Islais Creek Bridge Location Hydraulic Study

San Francisco Public Works (SFPW)

Federal-Aid Project Number: BHLO-5934(168)

Project number: 60526895

April 28, 2023

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Courtney Fournier, EIT	Gary Sjelin, PE	Jimmy Medellin, PE	
AECOM 888 SW 5th Ave Suite 600 Portland, OR 97204	AECOM 999 W. Town & Country Rd Orange, CA 92868	AECOM 999 W. Town & Country Rd Orange, CA 92868	

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

San Francisco Public Works
49 South Van Ness, Suite 700
San Francisco, CA 94103

Prepared by:

AECOM
300 Lakeside Drive
Suite 400
Oakland
CA 94612
aecom.com

Table of Contents

Figures

Tables

Abbreviations

BFE	Base Flood Elevation
CFS	Cubic Feet Per Second
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
HUC	Hydrologic Unit Code
PAED	Project Approval/Environmental Document
PM	Post Mile

Executive Summary

San Francisco Public Works (SFPW) is proposing to replace the existing bridge superstructure of the Islais Creek Bridge (Bridge No. 34C0024; also known as the Levon Hagop Nishkian Bridge) along Third Street in the City and County of San Francisco (CCSF).

The effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) shows that part of the proposed project area is located within the 100-year floodplain. When a floodplain encroachment is anticipated, a Location Hydraulic Study is required by the California Department of Transportation (Caltrans). The Location Hydraulic Study is a preliminary study of base floodplain encroachments. An increase in the base floodplain elevation (BFE) is not anticipated; therefore, a hydraulic computer model was not required. A Location Hydraulic Study and Summary Floodplain Encroachment Report are required for submittal. These forms can be found in **Section 1** of the report.

Regulatory Setting

Executive Order (EO) 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. The Federal Highway Administration (FHWA) requirements for compliance are outlined in 23 Code of Federal Regulations (CFR) 650 Subpart A.

To comply, the following must be analyzed:

- The practicability of alternatives to any longitudinal encroachments.
- Risks of the action.
- Impacts on natural and beneficial floodplain values.
- Support of incompatible floodplain development.
- Measures to minimize floodplain impacts and to preserve/restore any beneficial floodplain values affected by the project.

The base floodplain is defined as “the area subject to flooding by the flood or tide having a one percent chance of being exceeded in any given year.” An encroachment is defined as “an action within the limits of the base floodplain.”

1. Introduction

1.1 Project Description

San Francisco Public Works (SFPW) is proposing to replace the superstructure of the Islais Creek Bridge (Bridge No. 34C0024) (officially named the Levon Hagop Nishkian Bridge) along Third Street in the City and County of San Francisco (CCSF). The bridge is approximately 1,700 feet east of Interstate 280, and approximately 3,300 feet west of San Francisco Bay (the Bay). The bridge spans the Islais Creek Channel, a dredged, channelized, tidal embayment with predominantly armored shorelines that extends from the Bay to the site of the former outfall of the now culverted and buried Islais Creek.

The existing bridge is a double-leaf bascule structure (drawbridge) constructed in 1949 with an open steel-grate roadway draining to the bay, and concrete abutments. It is approximately 114 feet long and 100 feet wide. A California Department of Transportation evaluation in 2004 determined that the bridge was significant as an example of Art Moderne style applied to a bridge.

The project area is very susceptible to seismic liquefaction and the condition of the bridge's structural system is poor. The bridge originally carried only vehicular traffic, but now additionally carries MUNI light-rail tracks. The deteriorated condition of the bridge makes the bridge deck susceptible to vibration induced by heavy vehicles, trucks, and light-rail vehicles crossing the span.

The areas surrounding Islais Creek are at risk of flooding from heavy rainfall events, coastal storm surge, and wave hazards, which will be exacerbated by sea-levels rise and rising groundwater. The steel sections of the bridge are increasingly subject to the deleterious effects of corrosion and saltwater intrusion.

The Standard Project Alternative will remove the existing drawbridge leaves, which have not been opened for navigation for over ten years, and all other drawbridge features. These will be replaced by a single-span concrete through-girder bridge with a concrete deck at a higher elevation to improve freeboard for flood flows and to accommodate sea-level rise.

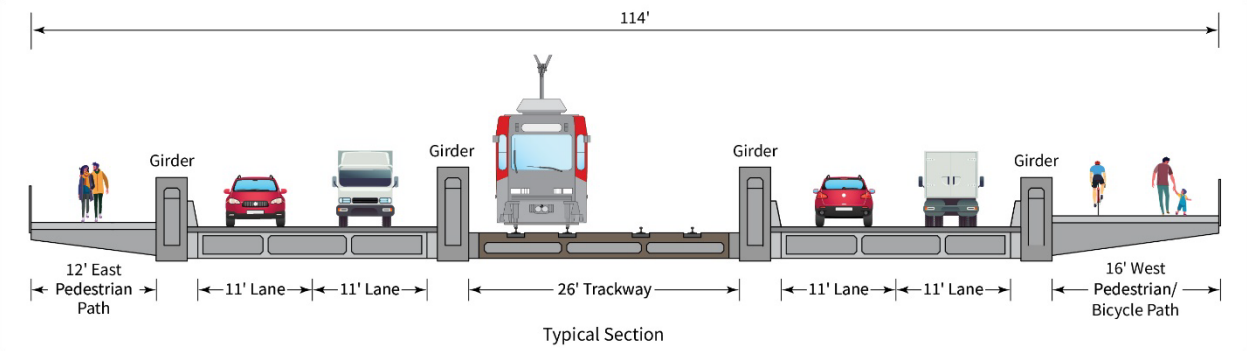


Figure 1. Proposed Bridge Cross Section

In addition to dedicated light-rail-vehicle trackways and two 11-foot travel lanes in each direction, the bridge will support a 12-foot-wide pedestrian path on its eastern side and a 16-foot-wide Class I shared pedestrian/bicycle path on its western side. The reconstructed trackway and roadway will be designed to convey surface runoff to the existing combined sewer/stormwater system. The control tower will be demolished down to the sidewalk level and the remaining portion will be used to create a public observation platform.

