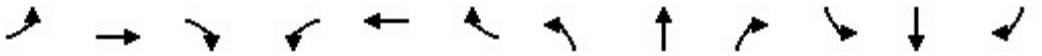
Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	13	1	0	36	0	1	0	0	0	0	1
Future Vol, veh/h	1	13	1	0	36	0	1	0	0	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	14	1	0	38	0	1	0	0	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	38	0	0	15	0	0	56	55	15	55	55	38
Stage 1	-	-	-	-	-	-	17	17	-	38	38	-
Stage 2	-	-	-	-	-	-	39	38	-	17	17	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1572	-	-	1603	-	-	941	836	1065	943	836	1034
Stage 1	-	-	-	-	-	-	1002	881	-	977	863	-
Stage 2	-	-	-	-	-	-	976	863	-	1002	881	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1572	-	-	1603	-	-	940	835	1065	943	835	1034
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	835	-	943	835	-
Stage 1	-	-	-	-	-	-	1001	880	-	976	863	-
Stage 2	-	-	-	-	-	-	975	863	-	1001	880	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0	8.8	8.5
HCM LOS			A	A

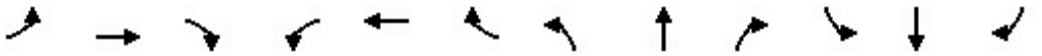
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	940	1572	-	-	1603	-	-	1034
HCM Lane V/C Ratio	0.001	0.001	-	-	-	-	-	0.001
HCM Control Delay (s)	8.8	7.3	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	1473	113	129	1577	93	92	50	104	44	41	99
Future Volume (vph)	78	1473	113	129	1577	93	92	50	104	44	41	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1626	3539	1569	1770	3420		1649	1732	1575	1719	1586	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1626	3539	1569	1770	3420		1649	1732	1575	1719	1586	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	81	1534	118	134	1643	97	96	52	108	46	43	103
RTOR Reduction (vph)	0	0	40	0	2	0	0	0	99	0	67	0
Lane Group Flow (vph)	81	1534	78	134	1738	0	73	75	9	46	79	0
Confl. Peds. (#/hr)			1			1			3	3		
Heavy Vehicles (%)	11%	2%	1%	2%	4%	14%	4%	2%	1%	5%	5%	8%
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	11.5	74.5	85.4	16.6	79.6		10.9	10.9	10.9	9.3	9.3	
Effective Green, g (s)	11.5	74.5	85.4	16.6	79.6		10.9	10.9	10.9	9.3	9.3	
Actuated g/C Ratio	0.09	0.57	0.66	0.13	0.61		0.08	0.08	0.08	0.07	0.07	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	143	2028	1030	226	2094		138	145	132	122	113	
v/s Ratio Prot	0.05	0.43	0.01	c0.08	c0.51		c0.04	0.04		0.03	c0.05	
v/s Ratio Perm			0.04						0.01			
v/c Ratio	0.57	0.76	0.08	0.59	0.83		0.53	0.52	0.07	0.38	0.70	
Uniform Delay, d1	56.9	20.9	8.0	53.5	19.9		57.1	57.0	54.9	57.6	59.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.1	2.7	0.0	3.5	4.0		2.8	2.3	0.2	1.4	16.6	
Delay (s)	61.0	23.6	8.1	57.0	23.8		59.9	59.3	55.0	59.0	75.6	
Level of Service	E	C	A	E	C		E	E	E	E	E	
Approach Delay (s)		24.3			26.2			57.7			71.6	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

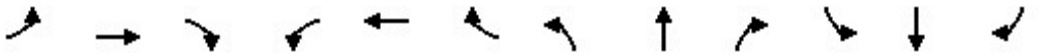
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	161	129	168	165	89	116	256	1116	266	166	1177	213
Future Volume (veh/h)	161	129	168	165	89	116	256	1116	266	166	1177	213
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		1.00	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1870	1856	1870	1841	1885	1885	1856	1885	1870	1870
Adj Flow Rate, veh/h	168	134	175	172	93	121	267	1162	277	173	1226	222
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	2	3	2	4	1	1	3	1	2	2
Cap, veh/h	173	288	236	169	285	236	254	1807	791	185	1656	718
Arrive On Green	0.10	0.15	0.15	0.10	0.15	0.15	0.14	0.50	0.50	0.10	0.47	0.47
Sat Flow, veh/h	1810	1885	1548	1767	1870	1548	1795	3582	1568	1795	3554	1542
Grp Volume(v), veh/h	168	134	175	172	93	121	267	1162	277	173	1226	222
Grp Sat Flow(s),veh/h/ln	1810	1885	1548	1767	1870	1548	1795	1791	1568	1795	1777	1542
Q Serve(g_s), s	12.0	8.4	14.0	12.4	5.8	9.3	18.4	30.9	13.8	12.4	36.6	11.7
Cycle Q Clear(g_c), s	12.0	8.4	14.0	12.4	5.8	9.3	18.4	30.9	13.8	12.4	36.6	11.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	173	288	236	169	285	236	254	1807	791	185	1656	718
V/C Ratio(X)	0.97	0.47	0.74	1.02	0.33	0.51	1.05	0.64	0.35	0.93	0.74	0.31
Avail Cap(c_a), veh/h	173	528	434	169	524	433	254	1807	791	185	1656	718
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.6	50.3	52.6	58.8	49.1	50.6	55.8	23.6	19.4	57.9	28.3	21.7
Incr Delay (d2), s/veh	60.4	1.0	3.9	74.8	0.6	1.5	70.4	1.8	1.2	47.7	3.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.4	4.0	5.7	9.0	2.7	3.7	13.3	13.4	5.2	8.1	16.1	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	119.1	51.3	56.5	133.6	49.7	52.1	126.2	25.4	20.6	105.6	31.3	22.8
LnGrp LOS	F	D	E	F	D	D	F	C	C	F	C	C
Approach Vol, veh/h		477			386			1706			1621	
Approach Delay, s/veh		77.1			87.8			40.4			38.1	
Approach LOS		E			F			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.0	70.6	17.0	24.4	23.0	65.6	17.0	24.4
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	14.4	32.9	14.4	16.0	20.4	38.6	14.0	11.3
Green Ext Time (p_c), s	0.0	7.9	0.0	1.1	0.0	3.7	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	48.0
HCM 6th LOS	D



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	83	0	0	0	228	868	181	0	1141	25
Future Volume (vph)	0	0	83	0	0	0	228	868	181	0	1141	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2814				3467	3505	1485		3494	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2814				3467	3505	1485		3494	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	86	0	0	0	238	904	189	0	1189	26
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	82	0	3	0
Lane Group Flow (vph)	0	0	86	0	0	0	238	904	107	0	1212	0
Confl. Peds. (#/hr)									36			39
Confl. Bikes (#/hr)												13
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	1%	3%	3%	0%	3%	0%
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			10.3				10.3	25.1	25.1		25.1	
Effective Green, g (s)			12.3				10.3	25.1	25.1		27.1	
Actuated g/C Ratio			0.28				0.23	0.57	0.57		0.61	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			779				804	1981	839		2132	
v/s Ratio Prot			0.03				c0.07	0.26			c0.35	
v/s Ratio Perm									0.07			
v/c Ratio			0.11				0.30	0.46	0.13		0.57	
Uniform Delay, d1			12.0				14.1	5.7	4.5		5.2	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.1				0.2	0.2	0.1		0.4	
Delay (s)			12.0				14.3	5.8	4.6		5.5	
Level of Service			B				B	A	A		A	
Approach Delay (s)		12.0			0.0			7.2			5.5	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	44.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

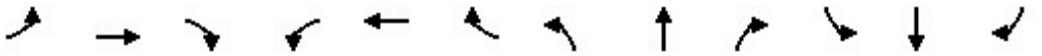
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	1073	4	0	1313
Future Vol, veh/h	0	2	1073	4	0	1313
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	0	1	25	0	2
Mvmt Flow	0	2	1118	4	0	1368

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	561	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	476	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	476	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0
HCM LOS	B		

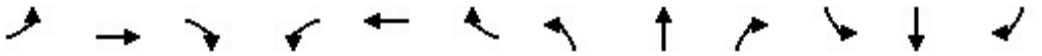
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	476	-
HCM Lane V/C Ratio	-	-	0.004	-
HCM Control Delay (s)	-	-	12.6	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-



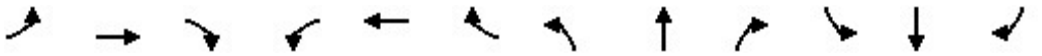
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	526	338	1	0	394	96	7	6	2	99	1	403
Future Volume (veh/h)	526	338	1	0	394	96	7	6	2	99	1	403
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1900	0	1885	1900	1900	1900	1900	1767	1900	1856
Adj Flow Rate, veh/h	548	352	1	0	410	100	7	6	2	103	1	420
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	0	0	1	0	0	0	0	9	0	3
Cap, veh/h	717	751	2	0	444	379	21	18	6	277	3	876
Arrive On Green	0.40	0.40	0.40	0.00	0.24	0.24	0.03	0.03	0.03	0.15	0.15	0.15
Sat Flow, veh/h	1781	1864	5	0	1885	1607	845	724	241	1793	17	1572
Grp Volume(v), veh/h	548	0	353	0	410	100	15	0	0	104	0	420
Grp Sat Flow(s),veh/h/ln	1781	0	1869	0	1885	1607	1811	0	0	1810	0	1572
Q Serve(g_s), s	29.2	0.0	15.3	0.0	23.4	5.6	0.9	0.0	0.0	5.7	0.0	17.0
Cycle Q Clear(g_c), s	29.2	0.0	15.3	0.0	23.4	5.6	0.9	0.0	0.0	5.7	0.0	17.0
Prop In Lane	1.00		0.00	0.00		1.00	0.47		0.13	0.99		1.00
Lane Grp Cap(c), veh/h	717	0	753	0	444	379	46	0	0	280	0	876
V/C Ratio(X)	0.76	0.00	0.47	0.00	0.92	0.26	0.33	0.00	0.00	0.37	0.00	0.48
Avail Cap(c_a), veh/h	717	0	753	0	463	394	395	0	0	280	0	876
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.3	0.0	24.2	0.0	41.1	34.3	52.7	0.0	0.0	41.7	0.0	14.5
Incr Delay (d2), s/veh	7.6	0.0	2.1	0.0	23.8	0.4	4.9	0.0	0.0	1.0	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.7	0.0	7.1	0.0	13.7	2.2	0.5	0.0	0.0	2.6	0.0	11.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.9	0.0	26.3	0.0	64.9	34.7	57.6	0.0	0.0	42.7	0.0	15.0
LnGrp LOS	D	A	C	A	E	C	E	A	A	D	A	B
Approach Vol, veh/h		901			510			15			524	
Approach Delay, s/veh		32.2			59.0			57.6			20.5	
Approach LOS		C			E			E			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		49.3		22.0		30.9		7.8				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		31.2		19.0		25.4		2.9				
Green Ext Time (p_c), s		0.0		0.0		0.6		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			36.2									
HCM 6th LOS			D									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	204	157	50	342	52	0	0	0	17	63	32
Future Volume (veh/h)	25	204	157	50	342	52	0	0	0	17	63	32
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.96				1.00		0.82
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1900	1900	1767	1737	1870	1900				1900	1900	1900
Adj Flow Rate, veh/h	26	212	164	52	356	54				18	66	33
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	0	9	11	2	0				0	0	0
Cap, veh/h	160	839	709	173	684	97				71	259	130
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48				0.27	0.27	0.27
Sat Flow, veh/h	75	1756	1483	102	1432	203				259	949	474
Grp Volume(v), veh/h	238	0	164	462	0	0				117	0	0
Grp Sat Flow(s),veh/h/ln	1830	0	1483	1736	0	0				1682	0	0
Q Serve(g_s), s	0.0	0.0	2.1	0.0	0.0	0.0				1.7	0.0	0.0
Cycle Q Clear(g_c), s	2.4	0.0	2.1	5.7	0.0	0.0				1.7	0.0	0.0
Prop In Lane	0.11		1.00	0.11		0.12				0.15		0.28
Lane Grp Cap(c), veh/h	999	0	709	954	0	0				460	0	0
V/C Ratio(X)	0.24	0.00	0.23	0.48	0.00	0.00				0.25	0.00	0.00
Avail Cap(c_a), veh/h	3285	0	2675	3160	0	0				1255	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	5.0	0.0	4.9	5.9	0.0	0.0				9.1	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.4	0.8	0.0	0.0				0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.4	1.3	0.0	0.0				0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.3	0.0	5.3	6.7	0.0	0.0				9.7	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		402			462						117	
Approach Delay, s/veh		5.3			6.7						9.7	
Approach LOS		A			A						A	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		19.4		12.8		19.4						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		58.0		24.0		58.0						
Max Q Clear Time (g_c+I1), s		4.4		3.7		7.7						
Green Ext Time (p_c), s		4.8		1.0		7.3						
Intersection Summary												
HCM 6th Ctrl Delay			6.5									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	235	24	47	359	6	46	10	28	77	121	60
Future Volume (veh/h)	9	235	24	47	359	6	46	10	28	77	121	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1900	1870	1885	1900	1900	1900	1796	1722	1811	1900
Adj Flow Rate, veh/h	9	245	25	49	374	6	48	10	29	80	126	62
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	0	2	1	0	0	0	7	12	6	0
Cap, veh/h	26	414	42	111	544	9	111	72	210	143	226	111
Arrive On Green	0.01	0.25	0.25	0.06	0.29	0.29	0.06	0.17	0.17	0.09	0.20	0.20
Sat Flow, veh/h	1810	1683	172	1781	1850	30	1810	419	1215	1640	1139	561
Grp Volume(v), veh/h	9	0	270	49	0	380	48	0	39	80	0	188
Grp Sat Flow(s),veh/h/ln	1810	0	1854	1781	0	1880	1810	0	1634	1640	0	1700
Q Serve(g_s), s	0.2	0.0	5.4	1.1	0.0	7.5	1.1	0.0	0.8	2.0	0.0	4.2
Cycle Q Clear(g_c), s	0.2	0.0	5.4	1.1	0.0	7.5	1.1	0.0	0.8	2.0	0.0	4.2
Prop In Lane	1.00		0.09	1.00		0.02	1.00		0.74	1.00		0.33
Lane Grp Cap(c), veh/h	26	0	456	111	0	553	111	0	283	143	0	337
V/C Ratio(X)	0.35	0.00	0.59	0.44	0.00	0.69	0.43	0.00	0.14	0.56	0.00	0.56
Avail Cap(c_a), veh/h	282	0	1890	363	0	2006	369	0	964	252	0	918
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.4	0.0	13.9	18.8	0.0	13.0	18.9	0.0	14.6	18.3	0.0	15.1
Incr Delay (d2), s/veh	5.9	0.0	0.9	2.0	0.0	1.1	2.0	0.0	0.2	2.6	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.0	0.5	0.0	2.7	0.5	0.0	0.3	0.7	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	0.0	14.8	20.9	0.0	14.2	20.8	0.0	14.8	20.8	0.0	16.1
LnGrp LOS	C	A	B	C	A	B	C	A	B	C	A	B
Approach Vol, veh/h		279			429			87			268	
Approach Delay, s/veh		15.2			14.9			18.1			17.5	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.1	14.8	7.1	12.8	5.1	16.8	8.1	11.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	42.5	8.5	22.5	6.5	44.5	6.4	24.6
Max Q Clear Time (g_c+I1), s	3.1	7.4	3.1	6.2	2.2	9.5	4.0	2.8
Green Ext Time (p_c), s	0.0	1.4	0.0	0.8	0.0	2.0	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	15.9
HCM 6th LOS	B

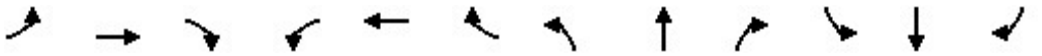
Intersection	
Int Delay, s/veh	3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	91	72	2	403	477	139
Future Vol, veh/h	91	72	2	403	477	139
Conflicting Peds, #/hr	0	48	25	0	0	25
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	2	0	2	2	0
Mvmt Flow	95	75	2	420	497	145

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1019	643	667	0	-	0
Stage 1	595	-	-	-	-	-
Stage 2	424	-	-	-	-	-
Critical Hdwy	6.4	6.22	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.318	2.2	-	-	-
Pot Cap-1 Maneuver	265	473	932	-	-	-
Stage 1	555	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	252	441	910	-	-	-
Mov Cap-2 Maneuver	252	-	-	-	-	-
Stage 1	540	-	-	-	-	-
Stage 2	648	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	910	-	252	441	-	-
HCM Lane V/C Ratio	0.002	-	0.376	0.17	-	-
HCM Control Delay (s)	9	0	27.7	14.8	-	-
HCM Lane LOS	A	A	D	B	-	-
HCM 95th %tile Q(veh)	0	-	1.7	0.6	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	975	597	27	466	16	358	157	53	187	368	46
Future Volume (veh/h)	15	975	597	27	466	16	358	157	53	187	368	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1885	1856	1900	1841	1796	1856	1885	1900	1856	1870	1826
Adj Flow Rate, veh/h	16	1016	0	28	485	17	373	164	55	195	383	48
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	1	3	0	4	7	3	1	0	3	2	5
Cap, veh/h	204	770		49	565	20	197	305	102	228	400	50
Arrive On Green	0.11	0.41	0.00	0.03	0.32	0.32	0.11	0.23	0.23	0.13	0.25	0.25
Sat Flow, veh/h	1810	1885	1572	1810	1768	62	1767	1351	453	1767	1629	204
Grp Volume(v), veh/h	16	1016	0	28	0	502	373	0	219	195	0	431
Grp Sat Flow(s),veh/h/ln	1810	1885	1572	1810	0	1830	1767	0	1804	1767	0	1833
Q Serve(g_s), s	0.8	39.9	0.0	1.5	0.0	25.1	10.9	0.0	10.5	10.6	0.0	22.6
Cycle Q Clear(g_c), s	0.8	39.9	0.0	1.5	0.0	25.1	10.9	0.0	10.5	10.6	0.0	22.6
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.25	1.00		0.11
Lane Grp Cap(c), veh/h	204	770		49	0	585	197	0	407	228	0	450
V/C Ratio(X)	0.08	1.32		0.57	0.00	0.86	1.89	0.00	0.54	0.86	0.00	0.96
Avail Cap(c_a), veh/h	204	770		93	0	751	197	0	407	259	0	450
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.8	28.9	0.0	46.9	0.0	31.1	43.4	0.0	33.3	41.7	0.0	36.3
Incr Delay (d2), s/veh	0.1	152.7	0.0	7.4	0.0	9.9	419.5	0.0	1.2	21.5	0.0	31.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	49.2	0.0	0.8	0.0	12.1	27.7	0.0	4.7	5.9	0.0	13.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	181.6	0.0	54.3	0.0	41.0	462.9	0.0	34.5	63.1	0.0	67.7
LnGrp LOS	D	F		D	A	D	F	A	C	E	A	E
Approach Vol, veh/h		1032			530			592			626	
Approach Delay, s/veh		179.4			41.7			304.4			66.3	
Approach LOS		F			D			F			E	

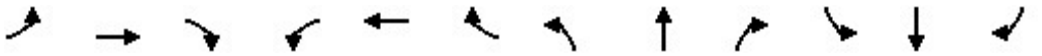
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.3	45.3	16.0	29.1	16.4	36.1	18.0	27.1
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	5.4	* 4.9	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	39.9	10.9	24.0	5.0	* 40	14.3	* 21
Max Q Clear Time (g_c+I1), s	3.5	41.9	12.9	24.6	2.8	27.1	12.6	12.5
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	4.1	0.1	0.6

Intersection Summary	
HCM 6th Ctrl Delay	154.3
HCM 6th LOS	F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	681	2	44	11	1	161	19	573	2	12	620	4
Future Volume (veh/h)	681	2	44	11	1	161	19	573	2	12	620	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1900	1900	1900	1900	1900	1648	1856	1900	1900	1841	1900
Adj Flow Rate, veh/h	709	2	46	11	1	168	20	597	2	12	646	4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	0	0	0	0	0	17	3	0	0	4	0
Cap, veh/h	206	0	577	51	25	347	36	790	3	27	735	643
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.02	0.43	0.43	0.01	0.40	0.40
Sat Flow, veh/h	308	1	1610	0	69	967	1570	1848	6	1810	1841	1610
Grp Volume(v), veh/h	711	0	46	180	0	0	20	0	599	12	646	4
Grp Sat Flow(s),veh/h/ln	309	0	1610	1036	0	0	1570	0	1854	1810	1841	1610
Q Serve(g_s), s	0.0	0.0	1.4	0.0	0.0	0.0	0.9	0.0	20.6	0.5	24.4	0.1
Cycle Q Clear(g_c), s	27.0	0.0	1.4	27.0	0.0	0.0	0.9	0.0	20.6	0.5	24.4	0.1
Prop In Lane	1.00		1.00	0.06		0.93	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	206	0	577	422	0	0	36	0	793	27	735	643
V/C Ratio(X)	3.45	0.00	0.08	0.43	0.00	0.00	0.56	0.00	0.76	0.45	0.88	0.01
Avail Cap(c_a), veh/h	206	0	577	422	0	0	127	0	1305	120	1269	1110
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.4	0.0	15.9	18.1	0.0	0.0	36.4	0.0	18.2	36.8	20.9	13.6
Incr Delay (d2), s/veh	1113.3	0.0	0.1	0.7	0.0	0.0	13.1	0.0	1.4	11.4	3.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	67.5	0.0	0.5	2.2	0.0	0.0	0.5	0.0	7.6	0.3	9.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	1143.7	0.0	16.0	18.7	0.0	0.0	49.5	0.0	19.6	48.2	24.4	13.6
LnGrp LOS	F	A	B	B	A	A	D	A	B	D	C	B
Approach Vol, veh/h		757			180			619			662	
Approach Delay, s/veh		1075.2			18.7			20.6			24.8	
Approach LOS		F			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	38.2		31.5	7.7	36.1		31.5				
Change Period (Y+Rc), s	4.5	6.0		4.5	6.0	* 6		4.5				
Max Green Setting (Gmax), s	5.0	53.0		27.0	6.1	* 52		27.0				
Max Q Clear Time (g_c+I1), s	2.5	22.6		29.0	2.9	26.4		29.0				
Green Ext Time (p_c), s	0.0	3.4		0.0	0.0	3.6		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		381.6
HCM 6th LOS		F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	790	21	7	499	1	52	0	13	5	0	31
Future Vol, veh/h	14	790	21	7	499	1	52	0	13	5	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	3	6	17	3	0	7	0	0	0	0	4
Mvmt Flow	15	823	22	7	520	1	54	0	14	5	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	521	0	0	845	0	0	1415	1399	834	1406	1410	521
Stage 1	-	-	-	-	-	-	864	864	-	535	535	-
Stage 2	-	-	-	-	-	-	551	535	-	871	875	-
Critical Hdwy	4.1	-	-	4.27	-	-	7.17	6.5	6.2	7.1	6.5	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.353	-	-	3.563	4	3.3	3.5	4	3.336
Pot Cap-1 Maneuver	1056	-	-	731	-	-	112	142	371	118	140	551
Stage 1	-	-	-	-	-	-	342	374	-	533	527	-
Stage 2	-	-	-	-	-	-	510	527	-	349	370	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1056	-	-	731	-	-	103	139	371	112	137	551
Mov Cap-2 Maneuver	-	-	-	-	-	-	103	139	-	112	137	-
Stage 1	-	-	-	-	-	-	337	369	-	526	522	-
Stage 2	-	-	-	-	-	-	476	522	-	331	365	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	68.2	16.3
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	120	1056	-	-	731	-	-	357
HCM Lane V/C Ratio	0.564	0.014	-	-	0.01	-	-	0.105
HCM Control Delay (s)	68.2	8.5	-	-	10	-	-	16.3
HCM Lane LOS	F	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	2.7	0	-	-	0	-	-	0.3

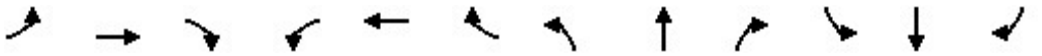
#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
1	**Viking Ave NW & SR 305 (Signalized)[1]**							
	EB (SR 305)	L	0.19	68	E	0.57	61	E
	EB (SR 305)	T	0.03	2.4	A	0.76	23.6	C
	EB (SR 305)	R	0	1.9	A	0.08	8.1	A
	EB Overall (SR 305)			**4.6**	**A**		**24.3**	**C**
	WB (SR 305)	L	0.19	68	E	0.59	57	E
	WB (SR 305)	TR	0.02	2.4	A	0.83	23.8	C
	WB (SR 305)	R	0	0	0	0	0	0
	WB Overall (SR 305)			**5.2**	**A**		**26.2**	**C**
	NB (Viking Ave NW)	L	0.03	63	E	0.53	59.9	E
	NB (Viking Ave NW)	TL	0.06	63.3	E	0.52	59.3	E
	NB (Viking Ave NW)	R	0	62.7	E	0.07	55	E
	NB Overall (Viking Ave NW)			**62.8**	**E**		**57.7**	**E**
	SB (Viking Ave NW)	L	0.12	63.8	E	0.38	59	E
	SB (Viking Ave NW)	TR	0.04	62.9	E	0.7	75.6	E
	SB (Viking Ave NW)	R	0	0	0	0	0	0
	SB Overall (Viking Ave NW)			**63.3**	**E**		**71.6**	**E**
	Overall			**11**	**B**		**29.5**	**C**
2	**SR 303 & NE McWilliams Rd (Signalized)**							
	EB (NE McWilliams Rd)	L	0.37	77.9	E	0.97	119.1	F
	EB (NE McWilliams Rd)	T	0.04	62	E	0.47	51.3	D
	EB (NE McWilliams Rd)	R	0.12	63	E	0.74	56.5	E
	EB Overall (NE McWilliams Rd)			**69.7**	**E**		**77.1**	**E**
	WB (NE McWilliams Rd)	L	0.38	76.4	E	1.02	133.6	F
	WB (NE McWilliams Rd)	T	0.06	62	E	0.33	49.7	D
	WB (NE McWilliams Rd)	R	0.16	63.2	E	0.51	52.1	D
	WB Overall (NE McWilliams Rd)			**68.4**	**E**		**87.8**	**F**
	NB (SR 303)	L	0.37	77.9	E	1.05	126.2	F
	NB (SR 303)	T	0.01	2.3	A	0.64	25.4	C
	NB (SR 303)	R	0	2.2	A	0.35	20.6	C
	NB Overall (SR 303)			**11.9**	**B**		**40.4**	**D**
	SB (SR 303)	L	0.36	88	F	0.93	105.6	F
	SB (SR 303)	T	0.01	2.4	A	0.74	31.3	C
	SB (SR 303)	R	0	2.4	A	0.31	22.8	C
	SB Overall (SR 303)			**7.5**	**A**		**38.1**	**D**
	Overall			**23.7**	**C**		**48**	**D**
3	**Alaskan Way & Yesler Way (Signalized)[1]**							
	EB (Yesler Way)	L	0	0	0	0	0	0
	EB (Yesler Way)	T	0	0	0	0	0	0
	EB (Yesler Way)	R	0.03	14.8	B	0.11	12	B
	EB Overall (Yesler Way)			**14.8**	**B**		**12**	**B**
	WB (Yesler Way)	L	0	0	0	0	0	0
	WB (Yesler Way)	T	0	0	0	0	0	0
	WB (Yesler Way)	R	0	0	0	0	0	0
	WB Overall (Yesler Way)			**0**	**A**		**0**	**A**
	NB (Alaskan Way)	L	0.03	16.7	B	0.3	14.3	B
	NB (Alaskan Way)	T	0.02	1.6	A	0.46	5.8	A
	NB (Alaskan Way)	R	0.01	1.5	A	0.13	4.6	A
	NB Overall (Alaskan Way)			**2.4**	**A**		**7.2**	**A**
	SB (Alaskan Way)	L	0	0	0	0	0	0
	SB (Alaskan Way)	T/TR	0.01	1	A	0.57	5.5	A
	SB (Alaskan Way)	R	0	0	0	0	0	0
	SB Overall (Alaskan Way)			**1**	**A**		**5.5**	**A**
	Overall			**3**	**A**		**6.6**	**A**
4	**Charleston Blvd & S Callow Ave (TWSC)[2]**							
	EB (Charleston Blvd)	L						
	EB (Charleston Blvd)	T						
	EB (Charleston Blvd)	R						
	EB Overall (Charleston Blvd)							
	WB (Charleston Blvd)	L						
	WB (Charleston Blvd)	T						
	WB (Charleston Blvd)	R	-	0	A	0.004	12.6	B
	WB Overall (Charleston Blvd)			**0**	**A**		**12.6**	**B**
	NB (S Callow Ave)	L						
	NB (S Callow Ave)	TR						
	NB (S Callow Ave)	R						
	NB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	SB (S Callow Ave)	L						
	SB (S Callow Ave)	T						
	SB (S Callow Ave)	R						
	SB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	Overall			**0**	**--**		**0**	

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
5	**Burwell St & Warren Ave (Signalized)**							
	EB (Burwell St)	L	0.02	2.6	A	0.76	35.9	D
	EB (Burwell St)	TL/T	0.01	2.5	A	0	0	A
	EB (Burwell St)	R	0	0	A	0.47	26.3	C
	EB Overall (Burwell St)			**2.6**	**A**		**32.2**	**C**
	WB (Burwell St)	L	0	0	A	0	0	A
	WB (Burwell St)	T	0.45	59	E	0.92	64.9	E
	WB (Burwell St)	R	0.02	51.9	D	0.26	34.7	C
	WB Overall (Burwell St)			**58.8**	**E**		**59**	**E**
	NB (Warren Ave)	L	0	0	A	0.33	57.6	E
	NB (Warren Ave)	LTR	0	0	A	0	0	A
	NB (Warren Ave)	R	0	0	A	0	0	A
	NB Overall (Warren Ave)			**0**	**0**		**57.6**	**E**
	SB (Warren Ave)	L	0.12	51.1	D	0.37	42.7	D
	SB (Warren Ave)	TL	0	0	A	0	0	A
	SB (Warren Ave)	R	0.04	1.6	A	0.48	15	B
	SB Overall (Warren Ave)			**9.7**	**A**		**20.5**	**C**
	Overall			**17.3**	**B**		**36.2**	**D**
6	**Burwell St & Pacific Ave (Signalized)**							
	EB (Pacific Ave)	L	0	0	A	0.24	5.3	A
	EB (Pacific Ave)	TL	0.07	2.6	A	0	0	A
	EB (Pacific Ave)	R	0.02	2.5	A	0.23	5.3	A
	EB Overall (Pacific Ave)			**2.5**	**A**		**5.3**	**A**
	WB (Pacific Ave	L	0.01	2.4	A	0.48	6.7	A
	WB (Pacific Ave	LTR	0	0	A	0	0	A
	WB (Pacific Ave	R	0	0	A	0	0	A
	WB Overall (Pacific Ave)			**2.4**	**A**		**6.7**	**A**
	NB (SR 303)	L	0	0	0	0	0	0
	NB (SR 303)	T	0	0	0	0	0	0
	NB (SR 303)	R	0	0	0	0	0	0
	NB Overall (SR 303)			**0**	**0**		**0**	**0**
	SB (SR 303)	L	0.34	17.2	B	0.25	9.7	A
	SB (SR 303)	LTR	0	0	A	0	0	A
	SB (SR 303)	R	0	0	A	0	0	A
	SB Overall (SR 303)			**17.2**	**B**		**9.7**	**A**
	Overall			**4.8**	**A**		**6.5**	**A**
7	**SR 166 & Sidney Ave (Signalized)**							
	EB (SR 166)	L	0.38	17.6	B	0.35	26.2	C
	EB (SR 166)	TR	0.02	6.9	A	0	0	A
	EB (SR 166)	R	0	0	A	0.59	14.8	B
	EB Overall (SR 166)			**14.6**	**B**		**15.2**	**B**
	WB (SR 166)	L	0.34	39.3	D	0.44	20.9	C
	WB (SR 166)	TR	0	0	A	0	0	A
	WB (SR 166)	R	0.14	8.1	A	0.69	14.2	B
	WB Overall (SR 166)			**8.9**	**A**		**14.9**	**B**
	NB (Sidney Ave)	L	0.18	27.1	C	0.43	20.8	C
	NB (Sidney Ave)	TR	0	0	A	0	0	A
	NB (Sidney Ave)	R	0.42	15.2	B	0.14	14.8	B
	NB Overall (Sidney Ave)			**15.3**	**B**		**18.1**	**B**
	SB (Sidney Ave)	L	0.18	27.1	C	0.56	20.8	C
	SB (Sidney Ave)	TR	0.01	13.4	B	0	0	A
	SB (Sidney Ave)	R	0	0	A	0.56	16.1	B
	SB Overall (Sidney Ave)			**20.2**	**C**		**17.5**	**B**
	Overall			**12.5**	**B**		**15.9**	**B**
8	**SW Barton St & Fauntleroy Way (TWSC)[2]**							
	EB (SW Barton St)	L	0.006	8.7	A	0.376	27.7	D
	EB (SW Barton St)	T						
	EB (SW Barton St)	R	0.005	8.4	A	0.17	14.8	B
	EB Overall (SW Barton St)			**8.6**	**A**		**22**	**C**
	WB (SW Barton St)	L						
	WB (SW Barton St)	T						
	WB (SW Barton St)	R						
	WB Overall (SW Barton St)							
	NB (Fauntleroy Way)	L	0.001	7.3	A	0.002	9	A
	NB (Fauntleroy Way)	T	-	0	A	-	0	A
	NB (Fauntleroy Way)	R						
	NB Overall (Fauntleroy Way)			**0.3**	**0**		**0**	**0**
	SB (Fauntleroy Way)	L						
	SB (Fauntleroy Way)	TR	-	-	-	-	-	-
	SB (Fauntleroy Way)	R						
	SB Overall (Fauntleroy Way)			**0**	**0**		**0**	**0**
	Overall			**2**			**3**	
9	**Sam Christopherson Ave & SR 3 W (Signalized)**							
	EB (SR 3 W)	L	0	0	A	0.08	38.9	D
	EB (SR 3 W)	T	0.05	7.7	A	1.32	181.6	F
	EB (SR 3 W)	R	0	0	0	0	0	0
	EB Overall (SR 3 W)			**7.7**	**A**		**179.4**	**F**
	WB (SR 3 W)	L	0	0	A	0.57	54.3	D
	WB (SR 3 W)	T	0	0	A	0	0	A
	WB (SR 3 W)	R	0.64	11.9	B	0.86	41	D
	WB Overall (SR 3 W)			**11.9**	**B**		**41.7**	**D**
	NB (SR 16)	L	0.81	26.5	C	1.89	462.9	F
	NB (SR 16)	T	0	0	A	0	0	A
	NB (SR 16)	R	0.02	12.9	B	0.54	34.5	C
	NB Overall (SR 16)			**26.1**	**C**		**304.4**	**F**
	SB (Sam Christopherson Ave)	L	0.42	40	D	0.86	63.1	E
	SB (Sam Christopherson Ave)	T	0	0	A	0	0	A
	SB (Sam Christopherson Ave)	R	0.15	21	C	0.96	67.7	E
	SB Overall (SR 16)			**28.9**	**C**		**66.3**	**E**
	Overall			**17.1**	**B**		**154.3**	**F**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
10	**Imperial Way & SR 3 W (Signalized)**							
	EB (Imperial Way)	L	0.02	14.2	B	3.45	1143.7	F
	EB (Imperial Way)	TL	0	0	A	0	0	A
	EB (Imperial Way)	R	0.08	16.6	B	0.08	16	B
	EB Overall (Imperial Way)			**14.7**	**B**		**1075.2**	**F**
	WB (Imperial Way)	L	0	0	A	0.43	18.7	B
	WB (Imperial Way)	LTR	0	0	A	0	0	A
	WB (Imperial Way)	R	0	0	A	0	0	A
	WB Overall (Imperial Way)			**0**	**0**		**18.7**	**B**
	NB (SR 3 W)	L	0.32	41.6	D	0.56	49.5	D
	NB (SR 3 W)	TR	0.06	6.3	A	0	0	A
	NB (SR 3 W)	R	0	0	A	0.76	19.6	B
	NB Overall (SR 3 W)			**7.9**	**A**		**20.6**	**C**
	SB (SR 3 W)	L	0.69	16	B	0.45	48.2	D
	SB (SR 3 W)	T	0.02	4.1	A	0.88	24.4	C
	SB (SR 3 W)	R	0.79	8.3	A	0.01	13.6	B
	SB Overall (SR 3 W)			**9.7**	**A**		**24.8**	**C**
	Overall			**9.6**	**A**		**381.6**	**F**
11	**SE Spring Creek Rd & SE Mullenix Rd (TWSC)[2]**							
	EB (SE Spring Creek Rd)	L	0.001	7.3	A	0.014	8.5	A
	EB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	EB (SE Spring Creek Rd)	R						
	EB Overall (SE Spring Creek Rd)			**0.5**	**0**		**0.1**	**0**
	WB (SE Spring Creek Rd)	L	-	0	A	0.01	10	A
	WB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	WB (SE Spring Creek Rd)	R						
	WB Overall (SE Spring Creek Rd)			**0**	**0**		**0.1**	**0**
	NB (SE Mullenix Rd)	L						
	NB (SE Mullenix Rd)	LTR	0.001	8.8	A	0.564	68.2	F
	NB (SE Mullenix Rd)	R						
	NB Overall (SE Mullenix Rd)			**8.8**	**A**		**68.2**	**F**
	SB (SE Mullenix Rd)	L						
	SB (SE Mullenix Rd)	LTR	0.001	8.5	A	0.105	16.3	C
	SB (SE Mullenix Rd)	R						
	SB Overall (SE Mullenix Rd)			**8.5**	**A**		**16.3**	**C**
	Overall			**0.5**			**3.6**	

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound
LTR = left/thru/right lanes
LOS = Level of Service
TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)
V/C = Volume to capacity ratio
Delay is Measured in Seconds Per Vehicle (sec/veh)
Red cells denote approaches and lane groups operating at unacceptable conditions.
1 - HCM 2000 Analysis
2 - The worst movement delay is reported for LOS.