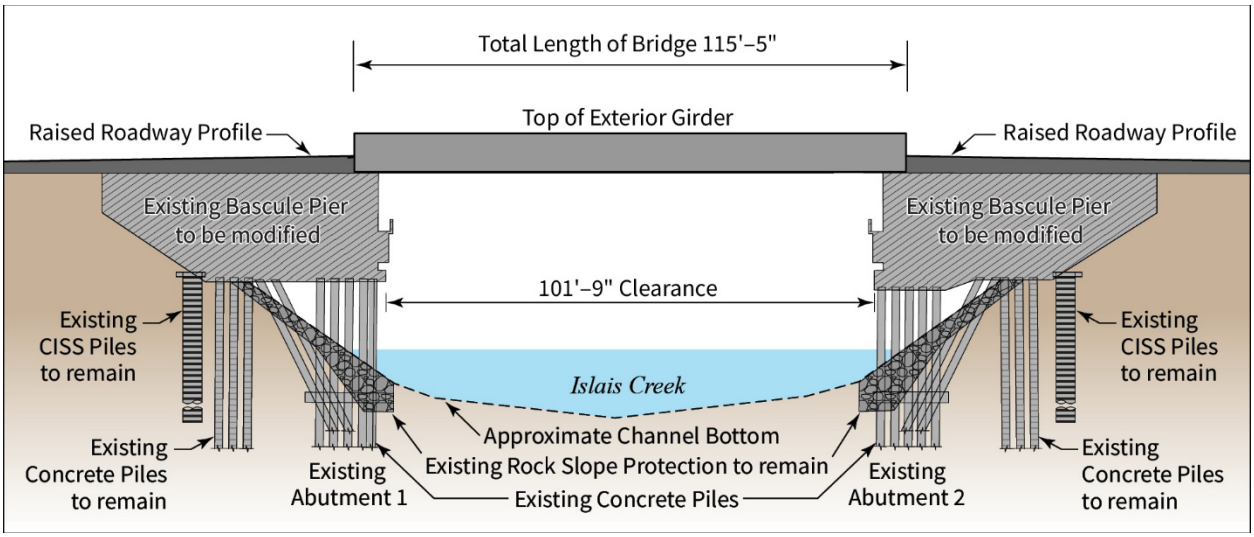


Figure 2. Proposed Bridge Longitudinal Section

The project's accommodation of a shared bicycle/pedestrian facility (Class I or Class IV) is based on advanced planning between the San Francisco Public Utilities Commission, Port of San Francisco, and the San Francisco

Municipal Transportation Agency in response to opportunities presented by the removal of the bridge's drawbridge function per the City's *Islais Creek Southeast Mobility Adaptation Strategy*). Although not yet officially designated a bicycle facility, the Islais Creek Bridge and portion of Third Street connecting to Cargo Way will be adopted as part of the updated San Francisco Bicycle Network and citywide active transportation plan that is currently under way and expected to be completed in 2024.

Besides the **Standard** project alternative described above, there are two other alternatives under consideration.

Under the project's **No Build Alternative**, no modifications will be made to the Islais Creek Bridge; only routine maintenance will be performed. Deterioration will continue to be addressed through short-term remedies but existing bridge structural and seismic deficiencies will remain and worsen. There will be no increase in bridge freeboard, so flood risks to the bridge and light-rail operations will remain and will increase with sea-level rise.

The **Partial Preservation Alternative** includes the project features described above for the Proposed Project, but will include salvage, rehabilitation, and reinstallation of as many of the historic character-defining features of the original bridge as feasible. If it is determined that for reasons of safety, construction standards, or sound engineering practice any of the character-defining features are not salvageable for reinstallation, these elements will be replicated with substitute materials to recreate the historic appearance. The Control Tower will be retained, its foundation and window system retrofitted, and its damaged concrete repaired.

A more extensive description of the project and its alternatives is available in the project's Environmental Assessment.

Construction will last 24 months and is assumed to begin no sooner than spring 2025. Bridge closure is expected to last the duration of construction. Detours that will route traffic to arterials that have capacity for the additional vehicles will be established to re-route traffic around the construction site. Detour routes will be developed during final design. The City of San Francisco will develop plans for substitute forms of transit to provide a comparable level of service during construction. The most probable replacement for disrupted light-rail service is a temporary bus service. Construction is anticipated to use typical eight-hour work shifts during daylight hours; nighttime and weekend construction is not anticipated. In addition to staging areas on the bridge approaches and on anchored barges, three potential off-site construction staging area options owned by the Port of San Francisco that are currently used for Port-related industrial purposes have been identified.

2. Floodplain Hazard

The effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) number 0602980232A (FEMA, 2021a) shows Zone AE with a Base Flood Elevation (BFE) of 10 feet based on North American Vertical Datum of 1988 (NAVD88) across the bridge. Zone AE is defined as areas subject to inundation by the 1-percent-annual-chance flood event (i.e., 100-year) determined through hydraulic analysis methods agreed upon by FEMA and the Engineering Consultants. To the south of the bridge, 3rd Street is mapped as Zone X (Shaded), which is subject to inundation by the 0.2-percent-annual-chance flood event (i.e., 500-year) and areas subject to the 1-percent-annual-chance flood with average depth less than one foot or with drainage areas less than one square mile. Other areas are mapped as Zone X (Unshaded), which are considered areas of minimal flood hazard and outside of the 100-year floodplain. About 2,000 feet downstream of the 3rd Street bridge, Islais Creek is mapped as Zone VE with a BFE of 12 feet, as the channel starts to enter San Francisco Bay where wave action has a greater impact compared with the more sheltered channel near the 3rd Street Bridge. Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Less than 400 feet to the east of the 3rd Street Bridge, there is a portion along the banks of Islais Creek Channel that are labeled as Zone D. Zone D areas are areas of undetermined flood hazard that have not been modeled but are identified as a possible area for flooding rise. For the FEMA study certain piers and wharfs were not modeled to account for potential flood risk FEMA designated those areas as Zone D. These areas are still at risk even though

flood insurance is not federally required by lenders. Zone D shows from the coastal transect baseline and extends towards open water where it is terminated at the end of the structures limit (FEMA, 2021a). The FIRM can be found in **Appendix A**.

2.1 Watershed Description

The Islais Creek Channel is in the San Francisco Bay sub-basin, a Hydrologic Unit Code (HUC) 8 sub-basin that has a drainage area of 1,333 square miles. HUC 8 maps the sub-basin level, analogous to medium-sized river basins. This sub-basin incorporates most of the San Francisco Bay shoreline and covers the southern half of the San Francisco community. The primary creeks in the San Francisco Bay watershed are Yosemite Creek, Mission creek, and Islais Creek; however, the streams have been routed primarily through underground storm sewers (FEMA, 2021b).

The Islais Creek Watershed features Islais Creek, which begins in Glen Canyon, running 3.5 miles in length and historically almost 1 mile wide at the mouth connecting into the Bay (**Figure 3**). Debris from the 1906 earthquake was used to fill the creek, hastening the area's conversion to an industrial waterfront hub. Much of Islais Creek and its marshy areas were eventually filled. The Islais Creek Watershed covers 6,496 acres.

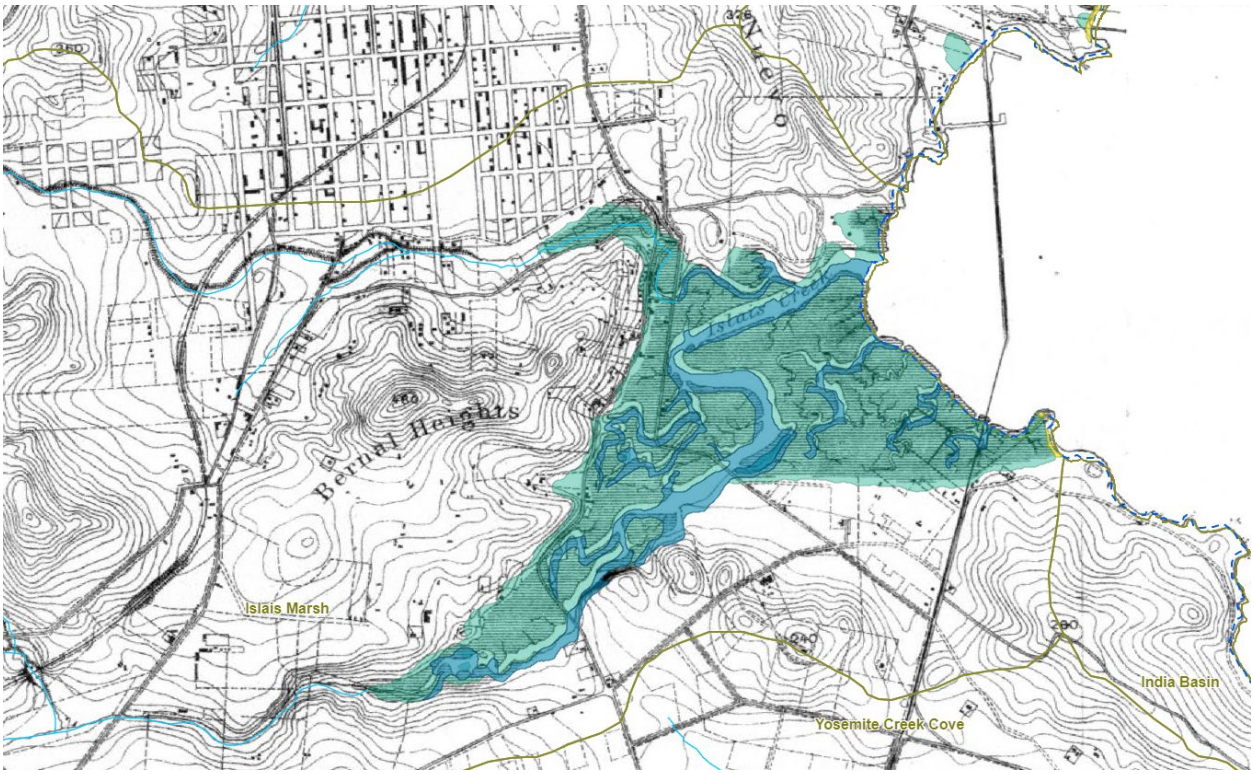


Figure 3 Historic (1860s) Islais Creek Tidal Marsh

As mentioned previously, most San Francisco's water sources have been directed into underground storm sewer and then built over. Islais Creek looks like a channel, but this creek once extended 3.5 miles from the hills of San Francisco into San Francisco Bay. In present day, the watershed is almost entirely diverted to the nearby water treatment plant; and therefore, Islais Creek behaves more like a Tidal Channel (SFPW, 2016).

Due to the flood risk and sea level rise, Islais Creek has become a focus among the city and environmentalists. The Islais Creek Southeast Mobility Adaptation Strategy (ICSMAS) that was initiated in 2019, is a set of projects and pathways to protect the Islais Creek shoreline and surrounding district from future flooding risk. A Flood Study, led by

the US Army Corps of Engineers (USACE) in partnership with the Port of San Francisco began in 2018 and will continue through 2025. This Flood Study will identify challenges and recommend solutions to reduce current and future flood risk. The Islais Creek Bridge Rehabilitation Project led by Public Works is part of the ICSMAS.

2.2 Flooding History

The history of flooding in San Francisco indicates that low-lying areas that are not adjacent to shorelines experience flooding from severe storms. Factors that contribute to this localized flooding could be from sewer overflow, equipment breakdowns in the aging infrastructure, and areas located on fill or bay mud. In 2009, the Mission District was flooded when heavy rains overwhelmed the storm sewers In 2019, the Mission District once again experienced flooding in low-lying spots due to heavy rainfall and excess runoff (ACB, 2019). In October 2021, the Bay area experienced flooding as a result of record breaking rainfall, the strongest storm to hit the Bay Area since 1960. (SF Chronicle, 2021).

Flooding in the Bay regularly occurs during the King Tide season, generally in December and January (FEMA, 2021b). King Tides are a non-scientific term to describe exceptionally high tides that typically occur during a new or full moon and when the Moon is at a perigee (or the Moon's closest point to Earth) (NOAA, King Tide). Rising sea levels will cause the King Tides to flood the coastal areas. There are many articles dated for the years 2019-2022 that state the King Tides were causing flooding. The most severe storms typically occur when elevated stormwater levels coincide with a significant high tide event (FEMA, 2021b).