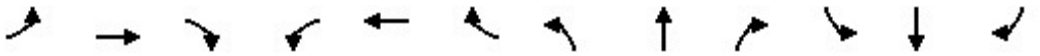
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	1306	50	51	1034	65	30	41	96	62	24	78
Future Volume (vph)	75	1306	50	51	1034	65	30	41	96	62	24	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1570	3406	1482	1719	3388		1573	1583	1553	1492	1560	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1570	3406	1482	1719	3388		1573	1583	1553	1492	1560	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	78	1360	52	53	1077	68	31	43	100	65	25	81
RTOR Reduction (vph)	0	0	14	0	2	0	0	0	93	0	75	0
Lane Group Flow (vph)	78	1360	38	53	1143	0	28	46	7	65	31	0
Heavy Vehicles (%)	15%	6%	9%	5%	5%	15%	9%	14%	4%	21%	4%	9%
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	11.5	85.3	94.2	7.8	81.6		8.9	8.9	8.9	9.3	9.3	
Effective Green, g (s)	11.5	85.3	94.2	7.8	81.6		8.9	8.9	8.9	9.3	9.3	
Actuated g/C Ratio	0.09	0.66	0.72	0.06	0.63		0.07	0.07	0.07	0.07	0.07	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	138	2234	1073	103	2126		107	108	106	106	111	
v/s Ratio Prot	c0.05	c0.40	0.00	0.03	0.34		0.02	c0.03		c0.04	0.02	
v/s Ratio Perm			0.02						0.00			
v/c Ratio	0.57	0.61	0.04	0.51	0.54		0.26	0.43	0.06	0.61	0.28	
Uniform Delay, d1	56.9	12.8	5.1	59.3	13.6		57.4	58.1	56.7	58.6	57.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.2	1.2	0.0	3.2	1.0		1.0	2.0	0.2	8.7	1.0	
Delay (s)	61.1	14.0	5.1	62.5	14.6		58.4	60.1	56.8	67.3	58.2	
Level of Service	E	B	A	E	B		E	E	E	E	E	
Approach Delay (s)		16.2			16.7			57.9			61.6	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	33	89	116	53	113	103	577	61	46	660	72
Future Volume (veh/h)	106	33	89	116	53	113	103	577	61	46	660	72
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1856	1811	1841	1856	1841	1841	1856	1796	1781	1856	1900
Adj Flow Rate, veh/h	110	34	93	121	55	118	107	601	64	48	688	75
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	3	6	4	3	4	4	3	7	8	3	0
Cap, veh/h	133	201	166	145	212	176	132	2208	953	64	2077	946
Arrive On Green	0.08	0.11	0.11	0.08	0.11	0.11	0.08	0.63	0.63	0.04	0.59	0.59
Sat Flow, veh/h	1739	1856	1531	1753	1856	1535	1753	3526	1521	1697	3526	1606
Grp Volume(v), veh/h	110	34	93	121	55	118	107	601	64	48	688	75
Grp Sat Flow(s),veh/h/ln	1739	1856	1531	1753	1856	1535	1753	1763	1521	1697	1763	1606
Q Serve(g_s), s	8.1	2.2	7.5	8.8	3.5	9.6	7.8	10.0	2.1	3.6	12.9	2.6
Cycle Q Clear(g_c), s	8.1	2.2	7.5	8.8	3.5	9.6	7.8	10.0	2.1	3.6	12.9	2.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	133	201	166	145	212	176	132	2208	953	64	2077	946
V/C Ratio(X)	0.83	0.17	0.56	0.84	0.26	0.67	0.81	0.27	0.07	0.74	0.33	0.08
Avail Cap(c_a), veh/h	166	520	429	167	520	430	248	2208	953	175	2077	946
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.2	52.6	55.0	58.8	52.5	55.2	59.2	10.9	9.5	61.9	13.6	11.5
Incr Delay (d2), s/veh	23.2	0.3	2.5	26.3	0.5	3.8	11.4	0.3	0.1	15.5	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	1.0	3.0	5.0	1.7	3.9	3.9	3.9	0.7	1.9	5.2	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.4	53.0	57.5	85.1	53.1	59.0	70.6	11.3	9.6	77.4	14.1	11.7
LnGrp LOS	F	D	E	F	D	E	E	B	A	E	B	B
Approach Vol, veh/h		237			294			772			811	
Approach Delay, s/veh		68.4			68.6			19.3			17.6	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	86.4	15.3	18.7	14.4	81.6	14.6	19.5
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	5.6	12.0	10.8	9.5	9.8	14.9	10.1	11.6
Green Ext Time (p_c), s	0.0	4.3	0.0	0.4	0.1	4.9	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	31.0
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	139	0	0	0	71	801	266	0	382	6
Future Volume (vph)	0	0	139	0	0	0	71	801	266	0	382	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2733				3367	3406	1510		3296	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2733				3367	3406	1510		3296	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	145	0	0	0	74	834	277	0	398	6
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	123	0	2	0
Lane Group Flow (vph)	0	0	145	0	0	0	74	834	154	0	402	0
Confl. Peds. (#/hr)			1						27			58
Confl. Bikes (#/hr)			2						8			2
Heavy Vehicles (%)	0%	0%	4%	0%	0%	0%	4%	6%	2%	0%	9%	25%
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			7.8				7.8	21.1	21.1		21.1	
Effective Green, g (s)			9.8				7.8	21.1	21.1		23.1	
Actuated g/C Ratio			0.26				0.21	0.56	0.56		0.61	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			706				692	1896	840		2008	
v/s Ratio Prot			c0.05				0.02	c0.24			0.12	
v/s Ratio Perm									0.10			
v/c Ratio			0.21				0.11	0.44	0.18		0.20	
Uniform Delay, d1			11.0				12.2	4.9	4.1		3.3	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.1				0.1	0.2	0.1		0.0	
Delay (s)			11.1				12.3	5.1	4.3		3.3	
Level of Service			B				B	A	A		A	
Approach Delay (s)		11.1			0.0			5.3			3.3	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

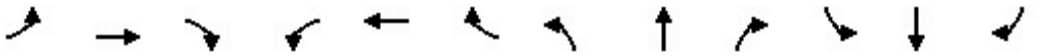
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	931	7	0	774
Future Vol, veh/h	0	2	931	7	0	774
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	0	100	2	71	0	4
Mvmt Flow	0	2	970	7	0	806

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	489	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	8.9	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	4.3	-	-	-	-
Pot Cap-1 Maneuver	0	330	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	330	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	0
HCM LOS	C		

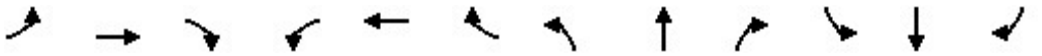
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	330	-
HCM Lane V/C Ratio	-	-	0.006	-
HCM Control Delay (s)	-	-	16	-
HCM Lane LOS	-	-	C	-
HCM 95th %tile Q(veh)	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	464	245	0	0	173	17	0	1	2	83	2	340
Future Volume (veh/h)	464	245	0	0	173	17	0	1	2	83	2	340
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.96	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1870	0	0	1781	1826	1900	1900	1900	1752	1900	1841
Adj Flow Rate, veh/h	483	255	0	0	180	18	0	1	2	86	2	354
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	2	0	0	8	5	0	0	0	10	0	4
Cap, veh/h	965	963	0	0	228	196	0	13	26	220	5	1039
Arrive On Green	0.54	0.54	0.00	0.00	0.13	0.13	0.00	0.02	0.02	0.12	0.12	0.12
Sat Flow, veh/h	1781	1870	0	0	1781	1529	0	550	1100	1770	41	1560
Grp Volume(v), veh/h	483	255	0	0	180	18	0	0	3	88	0	354
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1781	1529	0	0	1650	1811	0	1560
Q Serve(g_s), s	18.7	8.4	0.0	0.0	10.8	1.1	0.0	0.0	0.2	4.9	0.0	10.8
Cycle Q Clear(g_c), s	18.7	8.4	0.0	0.0	10.8	1.1	0.0	0.0	0.2	4.9	0.0	10.8
Prop In Lane	1.00		0.00	0.00		1.00	0.00		0.67	0.98		1.00
Lane Grp Cap(c), veh/h	965	963	0	0	228	196	0	0	40	225	0	1039
V/C Ratio(X)	0.50	0.26	0.00	0.00	0.79	0.09	0.00	0.00	0.08	0.39	0.00	0.34
Avail Cap(c_a), veh/h	965	963	0	0	437	375	0	0	360	280	0	1087
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.8	13.5	0.0	0.0	46.5	42.3	0.0	0.0	52.5	44.3	0.0	7.9
Incr Delay (d2), s/veh	1.9	0.7	0.0	0.0	7.2	0.2	0.0	0.0	1.0	1.3	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	3.5	0.0	0.0	5.2	0.4	0.0	0.0	0.1	2.3	0.0	9.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.7	14.1	0.0	0.0	53.7	42.6	0.0	0.0	53.5	45.7	0.0	8.2
LnGrp LOS	B	B	A	A	D	D	A	A	D	D	A	A
Approach Vol, veh/h		738			198			3			442	
Approach Delay, s/veh		16.5			52.7			53.5			15.6	
Approach LOS		B			D			D			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		64.6		18.7		19.1		7.6				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		20.7		12.8		12.8		2.2				
Green Ext Time (p_c), s		0.7		0.9		1.0		0.0				

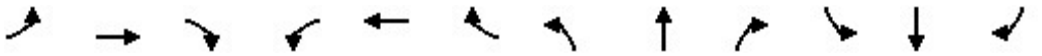
Intersection Summary												
HCM 6th Ctrl Delay			21.5									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	127	237	49	128	6	0	0	0	29	92	12
Future Volume (veh/h)	6	127	237	49	128	6	0	0	0	29	92	12
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.96				1.00		0.78
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1707	1870	1693	1559	1870	1900				1900	1796	1900
Adj Flow Rate, veh/h	6	132	247	51	133	6				30	96	12
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	13	2	14	23	2	0				0	7	0
Cap, veh/h	133	667	509	239	493	19				137	439	55
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36				0.37	0.37	0.37
Sat Flow, veh/h	22	1836	1401	239	1359	52				370	1184	148
Grp Volume(v), veh/h	138	0	247	190	0	0				138	0	0
Grp Sat Flow(s),veh/h/ln	1859	0	1401	1650	0	0				1702	0	0
Q Serve(g_s), s	0.0	0.0	4.1	0.0	0.0	0.0				1.7	0.0	0.0
Cycle Q Clear(g_c), s	1.5	0.0	4.1	2.2	0.0	0.0				1.7	0.0	0.0
Prop In Lane	0.04		1.00	0.27		0.03				0.22		0.09
Lane Grp Cap(c), veh/h	800	0	509	751	0	0				631	0	0
V/C Ratio(X)	0.17	0.00	0.49	0.25	0.00	0.00				0.22	0.00	0.00
Avail Cap(c_a), veh/h	3241	0	2379	2761	0	0				1756	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	6.6	0.0	7.4	6.8	0.0	0.0				6.5	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.5	0.4	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.9	0.6	0.0	0.0				0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.8	0.0	8.9	7.2	0.0	0.0				6.8	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		385			190						138	
Approach Delay, s/veh		8.2			7.2						6.8	
Approach LOS		A			A						A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		14.9		15.1		14.9						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		51.0		31.0		51.0						
Max Q Clear Time (g_c+I1), s		6.1		3.7		4.2						
Green Ext Time (p_c), s		4.1		1.4		2.6						

Intersection Summary												
HCM 6th Ctrl Delay			7.6									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	171	7	27	323	62	19	78	13	9	10	7
Future Volume (veh/h)	31	171	7	27	323	62	19	78	13	9	10	7
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1826	1737	1811	1870	1900	1900	1900	1707	1218	1530	1900
Adj Flow Rate, veh/h	32	178	7	28	336	65	20	81	14	9	10	7
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	5	11	6	2	0	0	0	13	46	25	0
Cap, veh/h	82	549	22	70	472	91	54	240	42	17	115	80
Arrive On Green	0.05	0.31	0.31	0.04	0.31	0.31	0.03	0.15	0.15	0.01	0.14	0.14
Sat Flow, veh/h	1810	1745	69	1725	1523	295	1810	1570	271	1160	836	586
Grp Volume(v), veh/h	32	0	185	28	0	401	20	0	95	9	0	17
Grp Sat Flow(s),veh/h/ln	1810	0	1813	1725	0	1817	1810	0	1842	1160	0	1422
Q Serve(g_s), s	0.6	0.0	2.9	0.6	0.0	7.4	0.4	0.0	1.7	0.3	0.0	0.4
Cycle Q Clear(g_c), s	0.6	0.0	2.9	0.6	0.0	7.4	0.4	0.0	1.7	0.3	0.0	0.4
Prop In Lane	1.00		0.04	1.00		0.16	1.00		0.15	1.00		0.41
Lane Grp Cap(c), veh/h	82	0	570	70	0	563	54	0	282	17	0	195
V/C Ratio(X)	0.39	0.00	0.32	0.40	0.00	0.71	0.37	0.00	0.34	0.54	0.00	0.09
Avail Cap(c_a), veh/h	312	0	2622	389	0	2724	360	0	1100	200	0	811
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.5	0.0	9.9	17.6	0.0	11.5	17.9	0.0	14.3	18.5	0.0	14.2
Incr Delay (d2), s/veh	2.2	0.0	0.2	2.7	0.0	1.3	3.0	0.0	0.5	18.8	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.9	0.3	0.0	2.4	0.2	0.0	0.7	0.2	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.7	0.0	10.1	20.4	0.0	12.8	21.0	0.0	14.8	37.3	0.0	14.3
LnGrp LOS	B	A	B	C	A	B	C	A	B	D	A	B
Approach Vol, veh/h		217			429			115			26	
Approach Delay, s/veh		11.5			13.3			15.8			22.3	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.0	16.4	5.6	9.7	6.2	16.2	5.0	10.3
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	54.5	7.5	21.5	6.5	56.5	6.5	22.5
Max Q Clear Time (g_c+I1), s	2.6	4.9	2.4	2.4	2.6	9.4	2.3	3.7
Green Ext Time (p_c), s	0.0	0.9	0.0	0.0	0.0	2.3	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	13.5
HCM 6th LOS	B

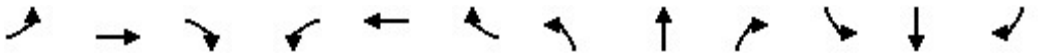
Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	100	68	63	333	250	99
Future Vol, veh/h	100	68	63	333	250	99
Conflicting Peds, #/hr	0	23	12	0	0	12
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	6	5	8	3	4	0
Mvmt Flow	104	71	66	347	260	103

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	803	347	375	0	-	0
Stage 1	324	-	-	-	-	-
Stage 2	479	-	-	-	-	-
Critical Hdwy	6.46	6.25	4.18	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.345	2.272	-	-	-
Pot Cap-1 Maneuver	347	689	1151	-	-	-
Stage 1	724	-	-	-	-	-
Stage 2	615	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	315	666	1138	-	-	-
Mov Cap-2 Maneuver	315	-	-	-	-	-
Stage 1	665	-	-	-	-	-
Stage 2	608	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.5	1.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1138	-	315	666	-	-
HCM Lane V/C Ratio	0.058	-	0.331	0.106	-	-
HCM Control Delay (s)	8.4	0	22	11	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.2	-	1.4	0.4	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	533	219	6	571	9	370	70	71	91	104	10
Future Volume (veh/h)	6	533	219	6	571	9	370	70	71	91	104	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	625	1826	1767	1900	1737	1604	1707	1737	1796	1752	1781	1366
Adj Flow Rate, veh/h	6	555	0	6	595	9	385	73	74	95	108	10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	86	5	9	0	11	20	13	11	7	10	8	36
Cap, veh/h	5	816		14	755	11	238	134	136	121	161	15
Arrive On Green	0.01	0.45	0.00	0.01	0.44	0.44	0.15	0.17	0.17	0.07	0.10	0.10
Sat Flow, veh/h	596	1826	1497	1810	1707	26	1626	791	802	1668	1606	149
Grp Volume(v), veh/h	6	555	0	6	0	604	385	0	147	95	0	118
Grp Sat Flow(s),veh/h/ln	596	1826	1497	1810	0	1732	1626	0	1593	1668	0	1755
Q Serve(g_s), s	0.5	16.3	0.0	0.2	0.0	20.2	9.9	0.0	5.7	3.8	0.0	4.4
Cycle Q Clear(g_c), s	0.5	16.3	0.0	0.2	0.0	20.2	9.9	0.0	5.7	3.8	0.0	4.4
Prop In Lane	1.00		1.00	1.00		0.01	1.00		0.50	1.00		0.08
Lane Grp Cap(c), veh/h	5	816		14	0	766	238	0	271	121	0	176
V/C Ratio(X)	1.28	0.68		0.42	0.00	0.79	1.62	0.00	0.54	0.79	0.00	0.67
Avail Cap(c_a), veh/h	44	1374		134	0	1308	238	0	520	288	0	622
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.6	14.9	0.0	33.4	0.0	16.1	28.9	0.0	25.7	30.9	0.0	29.4
Incr Delay (d2), s/veh	260.7	1.2	0.0	14.0	0.0	3.5	296.8	0.0	1.3	9.9	0.0	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	5.9	0.0	0.1	0.0	7.4	23.3	0.0	2.2	1.8	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	294.3	16.1	0.0	47.4	0.0	19.7	325.7	0.0	26.9	40.7	0.0	32.6
LnGrp LOS	F	B		D	A	B	F	A	C	D	A	C
Approach Vol, veh/h		561			610			532			213	
Approach Delay, s/veh		19.1			20.0			243.1			36.2	
Approach LOS		B			B			F			D	

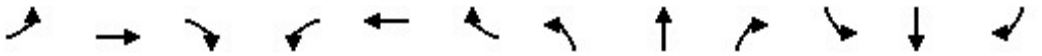
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.1	35.6	15.0	11.9	5.4	35.3	10.3	16.6
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	4.9	* 5.4	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	50.9	9.9	24.0	5.0	* 51	11.7	* 22
Max Q Clear Time (g_c+I1), s	2.2	18.3	11.9	6.4	2.5	22.2	5.8	7.7
Green Ext Time (p_c), s	0.0	4.6	0.0	0.4	0.0	7.7	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	83.5
HCM 6th LOS	F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	1	13	2	0	5	35	619	4	103	294	362
Future Volume (veh/h)	51	1	13	2	0	5	35	619	4	103	294	362
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1203	1900	1604	1900	1900	1900	1870	1856	1900	1900	1781	1900
Adj Flow Rate, veh/h	53	1	14	2	0	5	36	645	4	107	306	377
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	47	0	20	0	0	0	2	3	0	0	8	0
Cap, veh/h	307	2	116	143	14	97	74	824	5	158	879	794
Arrive On Green	0.09	0.09	0.09	0.09	0.00	0.09	0.04	0.45	0.45	0.09	0.49	0.49
Sat Flow, veh/h	1483	28	1359	297	159	1139	1781	1842	11	1810	1781	1610
Grp Volume(v), veh/h	54	0	14	7	0	0	36	0	649	107	306	377
Grp Sat Flow(s),veh/h/ln	1511	0	1359	1595	0	0	1781	0	1853	1810	1781	1610
Q Serve(g_s), s	0.6	0.0	0.4	0.0	0.0	0.0	0.8	0.0	11.8	2.3	4.1	6.1
Cycle Q Clear(g_c), s	1.2	0.0	0.4	0.2	0.0	0.0	0.8	0.0	11.8	2.3	4.1	6.1
Prop In Lane	0.98		1.00	0.29		0.71	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	309	0	116	253	0	0	74	0	829	158	879	794
V/C Ratio(X)	0.17	0.00	0.12	0.03	0.00	0.00	0.49	0.00	0.78	0.68	0.35	0.47
Avail Cap(c_a), veh/h	1172	0	930	1182	0	0	307	0	2959	229	2763	2497
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.0	0.0	16.7	16.6	0.0	0.0	18.5	0.0	9.3	17.5	6.1	6.6
Incr Delay (d2), s/veh	0.3	0.0	0.5	0.0	0.0	0.0	5.0	0.0	1.5	5.0	0.2	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.1	0.1	0.0	0.0	0.3	0.0	2.6	0.9	0.7	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.3	0.0	17.1	16.6	0.0	0.0	23.5	0.0	10.8	22.4	6.3	7.0
LnGrp LOS	B	A	B	B	A	A	C	A	B	C	A	A
Approach Vol, veh/h		68			7			685			790	
Approach Delay, s/veh		17.3			16.6			11.5			8.8	
Approach LOS		B			B			B			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	23.6		7.9	6.1	25.5		7.9				
Change Period (Y+Rc), s	4.5	6.0		4.5	4.5	6.0		4.5				
Max Green Setting (Gmax), s	5.0	63.0		27.0	6.8	61.2		27.0				
Max Q Clear Time (g_c+I1), s	4.3	13.8		3.2	2.8	8.1		2.2				
Green Ext Time (p_c), s	0.0	3.9		0.3	0.0	2.7		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			10.4									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	199	27	14	573	2	14	0	2	1	0	13
Future Vol, veh/h	13	199	27	14	573	2	14	0	2	1	0	13
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	7	5	20	13	1	0	13	0	0	100	0	0
Mvmt Flow	14	207	28	15	597	2	15	0	2	1	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	599	0	0	236	0	0	885	879	222	878	892	598
Stage 1	-	-	-	-	-	-	250	250	-	628	628	-
Stage 2	-	-	-	-	-	-	635	629	-	250	264	-
Critical Hdwy	4.17	-	-	4.23	-	-	7.23	6.5	6.2	8.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.23	5.5	-	7.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.23	5.5	-	7.1	5.5	-
Follow-up Hdwy	2.263	-	-	2.317	-	-	3.617	4	3.3	4.4	4	3.3
Pot Cap-1 Maneuver	954	-	-	1269	-	-	254	288	823	185	283	506
Stage 1	-	-	-	-	-	-	730	704	-	340	479	-
Stage 2	-	-	-	-	-	-	449	478	-	580	694	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	954	-	-	1268	-	-	242	280	822	181	275	506
Mov Cap-2 Maneuver	-	-	-	-	-	-	242	280	-	181	275	-
Stage 1	-	-	-	-	-	-	718	693	-	335	473	-
Stage 2	-	-	-	-	-	-	432	472	-	570	683	-

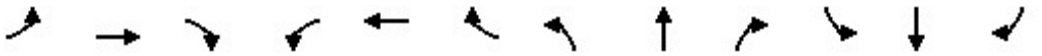
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	19.5	13.3
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	265	954	-	-	1268	-	-	448
HCM Lane V/C Ratio	0.063	0.014	-	-	0.012	-	-	0.033
HCM Control Delay (s)	19.5	8.8	-	-	7.9	-	-	13.3
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	957	73	84	1025	61	60	33	68	54	43	93
Future Volume (vph)	50	957	73	84	1025	61	60	33	68	54	43	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1552	1770	3505		1681	1743	1559	1770	1672	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1552	1770	3505		1681	1743	1559	1770	1672	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	52	997	76	88	1068	64	62	34	71	56	45	97
RTOR Reduction (vph)	0	0	24	0	2	0	0	0	66	0	59	0
Lane Group Flow (vph)	52	997	52	88	1130	0	48	49	5	56	83	0
Confl. Peds. (#/hr)			1			1			3	3		
Turn Type	Prot	NA	pm+ov	Prot	NA		Split	NA	Perm	Split	NA	
Protected Phases	5	2	8	1	6		8	8		4	4	
Permitted Phases			2						8			
Actuated Green, G (s)	7.7	79.3	88.1	11.4	83.0		8.8	8.8	8.8	11.8	11.8	
Effective Green, g (s)	7.7	79.3	88.1	11.4	83.0		8.8	8.8	8.8	11.8	11.8	
Actuated g/C Ratio	0.06	0.61	0.68	0.09	0.64		0.07	0.07	0.07	0.09	0.09	
Clearance Time (s)	4.6	4.9	4.6	4.6	4.9		4.6	4.6	4.6	4.6	4.6	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)	104	2158	1051	155	2237		113	117	105	160	151	
v/s Ratio Prot	0.03	0.28	0.00	c0.05	c0.32		c0.03	0.03		0.03	c0.05	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	0.50	0.46	0.05	0.57	0.51		0.42	0.42	0.05	0.35	0.55	
Uniform Delay, d1	59.3	13.8	7.0	56.9	12.5		58.2	58.1	56.7	55.5	56.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.7	0.7	0.0	3.8	0.8		1.9	1.8	0.1	1.0	3.2	
Delay (s)	62.0	14.5	7.0	60.8	13.4		60.0	59.9	56.8	56.5	59.8	
Level of Service	E	B	A	E	B		E	E	E	E	E	
Approach Delay (s)		16.2			16.8			58.6			58.8	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

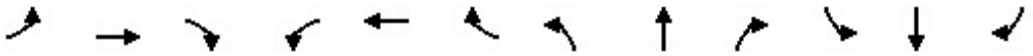
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	84	109	111	60	79	167	726	173	108	765	139
Future Volume (veh/h)	105	84	109	111	60	79	167	726	173	108	765	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.99	1.00		1.00	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	109	88	114	116	62	82	174	756	180	112	797	145
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	133	221	182	140	229	192	200	2068	920	136	1940	843
Arrive On Green	0.07	0.12	0.12	0.08	0.12	0.12	0.11	0.58	0.58	0.08	0.55	0.55
Sat Flow, veh/h	1781	1870	1543	1781	1870	1570	1781	3554	1581	1781	3554	1544
Grp Volume(v), veh/h	109	88	114	116	62	82	174	756	180	112	797	145
Grp Sat Flow(s),veh/h/ln	1781	1870	1543	1781	1870	1570	1781	1777	1581	1781	1777	1544
Q Serve(g_s), s	7.8	5.7	9.1	8.3	3.9	6.3	12.5	14.7	7.0	8.1	17.1	6.1
Cycle Q Clear(g_c), s	7.8	5.7	9.1	8.3	3.9	6.3	12.5	14.7	7.0	8.1	17.1	6.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	133	221	182	140	229	192	200	2068	920	136	1940	843
V/C Ratio(X)	0.82	0.40	0.62	0.83	0.27	0.43	0.87	0.37	0.20	0.82	0.41	0.17
Avail Cap(c_a), veh/h	170	524	432	170	524	439	252	2068	920	184	1940	843
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	59.3	53.0	54.6	59.0	51.8	52.8	56.7	14.4	12.8	59.2	17.3	14.8
Incr Delay (d2), s/veh	21.4	1.0	3.0	23.7	0.5	1.3	22.2	0.5	0.5	19.1	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	2.7	3.7	4.7	1.9	0.1	6.9	6.0	2.6	4.4	7.1	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	80.7	54.0	57.5	82.7	52.3	54.1	78.9	14.9	13.3	78.2	17.9	15.2
LnGrp LOS	F	D	E	F	D	D	E	B	B	E	B	B
Approach Vol, veh/h		311			260			1110			1054	
Approach Delay, s/veh		64.7			66.4			24.7			24.0	
Approach LOS		E			E			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.5	80.6	14.8	20.0	19.2	76.0	14.3	20.5
Change Period (Y+Rc), s	4.6	5.0	4.6	4.6	4.6	5.0	4.6	4.6
Max Green Setting (Gmax), s	13.4	49.0	12.4	36.4	18.4	44.0	12.4	36.4
Max Q Clear Time (g_c+I1), s	10.1	16.7	10.3	11.1	14.5	19.1	9.8	8.3
Green Ext Time (p_c), s	0.1	6.0	0.0	0.7	0.2	5.9	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	32.9
HCM 6th LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	54	0	0	0	148	570	118	0	755	17
Future Volume (vph)	0	0	54	0	0	0	148	570	118	0	755	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			2.5				4.5	4.5	4.5		2.5	
Lane Util. Factor			0.88				0.97	0.95	1.00		0.95	
Frpb, ped/bikes			1.00				1.00	1.00	0.95		1.00	
Flpb, ped/bikes			1.00				1.00	1.00	1.00		1.00	
Frt			0.85				1.00	1.00	0.85		1.00	
Flt Protected			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (prot)			2787				3433	3539	1511		3525	
Flt Permitted			1.00				0.95	1.00	1.00		1.00	
Satd. Flow (perm)			2787				3433	3539	1511		3525	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	56	0	0	0	154	594	123	0	786	18
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	59	0	3	0
Lane Group Flow (vph)	0	0	56	0	0	0	154	594	64	0	801	0
Confl. Peds. (#/hr)									36			39
Confl. Bikes (#/hr)												13
Turn Type			Over				Prot	NA	Perm		NA	
Protected Phases			5				5	2			6	
Permitted Phases									2			
Actuated Green, G (s)			7.8				7.8	18.1	18.1		18.1	
Effective Green, g (s)			9.8				7.8	18.1	18.1		20.1	
Actuated g/C Ratio			0.28				0.22	0.52	0.52		0.58	
Clearance Time (s)			4.5				4.5	4.5	4.5		4.5	
Vehicle Extension (s)			3.0				3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)			782				767	1835	783		2030	
v/s Ratio Prot			0.02				c0.04	0.17			c0.23	
v/s Ratio Perm									0.04			
v/c Ratio			0.07				0.20	0.32	0.08		0.39	
Uniform Delay, d1			9.2				11.0	4.9	4.2		4.1	
Progression Factor			1.00				1.00	1.00	1.00		1.00	
Incremental Delay, d2			0.0				0.1	0.1	0.0		0.1	
Delay (s)			9.3				11.1	5.0	4.3		4.2	
Level of Service			A				B	A	A		A	
Approach Delay (s)		9.3			0.0			6.0			4.2	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	34.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