The FEMA Flood Insurance (FIS) report states that major disaster declarations for flooding in San Francisco County were issued in April 1995, December 1996, and February 1998.

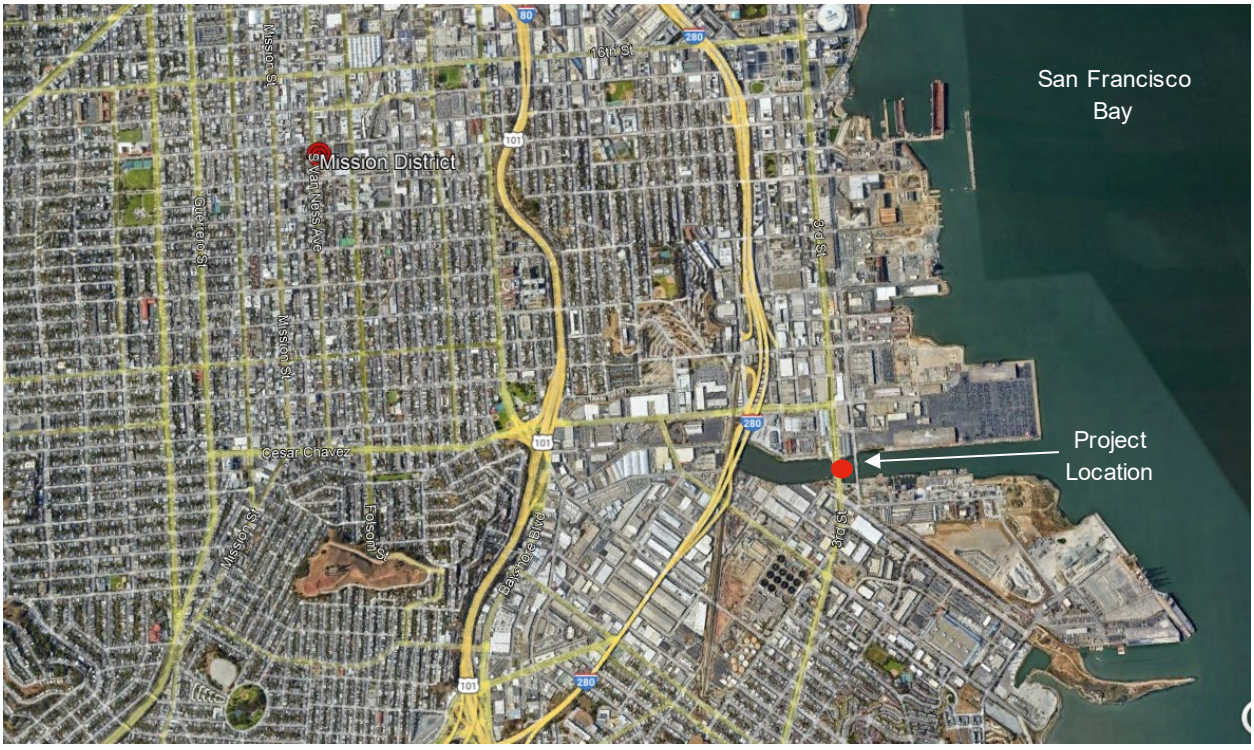


Figure 4. Reported Flood History Locations

3. Floodplain Assessment

Islais Creek's primary sources of flooding are from San Francisco Bay and storm drain runoff. The flood risks associated with the San Francisco Bay is caused by high tides and heavy storm flows. The San Francisco Public Utilities Commission owns several above ground reservoirs tanks in San Francisco. If these structures were to fail because of earthquakes it would inundate limited areas of the city. During high storm events, the combined sewer system that conveys both wastewater and stormwater could overflow and cause flooding. Over 90% of San Francisco is served by a combined sewer system. (FEMA, 2021b)

3.1 Islais Creek Flooding

Islais Creek is a low-lying channel that is currently at-risk for flooding from storms and coastal flooding with an increased vulnerability for significant flooding and sea level rise due to climate change. Islais Creek is within Zone AE with a 100-year flood elevation of 10 ft NAVD88. The mouth of the channel that is mapped as Zone VE has a 100-year flood elevation of 12 ft NAVD88. The proposed soffit elevation at the face of the abutment is 15.4 ft NAVD88. The proposed bridge freeboard would be 5.4 feet (15.4 feet -10 feet) from the base flood elevation (BFE) to the bridge soffit. Coastal Flooding

Per the 2021 FIS., coastal flood hazard analyses were performed to provide estimates of coastal BFEs for areas of San Francisco that are impacted by coastal flooding. Coastal BFEs reflect the increase in water levels during a flood event due to extreme tides and storm surge as well as overland wave effects. Coastal BFEs are calculated as the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm plus the additional flood hazard from overland wave effects (storm-induced erosion, overland wave propagation, wave runup and wave overtopping).

Coastal flooding is identified on FIRM maps as Zone VE or Zone V. Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone. Zone V is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. **Table 1** provides a summary of the FEMA coastal analyses, including flooding source, study limits, and hydraulic model use for the analysis.

Table 1. Summary of Coastal Analyses

Flooding Source	Study Limits From	Study Limits To	Hazard Evaluated	Model or Method Used	Date Analysis was Completed
San Francisco Bay	Entire shoreline within the City and County of San Francisco	Entire shoreline within the City and County of San Francisco	Overland Wave Propagation	WHAFIS Version 4	July 2015
San Francisco Bay	Entire shoreline within the City and County of San Francisco	Entire shoreline within the City and County of San Francisco	Wave Setup and Runup	DIM/TAW/SPM	July 2015
San Francisco Bay	Entire shoreline within the City and County of San Francisco	Entire shoreline within the City and County of San Francisco	Stillwater Level and Deepwater Wave Conditions	MIKE 21 Flow Model (HD), MIKE 21 Spectral Wave (SW)	July 2015

Source: Effective FEMA FIS, Table 14.

Figure 5 shows the relationship between the base flood elevation, the 1% annual chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE areas in an area without a primary frontal dune (PFD) subject to overland wave propagation. The Limit of Moderate Wave Action (LiMWA) is the inland limit of the Coastal A Zone in which the area is affected by waves greater than 1.5 feet. The Coastal Transect Baseline is the 0.0-foot elevation contour and represents the starting point for the transect and the measuring point for the coastal mapping. This figure also illustrates energy dissipation and regeneration of a wave as it moves inland.

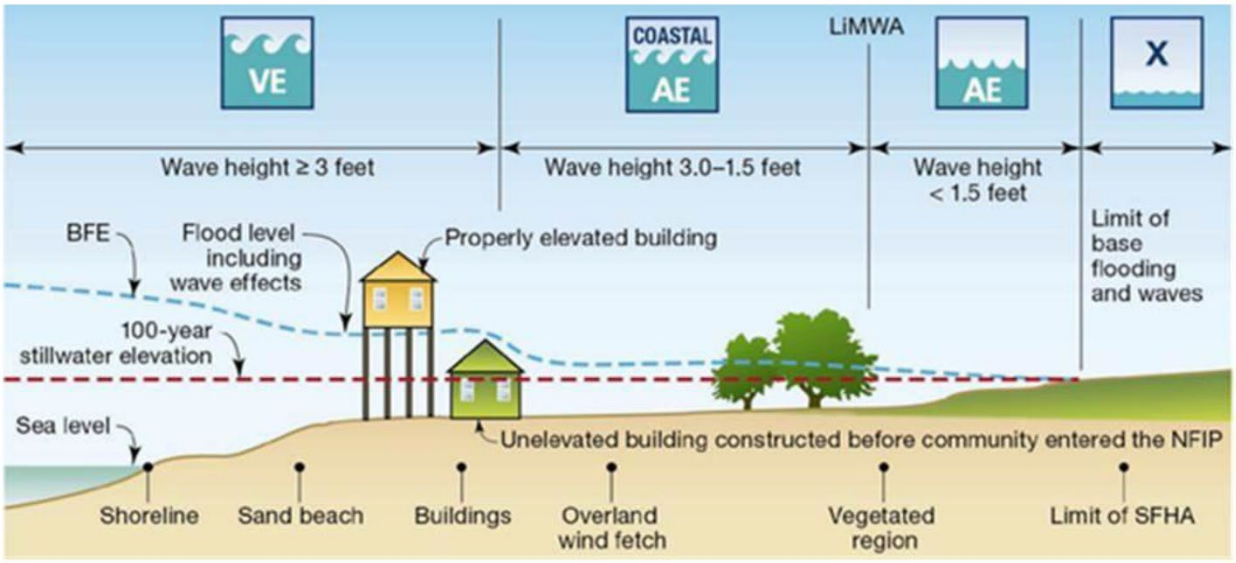


Figure 5. Coastal Transect Schematic

The total water level for a 1% annual chance is 11.6 feet at coastal transect 53 and 13.3 feet at coastal transect 54, both located to the north of Islais Creek. The 1% annual Stillwater elevation is 9.9 feet at coastal transect 55, located at the southern mouth of Islais Creek. The total water level for a 1% annual chance is 11.9 feet to the south of Islais creek and 9.9 ft at coastal transect 56 (FIS,2021). The coast transect locations can be seen in **Figure 6** and summarized in **Table 2**.

Table 2. Coastal Transect Parameter near Islais Creek Bridge

Coastal Transect	Total Water Level – 1% Annual Chance (NAVD88)
53	11.6 feet
54	13.3 feet
55	9.9 feet
56	11.9 feet

Figure 6. Coastal Transect Location & 1% Total Water Elevation

3.2 Climate Change Impact

A Sea Level Rise Memorandum for the Islais Creek Bridge Rehabilitation Project was completed in January 2023 by San Francisco Public Works (SFPW, 2023) The analysis considered the following Representative Concentration Pathways (RCP):

- RCP 8.5 assumes anthropogenic global greenhouse gas emissions continue to rise over the next century (i.e., there are no significant efforts to limit or reduce emissions)
- RCP 6.0 assumes anthropogenic global greenhouse gas emissions peak in 2080 and then decline
- RCP 4.5 assumes anthropogenic global greenhouse gas emissions peak in 2040 and then decline
- RCP 2.6 assumes stringent emissions reductions, with anthropogenic global emissions declining by about 70% between 2015 and 2050, to zero by 2080, and below zero thereafter (i.e., humans would absorb more greenhouse gasses from the atmosphere than they emit)

These RCPs were based on the 2014 Intergovernmental Panel on Climate Change (IPCC, 2018).

If Islais Creek deck configuration were to remain at the same elevation as the existing condition, the machinery pits and bottom of steel girders would be submerged between 1.8 feet (under RCP 4.5) and 4.2 feet (under RCP 8.5) by 2075. Given the geometric constraints at the site, the bridge deck could be raised between 2.5 feet and 3 feet, resulting in a soffit elevation of 15.2 feet and a deck elevation of 18.6 feet. For a 50-year design life, the elevation gain provided in the Islais Creek Bridge Rehabilitation project would reduce the likelihood of flooding on the bridge due to sea level rise. If RCP 8.5 were evaluated beyond the 50-year design life, the bridge deck elevation of 18.6 feet would still be sufficiently high to avoid inundation by the year 2100. However, raising the bridge any higher would not result in additional benefits because the surrounding area could still be flooded. This means roads such as Third Street could be non-traversable. (SFPW, 2023)

The RCP 4.5 “likely” scenario (i.e., additional 1.9 feet of sea-level rise) would result in some localized flooding in the lowest surrounding areas under current shoreline conditions. Sea-level rise projections beyond the end of the functional lifespan of the structure are not relevant, as the bridge is anticipated to require future replacement beyond that date. At that time and depending on future sea-level-rise conditions and updated projections, a new bridge structure would need to be constructed in concert with larger regional adaptation measures. The Islais Creek Bridge Rehabilitation project would reduce the likelihood of flooding on the bridge due to sea level rise for a 50-year design life.

The complete Sea Level Rise Memorandum can be found in **Appendix B**.