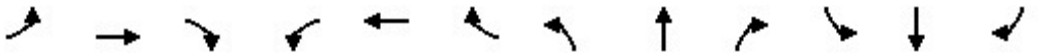
Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	1	708	3	0	864
Future Vol, veh/h	0	1	708	3	0	864
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1	738	3	0	900

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	371	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	626	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	626	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0
HCM LOS	B		

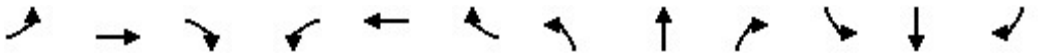
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	626	-
HCM Lane V/C Ratio	-	-	0.002	-
HCM Control Delay (s)	-	-	10.8	-
HCM Lane LOS	-	-	B	-
HCM 95th %tile Q(veh)	-	-	0	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	342	229	1	0	266	64	4	3	1	64	1	262
Future Volume (veh/h)	342	229	1	0	266	64	4	3	1	64	1	262
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	0	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	356	239	1	0	277	67	4	3	1	67	1	273
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	0	2	2	2	2	2	2	2	2
Cap, veh/h	930	971	4	0	327	277	15	12	4	183	3	992
Arrive On Green	0.52	0.52	0.52	0.00	0.17	0.17	0.02	0.02	0.02	0.10	0.10	0.10
Sat Flow, veh/h	1781	1861	8	0	1870	1581	891	669	223	1756	26	1585
Grp Volume(v), veh/h	356	0	240	0	277	67	8	0	0	68	0	273
Grp Sat Flow(s),veh/h/ln	1781	0	1869	0	1870	1581	1783	0	0	1783	0	1585
Q Serve(g_s), s	13.1	0.0	7.7	0.0	15.8	4.0	0.5	0.0	0.0	3.9	0.0	8.6
Cycle Q Clear(g_c), s	13.1	0.0	7.7	0.0	15.8	4.0	0.5	0.0	0.0	3.9	0.0	8.6
Prop In Lane	1.00		0.00	0.00		1.00	0.50		0.12	0.99		1.00
Lane Grp Cap(c), veh/h	930	0	975	0	327	277	31	0	0	185	0	992
V/C Ratio(X)	0.38	0.00	0.25	0.00	0.85	0.24	0.26	0.00	0.00	0.37	0.00	0.28
Avail Cap(c_a), veh/h	930	0	975	0	459	388	389	0	0	275	0	1072
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.7	0.0	14.4	0.0	43.9	39.1	53.4	0.0	0.0	45.9	0.0	9.3
Incr Delay (d2), s/veh	1.2	0.0	0.6	0.0	10.8	0.5	5.2	0.0	0.0	1.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	0.0	3.4	0.0	8.2	1.6	0.3	0.0	0.0	1.8	0.0	7.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.9	0.0	15.0	0.0	54.8	39.6	58.6	0.0	0.0	47.4	0.0	9.5
LnGrp LOS	B	A	B	A	D	D	E	A	A	D	A	A
Approach Vol, veh/h		596			344			8			341	
Approach Delay, s/veh		16.2			51.8			58.6			17.0	
Approach LOS		B			D			E			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		62.4		16.4		24.2		6.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		22.0		17.0		27.0		24.0				
Max Q Clear Time (g_c+I1), s		15.1		10.6		17.8		2.5				
Green Ext Time (p_c), s		2.4		0.9		1.4		0.0				

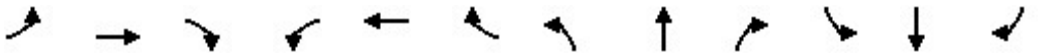
Intersection Summary												
HCM 6th Ctrl Delay			26.2									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	133	112	33	232	35	0	0	0	11	41	21
Future Volume (veh/h)	16	133	112	33	232	35	0	0	0	11	41	21
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.96				1.00		0.82
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870				1870	1870	1870
Adj Flow Rate, veh/h	17	139	117	34	242	36				11	43	22
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2				2	2	2
Cap, veh/h	187	720	644	196	604	84				65	254	130
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41				0.27	0.27	0.27
Sat Flow, veh/h	69	1751	1568	90	1469	203				239	934	478
Grp Volume(v), veh/h	156	0	117	312	0	0				76	0	0
Grp Sat Flow(s),veh/h/ln	1821	0	1568	1763	0	0				1651	0	0
Q Serve(g_s), s	0.0	0.0	1.2	0.0	0.0	0.0				0.9	0.0	0.0
Cycle Q Clear(g_c), s	1.4	0.0	1.2	3.1	0.0	0.0				0.9	0.0	0.0
Prop In Lane	0.11		1.00	0.11		0.12				0.14		0.29
Lane Grp Cap(c), veh/h	907	0	644	883	0	0				448	0	0
V/C Ratio(X)	0.17	0.00	0.18	0.35	0.00	0.00				0.17	0.00	0.00
Avail Cap(c_a), veh/h	4187	0	3608	4097	0	0				1572	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	4.8	0.0	4.7	5.3	0.0	0.0				7.0	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.5	0.0	0.0				0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.2	0.6	0.0	0.0				0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.0	0.0	5.0	5.8	0.0	0.0				7.4	0.0	0.0
LnGrp LOS	A	A	A	A	A	A				A	A	A
Approach Vol, veh/h		273			312						76	
Approach Delay, s/veh		5.0			5.8						7.4	
Approach LOS		A			A						A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		14.4		10.8		14.4						
Change Period (Y+Rc), s		4.0		4.0		4.0						
Max Green Setting (Gmax), s		58.0		24.0		58.0						
Max Q Clear Time (g_c+I1), s		3.4		2.9		5.1						
Green Ext Time (p_c), s		3.0		0.6		4.4						

Intersection Summary												
HCM 6th Ctrl Delay			5.6									
HCM 6th LOS			A									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	153	16	30	234	4	30	7	19	75	110	52
Future Volume (veh/h)	6	153	16	30	234	4	30	7	19	75	110	52
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	6	159	17	31	244	4	31	7	20	78	115	54
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	17	420	45	78	527	9	78	72	205	154	258	121
Arrive On Green	0.01	0.25	0.25	0.04	0.29	0.29	0.04	0.17	0.17	0.09	0.22	0.22
Sat Flow, veh/h	1781	1661	178	1781	1835	30	1781	417	1192	1781	1197	562
Grp Volume(v), veh/h	6	0	176	31	0	248	31	0	27	78	0	169
Grp Sat Flow(s),veh/h/ln	1781	0	1838	1781	0	1865	1781	0	1609	1781	0	1760
Q Serve(g_s), s	0.1	0.0	3.2	0.7	0.0	4.4	0.7	0.0	0.6	1.7	0.0	3.4
Cycle Q Clear(g_c), s	0.1	0.0	3.2	0.7	0.0	4.4	0.7	0.0	0.6	1.7	0.0	3.4
Prop In Lane	1.00		0.10	1.00		0.02	1.00		0.74	1.00		0.32
Lane Grp Cap(c), veh/h	17	0	465	78	0	535	78	0	277	154	0	378
V/C Ratio(X)	0.35	0.00	0.38	0.40	0.00	0.46	0.40	0.00	0.10	0.51	0.00	0.45
Avail Cap(c_a), veh/h	286	0	1930	374	0	2049	374	0	978	282	0	978
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.9	0.0	12.5	18.8	0.0	11.9	18.8	0.0	14.1	17.7	0.0	13.8
Incr Delay (d2), s/veh	8.7	0.0	0.4	2.4	0.0	0.5	2.4	0.0	0.1	1.9	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	1.1	0.3	0.0	1.5	0.3	0.0	0.2	0.7	0.0	1.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.6	0.0	12.9	21.3	0.0	12.3	21.3	0.0	14.2	19.6	0.0	14.4
LnGrp LOS	C	A	B	C	A	B	C	A	B	B	A	B
Approach Vol, veh/h		182			279			58			247	
Approach Delay, s/veh		13.4			13.3			18.0			16.0	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.3	14.7	6.3	13.2	4.9	16.1	8.0	11.5
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	8.5	42.5	8.5	22.5	6.5	44.5	6.4	24.6
Max Q Clear Time (g_c+I1), s	2.7	5.2	2.7	5.4	2.1	6.4	3.7	2.6
Green Ext Time (p_c), s	0.0	0.9	0.0	0.7	0.0	1.2	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	14.6
HCM 6th LOS	B

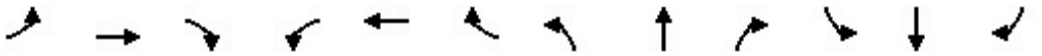
Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	120	86	1	262	310	91
Future Vol, veh/h	120	86	1	262	310	91
Conflicting Peds, #/hr	0	48	25	0	0	25
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	125	90	1	273	323	95

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	671	444	443	0	-	0
Stage 1	396	-	-	-	-	-
Stage 2	275	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	422	614	1117	-	-	-
Stage 1	680	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	402	572	1090	-	-	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	752	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.6	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1090	-	402	572	-	-
HCM Lane V/C Ratio	0.001	-	0.311	0.157	-	-
HCM Control Delay (s)	8.3	0	17.9	12.5	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0	-	1.3	0.6	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	616	392	17	303	11	244	102	34	121	239	30
Future Volume (veh/h)	10	616	392	17	303	11	244	102	34	121	239	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	642	0	18	316	11	254	106	35	126	249	31
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	312	736		37	423	15	249	312	103	161	303	38
Arrive On Green	0.17	0.39	0.00	0.02	0.24	0.24	0.14	0.23	0.23	0.09	0.19	0.19
Sat Flow, veh/h	1781	1870	1585	1781	1797	63	1781	1346	444	1781	1630	203
Grp Volume(v), veh/h	10	642	0	18	0	327	254	0	141	126	0	280
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1859	1781	0	1790	1781	0	1833
Q Serve(g_s), s	0.4	24.7	0.0	0.8	0.0	12.7	10.9	0.0	5.1	5.4	0.0	11.4
Cycle Q Clear(g_c), s	0.4	24.7	0.0	0.8	0.0	12.7	10.9	0.0	5.1	5.4	0.0	11.4
Prop In Lane	1.00		1.00	1.00		0.03	1.00		0.25	1.00		0.11
Lane Grp Cap(c), veh/h	312	736		37	0	438	249	0	415	161	0	341
V/C Ratio(X)	0.03	0.87		0.49	0.00	0.75	1.02	0.00	0.34	0.78	0.00	0.82
Avail Cap(c_a), veh/h	312	959		114	0	958	249	0	472	327	0	565
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.6	21.8	0.0	37.7	0.0	27.6	33.5	0.0	24.9	34.7	0.0	30.4
Incr Delay (d2), s/veh	0.0	7.5	0.0	7.2	0.0	4.9	61.7	0.0	0.4	7.3	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	11.1	0.0	0.4	0.0	5.8	8.8	0.0	2.1	2.6	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.7	29.3	0.0	44.9	0.0	32.5	95.2	0.0	25.3	42.0	0.0	34.1
LnGrp LOS	C	C		D	A	C	F	A	C	D	A	C
Approach Vol, veh/h		652			345			395			406	
Approach Delay, s/veh		29.3			33.1			70.2			36.6	
Approach LOS		C			C			E			D	

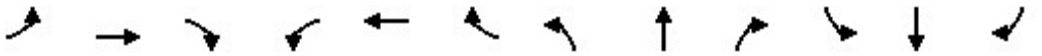
Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.2	36.0	16.0	19.6	19.0	23.2	12.4	23.1
Change Period (Y+Rc), s	4.6	5.4	5.1	5.1	5.4	* 4.9	5.4	* 5.1
Max Green Setting (Gmax), s	5.0	39.9	10.9	24.0	5.0	* 40	14.3	* 21
Max Q Clear Time (g_c+I1), s	2.8	26.7	12.9	13.4	2.4	14.7	7.4	7.1
Green Ext Time (p_c), s	0.0	4.0	0.0	1.0	0.0	3.4	0.1	0.5

Intersection Summary	
HCM 6th Ctrl Delay	40.7
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	431	1	29	8	1	102	13	372	1	10	403	11
Future Volume (veh/h)	431	1	29	8	1	102	13	372	1	10	403	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	449	1	30	8	1	106	14	388	1	10	420	11
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	253	0	694	62	34	399	31	571	1	23	519	439
Arrive On Green	0.44	0.44	0.44	0.44	0.44	0.44	0.02	0.31	0.31	0.01	0.28	0.28
Sat Flow, veh/h	311	1	1585	0	77	912	1781	1865	5	1781	1870	1585
Grp Volume(v), veh/h	450	0	30	115	0	0	14	0	389	10	420	11
Grp Sat Flow(s),veh/h/ln	312	0	1585	989	0	0	1781	0	1869	1781	1870	1585
Q Serve(g_s), s	0.0	0.0	0.7	0.0	0.0	0.0	0.5	0.0	11.2	0.3	12.9	0.3
Cycle Q Clear(g_c), s	27.0	0.0	0.7	27.0	0.0	0.0	0.5	0.0	11.2	0.3	12.9	0.3
Prop In Lane	1.00		1.00	0.07		0.92	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	253	0	694	495	0	0	31	0	572	23	519	439
V/C Ratio(X)	1.78	0.00	0.04	0.23	0.00	0.00	0.45	0.00	0.68	0.44	0.81	0.03
Avail Cap(c_a), veh/h	253	0	694	495	0	0	176	0	1607	144	1574	1334
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.5	0.0	9.9	11.4	0.0	0.0	30.0	0.0	18.7	30.2	20.8	16.2
Incr Delay (d2), s/veh	365.0	0.0	0.0	0.2	0.0	0.0	10.1	0.0	1.3	12.8	2.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	29.3	0.0	0.2	0.8	0.0	0.0	0.3	0.0	4.2	0.2	5.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	388.6	0.0	10.0	11.6	0.0	0.0	40.1	0.0	20.0	43.0	23.6	16.2
LnGrp LOS	F	A	A	B	A	A	D	A	C	D	C	B
Approach Vol, veh/h		480			115			403			441	
Approach Delay, s/veh		364.9			11.6			20.7			23.8	
Approach LOS		F			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	24.9		31.5	7.1	23.1		31.5				
Change Period (Y+Rc), s	4.5	6.0		4.5	6.0	* 6		4.5				
Max Green Setting (Gmax), s	5.0	53.0		27.0	6.1	* 52		27.0				
Max Q Clear Time (g_c+I1), s	2.3	13.2		29.0	2.5	14.9		29.0				
Green Ext Time (p_c), s	0.0	2.0		0.0	0.0	2.2		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		135.8
HCM 6th LOS		F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	513	14	5	324	1	46	0	15	3	0	21
Future Vol, veh/h	9	513	14	5	324	1	46	0	15	3	0	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	200	-	-	170	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	534	15	5	338	1	48	0	16	3	0	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	549	0	0	920	909	542	917	916	339
Stage 1	-	-	-	-	-	-	560	560	-	349	349	-
Stage 2	-	-	-	-	-	-	360	349	-	568	567	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1220	-	-	1021	-	-	251	275	540	253	272	703
Stage 1	-	-	-	-	-	-	513	511	-	667	633	-
Stage 2	-	-	-	-	-	-	658	633	-	508	507	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1220	-	-	1021	-	-	241	272	540	243	269	703
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	272	-	243	269	-
Stage 1	-	-	-	-	-	-	509	507	-	662	630	-
Stage 2	-	-	-	-	-	-	634	630	-	490	503	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	21.7	11.6
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	279	1220	-	-	1021	-	-	568
HCM Lane V/C Ratio	0.228	0.008	-	-	0.005	-	-	0.044
HCM Control Delay (s)	21.7	8	-	-	8.5	-	-	11.6
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.9	0	-	-	0	-	-	0.1

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
1	**Viking Ave NW & SR 305 (Signalized)[1]**							
	EB (SR 305)	L	0.57	61.1	E	0.5	62	E
	EB (SR 305)	T	0.61	14	B	0.46	14.5	B
	EB (SR 305)	R	0.04	5.1	A	0.05	7	A
	EB Overall (SR 305)			**16.2**	**B**		**16.2**	**B**
	WB (SR 305)	L	0.51	62.5	E	0.57	60.8	E
	WB (SR 305)	TR	0.54	14.6	B	0.51	13.4	B
	WB Overall (SR 305)			**16.7**	**B**		**16.8**	**B**
	NB (Viking Ave NW)	L	0.26	58.4	E	0.42	60	E
	NB (Viking Ave NW)	TL	0.43	60.1	E	0.42	59.9	E
	NB (Viking Ave NW)	R	0.06	56.8	E	0.05	56.8	E
	NB Overall (Viking Ave NW)			**57.9**	**E**		**58.6**	**E**
	SB (Viking Ave NW)	L	0.61	67.3	E	0.35	56.5	E
	SB (Viking Ave NW)	TR	0.28	58.2	E	0.55	59.8	E
	SB Overall (Viking Ave NW)			**61.6**	**E**		**58.8**	**E**
	Overall			**21.3**	**C**		**22.2**	**C**
2	**SR 303 & NE McWilliams Rd (Signalized)**							
	EB (NE McWilliams Rd)	L	0.83	82.4	F	0.82	80.7	F
	EB (NE McWilliams Rd)	T	0.17	53	D	0.4	54	D
	EB (NE McWilliams Rd)	R	0.56	57.5	E	0.62	57.5	E
	EB Overall (NE McWilliams Rd)			**68.4**	**E**		**64.7**	**E**
	WB (NE McWilliams Rd)	L	0.84	85.1	F	0.83	82.7	F
	WB (NE McWilliams Rd)	T	0.26	53.1	D	0.27	52.3	D
	WB (NE McWilliams Rd)	R	0.67	59	E	0.43	54.1	D
	WB Overall (NE McWilliams Rd)			**68.6**	**E**		**66.4**	**E**
	NB (SR 303)	L	0.81	70.6	E	0.87	78.9	E
	NB (SR 303)	T	0.27	11.3	B	0.37	14.9	B
	NB (SR 303)	R	0.07	9.6	A	0.2	13.3	B
	NB Overall (SR 303)			**19.3**	**B**		**24.7**	**C**
	SB (SR 303)	L	0.74	77.4	E	0.82	78.2	E
	SB (SR 303)	T	0.33	14.1	B	0.41	17.9	B
	SB (SR 303)	R	0.08	11.7	B	0.17	15.2	B
	SB Overall (SR 303)			**17.6**	**B**		**24**	**C**
	Overall			**31**	**C**		**32.9**	**C**
3	**Alaskan Way & Yesler Way (Signalized)[1]**							
	EB (Yesler Way)	R	0.21	11.1	B	0.07	9.3	A
	EB Overall (Yesler Way)			**11.1**	**B**		**9.3**	**A**
	NB (Alaskan Way)	L	0.11	12.3	B	0.2	11.1	B
	NB (Alaskan Way)	T	0.44	5.1	A	0.32	5	A
	NB (Alaskan Way)	R	0.18	4.3	A	0.08	4.3	A
	NB Overall (Alaskan Way)			**5.3**	**A**		**6**	**A**
	SB (Alaskan Way)	T/TR	0.2	3.3	A	0.39	4.2	A
	SB Overall (Alaskan Way)			**3.3**	**A**		**4.2**	**A**
	Overall			**5.4**	**A**		**5.2**	**A**
4	**Charleston Blvd & S Callow Ave (TWSC)[2]**							
	WB (Charleston Blvd)	R	0.006	16	C	0.002	10.8	B
	WB Overall (Charleston Blvd)			**16**	**C**		**10.8**	**B**
	NB (S Callow Ave)	TR						
	NB (S Callow Ave)	R						
	NB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	SB (S Callow Ave)	T						
	SB Overall (S Callow Ave)			**0**	**0**		**0**	**0**
	Overall			**0**	--		**0**	

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
5	**Burwell St & Warren Ave (Signalized)**							
	EB (Burwell St)	TL/T	0.26	14.1	B	0	0	A
	EB Overall (Burwell St)			**16.5**	**B**		**16.2**	**B**
	WB (Burwell St)	T	0.79	53.7	D	0.85	54.8	D
	WB (Burwell St)	R	0.09	42.6	D	0.24	39.6	D
	WB Overall (Burwell St)			**52.7**	**D**		**51.8**	**D**
	NB (Warren Ave)	LTR	0	0	A	0	0	A
	NB Overall (Warren Ave)			**53.5**	**D**		**58.6**	**E**
	SB (Warren Ave)	TL	0	0	A	0	0	A
	SB (Warren Ave)	R	0.34	8.2	A	0.28	9.5	A
	SB Overall (Warren Ave)			**15.6**	**B**		**17**	**B**
	Overall			**21.5**	**C**		**26.2**	**C**
6	**Burwell St & Pacific Ave (Signalized)**							
	EB (Pacific Ave)	TL	0	0	A	0	0	A
	EB (Pacific Ave)	R	0.49	8.9	A	0.18	5	A
	EB Overall (Pacific Ave)			**8.2**	**A**		**5**	**A**
	WB (Pacific Ave	LTR	0	0	A	0	0	A
	WB Overall (Pacific Ave)			**7.2**	**A**		**5.8**	**A**
	SB (SR 303)	LTR	0	0	A	0	0	A
	SB Overall (SR 303)			**6.8**	**A**		**7.4**	**A**
	Overall			**7.6**	**A**		**5.6**	**A**
7	**SR 166 & Sidney Ave (Signalized)**							
	EB (SR 166)	L	0.39	19.7	B	0.35	28.6	C
	EB (SR 166)	TR	0	0	A	0	0	A
	EB Overall (SR 166)			**11.5**	**B**		**13.4**	**B**
	WB (SR 166)	L	0.4	20.4	C	0.4	21.3	C
	WB (SR 166)	TR	0	0	A	0	0	A
	WB Overall (SR 166)			**13.3**	**B**		**13.3**	**B**
	NB (Sidney Ave)	L	0.37	21	C	0.4	21.3	C
	NB (Sidney Ave)	TR	0	0	A	0	0	A
	NB Overall (Sidney Ave)			**15.8**	**B**		**18**	**B**
	SB (Sidney Ave)	L	0.54	37.3	D	0.51	19.6	B
	SB (Sidney Ave)	TR	0	0	A	0	0	A
	SB Overall (Sidney Ave)			**22.3**	**C**		**16**	**B**
	Overall			**13.5**	**B**		**14.6**	**B**
8	**SW Barton St & Fauntleroy Way (TWSC)[2]**							
	EB (SW Barton St)	L	0.331	22	C	0.311	17.9	C
	EB (SW Barton St)	R	0.106	11	B	0.157	12.5	B
	EB Overall (SW Barton St)			**17.5**	**C**		**15.6**	**C**
	NB (Fauntleroy Way)	T	-	0	A	-	0	A
	NB Overall (Fauntleroy Way)			**1.3**	**0**		**0**	**0**
	SB (Fauntleroy Way)	TR	-	-	-	-	-	-
	SB Overall (Fauntleroy Way)			**0**	**0**		**0**	**0**
	Overall			**3.8**			**3.7**	
9	**Sam Christopherson Ave & SR 3 W (Signalized)**							
	EB (SR 3 W)	L	1.28	294.3	F	0.03	26.7	C
	EB (SR 3 W)	T	0.68	16.1	B	0.87	29.3	C
	EB Overall (SR 3 W)			**19.1**	**B**		**29.3**	**C**
	WB (SR 3 W)	L	0.42	47.4	D	0.49	44.9	D
	WB (SR 3 W)	T	0	0	A	0	0	A
	WB Overall (SR 3 W)			**20**	**B**		**33.1**	**C**
	NB (SR 16)	L	1.62	325.7	F	1.02	1.02	F
	NB (SR 16)	T	0	0	A	0	0	A
	NB (SR 16)	R	0.54	26.9	C	0.34	25.3	C
	NB Overall (SR 16)			**243.1**	**F**		**70.2**	**E**
	SB (Sam Christopherson Ave)	L	0.79	40.7	D	0.78	42	D
	SB (Sam Christopherson Ave)	T	0	0	A	0	0	A
	SB Overall (SR 16)			**36.2**	**D**		**36.6**	**D**
	Overall			**83.5**	**F**		**40.7**	**D**

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			V/C Ratio	Delay (sec/ veh)	LOS	V/C Ratio	Delay (sec/ veh)	LOS
10	**Imperial Way & SR 3 W (Signalized)**							
	EB (Imperial Way)	TL	0	0	A	0	0	A
	EB (Imperial Way)	R	0.12	17.1	B	0.04	10	A
	EB Overall (Imperial Way)			**17.3**	**B**		**364.9**	**F**
	WB (Imperial Way)	LTR	0	0	A	0	0	A
	WB Overall (Imperial Way)			**16.6**	**B**		**11.6**	**B**
	NB (SR 3 W)	L	0.49	23.5	C	0.45	40.1	D
	NB (SR 3 W)	TR	0	0	A	0	0	A
	NB Overall (SR 3 W)			**11.5**	**B**		**20.7**	**C**
	SB (SR 3 W)	L	0.68	22.4	C	0.44	43	D
	SB (SR 3 W)	T	0.35	6.3	A	0.81	23.6	C
	SB (SR 3 W)	R	0.47	7	A	0.03	16.2	B
	SB Overall (SR 3 W)			**8.8**	**A**		**23.8**	**C**
	Overall			**10.4**	**B**		**135.8**	**F**
11	**SE Spring Creek Rd & SE Mullenix Rd (TWSC)[2]**							
	EB (SE Spring Creek Rd)	L	0.014	8.8	A	0.008	8	A
	EB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	EB Overall (SE Spring Creek Rd)			**0.5**	**0**		**0.1**	**0**
	WB (SE Spring Creek Rd)	L	0.012	7.9	A	0.005	8.5	A
	WB (SE Spring Creek Rd)	TR	-	-	-	-	-	-
	WB Overall (SE Spring Creek Rd)			**0.2**	**0**		**0.1**	**0**
	NB (SE Mullenix Rd)	LTR	0.063	19.5	C	0.228	21.7	C
	NB Overall (SE Mullenix Rd)			**19.5**	**C**		**21.7**	**C**
	SB (SE Mullenix Rd)	LTR	0.033	13.3	B	0.044	11.6	B
	SB Overall (SE Mullenix Rd)			**13.3**	**B**		**11.6**	**B**
	Overall			**0.9**			**1.8**	

Notes:

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left/thru/right lanes

LOS = Level of Service

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

V/C = Volume to capacity ratio

Delay is Measured in Seconds Per Vehicle (sec/veh)

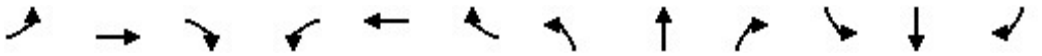
Red cells denote approaches and lane groups operating at unacceptable conditions.

1 - HCM 2000 Analysis

2 - The worst movement delay is reported for LOS.

Attachment F
2030 Build with Mitigation Synchro Reports

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	33	15	0	453	1	280	4	4	5	6	1
Future Volume (vph)	0	33	15	0	453	1	280	4	4	5	6	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.4	5.4		4.9		4.9	4.9		5.1	5.1	
Lane Util. Factor		0.95	1.00		1.00		0.95	0.95		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	1.00		1.00	0.98	
Flt Protected		1.00	1.00		1.00		0.95	0.95		0.95	1.00	
Satd. Flow (prot)		3539	1583		1862		1681	1683		1770	1823	
Flt Permitted		1.00	1.00		1.00		0.95	0.95		0.95	1.00	
Satd. Flow (perm)		3539	1583		1862		1681	1683		1770	1823	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	34	16	0	472	1	292	4	4	5	6	1
RTOR Reduction (vph)	0	0	9	0	0	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	34	7	0	473	0	149	150	0	5	6	0
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2									
Actuated Green, G (s)		17.4	17.4		17.9		5.4	5.4		0.8	0.8	
Effective Green, g (s)		17.4	17.4		17.9		5.4	5.4		0.8	0.8	
Actuated g/C Ratio		0.45	0.45		0.46		0.14	0.14		0.02	0.02	
Clearance Time (s)		5.4	5.4		4.9		4.9	4.9		5.1	5.1	
Vehicle Extension (s)		3.5	3.5		4.8		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		1578	706		854		232	233		36	37	
v/s Ratio Prot		0.01			c0.25		0.09	c0.09		0.00	c0.00	
v/s Ratio Perm			0.00									
v/c Ratio		0.02	0.01		0.55		0.64	0.64		0.14	0.16	
Uniform Delay, d1		6.0	6.0		7.7		15.9	15.9		18.8	18.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.0	0.0		1.3		5.3	5.3		1.3	1.5	
Delay (s)		6.0	6.0		8.9		21.2	21.2		20.0	20.3	
Level of Service		A	A		A		C	C		C	C	
Approach Delay (s)		6.0			8.9			21.2			20.2	
Approach LOS		A			A			C			C	

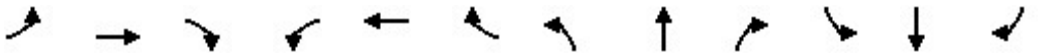
Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	39.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	0	1	0	0	0	2	39	0	141	18	562
Future Volume (vph)	4	0	1	0	0	0	2	39	0	141	18	562
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5					4.5	6.0		4.5	6.0	6.0
Lane Util. Factor	0.95	0.95					1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93					1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.98					0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1681	1597					1770	1863		1770	1863	1583
Flt Permitted	0.95	0.98					0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1681	1597					1770	1863		1770	1863	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	4	0	1	0	0	0	2	41	0	147	19	585
RTOR Reduction (vph)	0	2	0	0	0	0	0	0	0	0	0	229
Lane Group Flow (vph)	3	0	0	0	0	0	2	41	0	147	19	356
Turn Type	Split	NA					Prot	NA		Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)	1.1	1.1					0.9	18.4		8.9	26.4	26.4
Effective Green, g (s)	1.1	1.1					0.9	18.4		8.9	26.4	26.4
Actuated g/C Ratio	0.03	0.03					0.02	0.42		0.21	0.61	0.61
Clearance Time (s)	4.5	4.5					4.5	6.0		4.5	6.0	6.0
Vehicle Extension (s)	3.0	3.0					3.0	2.8		3.0	2.8	2.8
Lane Grp Cap (vph)	42	40					36	789		362	1133	962
v/s Ratio Prot	c0.00	0.00					c0.00	0.02		0.08	0.01	
v/s Ratio Perm												c0.22
v/c Ratio	0.07	0.00					0.06	0.05		0.41	0.02	0.37
Uniform Delay, d1	20.7	20.6					20.8	7.4		15.0	3.4	4.3
Progression Factor	1.00	1.00					1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.0					0.6	0.0		0.7	0.0	0.2
Delay (s)	21.4	20.6					21.5	7.4		15.7	3.4	4.5
Level of Service	C	C					C	A		B	A	A
Approach Delay (s)		21.1			0.0			8.0			6.7	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	43.4	Sum of lost time (s)	19.5
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



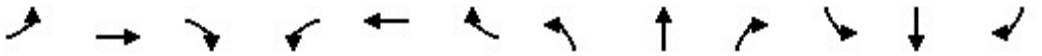
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	975	597	27	466	16	358	157	53	187	368	46
Future Volume (vph)	15	975	597	27	466	16	358	157	53	187	368	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9	5.4	5.4	4.6	4.9		4.9	4.9		5.1	5.1	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00		0.95	0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.99		0.95	1.00	
Satd. Flow (prot)	1805	3574	1532	1805	1816		1665	1709		1752	1823	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.99		0.95	1.00	
Satd. Flow (perm)	1805	3574	1532	1805	1816		1665	1709		1752	1823	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	1016	622	28	485	17	373	164	55	195	383	48
RTOR Reduction (vph)	0	0	341	0	1	0	0	8	0	0	4	0
Lane Group Flow (vph)	16	1016	281	28	501	0	295	289	0	195	427	0
Confl. Peds. (#/hr)			2									1
Heavy Vehicles (%)	0%	1%	3%	0%	4%	7%	3%	1%	0%	3%	2%	5%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2									
Actuated Green, G (s)	1.9	31.4	31.4	2.8	32.5		15.2	15.2		23.2	23.2	
Effective Green, g (s)	1.9	31.4	31.4	2.8	32.5		15.2	15.2		23.2	23.2	
Actuated g/C Ratio	0.02	0.34	0.34	0.03	0.35		0.16	0.16		0.25	0.25	
Clearance Time (s)	4.9	5.4	5.4	4.6	4.9		4.9	4.9		5.1	5.1	
Vehicle Extension (s)	2.5	3.5	3.5	2.5	4.8		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	37	1211	519	54	637		273	280		438	456	
v/s Ratio Prot	0.01	c0.28		0.02	c0.28		c0.18	0.17		0.11	c0.23	
v/s Ratio Perm			0.18									
v/c Ratio	0.43	0.84	0.54	0.52	0.79		1.08	1.03		0.45	0.94	
Uniform Delay, d1	44.8	28.3	24.8	44.2	26.9		38.7	38.7		29.3	34.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	5.4	1.3	6.1	7.2		77.6	62.0		0.5	26.5	
Delay (s)	50.6	33.7	26.1	50.4	34.2		116.3	100.7		29.8	60.5	
Level of Service	D	C	C	D	C		F	F		C	E	
Approach Delay (s)		31.0			35.0			108.5			50.9	
Approach LOS		C			D			F			D	

Intersection Summary					
HCM 2000 Control Delay	48.8	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	0.94				
Actuated Cycle Length (s)	92.6	Sum of lost time (s)		20.0	
Intersection Capacity Utilization	77.6%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	681	2	44	11	1	161	19	573	2	12	620	4
Future Volume (vph)	681	2	44	11	1	161	19	573	2	12	620	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	6.0		4.5	6.0	6.0
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98			0.87		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.96			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1633	1627			1656		1543	1844		1805	1827	1615
Flt Permitted	0.95	0.96			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1633	1627			1656		1543	1844		1805	1827	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	709	2	46	11	1	168	20	597	2	12	646	4
RTOR Reduction (vph)	0	6	0	0	156	0	0	0	0	0	0	2
Lane Group Flow (vph)	383	368	0	0	24	0	20	599	0	13	646	2
Heavy Vehicles (%)	5%	0%	0%	0%	0%	0%	17%	3%	0%	0%	4%	0%
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)	23.6	23.6			6.1		2.6	33.6		0.9	31.9	31.9
Effective Green, g (s)	23.6	23.6			6.1		2.6	33.6		0.9	31.9	31.9
Actuated g/C Ratio	0.28	0.28			0.07		0.03	0.40		0.01	0.38	0.38
Clearance Time (s)	4.5	4.5			4.5		4.5	6.0		4.5	6.0	6.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	2.8		3.0	2.8	2.8
Lane Grp Cap (vph)	460	458			120		47	740		19	696	615
v/s Ratio Prot	c0.23	0.23			c0.01		0.01	c0.32		0.01	c0.35	
v/s Ratio Perm												0.00
v/c Ratio	0.83	0.80			0.20		0.43	0.81		0.68	0.93	0.00
Uniform Delay, d1	28.2	27.9			36.5		39.8	22.2		41.3	24.8	16.0
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	12.2	9.9			0.8		6.1	6.5		69.9	18.5	0.0
Delay (s)	40.4	37.8			37.3		45.9	28.7		111.2	43.3	16.0
Level of Service	D	D			D		D	C		F	D	B
Approach Delay (s)		39.1			37.3			29.2			44.5	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	37.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	83.7	Sum of lost time (s)	19.5
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

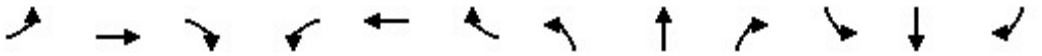


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	533	219	6	571	9	370	70	71	91	104	10
Future Volume (vph)	6	533	219	6	571	9	370	70	71	91	104	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9	5.4	5.4	4.6	4.9		4.9	4.9		5.1	5.1	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00		0.95	0.95		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.98		0.95	1.00	
Satd. Flow (prot)	970	3438	1482	1805	1706		1517	1527		1641	1700	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.98		0.95	1.00	
Satd. Flow (perm)	970	3438	1482	1805	1706		1517	1527		1641	1700	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	6	555	228	6	595	9	385	73	74	95	108	10
RTOR Reduction (vph)	0	0	132	0	1	0	0	12	0	0	4	0
Lane Group Flow (vph)	6	555	96	6	603	0	269	251	0	95	114	0
Heavy Vehicles (%)	86%	5%	9%	0%	11%	20%	13%	11%	7%	10%	8%	36%
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2									
Actuated Green, G (s)	0.9	37.1	37.1	0.9	37.3		19.2	19.2		10.5	10.5	
Effective Green, g (s)	0.9	37.1	37.1	0.9	37.3		19.2	19.2		10.5	10.5	
Actuated g/C Ratio	0.01	0.42	0.42	0.01	0.43		0.22	0.22		0.12	0.12	
Clearance Time (s)	4.9	5.4	5.4	4.6	4.9		4.9	4.9		5.1	5.1	
Vehicle Extension (s)	2.5	3.5	3.5	2.5	4.8		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	9	1454	626	18	725		332	334		196	203	
v/s Ratio Prot	0.01	c0.16		0.00	c0.35		c0.18	0.16		0.06	c0.07	
v/s Ratio Perm			0.07									
v/c Ratio	0.67	0.38	0.15	0.33	0.83		0.81	0.75		0.48	0.56	
Uniform Delay, d1	43.3	17.4	15.6	43.1	22.4		32.5	32.0		36.1	36.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	101.9	0.2	0.1	7.8	8.9		13.5	8.7		1.4	2.9	
Delay (s)	145.2	17.6	15.8	50.9	31.3		46.1	40.7		37.4	39.3	
Level of Service	F	B	B	D	C		D	D		D	D	
Approach Delay (s)		18.0			31.5			43.4			38.5	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	87.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	1	13	2	0	5	35	619	4	103	294	362
Future Volume (vph)	51	1	13	2	0	5	35	619	4	103	294	362
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	6.0		4.5	6.0	6.0
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.94			0.90		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.97			0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1166	1227			1693		1770	1843		1805	1759	1615
Flt Permitted	0.95	0.97			0.99		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1166	1227			1693		1770	1843		1805	1759	1615
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	53	1	14	2	0	5	36	645	4	107	306	377
RTOR Reduction (vph)	0	13	0	0	7	0	0	0	0	0	0	175
Lane Group Flow (vph)	35	20	0	0	0	0	36	649	0	107	306	202
Heavy Vehicles (%)	47%	0%	20%	0%	0%	0%	2%	3%	0%	0%	8%	0%
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)	4.8	4.8			1.0		6.3	36.7		6.2	36.6	36.6
Effective Green, g (s)	4.8	4.8			1.0		6.3	36.7		6.2	36.6	36.6
Actuated g/C Ratio	0.07	0.07			0.01		0.09	0.54		0.09	0.54	0.54
Clearance Time (s)	4.5	4.5			4.5		4.5	6.0		4.5	6.0	6.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	2.8		3.0	2.8	2.8
Lane Grp Cap (vph)	82	86			24		163	991		164	943	866
v/s Ratio Prot	c0.03	0.02			c0.00		0.02	c0.35		c0.06	0.17	
v/s Ratio Perm												0.13
v/c Ratio	0.43	0.23			0.00		0.22	0.65		0.65	0.32	0.23
Uniform Delay, d1	30.4	30.0			33.1		28.7	11.2		30.0	8.9	8.4
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.5	1.4			0.1		0.7	1.5		9.0	0.2	0.1
Delay (s)	33.9	31.3			33.2		29.4	12.7		38.9	9.0	8.5
Level of Service	C	C			C		C	B		D	A	A
Approach Delay (s)		32.7			33.2			13.6			12.8	
Approach LOS		C			C			B			B	

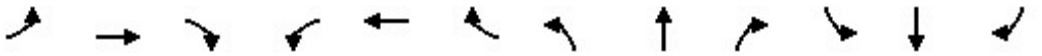
Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	68.2	Sum of lost time (s)	19.5
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	616	392	17	303	11	244	102	34	121	239	30
Future Volume (vph)	10	616	392	17	303	11	244	102	34	121	239	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9	5.4	5.4	4.6	4.9		4.9	4.9		5.1	5.1	
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00		0.95	0.95		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.99		0.95	1.00	
Satd. Flow (prot)	1770	3539	1548	1770	1853		1681	1698		1770	1829	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.99		0.95	1.00	
Satd. Flow (perm)	1770	3539	1548	1770	1853		1681	1698		1770	1829	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	10	642	408	18	316	11	254	106	35	126	249	31
RTOR Reduction (vph)	0	0	269	0	1	0	0	9	0	0	5	0
Lane Group Flow (vph)	10	642	139	18	326	0	198	188	0	126	275	0
Confl. Peds. (#/hr)			2									1
Turn Type	Prot	NA	Perm	Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases			2									
Actuated Green, G (s)	1.0	21.0	21.0	0.7	20.9		5.4	5.4		14.4	14.4	
Effective Green, g (s)	1.0	21.0	21.0	0.7	20.9		5.4	5.4		14.4	14.4	
Actuated g/C Ratio	0.02	0.34	0.34	0.01	0.34		0.09	0.09		0.23	0.23	
Clearance Time (s)	4.9	5.4	5.4	4.6	4.9		4.9	4.9		5.1	5.1	
Vehicle Extension (s)	2.5	3.5	3.5	2.5	4.8		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)	28	1208	528	20	629		147	149		414	428	
v/s Ratio Prot	0.01	c0.18		0.01	c0.18		c0.12	0.11		0.07	c0.15	
v/s Ratio Perm			0.09									
v/c Ratio	0.36	0.53	0.26	0.90	0.52		1.35	1.26		0.30	0.64	
Uniform Delay, d1	29.9	16.3	14.7	30.4	16.3		28.1	28.1		19.4	21.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.6	0.5	0.3	153.9	1.3		194.3	160.2		0.3	2.9	
Delay (s)	35.5	16.8	15.0	184.3	17.6		222.4	188.3		19.7	24.1	
Level of Service	D	B	B	F	B		F	F		B	C	
Approach Delay (s)		16.3			26.3			205.4			22.8	
Approach LOS		B			C			F			C	

Intersection Summary			
HCM 2000 Control Delay	52.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	431	1	29	8	1	102	13	372	1	10	403	11
Future Volume (vph)	431	1	29	8	1	102	13	372	1	10	403	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	6.0		4.5	6.0	6.0
Lane Util. Factor	0.95	0.95			1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98			0.88		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	0.96			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1681	1664			1625		1770	1862		1770	1863	1583
Flt Permitted	0.95	0.96			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1681	1664			1625		1770	1862		1770	1863	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	449	1	30	8	1	106	14	388	1	10	420	11
RTOR Reduction (vph)	0	6	0	0	97	0	0	0	0	0	0	8
Lane Group Flow (vph)	242	232	0	0	18	0	14	389	0	10	420	3
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases												6
Actuated Green, G (s)	15.1	15.1			5.0		0.6	18.7		0.6	18.7	18.7
Effective Green, g (s)	15.1	15.1			5.0		0.6	18.7		0.6	18.7	18.7
Actuated g/C Ratio	0.26	0.26			0.08		0.01	0.32		0.01	0.32	0.32
Clearance Time (s)	4.5	4.5			4.5		4.5	6.0		4.5	6.0	6.0
Vehicle Extension (s)	3.0	3.0			3.0		3.0	2.8		3.0	2.8	2.8
Lane Grp Cap (vph)	430	426			137		18	591		18	591	502
v/s Ratio Prot	c0.14	0.14			c0.01		c0.01	0.21		0.01	c0.23	
v/s Ratio Perm												0.00
v/c Ratio	0.56	0.54			0.13		0.78	0.66		0.56	0.71	0.01
Uniform Delay, d1	19.0	18.9			24.9		29.1	17.3		29.0	17.7	13.7
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.7	1.4			0.4		107.6	2.5		32.3	3.9	0.0
Delay (s)	20.7	20.4			25.4		136.7	19.9		61.3	21.6	13.8
Level of Service	C	C			C		F	B		E	C	B
Approach Delay (s)		20.5			25.4			23.9			22.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	58.9	Sum of lost time (s)	19.5
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Attachment G
References

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Transportation Research Board (TRB). 2010. *Highway Capacity Manual 2010*. Washington, DC: Transportation Research Board.

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MEMORANDUM

CARDNO AECOM
A JOINT VENTURE

To: Chris Stevenson, NAVFAC NW

From: Doug Gilkey, Cardno AECOM JV

cc: Bill Craig, Allison Payne

Date: November 9, 2023

Re: Addendum 2, Traffic Analysis Work Plan, Bremerton Waterfront Infrastructure Improvements EIS

The purpose of this memorandum is to update and further describe how the Cardno-AECOM Pacific Joint Venture (JV) will perform the Traffic Analysis in accordance with the Environmental Impact Statement (EIS) scope of work for Task 18. The memo serves to supplement the original Addendum to the previous Traffic Analysis Work Plan to focus on the tasks related to the land side transportation study. Addendum 2 is necessary because previous data was collected in 2021 during COVID travel restrictions and recent design optimizations have changed several basic assumptions most notably including the number of construction workers and shift timing.

Background and Project Description

The Navy proposes to construct dry dock and associated waterfront infrastructure improvements at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF) on Naval Base (NAVBASE) Kitsap-Bremerton. The purpose of the EIS Proposed Action is to improve the infrastructure at NAVBASE Kitsap-Bremerton to enable PSNS & IMF to meet its mission to maintain, repair, modernize, inactivate, and recycle Navy ships, submarines, and aircraft carriers. The Navy proposes to implement multiple component actions as part of the Proposed Action. The Proposed Action would include demolition of existing in-water structures, construction of new in-water structures, upgrade or replacement of existing in-water structures, and modification of upland facilities required to support the in-water structures.

The EIS will include analysis of a no action alternative and two action alternatives. This Work Plan is an update for a portion of the overall project that involves traffic within the areas potentially affected by construction and operation of the action alternatives.

Basic Assumptions – (unchanged from Addendum 1)

Direction from the background project material indicated that the operational workforce at NAVBASE Kitsap-Bremerton will remain similar to the existing level even after the improvements implemented by

the Proposed Action. This implies that operational impacts would be negligible, and it is assumed that analyses of operational impacts would not be needed.

Therefore, the land side transportation analyses focus on construction transportation impacts, including construction equipment and material delivery impacts, construction worker impacts, and construction waste shipment impacts. Background project documents indicate that most construction materials and equipment will be transported to NAVBASE Kitsap-Bremerton by barge.

The background project documents also indicate that construction workers will not be allowed to drive into and park at NAVBASE Kitsap-Bremerton. Therefore, no parking resources will be needed on base and activity at entry control facilities (ECFs) will be primarily pedestrian related. Construction workers are assumed to travel by personal automobile or public transit to off-site parking areas and travel to the worksite by bus, ferry, and/or foot.

Given these combination modes of construction worker transportation, construction transportation operational analyses will focus on vehicular impacts in the vicinity and at park and ride facilities. Secondary impacts of vehicles parking in the vicinity but outside of NAVBASE Kitsap-Bremerton will be quantified.

The following describes work tasks involved in completing a land side transportation analysis for this project.

Work Tasks

Collect Transportation Data

- Existing traffic and transit data will be reviewed for any post-COVID updates.
- New turning movement count and traffic data at signalized intersections on routes where traffic is assigned will be collected for all shifts:

SR 305 and Viking Avenue
SR 303 and NE McWilliams Road
Alaskan Way and Yesler Way
Callow Avenue and Charleston Boulevard
Warren Avenue and Burwell Street
Pacific Avenue and Burwell Street
SR 166 and Sidney Avenue
Fauntleroy Way and Barton Street
SR 3 and W Sam Christopherson Avenue
Imperial Way and SR 3
Mullenix Road and SE Spring Creek Road

- For each shift, arrival at a Park and Ride will be assumed to be 30 minutes before the shift and departure 30 minutes after the shift.

- Non-pandemic impacted traffic data – the traffic data collected in 2021 was impacted by on-going pandemic restrictions and should be recollected.
- Non-construction impacted traffic data – the 2021 data was impacted by construction at Yesler Way at Alaskan Way near the Seattle Ferry Terminal and should be recollected.

- Updated data from Kitsap Transit to assess capacity at Harper Church park and ride.
- Collect traffic data in November 2023.

Data Assumptions:

- The estimate is for 1,000 construction workers (maximum) on site per shift and this period of max construction workers on site will stretch from the start of the project to the end of construction. We assume our design traffic Build/No Build year will be the last year of construction.
- The shifts temporal distribution will be confirmed based on consultation with the Navy. Based on communication with the Navy's Design Engineer WSM on May 10, 2023, the shifts are assumed to be as follows:
    - *The shifts (1 and 2) will be equally distributed. The proposed work shifts would be:*
        - *Shift 1 – 1,000 construction workers, arriving at the site by 3:00am and departing the site at 3:00pm*
        - *Shift 2 – 1,000 construction workers, arriving at the site by 7:00am and departing the site at 7:00pm*
- The areas of residence for construction workers (origin of construction worker trips) will stay the same as described in Addendum 1
- There is a new proposed off-site parking area, which will be located at or near the Bremerton Airport. The Harper Church park and ride will remain.
    - The Washington State Ferry and Kitsap Transit's Port Orchard foot ferry do not provide service in the overnight hours. Therefore, Shift 1 construction workers will be required to drive and park. Trip distribution assignments are shown in Table 1. Table 1 has been amended to account for a portion of construction workers driving to and parking in the city of Bremerton.
        - A portion of construction workers outside of the Bremerton area will drive through Tacoma on SR 16 to SR 3 to the Bremerton Airport.
        - A portion of Bremerton/Kitsap County area construction workers will drive SR 3 or SR 304 to the Bremerton Airport.
    - Shift 2 trip assignments are shown in Table 2. Table 2 has been amended to account for some construction workers driving to and parking in Bremerton. A portion of construction workers who originate in or east of the City of Seattle would drive to the Bremerton Airport parking area. Construction workers assumed to park in Seattle and walk to the Bremerton Ferry, will continue to take the Ferry to the Bremerton Transportation Center and then walk to NAVBASE Kitsap-Bremerton. A portion of construction workers would drive to and park in the city of Bremerton.
    - For the purpose of generating trips, it will be assumed that one construction worker = one vehicle.

- Due to the imbalance of traffic arrivals due to this new staffing scheme, we will need to run 4 analyses (Shift 1 Arrival, Shift 2 Arrival, Shift 1 Departure, Shift 2 Departure) for the three scenarios (Existing [2023], No Build and Build).

Forecast Construction Worker Travel

Trip Assignment

Table 1 – Shift 1 (0300 to 1500 hours)
Construction Worker Traffic Assignment to NAVBASE Kitsap-Bremerton

Construction Worker Traffic Assignment Route	Percent	Daily One-Way Traffic Volume
Drive alone from all geographies to Bremerton. Park in City of Bremerton. Walk to NAVBASE Kitsap-Bremerton.	15	150
Drive alone from Bremerton/Kitsap County area to the Bremerton Airport parking area via SR 3 or SR 304. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	30	300
Drive alone from the south through Tacoma on SR 16 to SR 3, or US 101 to SR 3, to the Bremerton Airport parking area. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	40	400
Drive alone to Port Orchard Marina. Ride contractor-provided ferry to temporary ferry dock at NAVBASE Kitsap-Bremerton.	14	140
Miscellaneous motorized modes and bikes	1	10
Total	100	1000

Table 2 – Shift 2 (0700 to 1900 hours)
Construction Worker Traffic Assignment to NAVBASE Kitsap-Bremerton

Construction Worker Traffic Assignment Route	Percent	Daily One-Way Traffic Volume
Drive alone from all geographies to Bremerton. Park in City of Bremerton. Walk to NAVBASE Kitsap-Bremerton.	10	100
Drive alone to an existing Kitsap Transit Park and Ride lot. Transit to Bremerton via Kitsap Transit bus and/or Kitsap Transit's Ferry from Annapolis or Port Orchard. Walk to NAVBASE Kitsap-Bremerton.	10	100
Drive alone, walk, or use public transit to arrive at Seattle Ferry Dock. Transit to Bremerton via Seattle-Bremerton Ferry to Bremerton (WSF or Kitsap Transit). Walk to NAVBASE Kitsap-Bremerton.	20	200
Drive alone from Bremerton/Kitsap County area to the Bremerton Airport parking area via SR 3 or SR 304. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	22	220
Drive alone from the south and east through Tacoma on SR 16 to SR 3 to the Bremerton Airport parking area. Ride contractor-provided shuttle to NAVBASE Kitsap-Bremerton.	21	210
Drive alone to Port Orchard Marina. Ride contractor-provided ferry to temporary ferry dock at NAVBASE Kitsap-Bremerton.	16	160
Miscellaneous motorized modes and bikes	1	10
Total	100	1000

APPENDIX P
Socioeconomics

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Appendix P: Socioeconomics

1 Introduction

This appendix provides supporting information for the analysis of socioeconomic impacts as discussed in Section 3.16 of the Environmental Impact Statement for the Bremerton Waterfront Infrastructure Improvements at Naval Base Kitsap, Bremerton, Washington. The socioeconomics analysis discusses population, schools, housing, employment and income, economic activity, tax revenue and related data providing key insights into the socioeconomic conditions that might be affected by a proposed action. Estimates of employment, labor income, economic activity, and tax revenues were developed using the Impact Analysis for Planning (IMPLAN) economic model for Kitsap County. In addition to the summary information of the model results that are presented in Section 3.16, this appendix provides supplemental details of the IMPLAN model results.

2 Methodology

Changes to population, schools, and housing are estimated as a maximum impact during peak on-site construction workforce periods. The maximum on-site construction workforce is estimated to be 1,000 workers for both action alternatives. Estimates of economic benefits resulting from construction and operations of each alternative are estimated for an average annual impact using the IMPLAN economic model for Kitsap County. The most recent IMPLAN model data was from 2020, and values are presented in 2022 dollars. Project cost inputs for the model were obtained from the Navy's preliminary design information. Direct construction costs and sales taxes were estimated to occur inside the region of influence (ROI) and overhead, profit, and large purchases of items or materials with no local supplier industry were estimated to occur outside the ROI. In addition to direct impacts in the ROI from construction expenditures and employment, the IMPLAN model estimates the indirect and induced impacts on employment, labor income, and total value added to the local economy. Indirect effects are generated by the spending of businesses that would supply goods and services that facilitate construction and operations. Indirect jobs include jobs at companies that supply construction materials and supplies, or support jobs related to operations and maintenance. Indirect jobs extend to include jobs related to the manufacture of products used to construct facilities and support operations. Indirect labor income includes the income earned by people working indirect jobs. Indirect value added includes the total contribution to the gross county product that are generated through indirect expenditures. Induced effects are the result of spending of the wages and salaries of the direct and indirect new employees on items such as food, housing, transportation, and medical services. This spending creates induced employment in nearly all sectors of the economy, especially the service sectors. These secondary effects are included in the estimated impacts to socioeconomic indicators.

2.1 Population

Population changes are estimated using information on the anticipated workforce along with information on the locally available workers. The large number of construction workers estimated for the project and the requirements for specialized workers may require some workers to come from outside the ROI. The number of new construction workers in the ROI that would be supported by each alternative is estimated based on the peak number of workers required minus the net in-commuting rate calculated in the IMPLAN data for Kitsap County (10.4 percent). The number of workers and the

types of skilled labor required for construction would change over the course of the project, so the population estimate for construction is a maximum that would only occur temporarily during the peak of construction. During the operations phase of the alternatives, estimated population changes would also be tied to the anticipated change in workforce, however, workforce levels are not estimated to change as a result of either Alternative 1 or Alternative 2. Some workers may remain in the area even after their construction jobs are finished; however, it is assumed that the temporary peak population levels associated with the project construction would steadily decline as the jobs are completed. Population change is not considered beneficial or adverse, as it may include both positive impacts, such as increased economic activity and tax revenues, and negative impacts, such as increased demand for public services. These are assumed to neutralize each other in this analysis. The degree of impact is measured as the potential percentage increase in population in Kitsap County.

2.2 Schools

Impacts to schools are estimated using an estimate of the increase in population caused by new workers moving to the area and estimating the number of school-aged children that would accompany the workers. An increased number of school children adds to the demand for educational facilities and employees and is considered a negative impact because of the additional resources that are required to be provided by the local government. The degree of impacts is measured as the percentage change in the number of students over the current conditions.

2.3 Housing

Housing demand is estimated using the projected increase in population and assuming that each new worker would require a housing unit. This total demand for housing is compared with the available housing in the ROI. Impacts on the housing market are estimated in terms of the peak expected demand. This peak level of demand would be temporary and would only last through the periods of construction with the highest demand for workers. Significance of the impacts would be based on the number of housing units required by the additional population in relation to the available housing in Kitsap County.

2.4 Employment and Income

The estimated change in employment includes the number of jobs created in the study area and the IMPLAN model results for indirect and induced employment resulting from local expenditures. Increases in labor income are also estimated using the IMPLAN model's projected increases throughout the local economy. Employment and income impacts are presented as an average annual level of impact during construction and during operations. Employment and income are considered beneficial and the significance of the changes in employment and income will be described in terms of the size of the change in relation to the existing conditions in Kitsap County.

2.5 Economic Activity and Value Added

Overall economic activity is estimated in terms of gross county product and is considered beneficial. The average contribution of each alternative to annual gross county product during construction and during operations is generated by the IMPLAN model. Degree of impact is described in terms of the percentage change to the gross county product of Kitsap County.

2.6 State and Local Tax Revenues

Local tax revenues generated by the alternatives are estimated by the IMPLAN model based on direct, indirect, and induced expenditures and employment. Tax revenue is considered beneficial, and significance is described in terms of the level of tax revenues generated relative to the existing state and local tax revenues.

3 IMPLAN

IMPLAN is a regional economic analysis software application that is designed to estimate the impact or ripple effect (specifically backward linkages) of a given economic activity within a specific geographic area through the implementation of its input-output model (IMPLAN Group, LLC, 2020). Input-output models are the standard approach for an economic impact analysis and IMPLAN is among the industry leading model systems. The IMPLAN model data used in this analysis are from 2020, and results are presented in 2022 dollars.

4 Model Setup

The socioeconomic impact analysis in Section 3.16 estimates impacts for construction and operations of the project across each alternative. Project cost inputs for the model were obtained from the Navy's preliminary design information. Direct construction costs and sales taxes were estimated to occur inside the ROI. The direct construction costs and sales taxes for each of the alternatives' components were input into IMPLAN's industry code 56 for the construction of other new nonresidential structures. Overhead, contingencies, profit, and large purchases of items or materials with no local supplier industry were estimated to occur outside the ROI and were not entered into the model. An adjustment was made to employee compensation to account for an estimated 88.6 percent in-commuting rate for construction workers.

5 Model Results

Model results used in the socioeconomic analysis include employment, labor income, value added, and taxes. The IMPLAN model results show impacts across 546 industries. Here the industry code results, which show affected industries, were aggregated into 22 North American Industry Classification System (NAICS) industry groups utilizing the 2017 NAICS scheme and using IMPLAN's recommended aggregation template (IMPLAN Group, LLC, 2020). Results for the total lifetime of the project are divided by the estimated number of years of construction for each alternative to give the average annual impact. No changes in operational employment or expenditures are anticipated as a result of the alternatives.

5.1 Alternative 1

Alternative 1 would include no action and therefore no impacts are modeled.

5.2 Alternative 2

Alternative 2 impacts assume a 15-year construction period and impacts are given as an average annual impact.

5.2.1 Employment

Table 5.2-1 shows the estimated average annual employment supported during construction, by aggregated industry.

Table 5.2-1 Average Annual Employment Supported, Alternative 2 Construction

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture, Forestry, Fishing & Hunting	0.0	0.6	0.2	0.8
Mining	0.0	4.3	0.0	4.3
Utilities	0.0	0.4	0.1	0.5
Construction	914.1	1.0	0.4	915.6
Manufacturing	0.0	20.2	0.1	20.3
Wholesale Trade	0.0	23.8	0.9	24.7
Retail Trade	0.0	51.8	10.1	61.9
Transportation & Warehousing	0.0	12.6	1.2	13.8
Information	0.0	1.7	0.5	2.2
Finance & Insurance	0.0	6.8	3.1	9.9
Real Estate & Rental	0.0	28.5	3.2	31.7
Professional - Scientific & Tech Services	0.0	48.6	1.8	50.4
Management Of Companies	0.0	2.8	0.2	3.0
Administrative and Support and Waste Management and Remediation Services	0.0	24.8	2.1	26.9
Educational Services	0.0	0.2	1.3	1.4
Health Care and Social Assistance	0.0	0.0	12.1	12.1
Arts, Entertainment & Recreation	0.0	1.5	1.9	3.4
Accommodation & Food Services	0.0	3.3	7.1	10.4
Other Services (Except Public Administration)	0.0	7.8	7.5	15.3
Government Enterprises	0.0	3.5	1.4	5.0
Non-NAICS	0.0	0.0	0.0	0.0
Administrative Government	0.0	0.0	0.0	0.0
Total	**914.1**	**244.2**	**55.4**	**1,213.7**

Sources: Table Aggregated from IMPLAN model results.

5.2.2 Labor Income

Table 5.2-2 shows the estimated average annual labor income during construction, by aggregated industry.

Table 5.2-2 Average Annual Labor Income, Alternative 2 Construction

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture, Forestry, Fishing & Hunting	$0	$6,200	$1,992	$8,192
Mining	$0	$148,113	$261	$148,374
Utilities	$0	$63,423	$14,973	$78,396
Construction	$60,183,292	$67,387	$26,408	$60,277,087
Manufacturing	$0	$1,134,964	$6,662	$1,141,626
Wholesale Trade	$0	$1,589,638	$61,785	$1,651,423
Retail Trade	$0	$2,346,603	$363,606	$2,710,209
Transportation & Warehousing	$0	$538,649	$35,360	$574,009
Information	$0	$225,884	$52,670	$278,554

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Finance & Insurance	$0	$440,409	$171,170	$611,578
Real Estate & Rental	$0	$1,000,372	$93,734	$1,094,106
Professional - Scientific & Tech Services	$0	$3,811,621	$127,739	$3,939,360
Management Of Companies	$0	$243,237	$18,311	$261,549
Administrative and Support and Waste Management and Remediation Services	$0	$1,061,977	$90,848	$1,152,824
Educational Services	$0	$4,624	$40,180	$44,803
Health Care and Social Assistance	$0	$35	$804,690	$804,725
Arts, Entertainment & Recreation	$0	$32,401	$45,301	$77,702
Accommodation & Food Services	$0	$95,393	$204,663	$300,056
Other Services (Except Public Administration)	$0	$489,837	$321,639	$811,476
Government Enterprises	$0	$300,067	$114,638	$414,704
Non-NAICS	$0	$0	$0	$0
Administrative Government	$0	$0	$0	$0
Total	**$60,183,292**	**$13,600,833**	**$2,596,628**	**$76,380,753**

Sources: Table Aggregated from IMPLAN model results.

5.2.3 Value Added

Table 5.2-3 shows the estimated average annual gross county product increases (as shown by value added) during construction, by aggregated industry.

Table 5.2-3 Average Annual Gross County Product Generated, Alternative 2 Construction

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture, Forestry, Fishing & Hunting	$0	$6,807	$5,313	$12,120
Mining	$0	$128,647	$94	$128,741
Utilities	$0	$347,022	$77,111	$424,133
Construction	$61,304,166	$93,132	$37,262	$61,434,560
Manufacturing	$0	$1,681,685	$9,662	$1,691,347
Wholesale Trade	$0	$4,255,128	$170,356	$4,425,484
Retail Trade	$0	$4,254,826	$550,142	$4,804,968
Transportation & Warehousing	$0	$593,533	$41,296	$634,829
Information	$0	$338,997	$88,486	$427,483
Finance & Insurance	$0	$920,286	$320,498	$1,240,783
Real Estate & Rental	$0	$2,847,231	$1,726,106	$4,573,337
Professional - Scientific & Tech Services	$0	$4,572,398	$204,454	$4,776,852
Management Of Companies	$0	$273,182	$20,566	$293,748
Administrative and Support and Waste Management and Remediation Services	$0	$1,377,927	$115,579	$1,493,506
Educational Services	$0	$5,018	$39,431	$44,449
Health Care and Social Assistance	$0	$39	$812,056	$812,094
Arts, Entertainment & Recreation	$0	$40,401	$58,710	$99,111
Accommodation & Food Services	$0	$145,288	$327,834	$473,123
Other Services (Except Public Administration)	$0	$581,788	$337,656	$919,444
Government Enterprises	$0	$354,072	$136,837	$490,909
Non-NAICS	$0	$0	$0	$0
Administrative Government	$0	$0	$0	$0

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Total	**$61,304,166**	**$22,817,407**	**$5,079,448**	**$89,201,020**

Sources: Table Aggregated from IMPLAN model results.

5.2.4 Tax Revenue

Table 5.2-4 shows the estimated average annual tax revenue generated in Kitsap County and the State of Washington during construction of Alternative 2, by aggregated tax category.

Table 5.2-4 Average Annual Tax Revenue Generated, Alternative 2 Construction

Tax	*Kitsap County*	*State of Washington*
Social Insurance Tax	$0	$424,953
TOPI: Sales Tax	$129,081	$773,895
TOPI: Property Tax	$147,681	$285,646
TOPI: Motor Vehicle License, Severance Tax, Special Assessments, Other Taxes	$34,631	$172,602
Personal Tax	$4,769	$82,199
Total	**$316,163**	**$1,739,295**

Legend: TOPI = Tax on Production and Imports.
Sources: Table Aggregated from IMPLAN model results.

5.3 Alternative 3

Alternative 3 impacts assume a 15-year construction period and impacts are given as an average annual impact.

5.3.1 Employment

Table 5.3-1 shows the estimated average annual employment supported during construction, by aggregated industry.