4. Summary

The proposed project will not change the land use and will not result in significant changes in the impervious area. The proposed work will not cause increase in fill inside the floodplain. The proposed project area is located within the 100-year floodplain designated on the effective FEMA flood insurance rate maps. There are no significant encroachments or longitudinal encroachments with this project. The proposed design raises the profile of the bridge which will accommodate sea level rise while minimizing flooding impacts to adjacent properties. Because the primary cause of flooding is tidal flooding, the proposed project is not expected to impact the existing FEMA 100-year BFE.

During the planning process, San Francisco Public Works selected year 2075 as the year for the Islais Creek Bridge Structure's evaluation, assuming a 50-year functional lifespan of the bridge. Using the current City guidance for a planning horizon of 2075, sea-level rise between 1.9 feet and 4.3 feet is anticipated. This range is bounded by RCP 4.5 (Likely scenario) as a lower bound estimate and RCP 8.5 (Worst case scenario) as an upper bound estimate. The proposed bridge design would provide a minimum of 0.9 feet of freeboard above a future base floodplain elevation of 14.3 feet assuming sea-level rise of 4.3 feet, which is the upper bound estimate.

This study concludes that there is minimal impact to flooding with the project; therefore, a Summary Floodplain Evaluation Report was completed.

5. Copy Attachment Forms

LOCATION HYDRAULIC STUDY FORM

Dist. 4 Co. San Francisco Rte. Third Street Project ID _____
Federal-Aid Project Number: BHLO-5934(168)

Floodplain Description:
Zone AE for Islais Creek Bridge and Islais Creek Chanel. Zone X to the south of Islais Creek Bridge on 3rd street. Zone VE at the mouth of Islais Creek Channel at San Francisco Bay.

1. Description of Proposal *(include any physical barriers i.e. concrete barriers, sound walls, etc. and design elements to minimize floodplain impacts)*
The Project proposing to replace the existing bridge superstructure of the Islais Creek Bridge (also known as the Levon Hagop Nishkian Bridge) along Third Street in the City and County of San Francisco.

2. ADT: Current 21,660 (2022) Projected 21,660 (no projected traffic study conducted)_____

3. Hydraulic Data: Base Flood Q100= N/A, FIS does not include summary of discharge because area is coastal flooding.

WSE100= 10 ft *The flood of record, if greater than Q100:*
Q= N/A coastal flooding WSE= _____
Overtopping flood Q= Not provided in FIS WSE= _____

Are NFIP maps and studies available? NO_____YES__X____

4. Is the highway location alternative within a regulatory floodway?
NO ___X_____YES_____

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q100 backwater damages:

A.	Residences?	NO___X_____	YES_____
B.	Other Bldgs?	NO_____	YES__X_____
C.	Crops?	NO__X_____	YES_____
D.	Natural and beneficial Floodplain values?	NO_____	YES__X_____

Note: Existing buildings are within 100-year floodplain. Project does not cause additional coastal flooding.
"Natural and beneficial flood-plain values" shall include but are not limited to fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge.

6. Type of Traffic:

A. Emergency supply or evacuation route?	NO_____	YES__X_____
B. Emergency vehicle access?	NO_____	YES__X_____
C. Practicable detour available?	NO_____	YES__X_____
D. School bus or mail route?	NO_____	YES__X_____

7. Estimated duration of traffic interruption for 100-year event hours: 0

8. Estimated value of Q100 flood damages (if any) – moderate risk level.

A.	Roadway	$ N/A
B	Property	$ N/A
	Total	$ N/A

9. Assessment of Level of Risk
Low__X_____
Moderate_____
High_____

For High Risk projects, during design phase, additional Design Study Risk Analysis may be necessary to determine design alternative.

LOCATION HYDRAULIC STUDY FORM cont.

Dist. 4 Co. San Francisco Rte. Third Street P.M.
Federal-Aid Project Number: BHLO-5934(168)
Project ID Bridge No. 34C0024

PREPARED BY:

Signature:
I certify that I have conducted a Location Hydraulic Study consistent with 23 CFR 650 and that the information summarized in items numbers 3, 4, 5, 7, and 9 of this form is accurate.

_____ *Date* _____
District Hydraulic Engineer *(capital and 'on' system projects)*

_____ *Date* May 10, 2023
Jimmy Medellin, PE
Local Agency/Consulting Hydraulic Engineer *(local assistance projects)*

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible Floodplain development? NO X YES

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

I certify that item numbers 1, 2, 6 and 8 of this Location Hydraulic Study Form are accurate and will ensure that Final PS&E reflects the information and recommendations of said report:

_____ *Date* _____
District Project Engineer *(capital and 'on' system projects)*

_____ *Date* May 10, 2023
Local Agency Project Engineer *(local assistance projects)*
Thomas R, Barnard, PE

CONCURRED BY:
I have reviewed the quality and adequacy of the floodplain submittal consistent with the attached checklist, and concur that the submittal is adequate to meet the mandates of 23 CFR 650.

_____ *Date* _____
District Project Manager *(capital and 'on' system projects)*

_____ *Date* May 30, 2023
Local Agency Project Manager *(Local Assistance projects)*

_____ *Date* _____
District Local Assistance Engineer *(or District Hydraulic Branch for very complex projects or when required expertise is unavailable. Note: District Hydraulic Branch review of local assistance projects shall be based on reasonableness and concurrence with the information provided).*

I concur that the natural and beneficial floodplain values are consistent with the results of other studies prepared pursuant to 23 CFR 771, and that the NEPA document or determination includes environmental mitigation consistent with the Floodplain analysis.

_____ *Date* _____
District Senior Environmental Planner *(or Designee)*

Note: If a significant floodplain encroachment is identified as a result of floodplains studies, FHWA will need to approve the encroachment and concur in the Only Practicable Alternative Finding.

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist. _____4_____Co. ____San Francisco_____ Rte.__Third Street_____ K.P. _____
Federal-Aid Project Number *(Local Assistance)*____BHLO-5934(168)_____
Project No.: _____ Bridge No. __34C0024_____
Limits: _____
_____

Floodplain Description: Zone AE for Islais Creek Bridge and Islais Creek Chanel. Zone X to the south of Islais Creek Bridge on 3rd street. Zone VE at the mouth of Islais Creek Channel at San Francisco Bay.