Table 5.3-1 Average Annual Employment Supported, Alternative 3 Construction

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture, Forestry, Fishing & Hunting	0.0	0.6	0.3	0.9
Mining	0.0	4.8	0.0	4.9
Utilities	0.0	0.4	0.1	0.6
Construction	1,026.4	1.2	0.6	1,028.1
Manufacturing	0.0	22.7	0.2	22.8
Wholesale Trade	0.0	26.7	1.2	27.9
Retail Trade	0.0	58.2	13.1	71.3
Transportation & Warehousing	0.0	14.2	1.5	15.7
Information	0.0	1.9	0.7	2.6
Finance & Insurance	0.0	7.6	4.0	11.6
Real Estate & Rental	0.0	32.0	4.2	36.2
Professional - Scientific & Tech Services	0.0	54.5	2.3	56.9
Management Of Companies	0.0	3.2	0.3	3.4
Administrative and Support and Waste Management and Remediation Services	0.0	27.9	2.7	30.6
Educational Services	0.0	0.2	1.6	1.8

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Health Care and Social Assistance	0.0	0.0	15.7	15.7
Arts, Entertainment & Recreation	0.0	1.7	2.4	4.1
Accommodation & Food Services	0.0	3.7	9.2	12.9
Other Services (Except Public Administration)	0.0	8.7	9.7	18.4
Government Enterprises	0.0	4.0	1.9	5.8
Non-NAICS	0.0	0.0	0.0	0.0
Administrative Government	0.0	0.0	0.0	0.0
Total	**1,026.4**	**274.2**	**71.7**	**1,372.3**

Sources: Table Aggregated from IMPLAN model results.

5.3.2 Labor Income

Table 5.3-2 shows the estimated average annual labor income during construction, by aggregated industry.

Table 5.3-2 Average Annual Labor Income, Alternative 3 Construction

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture, Forestry, Fishing & Hunting	$0	$6,962	$2,582	$9,544
Mining	$0	$166,315	$339	$166,654
Utilities	$0	$71,217	$19,521	$90,738
Construction	$67,579,004	$75,668	$34,209	$67,688,881
Manufacturing	$0	$1,274,435	$8,468	$1,282,903
Wholesale Trade	$0	$1,784,983	$80,213	$1,865,196
Retail Trade	$0	$2,634,969	$471,515	$3,106,484
Transportation & Warehousing	$0	$604,842	$45,818	$650,660
Information	$0	$253,642	$68,232	$321,873
Finance & Insurance	$0	$494,529	$220,947	$715,476
Real Estate & Rental	$0	$1,123,304	$122,092	$1,245,396
Professional - Scientific & Tech Services	$0	$4,280,017	$165,274	$4,445,291
Management Of Companies	$0	$273,128	$23,714	$296,842
Administrative and Support and Waste Management and Remediation Services	$0	$1,192,479	$117,487	$1,309,967
Educational Services	$0	$5,192	$51,078	$56,270
Health Care and Social Assistance	$0	$39	$1,044,316	$1,044,355
Arts, Entertainment & Recreation	$0	$36,382	$58,340	$94,722
Accommodation & Food Services	$0	$107,116	$264,977	$372,093
Other Services (Except Public Administration)	$0	$550,031	$416,149	$966,181
Government Enterprises	$0	$336,941	$149,063	$486,004
Non-NAICS	$0	$0	$0	$0
Administrative Government	$0	$0	$0	$0
Total	**$67,579,004**	**$15,272,191**	**$3,364,333**	**$86,215,529**

Sources: Table Aggregated from IMPLAN model results.

5.3.3 Value Added

Table 5.3-3 shows the estimated average annual gross county product increases (as shown by value added) during construction, by aggregated industry.

Table 5.3-3 Average Annual Gross County Product Generated, Alternative 3 Construction

Industry Name	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture, Forestry, Fishing & Hunting	$0	$7,644	$6,906	$14,550
Mining	$0	$144,456	$122	$144,578
Utilities	$0	$389,666	$100,548	$490,214
Construction	$68,837,618	$104,577	$48,265	$68,990,460
Manufacturing	$0	$1,888,341	$12,301	$1,900,642
Wholesale Trade	$0	$4,778,026	$221,168	$4,999,194
Retail Trade	$0	$4,777,687	$713,389	$5,491,075
Transportation & Warehousing	$0	$666,471	$53,498	$719,969
Information	$0	$380,655	$114,717	$495,372
Finance & Insurance	$0	$1,033,376	$414,659	$1,448,035
Real Estate & Rental	$0	$3,197,117	$2,230,770	$5,427,887
Professional - Scientific & Tech Services	$0	$5,134,284	$264,539	$5,398,823
Management Of Companies	$0	$306,752	$26,633	$333,385
Administrative and Support and Waste Management and Remediation Services	$0	$1,547,256	$149,538	$1,696,794
Educational Services	$0	$5,634	$50,152	$55,787
Health Care and Social Assistance	$0	$43	$1,053,992	$1,054,035
Arts, Entertainment & Recreation	$0	$45,366	$75,722	$121,088
Accommodation & Food Services	$0	$163,142	$424,660	$587,802
Other Services (Except Public Administration)	$0	$653,282	$437,061	$1,090,343
Government Enterprises	$0	$397,583	$178,150	$575,732
Non-NAICS	$0	$0	$0	$0
Administrative Government	$0	$0	$0	$0
Total	**$68,837,618**	**$25,621,358**	**$6,576,789**	**$101,035,765**

Sources: Table Aggregated from IMPLAN model results.

5.3.4 Tax Revenue

Table 5.3-4 shows the estimated average annual tax revenue increase generated in Kitsap County and the State of Washington during construction of Alternative 3, by aggregated tax category.

Table 5.3-4 Average Annual Tax Revenue Generated, Alternative 3 Construction

Tax	*Kitsap County*	*State of Washington*
Social Insurance Tax	$0	$479,356
TOPI: Sales Tax	$155,060	$929,645
TOPI: Property Tax	$177,403	$343,134
TOPI: Motor Vehicle License, Severance Tax, Special Assessments, Other Taxes	$41,601	$207,339
Personal Tax	$5,384	$92,789
Total	**$379,447**	**$2,052,263**

Legend: TOPI = Tax on Production and Imports.
Sources: Table Aggregated from IMPLAN model results.

6 References

IMPLAN Group, LLC. (2020). IMPLAN® model, 2020 Data, using inputs provided by the user and IMPLAN Group LLC, IMPLAN System (data and software), 16905 Northcross Dr., Suite 120, Huntersville, NC 28078 www.IMPLAN.com.

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APPENDIX Q
Coastal Consistency Determination (To be provided with Final EIS)

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APPENDIX R
Fish Entrainment Study

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Results of the 2020-22 Entrainment Study to Assess Potential Impacts to ESA-listed Salmonids and Other Fish During Dry Dock Dewatering Events at Naval Base Kitsap - Bremerton

Prepared for:

Naval Facilities Engineering Systems Command Northwest (NAVFAC NW)

Submitted by:

WDFW Marine Fish Science Unit
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For Cooperative Agreement N44255-20-2-0001

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Executive Summary

The Department of the Navy (DON) operates six dry docks at the Puget Sound Naval Shipyards and Intermediate Maintenance Facility (PSNS & IMF) on Sinclair Inlet in Bremerton, Washington, each with the potential to entrain the following marine fish species listed as threatened or endangered under the federal Endangered Species Act (ESA): Puget Sound Chinook (*Oncorhynchus tshawytscha*), Puget Sound steelhead (*O. mykiss*), bull trout (*Salvelinus confluentus*), and Puget Sound/Georgia Basin populations of bocaccio (*Sebastes paucispinis*), and yelloweye rockfish (*S. ruberrimus*). To meet its mission to support the DON's nuclear fleet and address critical deficiencies in dry dock capability, capacity, and seismic survivability at Naval Base Kitsap - Bremerton, the PSNS & IMF is proposing to construct a new multi-mission dry dock that can accommodate the DON's newest class of nuclear aircraft carriers, and to upgrade the seismic capabilities of Dry Dock 6 (https://www.federalregister.gov/documents/2022/06/08/2022-11852/notice-of-intent-to-prepare-an-environmental-impact-statement-for-bremerton-waterfront). These actions have the potential to entrain ESA-listed fish and forage fish and may affect habitats protected under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). As a result, this project will require ESA and MSA consultation with National Marine Fisheries Service (NMFS) and ESA consultation with the US Fish and Wildlife Service (USFWS).

In January 2020, the Naval Facilities Engineering Systems Command Northwest (NAVFAC NW) and the Washington Department of Fish and Wildlife (WDFW) entered into a cooperative agreement (CA) to conduct a study to evaluate the potential impacts of current dry dock operations on ESA-listed fish. Such studies are needed for the PSNS & IMF to ensure compliance with all other natural resource associated laws such as ESA, MSA, Fish and Wildlife Conservation Act, Fish and Wildlife Coordination Act, and Sikes Act Improvement Act. A kickoff meeting was held between PSNS & IMF and WDFW on 26 February 2020 to discuss the scope and duration of the study. Dry dock flooding and dewatering events are not scheduled with regularity and may occur at any time of the year, sometimes with little advanced notice. At the meeting, it was agreed that as many dry docks as possible should be sampled at least once during a 25-month study period commencing in March 2020. It was further agreed that sampling would occur opportunistically, subject to security constraints at the facility and the ability to rapidly assemble sampling and logistics teams for short notice dewatering events. The PSNS & IMF provided technical specifications for each dry dock to the WDFW. In addition, staff from the WDFW conducted a pre-study site visit with PSNS & IMF personnel to measure two of the dry docks and examine the inflow and outflow apertures. The specifications and on-site observations were used by the WDFW to develop a sampling methodology that was approved by PSNS & IMF staff.

The Navy and WDFW originally planned for 8 sampling events to be conducted over 25 months, but due to challenges associated with the SARS-CoV-2 pandemic and various security restrictions encountered during the project, the CA was amended in March 2022 to reduce the number of sampling events to seven and extend the study period by six months to provide sufficient time to conduct additional sampling events and write the final report.

Fish encountered in the sampling events were dominated by non-salmonid species, mainly Pacific herring. Overall, a total of 187 Chinook Salmon were encountered in the study. Of these, 137 fish were clipped (hatchery origin) and 50 were non-clipped and presumably wild fish. Other salmonids included 7 Coho Salmon, and 2 Chum Salmon. Most of the salmonids were smolts; fish larger than 40 cm comprised only 6% of all salmonids captured. Chinook Salmon released into Sinclair Inlet from the Gorst Creek Hatchery and Rearing Pond and the Minter Creek Hatchery are not listed under the ESA, whereas the

small numbers of Chinook salmon that spawn naturally in the creeks and streams emptying into Sinclair Inlet are recognized as part of the ESU and therefore covered under the 1999 ESA listing. ESA-listed Chinook from other sources may also stray into Sinclair Inlet, but this would be considered a rare occurrence, and given the large numbers of Chinook salmon released annually by GCHRP and MC (>1 million), the probability of Chinook salmon in Sinclair Inlet being ESA-listed is likely very small. No other ESA-listed species were encountered in the study. No marine mammals were encountered in the study.

Based on our findings, we conclude that the direct impacts on ESA-listed salmonids during the types of dewatering events experienced in this study are likely to be minimal; however, due to the limited number of samples collected and the short temporal span of the study, we cannot rule out that greater impacts are possible.

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Introduction

The United States Department of the Navy (DON) currently operates six dry docks at Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), located at Naval Base Kitsap (NBK) – Bremerton, along the northern shore of Sinclair Inlet (Figure 1). Sinclair Inlet is fed by over 20 streams and is terminated at the west end by the Gorst Creek Watershed, which provides critical refugia for salmonids, including federally threatened Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout (*O. mykiss*) (Fresh 2006, Sinclair Inlet Development Concept Plan 2012). The Gorst Creek Rearing Pond is located within the watershed and releases between 500,000 and 1.7 million Chinook salmon smolts and 300,000 Coho salmon smolts annually. The location of PSNS is directly in the migratory path of salmon and steelhead trout smolts leaving the watershed and adult salmon and steelhead trout returning to the watershed to spawn, and the dry docks are known to entrain salmonids, forage fish, and a diversity of marine fish and invertebrates during dewatering events. The Navy proposes to update multiple waterfront infrastructure and facilities at PSNS to address critical deficiencies in dry dock capability, capacity, and seismic survivability to meet its mission to support the DON's nuclear fleet. The construction of a new multi-mission dry dock and the reconstruction of the existing Dry Dock 6, the largest at PSNS, are vital components of the proposed action.

To evaluate the potential operational impacts of this proposed action on ESA-listed salmonids, forage fish, and marine fish during dewatering events, a Cooperative Agreement (CA) was established between the DON and the Washington Department of Fish and Wildlife (WDFW) to design and implement a study to assess the size and species composition of fishes entrained in the dry docks during 8 dewatering events over a 25-month period. The findings of this study will be used to ensure compliance with the Endangered Species Act (16 USC 1531 et seq), Magnuson–Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq), Fish and Wildlife Conservation Act (16 USC 2901 et seq), Fish and Wildlife Coordination Act (16 USC 661et seq), and Sikes Act Improvement Act (SAIA) (Section 2905 (c)).

Several fish species have been afforded legal protection under the Endangered Species Act (ESA) throughout some portion or the entirety of the inland marine waters of Washington State, which include all waters east of Cape Flattery and south of the Canadian border (i.e., Puget Sound). Of these listed species, eulachon (*Thaleichthys pacificus*) (NMFS 2010), Chinook salmon and Hood Canal summer-run chum salmon (*O. keta*) (NMFS 1999), steelhead trout (NMFS 2007), and bull trout (*Salvelinus confluentus*) (USFWS 1999), exhibit migratory behaviors along shorelines and some may become concentrated in estuarine habitats during one or more of their life history phases (Duffy et al. 2005: Fresh 2006). Additionally, yelloweye rockfish (*Sebastes ruberrimus*) and bocaccio (*S. paucispinis*) within the Puget Sound/Georgia Basin Distinct Population Segment (DPS) are listed under the ESA as Threatened and Endangered, respectively (Drake et al. 2010; NMFS 2010)[1]. During parturition, rockfish release thousands to millions of larvae into the water column. Whether by passive (e.g., larvae) or active (e.g., juveniles and adults) post-parturition dispersal, some rockfish may take up residence in shallow nearshore waters, usually in or near structured habitat. Thus, ESA-listed fish that occur in the vicinity of Naval Base Kitsap Bremerton are vulnerable to nearshore industrial activities. In support of Navy obligations under Section 7(a)(2) of the ESA (United States 1983), this Cooperative Agreement was awarded to fulfill the requirements identified within the NMFS (2011) BiOp Endangered Species Act Section 7 Formal Consultation for the Navy Dry Dock Operations at Puget Sound Naval Shipyard and Sub-Base Bangor, Kitsap County, as modified by the NMFS (2019) modification to the "Navy Dry Dock Operations at Puget Sound Naval Shipyard and Sub-Base Bangor" consultation 2009/06414. In the NMFS (2019) modification, the Terms and Conditions identified for responding to Reasonable and Prudent Measures #1 indicate "the Navy shall conduct further studies to understand the extent of possible steelhead and

[1] Canary rockfish were delisted in April 2017 (NMFS 2017).

salmonid entrainment, and their corresponding potential mortality at the Bangor dock facility. The Navy shall also seek funding and/or other opportunities to conduct fish surveys at the PSNS & IMF facilities at Bremerton."

The project tasks identified in the CA were:

1. Project management, kick-off meeting and review meetings
2. Badging/site visit
3. Field work preparation and fish screen construction
4. Field data collection events
5. Data entry
6. Section 7 authorization and annual progress reporting
7. Reporting

Study Area and Design

The focus of the entrainment study were the six dry docks in the Controlled Industrial Area (CIA) of the PSNS & IMF located at NBK - Bremerton (Figure 1). The dry docks vary in size, age, and configuration with dry dock 1 (DD1) being the oldest and smallest dock (Table 1, Figure 2). Dry docks 2 and 3 are similar in size, although DD3 can be operated as two separate docks (upper and lower) with each chamber being slightly smaller than DD1 and the floor of the lower chamber (south end) being ~4 feet lower than the upper chamber floor. Dry docks 4 and 5 are nearly identical in size and about 25% smaller in surface area than DD6, which is the largest of the docks. The long axes of the docks are oriented north-south and are sealed at the south end with a movable dam (caisson) (Figure 3). The docks are typically kept dry until a vessel is brought into the dock, with flooding events usually lasting 3-5 hours.

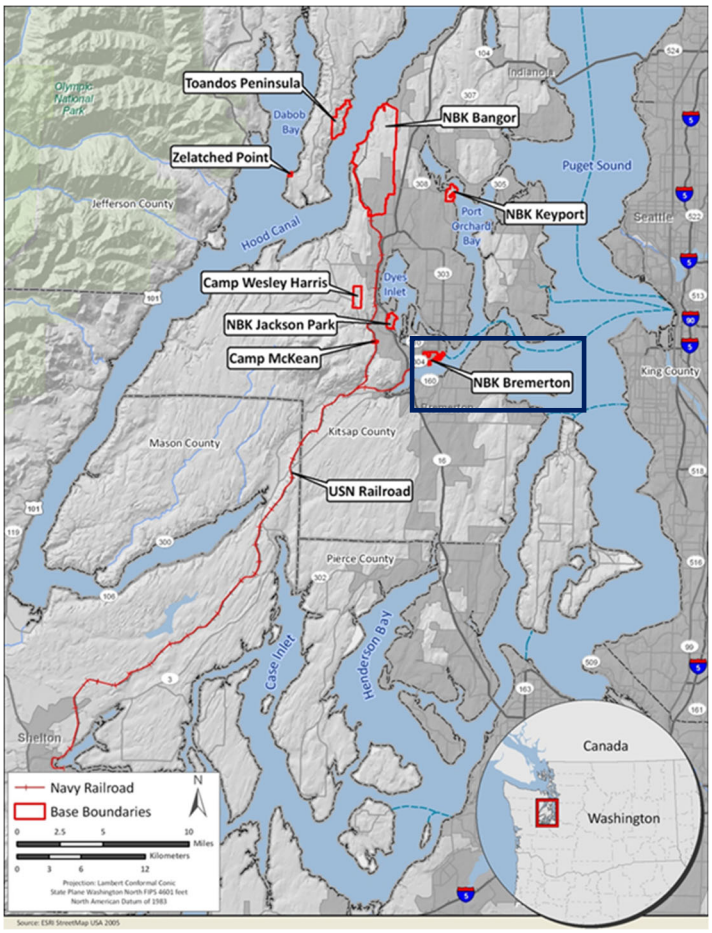


Figure 1. Map of Puget Sound Naval Shipyard (blue box) at Naval Base Kitsap-Bremerton on Sinclair Inlet. Bremerton, Washington.



Figure 2. Orthophoto of the PSNS dry docks. Image from Esri DigitalGlobe.

Table 1. Physical dimensions and volume of PSNS dry dock. Asterisks denote dry docks sampled in this study.

Dock #	Width (ft)	Length (ft)	Area (ft^2)	Average Volume (millions of gallons)	Year of Completion
DD1	115	600	69,000	n/a	1896
DD2*	145	867	125,715	24.7	1913
DD3*	120	927	111,240	17.5	1919
DD4	147	998	146,706	44.9	1940
DD5*	147	1,031	151,557	44.9	1942
DD6*	180	1,152	207,360	79.0	1962

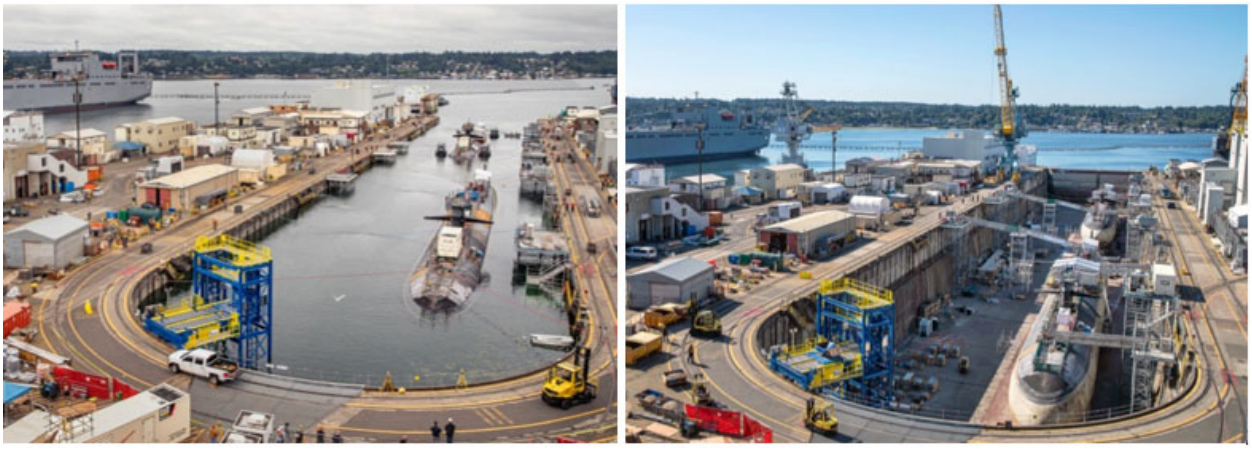


Figure 3. Example of a PSNS dry dock (DD5) with caisson removed for vessel docking/undocking (left) and after dewatering with the caisson installed (right).

During the project development phase, WDFW personnel toured two of the dry docks (DD3 & DD6) in April 2019 to inspect the drainage configurations and obtain measurements to evaluate the best approach for conducting the study. Based on this initial inspection and the limited technical specifications of the drainage systems available, the WDFW proposed to use rigid metal screens to cover the identified horizontal drain surfaces in each dock during a dewatering event (Figure 4). Navy engineers were concerned that affixing screens to the actively pumping drains had the potential to damage the pump systems if water flow was impeded to a point that caused the pumps to cavitate. Therefore, to minimize the potential for pump cavitation, it was concluded that the minimum mesh size for the metal screens would be limited to no smaller than ½ inch. Based on the total area of DD6 floor drain, the largest drain in any of the docks, 42 screens measuring 3 ft. x 5 ft. 6 in. were constructed for the project. For sampling in DD6, the WDFW constructed 24 mesh bags (1in. stretched) measuring 4 ft. x 6 ft. that were designed to be installed on a metal frame and placed under a third of the main drains and behind four of the vertical side openings in a double-bag configuration using a system of breakaway ties (Figure 5). However, after the bags were constructed, it was determined that their use would require substantially more time and coordination with Navy dock crews than was factored into the project, and the bags were never used for

their intended purpose. Despite this setback, the bags were repurposed (without the frames) to block off other drain points identified in each of the docks as the project progressed.



Figure 4. Screens used to entrain fish on drainage grates and other drain opening in the 2020-22 PSNS dry dock study.



Figure 5. Example of mesh bag constructed for use in the 2020-22 Navy dry dock entrainment study.

Each dry dock has one or more primary drains in the dock floor through which water is actively pumped out of the dock during the dewatering process, with the dry dock floor sloping gradually toward these drains. The drains are covered by heavy steel grating with openings of various sizes ranging from 1-2 in. wide by 4-12 in. long. Each dry dock also has a series of gutters cut into the dock floor that passively channel water remaining at the end of the dewatering process (after pump shutdown) into sand traps and sump pools comprising the Process Water Collection System (PWCS). The configuration of the gutter systems varies between docks, with the basic configuration being a main gutter running along each side of the dry dock and side gutters branching off that lead to the PWCS sand traps and sump pool. The PWCS is a separate system from the primary dewatering system, and the PWCS pumps are shut off during the

dry dock dewatering process until the main dewatering pumps are shut down. Gutter sizes vary within and between docks, ranging from 4-24 in. wide by 4-36 in. in deep. The length of most of these gutters are covered by heavy steel grates with openings ranging from 1-2 in. wide by 4-12 in. long. In some of the dry docks, piping and other equipment run along the length of the deeper gutters. Dock-specific details for the four docks sampled in this study are provided below.

There are two floor drains in DD2 located at the southwest and southeast corners of the dock, each measuring 16 ft. by 12 ft. (Figure 6). Each of these drains has an adjacent wall drain that is rectangular at the bottom and semicircular at the top, with the maximum dimensions being 12 ft. 4 in. high by 8 ft. wide.

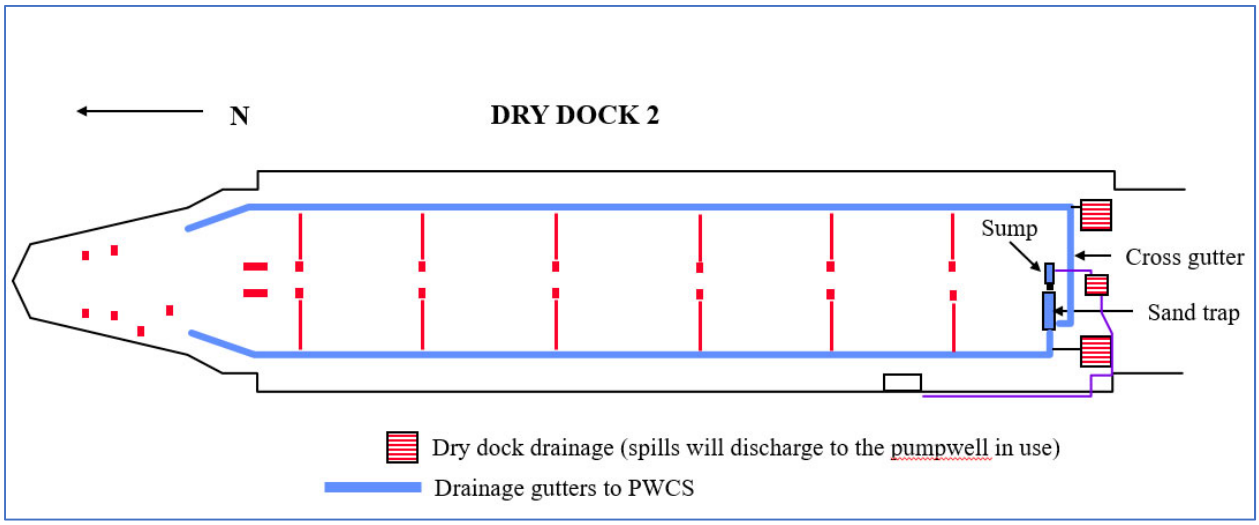


Figure 6. Schematic of drain configuration and PWCS in dry dock 2 (provided by PSNS & IMF).

The primary floor drain in DD3 is 10 ft. in diameter and located in the lower (southern) section of the drydock on the west side (no figure available). This dock also has seven 3 in. diameter holes along the dock wall in the lower section of the dock that were reported to be inflow points during the pre-project dock visit but were discovered to be functioning as drainage points during the first sampling event in this dock.

There are two primary dewatering drains in DD5 located adjacent to each other at the northeast end of the dry dock floor (Figure 7). The north drain measures 13 ft. 10 in. by 8 ft. 3 in. and the south drain measures 14 ft. 1 in. by 8 ft. 3 in. This dock also has four vertical openings measuring 6 ft. high by 2 ft. 6 in. wide that are connected to the dry dock drainage tunnel (wet well) and serve as passive drains during dewatering. These openings are covered by steel grates with openings measuring ~2 in. wide by 24 in. high. Dry dock 5 also has a series of ~24 in. diameter passive drains along each side of the dock, 37 on the east side and 34 on the west side. This dock is filled via two sluice gates measuring 6 ft. by 6 ft. located ~6 ft above the dock floor, one on each side of the dock near the entrance.

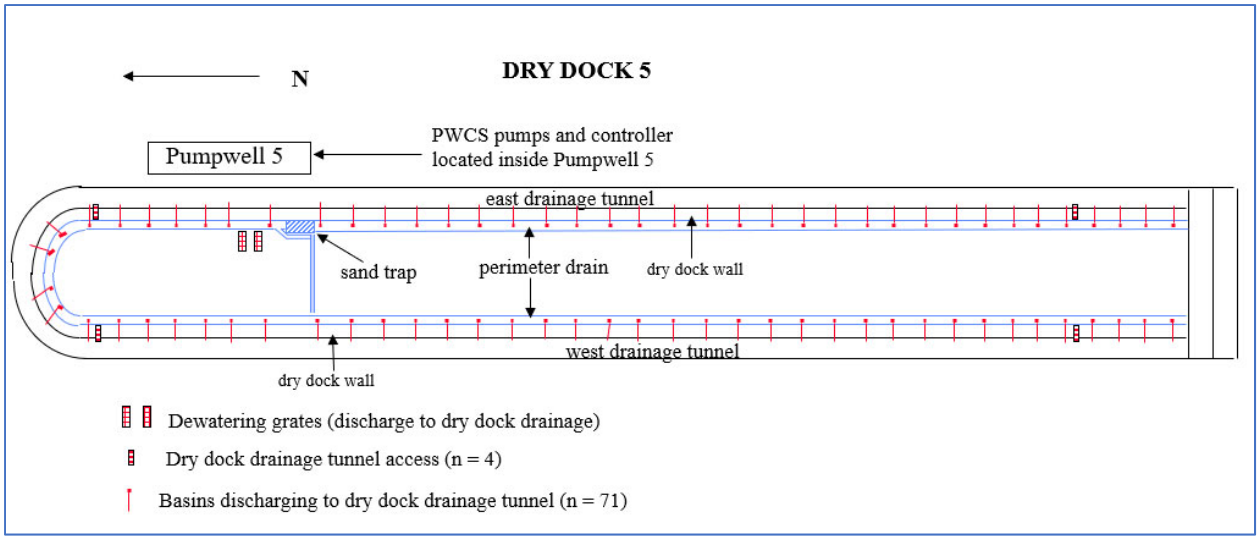


Figure 7. Schematic of drain configuration and PWCS in dry dock 5 (provided by PSNS & IMF).

The primary dewatering drain in DD6 measures 62 ft. x 12 ft. and is located on the southeast side of the dock (Figure 8). This dock has 11 vertical openings measuring 7 ft. 2 in. high by 3 ft. wide – five on the east side and six on the west – that are connected to the dry dock drainage tunnel (wet well) and serve as passive drains during dewatering. These openings are covered by steel grates with openings of 1 in. by 4.5 in. with a 3 in. opening at the top to allow access for wiring. This dock is filled through 18 flood gates located at the south end of the dock, each measuring 10 ft. 6 in. long by 2 ft. 5 in. wide and covered by heavy steel grates with 1 in. by 5.75 in. openings (Figure 8 and Figure ***9***). A 9 ft. wide by 26 in. deep gutter runs across the dry dock floors just south of the flood gates, with two 8 in. drain holes located 26 ft. from each end of the gutter.

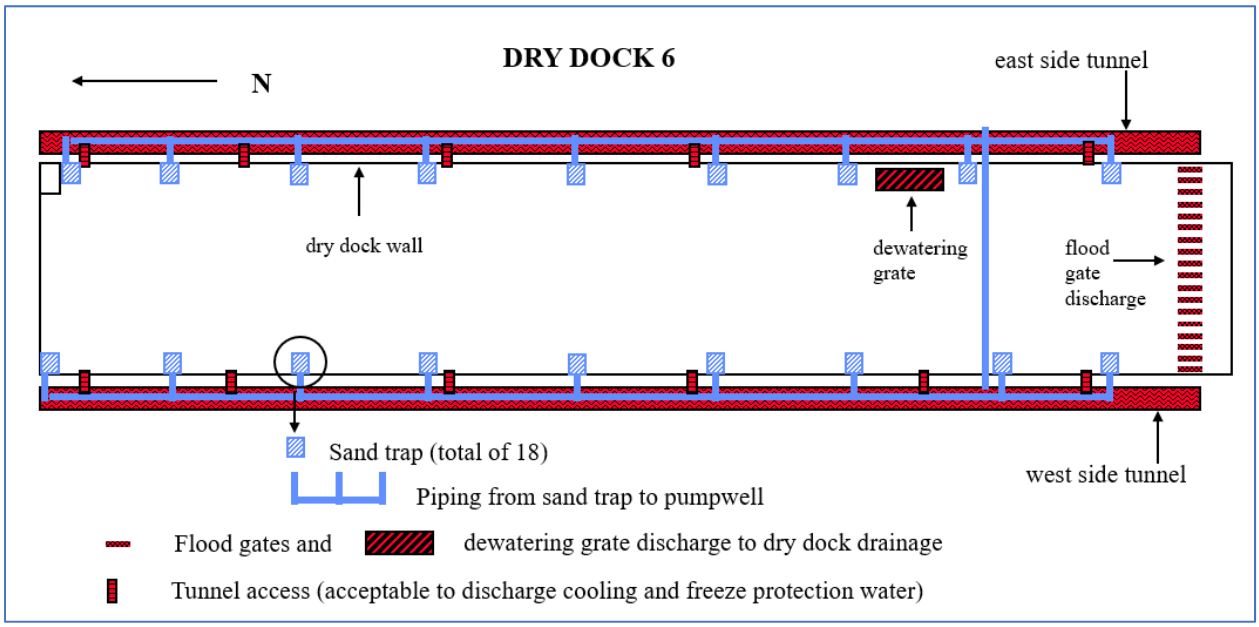


Figure 8. Schematic of drain configuration and PWCS in dry dock 6 (provided by PSNS & IMF).



Figure 9. Initiation of flooding of dry dock 6 on 3 April 2020.

Sampling Methods

Drain screen and net installation

Installation of the drain screens and nets usually occurred 2-5 days prior to a planned sampling event. On a designated installation day, WDFW, NAVFAC NW, and PSNS & IMF staff met at a predetermined time in the PSNS parking lot prior to entering the CIA. In addition to NAVFAC NW Project Manager Phil Thorson and PSNS & IMF project partner Richard Stone, additional PSNS & IMF and NAVFAC NW staff assisted WDFW personnel with the installation process and fish sampling at all events. For the first two events, WDFW staff brought the screens on installation day. For the remaining five events, WDFW staff delivered the screens to the PSNS one to two days before the installation so that PSNS dry dock personnel could lower them into the dry dock floor via crane or elevator to stage them for installation. During installation, screens were attached to the horizontal drain grates and vertical openings with a combination of rebar tie wire, zip ties, and nylon cord depending on the configuration of the grates. The priority was to cover the main drains, followed by any remaining drains (actual or presumed) until all the screens and nets were used. To minimize fish escapement through the Process Water Collection System (PWCS), screens or nets were installed in the PWCS gutters as close to the point where they emptied into a PWCS sand trap or sump.