		No	Yes
1.	Is the proposed action a longitudinal encroachment of the base floodplain?	_X_	___
2.	Are the risks associated with the implementation of the proposed action significant?	_X_	___
3.	Will the proposed action support probable incompatible floodplain development?	_X_	___
4.	Are there any significant impacts on natural and beneficial floodplain values?	_X_	___
5.	Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain.	_X_	___
6.	Does the proposed action constitute a significant floodplain encroachment as defined in 23 CFR, Section 650.105(q).	_X_	___
7.	Are Location Hydraulic Studies that document the above answers on file? If not explain.	___	_X_

PREPARED BY:

_____ *Date* _____
District Project Engineer *(capital and 'on' system projects)*

_____ *Date* May 10, 2023
Jimmy Medellin, PE
Local Agency Project Engineer *(local assistance projects)*

CONCURRED BY:

_____ *Date* _____
District Project Manager *(capital and 'on' system projects)*

_____ *Date* _____
District Local Assistance Engineer *(Local Assistance projects)*

I concur that impacts to natural and beneficial floodplain values are consistent with the results of other studies prepared pursuant to 23 CFR 771, and that the NEPA document or determination includes environmental mitigation consistent with the Floodplain analysis.

_____ *Date* _____
District Senior Environmental Planner *(or Designee)*

Note: If a significant floodplain encroachment is identified as a result of floodplains studies, FHWA will need to approve the encroachment and concur in the Only Practicable Alternative Finding.

6. References

ABC7 News. October 20, 2009. *Sudden Downpour Causes Flooding.* https://abc7.com/archive/7072716/

ABC7 News. December 9, 2019. *Video Shows Intense Downpours turn San Francisco Streets, Muni Stairs Into Rivers*. https://abc7news.com/san-francisco-flooding-flooded-streets-in-sf-video-of/5742118/

Federal Emergency Management Agency (FEMA), March 31, 2021a. Flood Insurance Rate Map (FIRM) for City and County of San Francisco, California. Map number 0602980232A.

Federal Emergency Management Agency (FEMA), March 23, 2021b. Flood Insurance Study (FIS), Number 060298V000A. City and County of San Francisco, California. Community number 060298.

The Mercury News. January 3, 2022. *King Tides Flood Low-Lying Coastal Regions in the Bay Area through Monday.* https://www.mercurynews.com/2022/01/03/king-tides-flood-low-lying-coastal-regions-in-the-bay-area-through-monday/

National Oceanic and Atmospheric Administration (NOAA). US Department of Commerce. *What is a King Tide?* https://oceanservice.noaa.gov/facts/kingtide.html

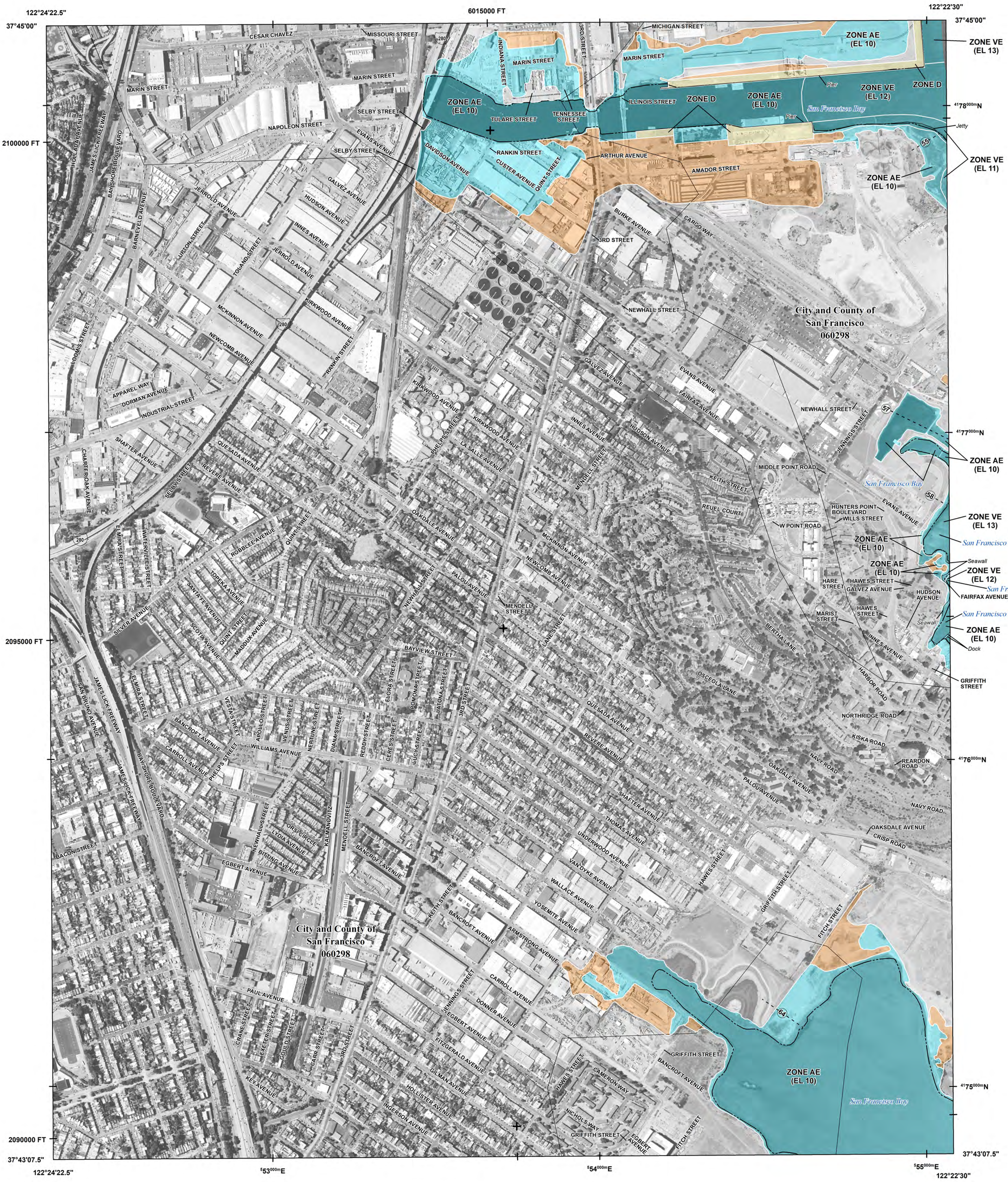
San Francisco Public Works (SFDPW), Structural Engineering Section. *Location Hydraulic Study & Sea Level Rise Report*: Islais Creek Bridge Rehabilitation Project. July, 2016. WRECO (HDR).