Sampling protocol

On designated sampling days, WDFW, NAVFAC NW, and PSNS & IMF staff met in the PSNS parking lot approximately two hours before dewatering was scheduled to be complete. Prior to entering the CIA, the WDFW lead scientist briefed WDFW, NAVFAC NW, and PSNS & IMF personnel on the planned sampling protocol, team assignments, and potential problems that might be encountered in the dock. Upon arriving at the designated dry dock, WDFW staff staged the sampling gear at the top of the dock and waited for permission from the PSNS & IMF Docking Officer to enter the dry dock. If the dry dock contained a vessel with a nuclear reactor, PSNS & IMF personnel assisted in close proximity to the vessel due to maintenance condition of the docking evolution. As dewatering progressed, WDFW, PSNS &

IMF, and NAVFAC NW personnel walked the upper perimeter of the dry dock looking for fish in the water from overhead, making note of large salmonids and schools of fish. Throughout the dewatering process, PSNS & IMF staff provided updates on the estimated time of entry to the dock.

Initially, the WDFW proposed to conduct the initial fish sampling using stick seines and dip nets in 2-3 feet of water with the dewatering process paused, then complete the sampling process after the dock had been completely drained. However, after the first sampling event in DD5 it was apparent that this method was not feasible for a variety of reasons. First, crew safety was compromised by the uneven surface of the dry dock floor, uncovered PWCS gutters and sump pools, and other potential hazards that were not visible to the samplers due to low water visibility. Another disadvantage of this technique was that fish were observed escaping the seine nets by swimming into the PWCS gutters and sump pools below the surface of the dry dock floor, and beneath the bottom of the net. Further, small fish were seen escaping through the net mesh and through gaps that occurred between nets, the dry dock walls, and keel blocks that were scattered over the dry dock floor. The method was also time and labor intensive and hampered by difficulties coordinating the activities of independent stick seine and dip net sampling teams over a large area with limited communication ability between teams. This inaugural sampling effort served as a good learning experience, and based on the safety considerations and inefficiencies encountered, future sampling protocols were modified.

For all subsequent events, WDFW personnel waited to enter the dry dock until the water was lowered to ~8-12 inches, and they were given permission to enter. Upon entry to the dock WDFW, PSNS & IMF, and NAVFAC NW personnel walked the dock as the water continued to drain to collect fish and invertebrates with dip nets and buckets. If any larger salmonids had been identified prior to entry to the dock, one or more teams were assigned to track and net these fish for immediate processing. On several occasions, the capture of larger salmonids was aided by Navy dock personnel spotting fish from the top of the dock and directing collecting teams to their location. When the dock was almost completely drained and while most personnel continued to collect fish, several WDFW personnel set up one or more sampling stations, usually near the main drain and/or the point of entry unless prevented by the presence of a ship or other obstruction. The sampling station(s) contained datasheets, length measuring boards, and, in some events, a small digital scale, and was run by a WDFW staff member familiar with fish identification and data recording. As fish were collected throughout the dock, they were placed in small bins or 5-gallon buckets and brought to the sampling station(s) for processing.

All live salmonids were processed first, with the highest priority given to larger fish (>25 cm), followed by dead salmonids and finally, non-salmonid fishes. During all but one of the sampled dewatering events, species, origin (wild vs. hatchery based on presence or absence of an adipose fin), and length information were recorded for all salmonids. On one occasion time constraints and a miscommunication between collection crews prevented this from occurring and data were collected from a subsample of collected fish. After processing, live salmonids — as well as other large, live fish — were returned to the waters of Sinclair Inlet. When possible, all non-salmonid fishes were sorted to species level. Depending on the numbers of fish encountered, all fish were individually sampled, or a random subsample was taken for extrapolation to the known (or estimated weight) of the total sample. In the third sampling event (DD3), a subsample of fish was taken to the WDFW lab to obtain individual fish weights needed to calculate total fish numbers.

Variations in the elevation of the PWCS gutters resulted in aggregations of fish — usually shiner perch (*Cymatogaster aggregata*) or Pacific herring (*Clupea pallasii*) — remaining in the gutters for most of the sampling event, often at great distances from the gutter exits at the PWCS sump pool. As the project progressed, it was determined that the best way to capture fish in the gutters was to install screens or

netting at the terminus of the gutters where they empty into the PWCS sump pool. When screening gutters at or near the sump was not practicable, they were screened as close to the sump as possible. When there were insufficient numbers of screens available sampling was conducted using dip nets to capture as many fish as possible before they could enter the PWCS sump pool.

Once sufficient effort had been made to capture as many fish as possible, the lead WDFW scientist would then direct the removal and consolidation of the drain screens while the sampling station finished processing the fish. Ultimately this modified sampling protocol, compared to the methods used in the first event with stick seines, proved to be far safer and much more effective for sampling as it tended to concentrate most fish at the active drains, allowing for a relatively efficient collection and sampling process.

At the beginning of the project several restrictions were placed on the types of sampling equipment allowed within the PSNS due to security concerns. Cameras and any other device capable of capturing photographic images were prohibited within the CIA; thus, it was not possible for WDFW staff to obtain photos of the docks for planning purposes or for documenting screen/net installation, dock configurations, or sampling activities. Photos of installed equipment presented in this report were provided by DON personnel after they obtained clearance for distribution from the appropriate DON authorities. Digital scales for weighing fish and CWT/RFID wands used to aid in determining the origin of salmonids were originally prohibited due to their Bluetooth capability; however, late in the project the WDFW was informed that these instruments could be used as needed. While this allowed for more accurate weights of fish and other entrained organisms to be collected in later events, no CWD/RFID wands were available to WDFW project staff for use in subsequent dewatering events.

Results

In total, seven dewatering events were sampled in four of the six dry docks (Table 2). Each sampling event presented challenges that necessitated real-time changes to pre-planned sampling protocols to meet the immediate needs of the dry dock personnel as described below. As a result, some non-target fish species (i.e., non-salmonids) were not always identified to the species level, and results for these species are aggregated at the Family level in this report. An overview of each sampling event is provided in the body of this report, with detailed summaries compiled in Appendix 1.

None of the sampling events went as originally planned and sampling was occasionally compromised by unanticipated complications. The sampling process during most events was rushed by Navy dock personnel pushing for sampling to be completed so they could access the dock and begin their work in the dock and on the vessel. This occasionally led to confusion among the sampling crew for the allowable timeframe. Some sampling events were marked by unanticipated delays to the dewatering schedule, some of which prevented sampling from occurring on the planned day (see below). During two sampling events, disruptions that occurred during the dewatering process resulted in the need for PSNS & IMF project partners, rather than WDFW staff, to collect fish data. This need arose due to unresolvable scheduling conflicts for WDFW personnel.

Table 2. Summary of dewatering events sampled in the 2020-22 PSNS dry dock entrainment study.

Sampling Event	Dry Dock	Installation Date	Sampling Date	Notes

1	5	28 May 2020	3 June 2020	Stick seine sampling in high water; numerous obstacles and safety hazards in dock and on dock floor (keel blocks, grating, uncovered PWCS gutters)
2	3	31 August 2020	2 September 2020	Night sampling: conditions not as expected – barge overhanging drains preventing access; pump backflow during sampling caused reflooding of the dock to ~ 8-10"; unknown drain discovered in SE corner of dock
3	3	N/A	18 September 2020	Screens left in place from previous event
N/A	1	12 October 2020	N/A	Sampling canceled; the day after installation, dock workers removed many of the screens around a valve access point, thereby exposing a large escapement potential that prevented sampling
4	6	3 March 2021	9 March 2021	DD6 flooded and open from 4-9 March
5	5	21 June 2021	23 June 2021	Dewatering completed on schedule. Decommissioned nuclear submarine in dock. Sampling rushed by Navy dock workers.
6	6	5 September 2021	11 September 2021	Jet fuel leak in dock prevented WDFW sampling fish; Richard Stone (PSNS & IMF) collected fish and recorded data when dewatering was completed on 9/14/2022.
	2	17 February 2022	23 February 2022	Pump issues prevented WDFW from sampling fish; Richard Stone (PSNS & IMF) collected fish and recorded data immediately following dewatering on 25 February.

Overview of sampling events

The first sampling event was expected to occur in March 2020 but was cancelled due to the SARS-CoV-2 pandemic, which created logistical complications and sampling efficiency challenges for the survey team throughout the project's duration.

Caisson removal times after flooding varied considerably among events, ranging from just less than 3 hours to over 5 days (Table 3. Caisson removal times and durations for the PSNS dry dock study.).

Table 3. Caisson removal times and durations for the PSNS dry dock study.

Dry Dock	Date	Time of caisson removal	Duration of caisson removal
DD5	02 JUNE 2020	00:00 to 03:25	3 hours 25 minutes
DD3	02 SEPT 2020	15:50 to 18:50	3 hours
DD3	18 SEPT 2020	03:32 to 06:25	2 hours 57 minutes
DD6	04 MARCH 2021	11:45 to 09 MARCH 12:03 (docking delayed due to high winds)	120 hours 18 minutes
DD5	23 JUNE 2021	10:52 to 16:05	6 hours 13 minutes
DD6	09 SEPT 2021	12:12 to 10 SEPT 2021 10:30	22 hours 18 minutes
DD2	22 FEB 2022	12:16 to 24 FEB 09:42 (super flood event)	45 hours 26 minutes

Sampling Event 1 – Dry Dock 5

The first dewatering event in DD5 occurred on 3 June 2020. The entire surface area of the floor drains and four side doors were covered with screens. Additionally, 10 of the 71 24 in. circular openings in the

dock were randomly selected for screening. During screen installation, the sluice gates on each side of the dock were identified as potential escapement points for small fish. The sluice gate on the west side of the dock was completely screened, but there were not enough screens remaining to cover the east sluice gate. The Navy was conducting pump testing during this event and water was pumped in and out of the dock over several hours before the sampling teams were allowed to enter and begin working. After dewatering, the screens attached to the west sluice gate were found lying on the dock floor, having been blown off during the flooding of the dock. Based on the apparent force of the inflow, WDFW staff consulted with PSNS & IMF project partners and decided that the sluice gates would not be screened during any future events in DD5. Also, the two doors covering the vertical openings on the south end of the dock were open and the screens attached to those doors were bent. Several seagulls were observed in the dock once the water level reached the height of the keel blocks (~4 feet), indicating the presence of fish or other food items.

This was the only event where stick seines were employed to capture fish with dewatering paused. Due to the numerous obstacles in the dock and hazards on the dock floor, this method proved to be too difficult to coordinate amongst sampling teams, and fish consistently escaped around and under the nets. Further, the mesh size of one seine was large enough to allow smaller fish to pass through the net. Teams continued to use the seines to drive as many fish as possible to the south end of the dock where they were collected and transferred to sampling containers. The original plan called for the dock to be completely drained to allow any remaining fish to be collected after using the stick seines, but this did not occur, and dewatering was stopped when the water level reached between 6-12 inches depending on the location in the dock.

As the collected fish were being processed, shipyard personnel notified PSNS & IMF that the sampling teams needed to leave the dock ASAP so that additional pump testing could occur prior to completely dewatering the dock. This process was expected to take several hours and was outside the planned timeframe for this sampling event, therefore sampling was concluded, leaving an unknown number of fish in the dock. Based on the large number of what appeared to be mostly forage fish observed from the top of the dock during dewatering, the total number of fish collected with the stick seines is probably much lower than the total numbers of fish entrained during this event. No fish weights were collected in this event.

Removal of the screens took considerably longer than anticipated due to the depth of water that obscured visibility and removal of the tie-downs. Two larger salmon were known to be in the dock but due to time constraints they could not be located and collected. Following complete dewatering after the departure of WDFW personnel, PSNS & IMF personnel were able to collect these fish; a 406 mm unclipped Chinook salmon and a 546 mm clipped Chinook salmon.

Sampling Event 2 – Dry Dock 3

The first dewatering event in DD3 occurred on 2 September 2020. The entire surface area of the floor drain was screened as well as ~40 feet of the western PWCS gutter beginning at the main drain and running north. Fish were concentrated at the floor drain, but a barge brought into the dock following the screen installation was blocking access to ~75% of the drain and 70-80% of the PWCS gutter on the west side of the dock. Despite this restricted access, sampling personnel began to collect fish that could be reached by hand and with a long-handled large squeegee. Within two minutes of starting to collect fish, the main dewatering pumps began to cavitate and were shut down, at which point water began to backflow through the floor drain, quickly raising the water level by about 8 in. and washing the fish trapped on the screens back into the dry dock. This backflow was also observed coming up through the

visible 3 in. openings located around the perimeter of the dock (some openings were obscured by the barge in the dock). Because personnel were focused on collecting the scattered fish, these perimeter openings were ignored for the remainder of the sampling event. As fish were being collected, a previously unknown drain measuring 21 in. by 26.5 in. was discovered in the SE corner of the dock. This drain is actively pumped by a smaller drainage pump system that is not activated until the main dewatering pumps are shut down. As WDFW staff monitored the lowering water level around this drain, they observed fewer than 10 fish escaping through the drain, with most of these appearing to be Pacific sand lance (*Ammodytes personatus*). No fish weights were collected in this event.

Sampling Event 3 – Dry Dock 3

The second dewatering event in DD3 occurred on 18 September 2020, with the screens left in place from the first event on 02 September 2020. Because WDFW staff had not anticipated the discovery of new drains in the first event, the screens not used for that event were left in storage and the SE corner drain could not be covered. However, as this was now a known drain, several screens were brought to this event and when the water level was ~20-24 in. deep, a WDFW crew member used the ledge running along the dock wall to access the drain and cover it with a screen, but not before observing what was estimated to be several hundred juvenile herring exiting through the drain in less than a minute. This estimate was used to estimate the total loss of Pacific herring through this drain for this event, as described below. The backflow condition experienced in the first event was anticipated and staff did not attempt to collect fish until after the backflow had occurred and the dock began to drain again through the main floor drains. As the dock was draining, a WDFW crew member observed fish being drawn into several of the 3 in. perimeter openings and used a dip net to collect 198 juvenile Pacific herring in 60 seconds at one of these openings. Because these openings had not been identified as drains prior to the first event in DD3, they were not screened. During this event, a continuous flow of water through the caisson seal prevented one of the drainage gutters from clearing, and a small school of shiner perch were able to remain in the gutter by swimming against the flow. These fish were captured by blocking the gutter with screens upstream and downstream of the school, allowing samplers to dipnet fish until they were all collected. It was estimated that the number of fish collected in the gutter represented 10-20% of the total number of shiner perch collected in this event. A subsample of fish was collected in this event and processed in a WDFW laboratory to obtain individual fish weights that were used to calculate the total sample weight and fish numbers. A summary of fish weights for this and following events are included in Appendix 2.

Sampling Event 4 – Dry Dock 6

The first sampling event in DD6 occurred on 9 March 2021. The entire surface area of the main drain was fully covered with a combination of 3 ft. x 3 ft., 3 ft. x 5 ft., and 4 ft. x 6 ft. metal screens. The 11 vertical openings to the wet well were covered with 4 ft. x 5 ft. screens, leaving the upper 2 ft. of the door uncovered. This was considered acceptable by PSNS & IMF project partners because these openings are not actively pumped, and it was considered unlikely that fish would avoid entrainment via escapement through these openings in the short time that it took for the water level to drop from the top of the opening to the top of the screen. A combination of materials was used to screen around the PWCS sand traps, including the mesh catch bags, small pieces of unframed steel mesh screen, and small framed screens. In this event, a mothballed conventional (i.e., non-nuclear) aircraft carrier was brought into the dock to be readied for transport to the scrapyard.

This event was originally scheduled for 4 March 2021 but sustained high wind conditions prevented the aircraft carrier from being moved into the dock as planned, and the dock remained open to Sinclair Inlet for five days. For these reasons, this was not considered to be a typical vessel docking. Although the

overall number of entrained fish was small, the diversity of fish collected in this event was higher than any other event. Unlike active Navy vessels, the hull of this vessel was covered with sessile marine invertebrates, predominantly tube worms and anemones, and because these organisms are significant sources of food and refuge for marine invertebrates and fish, it is likely some of the fish sampled in this event were transported into the dock on the hull of the carrier. Some fish were collected from the nets installed around the PWCS sand traps, but the size of the dock, small sampling crew, and working at night with headlamps did not allow for the sampling team to quantify the proportion of these fish relative to the total number of fish collected. Fish weights were collected in this event and are summarized in Appendix 2.

Sampling Event 5 – Dry Dock 5

The second sampling event in DD5 occurred on 23 June 2021. As in the first event in this dock, the entire surface area of the main floor drains was screened (Figure 10a). To cover as many of the circular perimeter drains as possible, the four vertical openings were covered with 4 ft. x 5 ft. screens, leaving the top 12 in. of the opening unscreened (Figure 10b). As in DD6, this was considered acceptable by PSNS & IMF project partners because these opening are not actively pumped by the MDPs, and it was considered unlikely that fish would avoid escapement through these openings in the short time that it took for the water level to drop from the top of the opening to the top of the screen. The vertical opening doors that had swung open in the first event in DD5 were tied shut before being screened, and these doors did not open during flooding. The remaining screens were used to cover 35 of the 71 24 in. circular drains along the east and west sides of the dock (Figure 10c). A decommissioned nuclear submarine was in the dock; therefore, PSNS & IMF personnel assisted with the fish collection and screen removal in close proximity to the vessel due to maintenance condition of the docking evolution. Sampling in this event was complicated by the higher-than-usual number of NAVFAC NW and PSNS & IMF personnel assisting with fish collection, which caused some confusion and miscommunication at the sampling station that resulted in a slight loss of data precision relative to other events. Sampling in this event was also rushed by Navy dockworkers needing to access the dock and begin their work. Based on a debriefing with the sampling crew after all the fish had been collected, it was determined that fewer than 50 fish were recovered from screens covering the perimeter drains, with most fish being collected at the main floor drains. A few fish could be seen swimming in the PWCS sump pool, but due to the water depth and machinery in the pool, these fish could not be collected or quantified; however, the number of fish visible appeared to be small in proportion to the number of fish collected in the dock. Water was observed entering the dry dock along a section of the caisson seal, which supplied a steady stream of water into the PWCS gutters on the west side of the dock and prevented the dock from draining completely. As fish were collected and processed, several WDFW and PSNS & IMF personnel spent ~60 minutes collecting fish from these gutters with dip nets before they could enter the PWCS sump pool, but only a few fish were captured in this effort. Most of these fish were small sculpins, and no salmonids were observed during this period. Due to the limited amount of sampling time available in the dock, WDFW team lead Pacunski conferred with PSNS & IMF partner Stone and concluded that it was not necessary to conduct further sampling of the PWCS gutters as it appeared that no fish were being introduced to the dry dock via the caisson leak and that all the salmonids in the dock had been collected. Fish weights were collected in this event and are summarized in Appendix 2.

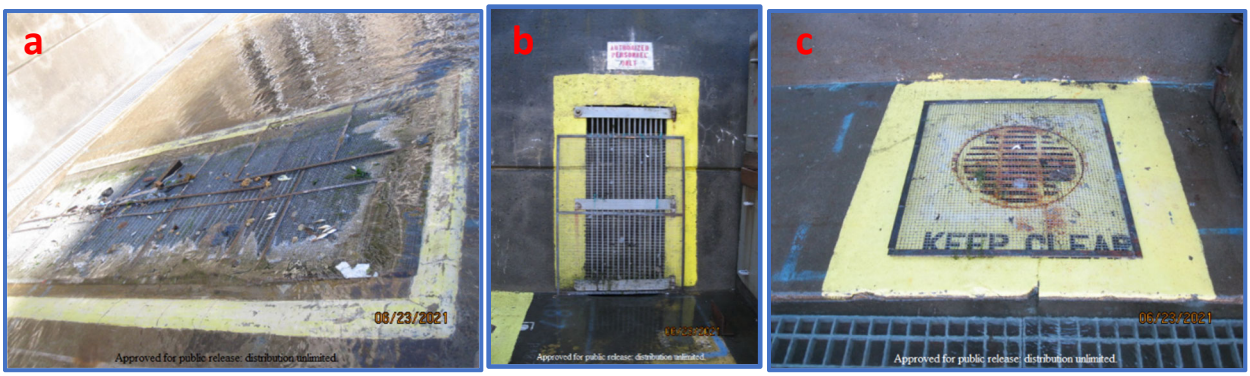


Figure 10. Metal screens in Dry Dock 5 covering one of the main floor drains (a), one of the vertical openings (b), and one of the 24" round grates (c).

Sampling Event 6 – Dry Dock 6

This dock was screened in the same way as the first event as described above. At the sampling event scheduled for 06 September 2021 in DD6, however, WDFW personnel arrived on site and were informed that a jet fuel spill had occurred and that the dewatering process had been halted until the dock could be secured, assessed for safety, and decontaminated. This process was first estimated to take 2-3 hours, thus WDFW staff and DON project partners remained on site with the expectation that sampling would occur that day. The fumes of the jet fuel in the dock were extremely noxious and personnel had to continually move around the area surrounding the dock to avoid the fumes as the wind changed directions. As Navy dry dock personnel coordinated the cleanup activities, the dewatering process continued and WDFW staff walked the perimeter of the dock making observations of a small school of salmonids and several small schools of forage fish. As the water level reached the top of the vertical openings along the side of the dock, no fish were observed passing through the ~3-in. gaps at the top of the screens in the vertical openings in DD6 before the water level had dropped to the level of the screens covering these openings, which took about five minutes. Once the water level had reached a depth of ~36 in., a team of Navy dock workers entered the dock with an oil-spill boom and began encircling the main part of the spill that was visible on top of the water, which took about 90 minutes to complete. After the team had exited the dock, WDFW lead scientist Pacunski spoke with DON staff and was informed that additional clean up requiring equipment that was not currently available (skimmer machine) required for clean-up would be necessary prior to any WDFW staff or project partners being allowed into the dock. This process was estimated to be completed near midnight; therefore, sampling was canceled for the day and WDFW staff departed the PSNS. Due to a lack of availability, WDFW staff could not be rescheduled to return to the dock when dewatering was estimated to be complete. When the dock was dewatered three days later, PSNS & IMF and NAVFAC NW project partners collected fish in the dry dock and sent the data to WDFW staff. No fish weights were collected in this event. PSNS & IMF and NAVFAC NW staff also removed the screens and nets and staged them at the top of the dock for pickup by WDFW staff.

Sampling Event 7 – Dry Dock 2

The final sampling event of the study and the only event conducted in DD2 was planned for 24 February 2022. This was a “super flood” event where the tide was higher than average, a condition needed to provide sufficient clearance for a large nuclear submarine to be placed on the keel blocks. The entire surface area of the horizontal and vertical drains was screened, and nets were installed around all the sand traps. WDFW staff arrived at PSNS between 1620 and 1645 and were informed at 1650 that 28 ft. of water remained in the dock and that dewatering had been halted due to an incident in the dock where the

caisson could not be properly seated due to the high tide conditions. The estimated time of complete dewatering was revised to 25 February at ~1000, and WDFW staff departed the PSNS. WDFW staff returned the next morning between 0730 and 0830. At ~0800, NAVFAC NW Project Manager Thorson received a phone call advising that dewatering would be complete between 1000 and 1200. At 1045, PSNS & IMF partner Stone informed WDFW staff that the dewatering had been delayed and would not be complete until at least 1500. As this time was outside of the prescribed sampling window, WDFW team lead Pacunski decided to send WDFW staff home, and sampling supplies were left with PSNS & IMF and NAVFAC NW staff to conduct sampling when the dock was dewatered, which did not occur until mid-afternoon on 25 February. No fish weights were collected in this event.

General fish observations

During each dewatering event, WDFW staff and NAVFAC NW and PSNS & IMF project partners walked around the upper dock perimeter making observations of any fish seen in the dock. Schools of forage fish – mostly Pacific herring and shiner perch – tended to swim along the perimeter of the dock until the water was almost drained from the dock, except when being pursued by larger salmonids. Once the water level had dropped to ~12–18 in., most fish could not overcome the suction of the main drain and were pulled onto the screens covering those drains, although some fish were drawn into the perimeter drains in DD3 and DD5 as described below. As the drain flow rate diminished, some fish were able to enter the PWCS gutters where water was still flowing from higher elevations in the dock. Most fish captured at the primary drains within each dock were mortalities, whereas most live fish other than large salmon were captured in the PWCS gutters.

In several events, the presence of gulls feeding in the dock during the dewatering process was an obvious indication that small fish were present in the dock (usually Pacific Herring and/or Shiner Perch), but there was no objective method to quantify this fish loss. The number of gulls varied from a few to several dozen, but once the water level was low enough for staff to enter the docks, their presence combined with sampling activities was enough to drive the gulls out of the dock.

Salmon

A total of 187 Chinook salmon (*Oncorhynchus tshawytscha*) were encountered in six of the seven sampling events, with 55% of these fish captured in the dewatering event in DD5 on 23 June 2021 (Table 4). The only other salmon encountered in the study were eight Coho salmon (*Oncorhynchus kisutch*) in two events (three hatchery, five undetermined origin) and two Chum salmon (*Oncorhynchus keta*) in one event (Table 5). Most of these fish were mortalities related to being impinged on the screens.

Table 4. Summary of Chinook salmon by presumed origin encountered in the 2020-22 PSNS dry dock entrainment study.

Dock – Event No.	Survey Date	Hatchery	Wild	Total
DD5 – 1	3 June 2020	8	18	26
DD3 – 2	2 September 2020	1	3	4
DD3 – 3	18 September 2020	3	5	8
DD6 – 4	9 March 2021	2	0	2
DD5 – 5*	23 June 2021	85	17	102
DD6 – 6	14 September 2021	38	7	45
DD2 – 7	25 February 2022	0	0	0
TOTAL		**137**	**50**	**187**

*Totals by origin were estimated from a subsample of 30 fish.

Table 5. Other salmon encountered in the 2020-22 PSNS dry dock entrainment study.

Dock – Event #	Species	Hatchery	Unknown/undetermined	Total
DD5 – 1	Coho	1	0	1
DD3 – 3	Coho	3	0	3
DD5 – 5	Coho	0	4	4
DD5 – 5	Chum	0	2	2

All Chinook and other salmonids were measured, except for fish in the 23 June 2021 event in DD5, in which a subsample of 30 fish were measured and the ratio of hatchery to wild fish in the subsample was extrapolated to obtain the total number of Chinook salmon by origin. Fish lengths were recorded as total length (TL) by WDFW staff, but fish measured in one event by Navy personnel were recorded as fork length (FL). To convert FL to TL for fish < 250 mm, we used the reciprocal of the average of two FL-to-TL conversion formulas for Atlantic salmon as determined by Jessop (1975), where

$$TL = 1.084FL$$

For larger fish, we used the conversions developed by Conrad and Gutmann (1996) for Chinook salmon on the west coast of the United States, where

$TL = 1.023 + (1.045FL)$ for lengths in the range of 350 mm $\leq$ FL < 680 mm,

and

$TL = 1.488 + (1.034FL)$ for lengths in the range of 680 mm $\leq$ FL < 800 mm.

Most encountered Chinook (74%) were presumed to be of hatchery origin due to the lack of an adipose fin (i.e., clipped), with the remaining fish (n = 50) presumed to be of native origin. Most Chinook salmon were smolts and juveniles ranging in length (TL) from 80 – 235 mm, with only 13 fish being larger (410 – 765 mm) (Figure 11). Three larger Chinook salmon recovered during sampling in the first event (DD5) were viable and returned to Sinclair Inlet and were observed swimming away from the area. Two large Chinook remaining in the dry dock after WDFW personnel had concluded sampling were recovered by Navy personnel (see event summary above) and returned to Sinclair Inlet. One fish was observed swimming away, but the 546 cm clipped Chinook was bleeding from the gills and observed sinking post-release and presumably did not survive. The large Chinook salmon captured in the fifth sampling event (DD5) were all viable and released immediately after obtaining lengths, although noticeable scale loss was observed on these fish. The large Chinook salmon captured in the sixth sampling event (DD6) were observed swimming in the dock throughout the dewatering process, although one fish was observed with what appeared to be a large scar on its back. These fish were observed swimming in the dock for several days after the designated sampling day but were dead when PSNS & IMF personnel conducted fish sampling on 14 September 2021, with mortality being attributed to prolonged jet fuel exposure.

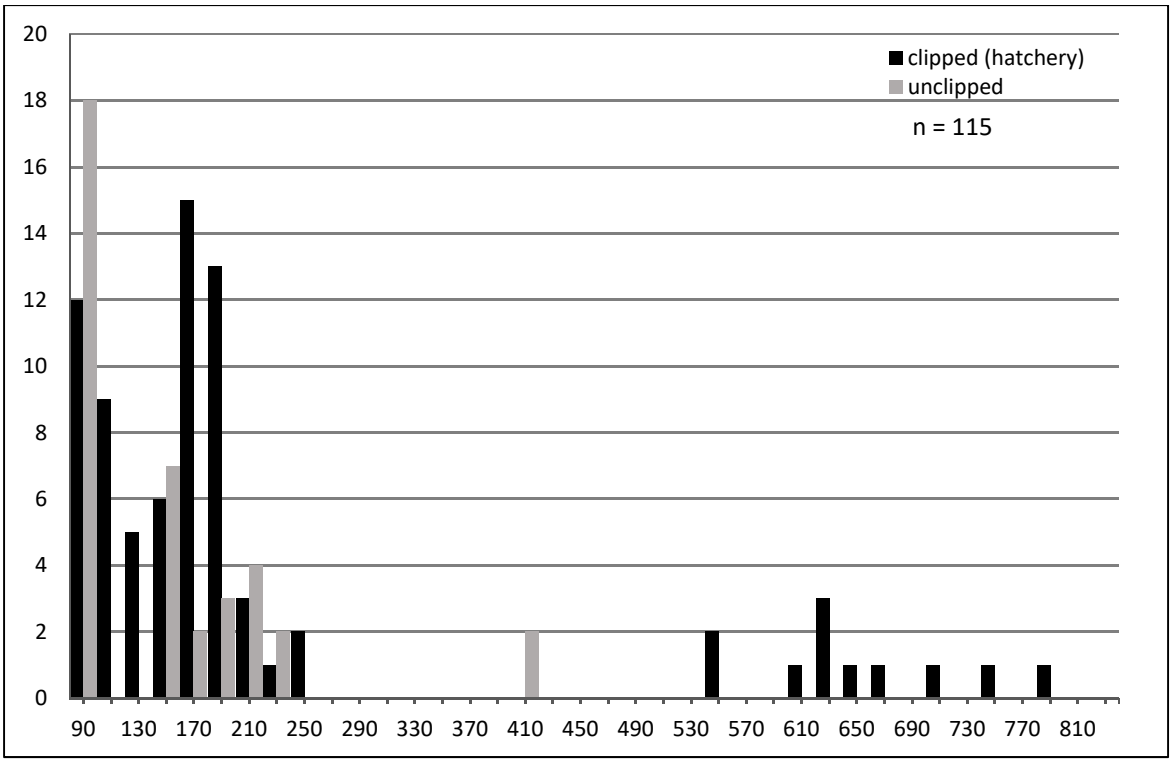


Figure 11. Length frequency distribution by clip status of Chinook salmon measured in the 2020-22 PSNS dry dock entrainment study. Fish are grouped into 20 cm length categories (e.g., 90 = 80-100 cm, etc.)

Other fish and invertebrates

A complete list of all organisms encountered in the study are listed in Appendix 3. During the first sampling event in DD5, complications with the pump testing being conducted in the dock resulted in shorter sampling window than expected, thus some fish and invertebrates were not counted and were only recorded as "present", and total counts presented in this report do not include these organisms. In total, 21,252 non-salmonid fishes representing 40 taxa were captured in the study, with 32 taxa identified to the species level, although only 4 taxa were dominant. Pacific Herring (*Clupea pallasii*) were the most abundant species encountered, occurring in six of the seven sampling events, but with most of these fish (97%) captured in the dewatering event in DD3 on 18 September 2020 (Table 6). As described above, an unknown number of fish were lost through previously unidentified drains and the visual estimate of fish escaping through the SE corner drain and the number of Pacific herring collected with a dip net at one of the 3" openings were used to calculate this potential loss under the following assumptions:

1) the water flow was not strong enough to pull fish through these opening until the water depth in the dock was ~24 inches, and
2) the water level dropped ~8 in. every 10 minutes based on WDFW field notes.

Under these conditions it would take ~30 minutes for these openings to be dry, and the maximum loss through the 3" drains was calculated as:

7 drains x 198 fish/min x 30 minutes = 41,580 fish,

which is just over two times the number of fish estimated to have been entrained in this event from the collected subsamples. However, WDFW staff present at that event concluded that it was highly unlikely that samplers in the dock would not have detected so many fish exiting these drains and decided that 25% of this value, or 10,395 fish, was a more reasonable estimate of potential fish loss via these openings. For the SE corner, the maximum potential loss through this drain was calculated as:

300 fish/min x 30 minutes = 9,000 fish.

All these potentially lost fish were presumed to be Pacific herring, and the calculated loss values were added to the count estimated from the subsample collected at this event (Table 6).

Table 6. Counts of dominant non-salmonid species captured in the 2020-22 PSNS entrainment study.

Dock - Event	Pacific Herring	Shiner Perch	Pacific Sand Lance	Sculpins (Cottidae)
DD5 – 1	130	0	242	Present
DD3 – 2	39	22	22	26
DD3 – 3	38,361*	149	0	43
DD6 – 4	125	0	0	59
DD6 – 5	12	479	0	10
DD6 – 6	513	22	3	15
DD2 – 7	0	0	0	1
Total	**39,180**	**214**	**267**	**154**

*Count includes estimated losses through previously unknown drains.

Shiner perch were the next most abundant species captured, occurring in four of the six sampling events but in much lower numbers than Pacific herring. Pacific sand lance (*Ammodytes hexapterus*) occurred in three events, but most of these fish were captured in the first event in DD5. As a group, sculpins (Family Cottidae) representing eight taxa (seven species + unidentified sculpin mix) were recorded in all sampling events in similar numbers to Pacific sand lance. The remaining fish taxa were recorded in numbers of 99 or fewer, with counts in 25 of these taxa being fewer than 13 fish. Two taxa, unidentified flatfish and longfin sculpin, were only recorded as "present" in the first event in DD5.

Only five rockfish were encountered in this study: three brown rockfish (including one 20 cm juvenile), one copper rockfish, and one juvenile that was identified as either a copper rockfish or quillback rockfish (or potential hybrid).

The dominant invertebrates captured in the dry docks were California market squid and shrimp (Appendix 2). Other invertebrates included several species of crabs, sea cucumbers, and starfish, all of which occurred in very low numbers.

For Chinook salmon and the four most dominant non-salmonid taxa (Pacific herring, Pacific sand lance, shiner perch, and sculpins), no correlations were found between the number of fish captured and dock size ($0.33 < P < 0.97$) or duration of caisson removal ($0.22 < P < 0.56$). Insufficient numbers of other organisms were captured to evaluate potential correlations.

Discussion

The only potentially ESA-listed species encountered in the study was Chinook salmon, with most of these fish being smolts and juveniles. Overall, only 187 of these fish were encountered, suggesting that the number of Chinook salmon in Sinclair Inlet near the PSNS dry docks is very low or that the bubble

curtains used when the caissons are removed are an effective deterrent to minimize fish entry into the dry docks. Most of the small Chinook salmon were mortalities due to impingement on the screens, and it is likely that most of these fish would die when passing through the pump systems. The size of the grating covering the dock drains prevents larger salmonids (and other fish) from being drawn into the Main Dewatering Pump system and suffering likely mortality. Four of the five larger Chinook salmon captured in the 3 June 2020 event were very viable and released alive, although some scale loss was evident and there was no way to evaluate their long-term survival. The fifth fish was released into Sinclair Inlet but was presumed to have died as it was observed bleeding from the gills and sinking. The large Chinook observed swimming in DD6 on 6 September 2021 continued to be observed swimming in the dock for several days by PSNS & IMF personnel until dewatering could be completed. These fish were all mortalities by the time sampling occurred on 14 September 2021, likely due to prolonged exposure to jet fuel, but otherwise would have been expected to survive the dewatering process. According to PSNS & IMF staff, the Navy has an unwritten protocol for removing larger salmonids during dewatering events (R. Stone email, 6/6/2022). The basic process entails arriving at the dock ~30 minutes prior to complete dewatering to look for larger salmonids. If large fish are spotted, the dock-master is notified, the dewatering process is halted with the water level at 6-8 inches and teams are sent in to capture these fish to be identified and returned to Sinclair Inlet. Upon complete dewatering, the teams quickly look for any fish that may have been missed and place them in seawater for return to Sinclair Inlet. Assuming that this procedure is followed in future dewatering events and that fish are not injured or otherwise suffer significant trauma during flooding and dewatering, we hypothesize that impacts to adult Chinook and other large marine fish from dry dock operations are negligible.

Juvenile Chinook salmon are known to be present in Sinclair Inlet from April to September (Fresh et al 2006), but their abundance in other months is not well documented. However, Fresh (2006) reports that juvenile Chinook salmon abundance in Sinclair Inlet is highest in June and early July, coinciding with the highest releases from the Gorst Creek Hatchery and Rearing Ponds (GCHRP). Between 500,000 and 1.7 million Chinook salmon smolts were released from the GCHRP between 2016 and 2021 (2022 numbers not available) (NWIFC RMIS). Adult Chinook salmon reside in Puget Sound year-round and low numbers of Chinook salmon spawn in Gorst Creek and nearby Blackjack Creek in the fall (Fresh 2006). Relative to other sources of natural mortality, the number of Chinook salmon captured in this study is insignificant, although the potential to entrain large numbers of salmonids in the docks cannot be ruled out, and only continued monitoring would be able to address this potential quantitatively. In 2020 and 2021, 99% and 100% of Chinook salmon smolts released into Sinclair Inlet from the GCHRP and Minter Creek Hatchery (MCH) were adipose-clipped (NWIFC RMIS; J. Smith, WDFW, pers. comm, 19 Sept. 2022). These values contrast with the 74% adipose-clipped fish encountered in the study and may suggest that non-clipped fish, which are presumed to be of native origin, may have a higher susceptibility to entrainment in the dry docks. Chinook salmon originating from the GCHRP and MCH are not included in the Puget Sound Chinook Ecologically Significant Unit (PS ESU) listing and thus are not covered under the Endangered Species Act, although it is very likely that unclipped Chinook salmon from various sources are also present in Sinclair Inlet throughout the year. Some of the Chinook entering Sinclair from outside sources would be expected to be ESA-listed from both natural and hatchery sources included in the Chinook ESU; however, some hatcheries do not clip all released fish, and distinguishing these fish from unclipped listed fish would require time and resources well beyond the scope of the current study (e.g., long-term genetic sampling). Lastly, it is likely that a small proportion of adult Chinook salmon produced by GCHRP and MCH stray and spawn naturally in the creeks and streams emptying into Sinclair Inlet (Fresh et al. 2006, Ruckelshaus et al. 2006). Per the 1999 listing of Puget Sound Chinook salmon, “This evolutionarily significant unit, or ESU, includes naturally spawned Chinook salmon

originating from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound and the Strait of Georgia.", therefore, these fish are protected by the ESA (G. Rule, NOAA, email comm. 30 Sept. 2022). Consequently, because the presence or absence of an adipose fin cannot be used as a reliable indicator of origin or ESA-listing status, the impacts of dry dock entrainment on listed Chinook salmon cannot be quantified at this time. However, given the large numbers of Chinook salmon released annually by GCHRP and MCH (>1 million fish), the authors conclude that the probability of ESA-listed Chinook salmon occurring in Sinclair Inlet is likely very low.

Except for the second sampling event in DD3 where large numbers of Pacific herring were encountered (including estimated fish loss via uncovered drains), very few non-salmonid fishes were encountered in the study. The presence of Pacific herring was not unexpected, as this species is common throughout Puget Sound and utilize shoreline habitats throughout their life cycle (Hay 1985). Pacific sand lance, shiner perch, and bay pipefish are also common residents of Puget Sound nearshore habitats. The presence of other non-salmonid fishes is representative of the fish diversity in Sinclair Inlet, and the low numbers of most fish captured in the dry docks suggests that their abundance in Sinclair Inlet close to the PSNS is low or that the bubble curtain effectively prevents most fish from entering the dry docks. The low number of rockfish encountered is supported by the results of a WDFW study conducted in 2013-2015 that assessed the distribution and abundance of ESA-listed rockfish adjacent to Naval Base Kitsap – Bremerton. In that study, Frierson et al. (2016) used a remotely operated vehicle (ROV) to survey the PSNS Floating Security Barrier and hook-and-line methods to fish within the CIA and encountered only five rockfish: four brown rockfish with the ROV and one copper rockfish with hook-and-line sampling. Lingcod are an important and highly prized species in the recreational bottomfish fishery and are known predators of forage fish and juvenile salmonids, but no lingcod were encountered in this study. This finding is also supported by the results of Frierson et al. (2016), which did not detect lingcod with the ROV or in hook-and-line sampling. Based on the limited number of sampling events completed in this study, we conclude that future dewatering events will have little or no impact on populations of non-salmonid fish residing in Sinclair Inlet if standard operating protocols remain in place.

The large number of Pacific herring captured in DD3 on 18 September 2020 was anomalous and difficult to interpret. As a schooling species, large aggregations are not unusual. According to PSNS & IMF (R. Stone email comm. 6/2/2022), this dewatering event was considered "normal", with the bubble curtain operating as expected and the caisson being removed for just under three hours (Table 3). Mr. Stone (email comm. 6/2/2022) further reported that photos of the dry docks from the 1940s and 1950s show the dock floor covered in 10-12 in. of Pacific herring (and likely other species) after a dewatering event, but bubble curtains were not used in these years and no barrier existed to prevent fish from entering the dry dock prior to the placement of the caisson. In the 18 September 2020 event, the two Chinook salmon and one brown rockfish entrained in the dry dock were large enough to feed on herring of the size range encountered, thus the possibility exists that these fish may have pursued a "herring ball" through the bubble curtain that subsequently became entrained in the dock.

There are only two possible ways for fish to enter the dry dock, either through the flooding ports of the dock and/or caisson or by passing through the bubble curtain. DD1, DD2, and DD4 are always flooded through the caisson, while the other docks are flooded through the inlet ports below the dock floor (R. Stone email comm. 7/15/22). The flood-through valves in the caissons are located about midway up the caisson, with the relative elevation varying with tidal height. At a low tide, the caisson valve would be closer to the surface. The caisson valves are not screened to a size that would prevent fish entry; thus, fish could be introduced to the dry dock via these ports, but this would also require further study to fully

understand. The flooding inlets for DD3, DD5, and DD6 are located near the seabed (R. Stone email comm. 7/11/22), and it is unknown if any screening or other exclusionary devices are used to prevent fish and other organisms or material from being drawn into the inlet tunnels during flooding. Due to their depth, the WDFW concludes that it is unlikely that many fish enter the dry dock through the inlet ports but would require further study to verify. The bubble curtain is run continuously whenever the caisson is removed (R. Stone email comm. 7/14/2022). During operation, we hypothesize that the bubble density in the curtain increases when a vessel is brought in or out of the dock because the bubbles directly under the vessel would be forced along the side of the vessel and merge with bubbles not under the vessel, presumably creating a greater barrier to fish passage. Also, during a vessel docking or undocking, small vessel activity increases (R. Stone email comm. 7/14/2022) and likely deters fish from entering the area around the mouth of the dry dock. Thus, we conclude that the most likely time for fish to penetrate the bubble curtain is when the bubble density is lowest, when no vessel is within the mouth of the dock.

Relative to the volume of water contained in any of the dry docks, the number of fish entrained in a dewatering event is small based on the results of this study. Due to the size and complexity of the drainage systems in each dock, it is highly unlikely that every fish entrained in each dewatering event was detected, and that the actual number of fish entrained for each event are higher than the numbers reported here, particularly for small (<10 cm) fish. However, based on observations of fish made from above the dock during the dewatering process, the WDFW concludes that these losses were very small. Incidences of high fish abundance such as occurred in the second event in DD3 cannot be predicted, and the estimated weight of 104 kg of Pacific herring captured in this event represents only 0.0005% of the 2021 Pacific herring spawning stock biomass estimate of 10,255 mt for Puget Sound (Dionne, WDFW, email comm. 3/31/2022).

Several factors that could potentially affect entrainment rates could not be addressed due to a paucity of data and the short temporal span of the study. Seasonal fluctuations in fish abundance related to run-timings of in- and out-migrating salmonids and spawning aggregations of forage fish could result in higher entrainment rates for these species. Light levels (i.e., time of day) may have been a factor affecting the species composition and number of fish entrained, although the number of sampling events was too low to evaluate this quantitatively. However, the highest numbers of Pacific herring were seen in the four events when the caisson was removed and replaced at night (two events), and when the dock was left open overnight (two events). Further, the only event where large numbers of Pacific sand lance occurred was in the one in which the caisson was removed and replaced at night. There is no minimum tide requirement for flooding of the docks (E. Mollerstuen, USN, email comm. 6/23/2022), although there is a minimum tidal height necessary to float the caisson for removal; tidal height may also influence entrainment rates, but evaluation of this factor would require extensive long-term monitoring.

The lack of correlation between dock size, caisson removal duration, species, and the number of fish captured strongly suggests that the diversity and abundance of fish entrained in a dock during any given dewatering event is a stochastic process that cannot be controlled and is essentially limited to whatever fish are close enough to the dock at the time of flooding to 1) penetrate the bubble curtain, or 2) be pulled into the dock via the inflow ports.

Recommendations

Based on the low numbers of all fish entrained in this study, the WDFW concludes that the PSNS & IMF dewatering operations have minimal impacts on fish populations in Sinclair Inlet. However, to further minimize the risk to ESA-listed Chinook salmon, the WDFW recommends the following actions:

1. The PSNS & IMF should continue to use bubble curtains throughout each dewatering event,

2. To the extent possible, dewatering events should not be conducted during May and June when Chinook salmon smolts are released from the Gorst Creek Rearing Ponds,

3. Caisson removal times should be kept as short as possible and removals that span multiple days and/or tidal cycles should be avoided to the extent possible,

4. To the extent possible, avoid caisson removals during nighttime hours, and

5. The PSNS & IMF should continue to use the described procedures for capturing and removing larger salmonids and other marine fish entrained during dewatering and for returning them to Sinclair Inlet.

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Appendix 1. Summary reports of sampling events conducted during the 2020-22 PSNS dry dock entrainment study.

Sampling Event #1 – DD5 – 3 June 2020

Summary of fish sampling activities at PSNS Dry Dock 5 on 3 June 2020

prepared by
Robert Pacunski
with contributions from
Jen Blaine, Andrea Hennings, Lisa Hillier, and Ian Craick
Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Screen installation - 28 May 2020

WDFW staff: Dayv Lowry, Bob Pacunski, Jen Blaine, Andrea Hennings, Mark Millard, Ian Craick, Katie Kennedy, Larry LeClair

WCC staff: Stephanie Lewis

Navy staff: Phil Thorson, Richard Stone, others

A total of 38 screens were installed over the main drains, the four side openings, and a randomly selected number of 24" drains along the dry dock walls (see notes for configuration). The west sluice gate was also screened.

Fish sampling – 3 June 2020

WDFW staff: Bob Pacunski, Jen Blaine, Andrea Hennings, Mark Millard, Ian Craick, Katie Kennedy, Lisa Hillier, Larry LeClair, Lisa Hiller

Navy staff: Phil Thorson, Richard Stone, others

Major Event Timeline for WDFW Staff

0900-0930	Meet at Naval Station Kitsap-Bremerton Lot F; transfer all sampling gear into WDFW van and F350.
1000-1100	Enter base in van, F350, and on foot; Pacunski and Millard denied entry due to non-readable ID badge, return to Pass and ID office for new badges.
1100	WDFW and Navy personnel convene at Dry Dock 5
1230-1300	Gear staged near dry dock; staff waiting on stairwell landings
1400	Sampling begins
1530	Sampling ends; tear down commences
1645	WDFW staff depart base, reconvene at Lot F
1700-1715	WDFW staff depart for home

While still in the parking lot and once most of the WDFW and Navy staff had arrived, I (Pacunski) laid out a tentative plan for sampling the drydock. Because Larry (LeClair) had not yet arrived with the sampling

gear, I did not have a complete understanding of what sampling gear was available, although I knew that we would have at least three stick seines. Based on this, I specifically stated that I wanted two to three teams using stick seines to start at the head end of the drydock and work together as best we could from the head end of the drydock toward the caisson end to drive as many fish as possible to a confined area where we could then collect samples for recording. Upon reaching the drydock and seeing the conditions we faced, I was not completely confident that my plan would work but decided to proceed as planned as no other plan I could devise seemed any better. Not knowing exactly how the sampling process was going to proceed, I did not assign dedicated tasks to any staff prior to entering the drydock, assuming that I could do that as we got closer to having samples in-hand. In hindsight I recognize that this was clearly a mistake given the inability to move quickly in knee deep water and the difficulty of communicating across the large and noisy water-filled chamber.

Upon reaching the dry dock at ~1030, there was 17 feet of water remaining. Pump tests were being conducted, and we were told it would take about two hours to get the level down to 2.5 feet and allow us to enter. During this time, we took account of the sampling gear and staged it on the landings leading down to the dry dock floor. As the water was being pumped out, Larry and I made several circuits around the dry dock to inspect the panels and see if they were still in place. All panels on the wall at the south end over the inflow grating (originally thought to be outflow only) on the west side were missing. Once the water level was low enough, we could see them lying haphazardly on the dry dock floor, suggesting that they had been forcibly blown off during flooding. The two inlet/outlet doors on the south end were observed to be open and the panels attached to these doors were bent at right angles on the hinge side. Multiple Naval personnel reported rumors of a harbor seal having been in the dry dock. We did not observe one, but the sighting was confirmed by the dock master. Once the water level was down to about 3 feet, we could see fish actively swimming along the edge of the drydock and through the keel blocks along the edge, but we could not tell if fish were swimming in the center of the drydock away from the edges due to the distance and glare on the water. Small fish actively avoided the whirlpools created by drains but some larger fish would approach the whirlpools. At no time did I ever witness fish being drawn into a whirlpool and down a drain. Throughout the draining process we only saw 3-4 seagulls in the drydock, and only when the water level was below the level of the highest keel blocks. As the water got to below 4 feet, we did see these few gulls chasing fish but could not determine if they were successful in capturing any.

During the pump test, the water level was dropped to approximately 2 feet and raised back up to about 3 feet. The primary inflow appeared to be at the southeast end, though water could be seen bubbling up through the circular grate drains throughout the dry dock during this time. It is unknown whether this was due to water being pumped through the drains or the result of backing water pressure. Water clarity decreased during this time and a large area of foam developed at the southeast end of the dry dock. Turbidity decreased while we sampled, but the foam remained in the corner for the duration and made locating fish in that area difficult.

The pump test took longer than planned, and we were allowed to enter the drydock around 1400, at which time the water depth was approximately 2.5 feet. I discussed our plans with the pump master and he said it would take about 90 minutes to drain the dry dock. I told him we would sample as the dock was being fully drained and then would need about 30 minutes to complete our sampling and recover our equipment, to which he agreed.

As mentioned previously, the original sampling plan was to start at the north (closed) end of the dry dock and have teams of two or three, each deploying a stick seine, walk in a line spanning the width of the dry dock to push as many fish as possible into a confined area at the south (caisson) end to obtain a representative sample for species composition and size distribution. This plan was predicated on the assumption that the drydock would eventually be drained dry (or nearly so), allowing us to obtain an estimate of the number of fish in the dry dock at the end of the sampling period. Due to the large number of obstacles in the dry dock, and an inability to effectively communicate within the space, this approach was not successful. Many of the drain covers were stacked randomly both singly and in piles along the side of the drydock, creating tripping hazards, snagging the seine nets, and creating escape routes for fish. Fish could also easily escape the seines through gaps in the keel blocks and the scaffolding. Due to the different mesh sizes in the seines, juvenile bait fish could easily swim through some of the seines. Approximately half-way down the dry dock, the keel blocks in the middle of the dock separated the line of stick seines such that it was impractical to attempt moving forward together. At this point, teams separated within the dry dock, with at least two teams continuing to the south end of the dry dock, another team spotting and attempting to corral an adult salmon towards the north end of the dry dock, and another completing a seine in the middle of the dry dock. Throughout the seining process, it was clear that some people were unfamiliar with how to use a seine net, and Adam's (Lindquist) and Larry's expertise in this area was invaluable in showing other staff how to use the seines and directing their movements.

The first team to reach the south end completed multiple seine sets and placed all the collected fish on the dry caisson platform, removing all the juvenile Salmonids for counts and lengths. The second team to arrive at the caisson platform closed their seine and used a hand dipnet to collect samples. Most of the thousands of fish in both of the nets were juvenile Pacific Sand Lance and juvenile Pacific Herring that were approximately 5-10 cm in length. The samples collected from the second net were combined with a sample from the seine in the middle of the dry dock, and a resulting subsample was retained for counts (all species) and estimated lengths (Salmonids and flatfishes). The only large invertebrates observed in the drydock were California Market Squid *(Doryteuthis opalescens*).

Separately, the other teams made several passes back through the dry dock in an attempt to collect larger fishes missed by the seines, and they selectively retained Salmonids and species other than Pacific Sand Lance and Pacific Herring. Of the species collected from these seines, Salmonids were counted, and lengths estimated, while other species were noted as "present". During the sweep we encountered at least three adult Salmonids and were successful in capturing a single 62 cm hatchery-origin Chinook Salmon. Anecdotally, Andrea observed at least one other slightly smaller Chinook at close range, and it also appeared to be missing an adipose fin. All fish that were measured for length were taken to the top of the caisson and dumped back into Sinclair Inlet.

At ~1500, the water stopped draining at about 12 inches depth. Approximately 30 minutes later, we were told by the pump master that we needed to exit the dry dock so more water could be pumped into the dry dock before in could be completely drained. This was not what was discussed prior to entering the dry dock, but we didn't have much say in the matter, so I directed the crew to finish up the fish sampling, wrap up the nets, and remove the panels, which took more time than expected due to the amount of water remaining and the limited visibility, which hampered removal of the tie downs. Other than the panels that had been blown off or bent, all the others had remained in their installed positions and showed no obvious signs of damage. All 38 panels were recovered. Richard used the Naval dinghy to

collect the panels as WDFW removed them and floated them to the base of the stairwell. The elevator was unavailable, so we created at "bucket line" to get the gear back up top. We exited the dry dock at ~1600. As we were loading the gear back into the vehicles, it was noticed that the dry dock was being drained again, which is not what we were told was going to happen. Shortly after exiting the drydock, large number of gulls began entering the drydock and appeared to be feeding on fish and squid, with nearly all of this activity concentrated at the caisson end. By the time we finished loading gear into the vehicles, the water level had been reduced to ~ 6 inches. Richard volunteered to stay until it was dry to see if he could locate the two remaining larger Salmonids. We returned to the shipyard lot and transferred gear back into Larry's truck, then the crew departed the lot at ~1715.

Lessons learned and suggestions for next sampling event:

Navy and associated contractors

- While the pump master was communicating with Bob regarding refilling the dry dock, dry dock staff were separately directing WDFW staff to leave the dry dock, resulting in confusion about what they should do and when. The pump master should provide WDFW staff a simple written plan and timetable and provide that plan to dry dock staff. Dry dock staff should not attempt to direct WDFW staff unless there is a safety concern or emergency.
- As the crew was finishing gear removal from the dry dock, an unknown person came up to WDFW staff and asked why we had been in the dry dock when water was being pumped back in and why a chain securing the stairwell had been left open. He acknowledged that it wasn't our fault but was clearly annoyed that safety protocols were not being followed. If the pump master is unavailable to communicate, at least one dry dock staff member should be in charge of communicating safety protocols and concerns to WDFW staff and acting as a liaison to address these concerns.
- WDFW crew installed panels according to the information provided at the time regarding which openings/grates were inflows and/or outflows. After the water level lowered, it was clear that some openings previously thought to have been only outflows were also inflows, and the panels didn't stay on. Naval staff should provide WDFW with a clearer understanding as to what type of opening each grate is so that WDFW can better adjust their installation of panels.

WDFW

- There was initial confusion about how seines would be set, and some staff were unsure how to use the gear, which resulted in large fish escaping the seine nets and sets to be abandoned. All staff should understand the sampling plan/protocol before getting into the dry dock and know the goal of sampling so as to make informed changes to protocol should communication within the dry dock be difficult between teams. Any changes in the protocol should be communicated by one person to each team whenever possible.
- It would also be a good practice to walk through the drydock on the day of the grate installation to devise and discuss potential netting/sampling strategies. However, as we learned in this first sampling event, the layout of keel blocks, drain grates, and scaffolding is likely to alter those plans.
- The dry dock acoustics are significantly affected by the presence of water, and communication within the space is difficult at distances greater than 20 feet, especially when people are moving

around in the water and their faces are covered by masks. This condition was not anticipated and it severely hampered our ability to coordinate seine teams and relay instructions.

- At least two sticks were torn from the stick seines due to poor attachment to the mesh when the seine stuck to a floor grate and/or from the force of the water, and a few of the small nets (both dip and seine) had existing holes large enough for fish to escape. All gear should be checked and repaired before the next sampling event. Each team should carry zip ties to be able to quickly reattach a broken net.
- Once we were in the dry dock and had fish in shallow bins and the white garbage can, Richard indicated that the only way of removing and releasing fish from the dry dock was to walk them up the stairs and throw them over the caisson. To expedite fish removal and reduce stress, those fish that must be released (e.g., ESA Salmonids) should be prioritized in counting and measuring, placed in 5-gallon buckets, and released by staff who self-identify before sampling as fit enough to walk to the top of the caisson and back.
- Focus sampling along the edges of the drydock – this is where most of the fish were moving
- Ensure that all the drain grates are placed back over the drain channels – this will reduce tripping hazards and make it much easier to sample with the seines. Also, it may minimize fish from using the drain channels until they are the only area with water.
- Water depth of approximately 1 foot is probably easiest to both move in and catch fish before they stick to the concrete bottom; collecting larger fish would be easier once the water level is 6 inches or less. This water depth would be ideal for using the orange trawl baskets for processing fish.
- If seining is to be used in future events, it is highly recommended that there be at least two spotters at the top of the drydock. During this event, Navy staff were able to spot the large salmonids that we could not see and direct us toward them for capture. Spotters would also be able to spot underwater hazards that may not be readily apparent to staff in the drydock. Communication would also be clearer as it was much easier to understand someone shouting from above than within the drydock, making it easier to direct the overall operation.
- Clearer expectations of what fish should be measured and/or collected need to be communicated to staff.
- Gear should be staged according to where it will be used. In this case, the seine and dip nets, bins (trawl baskets in future), and one or two 5-gallon buckets with a measuring tape should have been staged on the north (closed) end. Meanwhile the containers with datasheets, additional fish sorting bins for subsamples, measuring boards, and snipping tools should be stage on the south (caisson) end, where the bulk of the fish sorting and data recording occurred. Staging in this manner should limit the amount of wading back and forth to obtain gear.
- Staff need to be better informed and/or better prepared regarding what gear they are expected to wear. Some came with waders with attached feet, not realizing that they had to wear steel toed boots. Some staff that had previously taken gear home on installation day did not return for fish sampling day, so some items were short.
- All gear purchased for use for Navy surveys should be returned at the end of the day to one location (i.e., the van to return to MC2). This would ensure that no items are forgotten or missing, no matter what personnel make up the crew on any given survey day.

Sampling Event #2 – DD3 – 2 September 2020

Summary of screen installation and fish sampling in PSNS Dry Dock 3
on 31 August and 02 September 2020

prepared by
Robert Pacunski
with contributions from
Jen Blaine, Andrea Hennings, Lisa Hillier, and Ian Craick
Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Screen Installation – 31 August 2020

WDFW staff: Dayv Lowry, Bob Pacunski, Andrea Hennings, Ian Craick,

WCC staff: Rachel Hosman, Nate Ridings

Navy staff: Phil Thorson, Richard Stone, others

WDFW and Washington Conservation Corps (WCC) staff arrived at Lot F between 0815 and 0900. DD3 consists of two sections of approximately even area; the upper (north, inland) section is approximately 4 feet shallower than the lower (south, waterward) section, with the floor in each section sloped slightly towards the waterward end. A moveable barrier (caisson) used to separate the dry dock sections was positioned on blocks in the upper section. In addition to the caisson, large concrete blocks with wood tops (hereafter "blocks") used to support the caisson and dry-docked vessels, were stacked throughout both sections of the dry dock along with several stacks of iron plates in the upper section.

Navy personnel indicated that the single round (~10-foot diameter) drain in the lower section was the only known outlet. Overlapping screens were installed over this drain grate, as well as over ~40 feet of the grated drain channel on the inward end leading towards and adjacent to the main drain. Screens were secured to the drain grates using rebar tie wire. Where overlapping screen edges were not flush to the grate or screen below, edges were tied down with zip ties to reduce the possibility of trapping small fish between the screens. Navy personnel indicated that the incoming barge would overhang the drain area but would not block access to the drain or installed screens. Installation of the screens was completed about 90 minutes after entering the dry dock.

Fish Sampling and Screen Removal – 2 Sept 2020

WDFW staff: Bob Pacunski, Larry LeClair, Jen Blaine, Andrea Hennings, Ian Craick, Lisa Hillier

WCC staff: Rachel Hosman, Michael Franks, Nate Ridings

Navy staff: Phil Thorson, Richard Stone, Rebecca Johnson, Matt Ridgeway

WDFW, WCC, and Navy personnel met in Lot F between 1915 and 2000. The sampling crew entered the Navy CIA at ~2030 and were met by Richard Stone, at which time there was ~6 feet of water remaining in the lower section of DD3. WDFW staff viewed the upper section of dry dock from above during the dewatering and did not observe any large fish. Ground-level access at the southern end of the dry dock was restricted to Navy personnel during the dewatering process as the barge was being maneuvered

into position, thus no observations could be made of the lower dry dock section at this time. By ~2100, the upper section was almost completely drained, and staff were cleared to enter the dry dock and began inspecting the upper section. Inspection and subsequent sampling activities were conducted primarily with headlamps and lanterns, augmented by overhead lighting attached to cranes and other equipment around the dry dock. No fish were found in the upper section, including between the blocks and the visible areas under the caisson.

At ~2130, approximately 1-2" of water remained in the lower section, mainly at the most waterward end but also in small depressions in the dry dock floor, and staff were given the OK to enter that section. The dry-docked barge was resting on 2" x 6" boards and was estimated to be covering ~40-50% of the accessible (i.e., not covered by blocks) dry dock floor in the lower section. During screen installation on 31 August, WDFW personnel were informed that hull shape of the dry-docked barge would provide approximately 3 feet of clearance over the drain, but upon entering the dry dock we observed that overhanging section only provided access to ~25% of the drain. The non-overhanging portion of the barge covered the remaining ~75% of the drain and 70-80% of the western drainage channel, with less than 3" of clearance over the dry dock floor. The lack of access under the non-overhanging section restricted our ability to visualize or collect any fish that may have been in these areas, and prevented the removal of screens from the drain and from a short section of the drainage channel adjacent to the main drain. At the time of entry into the lower section, water was no longer flowing into the main drain and several small fish were lying on the screens that were visible, but no fish were observed on the screens attached to the drainage grates. Bob directed a small crew to collect the fish from the main drain screens, but just as the crew was about to begin, the pumps were unexpectedly turned off and water began to backflow from the drain grate and a series of 3" holes along the periphery of the dry dock floor. The backflow immediately flushed all the fish off of the main drain screens and dispersed them throughout the rising water. The backflow continued for several minutes, resulting in the water level in the lower section of the drydock being raised to ~8-10", after which the passive drainage system began to redrain the dry dock. As soon as the backflow began, Bob instructed personnel to take buckets and dipnets and work in teams to capture as many fish as possible, based on the assumption that the water level would remain constant. During this effort, an additional drain was discovered in the SE corner of the drydock, measuring 21" by 26.5" with 1.25" square grate openings. While standing near this drain, WDFW staff observed <10 small fish swept through this opening that appeared to be Pacific Sand Lance.

At ~2200, the lower section was completely dewatered except for ~50-75' at the waterward end, which had about 1-2" of water remaining. Staff conducted another thorough inspection of this section and collected all visible remaining fishes and invertebrates. As sampling of fish from the main drain screens was concluding, an unknown number of fish were detected swimming in the water remaining in the drainage channel on the west side of the lower level, and a cursory inspection of several fish by Larry LeClair indicated that they were predominantly Sailfin Sculpins. As access to most of this drainage channel was blocked by the barge and limited our sampling ability, and because Navy personnel needed access to the uncovered portion of the lower section that the drainage channel runs through, Bob made the decision not to sample the drainage channel.

All collected organisms were sorted, processed, and recorded by Jen, Andrea, Larry, and Bob. Of the fish identified on site, four were Chinook Salmon, ranging in size from 142-190 mm, one of which was a clipped hatchery fish. Other species identified were primarily juveniles and included 37 Pacific Herring

(most ~85 mm in length), 22 Pacific Sand Lance, 22 Shiner Perch, 9 Bay Pipefish, 8 Sailfin Sculpin, 2 Great Sculpin, 2 Striped Sea Perch, 2 Kelp Perch, 1 Copper or Quillback Rockfish, and 1 Painted Greenling. There were also 18 unidentified sculpins (54-131 mm) that were bagged and labeled for later identification in the lab. Several invertebrate species were found and identified as well, and including Red Rock Crab, Pacific Graceful Crab, Dock Shrimp, Ochre Sea Stars, and several other species of crab (exact numbers and species in attached data summary). All live fish were held in seawater for processing, then transferred to a 32-gallon garbage can that was carried to the top of the dry dock where the fish were released into Sinclair Inlet. Sampling crew not participating in data collection removed the accessible screens from the drainage channel grates.

Upon completion of sampling, Richard and Bob discussed the possibility of conducting a second sampling event in DD3 in the next month, and the remaining screens were left in place. The removed screens, sampling gear, and samples for post-processing were returned to WDFW vehicles, and all crew exited the dry dock by 2230.

Follow-up thoughts

This sampling event provided another opportunity to learn, adapt, and refine plans for future sampling events. Several obvious thoughts come to mind:

- If nighttime sampling is anticipated for future events, additional lighting will be required, such as the crane lighting that was provided for the Navy night crew. The overhead lighting available to the sampling crew during the current event was insufficient for anything other than general movement in the dry dock, and we were only able to sample successfully thanks to the use of personal headlamps and hand-held lanterns.
- If the dry dock to be sampled has not previously been entered and/or a diagram has not been created by or provided to WDFW staff, the installation crew should measure the dry dock and diagram the location of any potential drains, whether they have been indicated by Navy staff as drains or not. Upon being cleared to enter the dry dock, the sampling crew should immediately inspect each of these points to assess their drainage status. In the current event, WDFW staff were unaware of the drain at the SE corner of DD3 as no schematics of the dry dock had been provided beforehand. Even if we had been aware of this drain, it was not accessible during screen installation due to the presence of Navy staff installing equipment in that area, although it may have been possible to arrange for Navy personnel to cover the drain. During the sampling event, this opening was found to be draining a large volume of water, and an unknown number of fish were observed exiting the dry dock through this drain.
- If a dry dock contains a drainage channel, it will need to be inspected for terminal drainage points to determine the best method for sampling fish that may be retained. In the current sampling event, the installation crew thought that covering a portion of the channel adjacent to the main drain (where the current speed was assumed to be the highest) could potentially reduce the number of fish retained in the channel. However, fish were swept into the channel throughout the dry dock, which negated the localized grate installation and should not be attempted in DD3 again.
- If the dry dock to be sampled will have a vessel in it, it would be helpful to know the vessel footprint, expected location, and expected clearances under and around the vessel to design a sampling strategy to account for areas and drains that may be blocked, and to coordinate recovery of any inaccessible screens.

Sampling Event #3 – DD3

Summary of screen installation and fish sampling in PSNS Dry Dock 3
on 31 August 2020 and 18 September 2020

prepared by
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with contributions from
Jen Blaine, Andrea Hennings, Lisa Hillier, and Ian Craick
Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Screen Panel Installation – 31 August 2020

The screens placed on the round (main) drain in the lower section of DD3 on 31 August for the dewatering event that occurred on 2 September were not removed after sampling due to a lack of access. This provided an opportunity for a second sampling event in DD3. The caisson that was dry-docked in the upper section on 2 September was still in place. The barge from the previous event had been removed.

Fish Sampling and Screen Panel Removal – 18 Sept 2020

WDFW staff: Bob Pacunski, Lisa Hillier, Ian Craick, Katie Kennedy, Kate Olson, Phill Dionne

Navy staff: Phil Thorson, Richard Stone, Trevor Richardson, Anne Adamson, Peter Dolton, Sarah Best

WDFW personnel arrived in Lot F between 0700 and 0730 and were met by Phil Thorson. These personnel entered the Navy CIA at ~0745 and were met by Richard Stone, Trevor Richardson, Anne Adamson, Peter Dolton, and Sarah Best, at which time there was ~10 feet of water remaining in the lower section of DD3. WDFW staff walked the full perimeter of the dry dock and observed large schools of small fish and several large salmonids swimming throughout the dry dock. As dewatering continued, fish observed in the upper level of the dry dock followed the receding water and were retained in the lower sections.

The sampling crew entered the upper section of the dry dock at 0820 with ~2-4” of water remaining at the waterward end of the upper section and inspected for fish until the upper section was completely dewatered around 0830. No fish were found in the upper section, including between the blocks and the visible areas under the caisson.

At ~0840, approximately 18” of water remained in the lower section of the dock. Having advanced knowledge of the drain in the SE corner, Bob quickly transported a screen panel (via the dry step along the side of the dry dock) to the SE corner and placed it over the drain, but not before observing hundreds of juvenile herring exiting through the drain. At ~0850, the water level was ~8-10” and the sampling crew entered the lower section of the dry dock. Water continued to flow into the main drain but only along the outer edge. In contrast to the sampling event on 2 September where only a few fish were observed, the screens over the main drain were completely covered in juvenile herring and other small fish. Prior to entering the dry dock, Bob had asked Richard for an advance warning about when the pumps would be shut off to avoid a backflow event as experienced on 2 September but was told that

this was highly unlikely. On the off chance that fish could be collected prior to the anticipated backflow, several personnel gathered around the main drain with the goal of collecting fish while the screens were exposed but prior to the pumps being shut down but were instructed by Navy personnel on the dry dock wall to move away from the drain so that the pumps could be shut down and "burped". Bob directed a crew to begin sampling at the SE corner drain while other personnel walked through the water remaining in the lower section to search for large fish and capture several large salmonids. This process was aided by Navy personnel on the drydock wall who could direct staff movements from above. At ~0900, the pumps were shut down and the main drain backflushed all of the fish back into the remaining 6-8" of water. No backflow was observed at the SE corner drain, strongly suggesting that this drain is not connected to the main dewatering pump system. Shortly after the pumps were shut down, water began to drain passively into the main drain and fish began to accumulate and become trapped on the screens. As fish became exposed, they were collected with dustpans and dipnets and placed into 32-gallon garbage cans. All identified salmonids were immediately pulled out and placed into buckets of water (dead or alive). Staff at the SE corner drain were able to remove and process nearly all the non-herring and non-salmonid species collected, which included several small sculpins (Buffalo, Sailfin, unidentified), one Starry Flounder, one Brown Rockfish (juvenile), 6 Tubesnouts, two unidentified snailfish, several kelp and rock crabs, and one ochre star. One small salmonid was observed trapped between the screen and grating of the SE corner drain and could not be reached before being pulled down the drain. Due to the dispersed nature of the fish at the main drain and the effort required to collect them, no attempt was made to separate non-herring species (other than salmon and large non-herring species). Due to the large number of fish retained during the dewatering, subsamples were collected at both drain locations for post-processing at the WDFW lab. Random samples were collected from the garbage cans during the collection of fish at the main drain, with additional samples taken after all the remaining fish had been collected at the main drain and from the dry dock floor. Random samples of herring were also taken from the SE drain after all the fish had been collected and sorted. Staff randomly scooped fish from the full garbage cans using dip nets to fill sample bins. Three subsamples (bins) were collected at the main drain and two subsamples (bins) were collected from the SE corner drain. After the subsamples were collected, staff measured out the number of bins of fish remaining in the garbage cans to get a total estimate of herring (SE drain) and mixed fish (main drain).

As the water level continued to drop, WDFW crewmember Katie Kennedy had the forethought to place a dipnet over one of the seven ~3" holes actively draining water around the periphery of the lower section, and in 60 seconds captured 198 juvenile herring. She also observed similar amounts of fish being sucked down several of the other perimeter holes (email 6/9/22). As determined during the previous sampling event in DD3, screens cannot be affixed to these holes due to a lack of attachment points and thus no effective way to sample them. It is also likely that sampling at one hole will not be representative of other holes due to fish movement and possible differential drainage rates at individual holes.

Several gulls were observed feeding on fish entrained in the dry dock, but this activity did not appear to have a significant impact on the overall numbers of fish collected. Fish continued to be collected after complete dewatering, and fish were observed swimming in the drainage channel on the west side of the lower dry dock as water flowing through an opening in the caisson seam seal continued to drain into this channel. The channel on the east side was dry and all the retained fish were collected. The drainage channels empty through drains at the inland (north) end of the channel. Navy staff removed several of

the grate panels at the inland end of the west channel and positioned themselves with dipnets to capture fish before they could exit via the drain, although it is likely that an unknown number of fish had already exited prior to being observed in the channel. Bob walked up and down the channel and only observed a small school of fish in the last 50 feet of the inland end of the channel were the water was deepest (~4-6”), which were moving back and forth in the channel as attempts were made to net them. To collect these fish, Bob removed a grate panel about 20 feet “behind” the fish and placed a screen in the channel, effectively creating a weir. Successive grate panels were then pulled up and screens placed until all the fish were captured.

As the last of the fish were being collected from the dry dock floor, several crewmembers began removing the screens from the main drain and transporting them back to the vehicles. Sampling was concluded at 1030 and screen removal at 1045, after which all personnel exited the dry dock. All WDFW personnel returned to Lot F for debriefing and gear dispersal to appropriate vehicles and departed the lot.

Sampling Event #4 – DD6

Summary of screen installation and fish sampling activities at PSNS Dry Dock 6 on 03 March and 09 March 2021

prepared by

Jennifer Blaine

Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Dry Dock Overview

DD6 is the largest dry dock at the shipyard, covering an estimated area of 312,700 square feet. There are 12 doors along the perimeter of the dock, each approximately 7’ high and 3’ wide. A one-foot-wide channel runs the perimeter of the dock as well, approximately 3’ from the wall, and ranges from ~10” – 2’ deep. Along the channel, there are 18 sand traps that are part of the outflow system. The floor of the dock overall has a gradual downward slope towards the caisson. Aside from the side doors and the sand traps, the remaining and primary drainage occurs in a large, rectangular floor grate (62’ x 12’) towards the caisson end of the dock.

Screen Installation – 3 March 2021 (screen staging 2 March 2021)

WDFW staff: Jen Blaine, Bob Pacunski, Andrea Hennings, Katie Kennedy, Ian Craick. WCC personnel were. Navy personnel included.

WCC staff: Kate Olson, Devon Greene, Casey Vaughn, Esmeralda Farias

Navy staff: Phil Thorson, Richard Stone, Paul Rudell

On 2 March 2021, Bob Pacunski met Richard Stone and Phil Thorson at DD6 with the screens. They employed the dock workers to transport the screens from the truck to the floor drain in the dock, making use of the forklifts and elevator. Thus, on the install day, the screens were already staged for the install crew.

On 3 March 2021 (install day), WDFW, Washington Conservation Corps (WCC), and Navy staff arrived at Lot F between 0830 and 0900. At 0900, the crew entered the base; however, they were turned around

at the CIA gate and instructed to go through the vehicle inspection, which had previously not been a required process. After passing inspection, the crew arrived at DD6 at 0930. Inside the dock, they split into teams and began installing screens over the pertinent areas. The crew attached one extra-large (4' x 5') screen over each of the 11 side doors using paracord. This left the upper 2' of door exposed, but it was predicted that most fish would swim down rather than out the top of the door. Around the sand traps, crew affixed a variety of materials, including balled-up nylon mesh catch bags, small pieces of unframed steel mesh screen, and small framed screens using paracord and tie wire. On the large, rectangular floor drains, crew affixed 47 screens (40 large 3' x 5', 3 x-large 4' x 5', and 4 small 3' x 3') with tie wire, covering the entire drainage area. Installation completed around 1340, and crew were back at Lot F by 1420.

Fish Sampling – 9 March 2021

WDFW staff: Jen Blaine, Katie Kennedy, Larry LeClair, Phill Dionne

Navy staff: Phil Thorson, Dayv Lowry, Paul Rudell, Nancy, and Hannah (last name not known)

DD6 was flooded on 4 March 2021 as scheduled; however, due to windy conditions, the aircraft carrier was not moved into the dock until 9 March. During the delay, the dock remained flooded and open and was thus subjected to a longer "soak" time compared to normal dry dock operations, which should be kept in mind during analysis.

On 9 March 2021, the WDFW and Navy personnel met in Lot F between 1430 and 1445. These crew members went through the CIA inspection gate and arrived at DD6 at 1500. Richard Stone and at least two other Navy personnel met the rest of the crew at DD6. Upon arrival, the water level in the dock was draining on schedule with approximately 3.5 feet remaining. Crew geared up and descended stairs with gear at 1520. At the base of the stairs, crew waited for ~10 minutes for the water level to be below boot depth (1.5 feet). Once fully in the dock, crew split into teams with dip nets and buckets and began surveying the dock for any fish and invertebrates.

The aircraft carrier in the dock was supported by large blocks and was high enough overhead for crew with headlamps to walk underneath the ship and collect fish. The carrier was, however, covered in biofouling, including tube worms, anemones, and other typically sessile invertebrates. Some of this biofouling was actively dropping onto the dock, and crew were instructed to not collect any of the invertebrates that were obviously biofoul (i.e., tube worms and anemones). At 1615, the water level towards the north end of the dock was <2 inches, and J. Blaine began to organize the sampling station, setting up sorting tubs, digital scale, and a measuring board. Crew began bringing fish to the sampling station on a rolling basis. Early on, 2 large adult Brown Rockfish and 1 hatchery Chinook Salmon were found, weighed, measured, and quickly released into Sinclair Inlet outside of the dock; a second Chinook was found later and also released immediately after measuring. Numerous fish were found entangled in the catch bags that had been around the sand traps. As crews finished collecting fish and the dock dried, they switched to removing screens while J. Blaine and K. Kennedy processed fish.

All screens were stacked on pallets to be picked up by WDFW at a later date while catch bags and other gear were carried to the top and loaded in vehicles. By 1800, all crew and gear were out of the dock and crew dispersed at Lot F by 1830.

On 12 March 2021, J. Blaine met R. Stone at DD6 to pick up the screens that had been moved out of the dock with forklifts and the freight elevator.

Sampling Results

All fish and invertebrates were identified to the lowest taxa possible in field, weighed, and counted. More numerous species, including shrimp and Pacific Herring, were subsampled and total estimates were extrapolated based on the whole weight subsampling method. Certain species were also measured. In total, approximately 218 fish consisting of 18 different species or taxa were collected, and 427 invertebrates of 15 species or taxa. Pacific Herring (*Clupea pallasii*) was the most abundant species, accounting for 125 of the total number of fish found, weighing a total of 3.355 kg. A subset of these individuals was measured and ranged in size from 92 mm to 180 mm, with an average of 122 mm. Two Chinook Salmon (*Oncorhynchus tshawytscha*) of hatchery origin measured 212 and 200 mm with a combined weight of 0.212 kg. Three rockfish were found: two Brown Rockfish that measured 343 and 373 mm and weighed a combined total of 1.82 kg, and one young Copper Rockfish that measured 134 mm and weighed 0.05 kg. Other species of note include a large Great Sculpin (*Myoxocephalus polyacanthocephalus*) that weighed 1.55 kg and measured 443 mm, along with several juveniles. Additionally, there were 13 Sailfin Sculpins (*Nautichthys oculofasciatus*), 24 other small, unidentified sculpins, and assorted other smaller fish species. Among the invertebrates were several shrimp species, small decorator crabs, and a few sea cucumbers. Most of these invertebrates, however, were likely associated with the biofouling on the ship rather than individuals that naturally entered the dry dock.

Sampling Event #5 – DD5

Summary of screen installation and fish sampling at PSNS Dry Dock 5
on 21 June and 23 June 2021

prepared by

Robert Pacunski

with contributions from

Jen Blaine, Andrea Hennings, Lisa Hillier, and Ian Craick

Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Screen installation – 21 June 2021

WDFW staff: Bob Pacunski, Ian Craick, Katie Kennedy, Kate Olson

WCC staff: Esmerelda Farias

Navy staff: Phil Thorson, Richard Stone, others

After some discussion with the operating engineers, Richard was able to arrange for the screens and sampling gear to be delivered on pallets to the drydock floor via the elevator, which greatly sped up the installation process. Due to our previous experience in this dock and practice gained in other drydocks, the installation process was very efficient, with all screens installed in about 3 hours. The entire main drain was screened as were all the doors along both sides of the drydock. The remaining screens were

used to screen off about half of the 71 small round drains along the perimeter of the drydock as possible (exact count obtained from Richard via email – no schematic was drawn for this event).

Fish Sampling – 23 June 2021

WDFW staff: Bob Pacunski, Andrea Hennings, Ian Craick, Katie Kennedy, Kate Olson,

WCC staff: Devon Greene, Kavi Rana, Esmerelda Farias

Navy staff: Phil Thorson, Richard Stone, Trevor Richardson, 6-8 others

Major Event Timeline

1600 – 1630 - WDFW staff meet in Bremerton Lot F
1640 - Briefing by Bob Pacunski
1700 – enter Navy base
1730 – personnel arrive at drydock, radiation briefing, stage gear and screens for elevator loading
1830 – drydock cleared for entry, sampling begins
1940 – sampling complete
2010 – weighing complete
2030 – reconvene in Lot F

WDFW, WCC, and a larger than normal contingent of Navy staff arrived at the drydock at 1730 hours and were met by Richard Stone. A that time there was 23 feet of water in the drydock. While waiting for the drydock to be cleared, WDFW and Navy personnel were briefed on the need for only PSNS & IMF personnel with qualifications to be in close proximity to conduct the fish collection and screen removal near the vessel, due to maintenance condition of the docking evolution. As pump out continued, shiner perch could be seen swimming in the drydock, and as the water level got to about 3 feet these fish began collecting on the main drain screens. At 1830 hours approximately 6-12 inches of water remained in the drydock and staff were allowed to enter to begin sampling.

Most fish were entrained on the main drain screens, and this is where the fish collection effort was initially focused. Andrea Hennings, Katie Kennedy, and Kate Olson lead the weighing and length station located near the main drain. The large number of collection staff relative to previous sampling events was initially helpful in delivering a lot of fish and invertebrates to the weighing and length station at once; however, these staff were generally unfamiliar with the species they had captured and were not able to sort their catch into separate species bins. This created a bottle neck for processing the fish and the weighing staff ultimately created a few larger bins into which the collection staff could place their samples so they could continue collection within the dry dock. This method increased efficiency for removing fish from the dry dock but subsequently resulted in the weighing staff sorting all the fish into individual species bins and creating a backlog to weighing and lengthing. As multiple adipose clipped and unclipped salmonid species were mixed with the other fishes, some collection staff were initially segregating them within their own catch to be further processed by Kate Olson, but this created both inefficiencies in the sorting process and confusion on where fish were coming from. All the adipose clipped and unclipped Chinook Salmon that were initially separated for lengths were combined during this process and were weighed together when it was clear there would not be time to reseparate them. Additionally, a 5-gallon bucket full of Loligo squid and water was dumped before they could be sorted and weighed.

As the remaining water drained, several personnel were assigned to canvas the drydock where access was available to collect any organisms stranded on the drydock floor. After most of the fish had been collected, WDFW and Navy staff began removing screens from the main drains and the side drains. Some of the screens could only be accessed by Navy personnel with radiation clearance due to the proximity of the screens to the vessel in the drydock. Screens were collected and placed on two pallets to be left in the drydock for the Navy to bring back up on the elevator the next day.

At about 1900 hours Bob discovered a slow but steady stream of water entering the drydock through the caisson seam seal. This prevented the drydock from draining completely and water was continuously running in the drain channels from the caisson end of the drydock to the process water collection station (PWCS). Multiple channels lead into the PWCS and it was not possible to screen every channel to capture fish. Instead, WDFW and Navy staff spent approximately one hour collecting fish at the end of several different channels where they dumped into the PWCS. Only a few fish were captured in this effort and most of these were small sculpins. Bob discussed the drain situation with Richard and after seeing very few fish and no salmon it was decided that enough sampling had been conducted and sampling operations were ceased at ~1940 hours. Weighing operations and screen collection were completed at 2010. WDFW and Navy staff left the drydock and reconvened in Lot F at 2030.

Due to the inability to screen all the side drains and channels leading to the SWCS, it is highly likely that some fish entered the SWCS and could not be captured in the sampling event. However, based on the very low numbers of fish collected at the drain channels, and the fact that none of these fish were salmonids, we are confident that all salmonids were captured in our sampling. The day after the sampling event, Trevor Richardson from the Navy checked the SWCS and saw a few Shiner Perch swimming in the remaining water. It is likely that other fish were present but due to the depth of the water in the SWCS and configuration of the pump system there was no safe way to collect these fish.

Shiner Perch constituted the majority of the entrained fish, with an estimate of 479 fish based on a sub-sample of 48 fish. The total Chinook Salmon count was estimated at 102 fish; 30 fish were randomly sampled, sorted by clipped vs. non-clipped, and measured for length. Another 72 Chinook Salmon were estimated from the weight of the uncounted catch. Only 2 Chum Salmon and 4 Coho Salmon were encountered. A total of 94 sculpins representing several species were captured, but due to their small size and the limited time available in the drydock for sampling, these fish were not separated into individual species. In addition to the sculpin mix, seven Sailfin Sculpin were identified in the catch. The remaining organisms in the catch represented a variety of fish and invertebrate species in very low numbers (1 – 18).

On the EOY meeting remembered that we counted 12-14 wild Chinook from this event and will check his records. Due to the high number of Chinook in the event, Richard needed to have a number to report for their ITP requirements and he's sure is right around a dozen. Looking at the data sheets we subsampled 30 Chinook, 5 of which were unclipped. Also, see the notes on the data sheets regarding the mixing issue.

Sampling Event #6 – DD6

Summary of screen installation and fish sampling at PSNS Dry Dock 6 on 06 September and 11 September 2021

prepared by

Bob Pacunski

Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Screen installation - 08 September 2021

WDFW staff: Bob Pacunski, Jen Blaine, Ian Craick, Katie Kennedy, Lisa Hillier, Phill Dionne

Navy staff: Phil Thorson, Richard Stone, others

See yellow book for schematic (page 10). Bob shows 8 doors/side but Richard's count on 5/26/22 was 5 east and 6 west (Dayv's original drawing shows 13/side). The flood gates were not covered due to a lack of screens.

Sampling event (cancelled) – 11 September 2021

WDFW staff: Bob Pacunski, Larry LeClair, Lisa Hillier, Ian Craick, Katie Kennedy

Navy staff: Phil Thorson, Richard Stone, Chris Hunt, Nancy (last name not obtained)

0830 - 0930. Staff arrive at Lot F.

0945 - proceed into the CIA and arrive at DD6 at 1000. Upon arrival there was ~5 feet of water remaining in the dock and it was covered in an oily sheen. WDFW staff observed >8 large salmonids in the dock. There was a heavy smell of jet fuel around the dock. WDFW and Navy staff had to keep moving around to minimize exposure. Even a couple of minutes of exposure was causing light-headedness and nausea in some staff.

1000 – draining halted with 5 feet of water remaining in the dock.

1000-1020 – Bob Pacunski and Chris Hunt walked the full circuit of DD6. The same group of salmon was observed swimming around the dock and there appeared to be a school of baitfish or shiner perch in the dock.

1025 - Richard Stone arrived on site and informed Bob that jet fuel had spilled during the locking and pump out would be halted until the spill could be cleaned up. Estimated time ~ 3-4 hours. Bob opted to keep staff on site in hopes that this schedule could be met.

1140 – water leveled lowered to 3.5 feet to allow personnel to enter with skimmers. Waiting for Navy incident response team to arrive and assess the situation.

1230 – Marine chemist arrived to test site and determines that hazard levels are low enough to allow Navy personnel to enter the dock to begin skimming operations. NOTE: I have no idea how this could even be allowed as the fumes at the top of the dock were making everyone sick unless they could find a lee from the wind.

1235 – Navy personnel in dock with skimmer. Still seeing the same group of large salmonids and forage fish – multilple observations by all staff

1415 – Dock has been completely swept with the oil boom.

1430 – spoke with Trevor Richardson (Navy) regarding next steps. Trevor told Bob that the Navy needed to lower a mechanical skimmer into the dock to complete the fuel recovery process before pump out could continue. He estimated that this process would take until at least midnight.

1440 – Bob informed staff that no sampling would be conducted and sent everyone home. Trevor and Richard said they would collect fish when the drydock was drained.

Followup:

- 11 September 2021 – pump out on hold.
- 12 September 2021 – pump out completed. Trevor and Richard collected fish - data sent to Jen.

Sampling Event #7 – DD1

Summary of screen installation and fish sampling at PSNS Dry Dock 2 on 17 February and 24 February 2022

prepared by

Bob Pacunski

Washington Dept of Fish & Wildlife: Marine Fish Science Unit

Screen installation – 17 February 2021

WDFW staff: Jen Blaine, Kat Meyer, Katie Kennedy, Ian Craick, Larry LeClair, Kate Olson

WCC staff: Nate Ridings, Louis Sun

Navy staff: Phil Thorson, Richard Stone, others

Installation of screens (see yellow book for more detail regarding number of screens and layout). The screen layout was pre-planned by Jen based on details of the drain configuration provided by Richard but had to be modified to account for small variations in some measurements. Richard and Phil installed net bags in a few of the sand traps.

Sampling event (cancelled) - 2/24/2022

WDFW staff: Kat Meyer, Katie Kennedy, Ian Craick, Larry LeClair, Lisa Hillier

Navy staff: Phil Thorson, Richard Stone, Paul Rudell, 3 Navy interns

1620 – 1645 - Crew met in Lot F

1650 – Richard Stone informs crew that pump out was halted with 28’ of water in the dock (we found out on 2/25 that his was due to a tugboat crushing the intake water hose to the nuclear sub in the dock and the water could not be drained until the hose had been repaired or replaced). Pump out is not scheduled to be complete at ~1000 on 2/25.

1710 – crew departs PSNS, will return in the morning.

Sampling event – 2nd attempt (cancelled) - 2/25/2022

WDFW staff: Bob Pacunski, Kat Meyer, Andrea Hennings, Ian Craick, Lisa Hillier

Navy staff: Phil Thorson, Richard Stone, Paul Rudell

0730 – 0830 – Crew met in Lot F

~0800 – Phil T. received a phone call from Richard saying that pump out will now be complete between 1000 and 1200.

1045 – Richard called Phil and informed him that pump out would not occur until at least 1500. WDFW crew opts to leave but leaves two length boards for Richard and Phil to use to sample fish when dewatering is complete. Dewatering was not completed until mid-afternoon on 2/25. Richard and Trevor Richardson collected fish and sent data to Jen.

Appendix 2. Summary of fish weights obtained during the 2020-22 entrainment study.

Dry Dock and Event No.	Species	Estimate Type	Total weight (kg)	Total count
DD3 - 3	Pacific Herring	Subsample	104.26*	18,966*
DD3 - 3	Shiner Perch	Subsample	1.480	149
DD3 - 3	Bay Pipefish	Subsample	0.370	80
DD3 - 3	Sculpin – unidentified	Subsample	0.590	40
DD6 - 4	Surf Smelt	Total	0.160	1
DD6 - 4	Brown Rockfish	Total	1.820	2
DD6 - 4	Chinook Salmon – clipped	Total	0.212	2
DD6 - 4	Pacific Herring	Total	1.256	47
DD6 - 4	Bay Pipefish	Total	0.028	5
DD6 - 4	Great Sculpin	Total	1.917	1
DD6 - 4	Sailfin Sculpin	Total	0.195	13
DD6 - 4	Plainfin Midshipmen	Total	0.010	5
DD5 - 5	Chum Salmon	Total	0.010	2
DD5 - 5	Coho Salmon	Total	0.046	4
DD5 - 5	Chinook Salmon – clipped + unclipped	Subsample	1.004	102
DD5 - 5	Pacific Herring	Total	0.263	12
DD5 - 5	Surf Smelt	Total	0.033	1
DD5 - 5	Bay Pipefish	Total	0.002	2
DD5 - 5	Tubesnout	Total	<0.001	1
DD5 - 5	Three-spined Stickleback	Total	0.009	1
DD5 - 5	Penpoint Gunnel	Total	0.002	1
DD5 - 5	Saddleback Gunnel	Total	0.037	3
DD5 - 5	Shiner Perch	Subsample	5.908	479
DD5 - 5	Sailfin Sculpin	Total	0.013	7
DD5 - 5	Decorated Warbonnet	Total	0.010	1
DD5 - 5	Snailfish – unidentified	Total	0.012	2
DD5 - 5	Starry Flounder	Total	0.166	1

*Total does not include estimated fish loss through unscreened drains

Appendix 3. List of taxa sampled during the 2020-22 PSNS dry dock entrainment study.

Functional Group	Common Name	*Scientific Name*	Sampling Event No. and Date							
			1 6/3/2020	2 9/2/2020	3 9/18/2020	4 3/9/2021	5 6/23/2021	6 9/14/2021	7 2/25/2022	Total
sea star	Ochre Sea Star	*Pisaster ochraceus*		3	1	1				**5**
sea cucumber	California Sea Cucumber	*Parastichopus californicus*				6	1			**7**
sea cucumber	Orange Sea Cucumber	*Cucumaria miniata*				1				**1**
sea urchin	Green Sea Urchin	*Strongylocentrotus droebachiensis*					1			**1**
squid	California Market Squid	*Doryteuthis opalescens*	22			13		627		**662**
shrimp	Coonstripe Shrimp	*Pandalus hypsinotus*				125				**125**
shrimp	Crangonid Shrimp uniden.	*Crangonidae*				8				**8**
shrimp	Dock Shrimp	*Pandalus danae*		15		58		61	104	**238**
shrimp	Shrimp unidentified	*Penaeoidea*					5			**5**
shrimp	Spiny Lebbeid	*Lebbeus groenlandicus*				184				**184**
crab	Decorator Crab unidentified	*Majidae*					2			**2**
crab	Graceful Crab - unsexed	*Cancer gracilis*				16				**16**
crab	Graceful crab - female	*Cancer gracilis*					3			**3**
crab	Graceful crab - male	*Cancer gracilis*				1	4			**5**
crab	Graceful Decorator Crab	*Oregonia gracilis*				1				**1**
crab	Helmet Crab	*Telmessus cheiragonus*		2						**2**
crab	Northern Kelp Crab	*Pugettia producta*		1	4	1	18			**24**
crab	Longhorn Decorator Crab	*Chorilia longipes*		1		7				**8**
crab	Pacific Graceful Crab - male	*Metacarcinus gracilis*		2						**2**
crab	Pygmy Rock Crab	*Glebocarcinus oregonensis*		1		1	3			**5**
crab	Red Rock Crab - unsexed	*Cancer productus*			1					**1**
crab	Red Rock Crab - female	*Cancer productus*		1						**1**
crab	Red Rock Crab - male	*Cancer productus*		2						**2**
crab	Sharpnose Crab	*Scyra acutifrons*				2				**2**

Functional Group	Common Name	*Scientific Name*	Sampling Event No. and Date							
			1 6/3/2020	2 9/2/2020	3 9/18/2020	4 3/9/2021	5 6/23/2021	6 9/14/2021	7 2/25/2022	Total
crab	Shore Crab	*Hemigrapsus oregonensis*		2						**2**
crab	Western Tube Crab	*Polyonyx quadriungulatus*				3				**3**
fish	Bay Goby	*Lepidogobius lepidus*				8				**8**
fish	Bay Pipefish	*Syngnathus leptorhynchus*	0	9	80	5	2	3		**99**
fish	Tubesnout	*Aulorhynchus flavidus*	0				1			**1**
fish	Northern Anchovy	*Engraulis mordax*						13		**13**
fish	Pacific Herring	*Clupea pallasii*	130	39	18,966	125	12	513		**19,785**
fish	Surf Smelt	*Hypomesus pretiosus*				1	1		3	**5**
fish	Pacific Sand Lance	*Ammodytes hexapterus*	242	22				3		**267**
fish	Stickleback unidentified	*Gasterosteidae*						6	4	**10**
fish	Three-spined Stickleback	*Gasterosteus aculeatus*					1			**1**
fish	Chinook Salmon (clipped and unclipped)	*Oncorhynchus tshawytscha*					102			**102**
fish	Chinook Salmon (clipped)	*Oncorhynchus tshawytscha*	7	1	3	2		38		**51**
fish	Chinook Salmon (unclipped)	*Oncorhynchus tshawytscha*	17	3	5			7		**32**
fish	Chum Salmon	*Oncorhynchus keta*					2			**2**
fish	Coho Salmon (clipped)	*Oncorhynchus kisutch*			3					**3**
fish	Coho Salmon (unknown origin)	*Oncorhynchus kisutch*	1				4			**5**
fish	Decorated Warbonnet	*Chirolophis decoratus*					1			**1**
fish	Snake Prickleback	*Lumpenus saggita*				1				**1**
fish	Shiner Perch	*Cymatogaster aggregata*		22	149		479	22		**672**
fish	Kelp Perch	*Brachyistius frenatus*		2		4				**6**
fish	Striped Seaperch	*Embiotoca lateralis*		2						**2**
fish	Buffalo Sculpin	*Enophrys bison*			1					**1**
fish	Great Sculpin	*Myoxocephalus polyacanthocephalus*		2		21				**23**

Functional Group	Common Name	*Scientific Name*	Sampling Event No. and Date							
			1 6/3/2020	**2** 9/2/2020	**3** 9/18/2020	**4** 3/9/2021	**5** 6/23/2021	**6** 9/14/2021	**7** 2/25/2022	**Total**
fish	Padded Sculpin	*Artedius fenestralis*				1				**1**
fish	Sailfin Sculpin	*Nautichthys oculofasciatus*		8	2	13	7			**30**
fish	Tidepool Sculpin	*Oligocottus maculosus*							1	**1**
fish	Sculpin mix	*Cottidae*					94			**94**
fish	Penpoint Gunnel	*Apodichthys flavidus*		1		1	1			**3**
fish	Saddleback Gunnel	*Pholis ornata*		1		1	3			**5**
fish	Poacher uniden.	*Agonidae*				1				**1**
fish	Copper Rockfish	*Sebastes caurinus*				1				**1**
fish	Brown Rockfish	*Sebastes auriculatus*			1	2				**3**
fish	Unidentified rockfish (Quillback or Copper)	*Sebastidae*		1						**1**
fish	Plainfin Midshipman	*Porichthys notatus*				5				**5**
fish	Northern Clingfish	*Gobiesox maeandricus*		1						**1**
fish	Snailfish unidentified	*Liparidae*			2	2	2			**6**
fish	Painted Greenling	*Oxylebius pictus*		1						**1**
fish	Pacific Sanddab	*Citharichthys sordidus*							1	**1**
fish	Starry Flounder	*Platichthys stellatus*	3		1		1		1	**6**
fish	Walleye Pollock	*Gadus chalcogrammus*	2							**2**