San Francisco Planning. June 20, 2021. *Islais Creek Southeast Mobility and Adaption Strategy (ICSMAS).* https://default.sfplanning.org/Citywide/Islais/IslaisCreek_FinalReport_August2021.pdf

San Francisco Chronicle (SF Chronicle). Buchmann, A. et.al. October 24, 2021. SF Bay Area Weather: Category 5 Atmospheric River Brings Flooding, Evacuation Orders and Outages. https://www.sfchronicle.com/weather/article/S-F-Bay-Area-weather-live-updates-Track-the-16558095.php

San Francisco Public Utilities Commission (SFPUC). *Discover Your Watershed*. https://sfgov.maps.arcgis.com/apps/MapSeries/index.html?appid=6341c3a2eb5d4dc597495bafa77b1ca1

Appendix A FIRM Map



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- NO SCREEN Areas of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert or Storm Sewer
- Accredited or Provisionally Accredited Levee, Dike or Floodwall
- Non-accredited Levee, Dike or Floodwall
- Dock, Jetty, Pier, Revetment or Seawall

OTHER FEATURES
- E 18.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation (BFE)
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was derived from multiple sources including USDA NAIP imagery dated 2016.

Coastal Base Flood Elevations shown on the map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Coastal flood elevations are also provided in the Coastal Transect Parameters table in the FIS Report for this jurisdiction. Elevations shown in the Coastal Transect Parameters table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

SCALE

N

Map Projection:
Universal Transverse Mercator Zone 10N; North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 250 500 750 1,000 2,000 feet

0 125 250 500 meters

PANEL LOCATOR

*PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

CITY AND COUNTY OF SAN FRANCISCO, CALIFORNIA

PANEL 232 OF 304

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN FRANCISCO, CITY AND COUNTY OF	060298	0232	A

VERSION NUMBER
2.3.2.0

MAP NUMBER
0602980232A

EFFECTIVE DATE
MARCH 23, 2021

Appendix B Islais Creek Sea Level Rise Memorandum

Patrick Rivera, PE, Acting Bureau Manager | Bureau of Project Management
patrick.rivera@sfdpw.org | T. 628.271.2456 | 49 South Van Ness Ave. 7th Floor, San Francisco, CA 94103

MEMORANDUM

TO: Chelsea Fordham, Principal Environmental Planner
Elizabeth White, Senior Environmental Planner
San Francisco Planning Department

FROM: Oliver Iberien
Regulatory Specialist
San Francisco Public Works – Office of Regulatory Affairs

THRU: Thomas Roitman, SE, PMP
Project Manager
San Francisco Public Works – Bureau of Project Management

DATE: January 11, 2023

SUBJECT: **CEQA –- Project-Related Flooding and Sea-Level Rise Analysis**
San Francisco Planning Department - Case No. 2022-000112ENV
Islais Creek Bridge Rehabilitation Project - San Francisco, California

Purpose

This memorandum analyzes whether the Islais Creek Bridge Rehabilitation Project would exacerbate existing flooding conditions such that people or other structures would be exposed to a significant risk from flooding under existing or future conditions. This memorandum only addresses flooding from sea level rise; existing flooding from other circumstances are addressed in the Islais Creek Bridge Location Hydraulic Study.[1]

Sea Level Rise Projections and Planning in San Francisco

The City and County of San Francisco relies upon the 2018 guidance developed by the State of California to inform sea level rise planning efforts.[2] The 2018 State of California Sea-Level Rise Guidance provides a science-based methodology for state and local governments to use in analyzing and assessing the risks associated with sea-level rise and to incorporate sea level rise into planning, permitting, and investment decisions. Projections regarding the extent of sea-level rise use different greenhouse gas emission

[1] San Francisco Public Works, Islais Creek Bridge Location Hydraulic Study, August 2022.
[2] State of California, Sea-Level Rise Guidance, 2018 Update. Available at: https://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

trajectory scenarios and are based on the Intergovernmental Panel on Climate Change (IPCC)'s 2014 "Representative Concentration Pathways," or RCPs.[3] These four scenarios are defined as follows:

- **RCP 8.5** assumes anthropogenic global greenhouse gas emissions continue to rise over the next century (i.e., there are no significant efforts to limit or reduce emissions)
- **RCP 6.0** assumes anthropogenic global greenhouse gas emissions peak in 2080 and then decline
- **RCP 4.5** assumes anthropogenic global greenhouse gas emissions peak in 2040 and then decline
- **RCP 2.6** assumes stringent emissions reductions, with anthropogenic global emissions declining by about 70% between 2015 and 2050, to zero by 2080, and below zero thereafter (i.e., humans would absorb more greenhouse gasses from the atmosphere than they emit)

The City and County of San Francisco has selected RCP 8.5 as the upper range and RCP 4.5 as the lower range for sea level rise planning. This is because RCP 4.5 represents a more realistic, or "likely" potential lower range for sea level rise planning since achieving RCP 2.6 requires significant actions at a global scale that are outside of San Francisco's control.

Incorporation of Sea Level Rise in Capital Planning

Released in March 2016, the City and County of San Francisco's Sea Level Rise Action Plan defines an overarching vision and set of objectives for future sea level rise and coastal flooding planning and mitigation in San Francisco. In response to the 2016 Sea Level Rise Action Plan, San Francisco's Office of Capital Planning requires that departments consider sea-level rise when assessing vulnerability and risk to support adaptation in capital projects.[4]

Several factors influence the selection of a sea level rise scenario when assessing the risks and vulnerability of a particular project, including but not limited to:

- **Functional Lifespan** – how long will the project be in use at this location (including regular repair and maintenance)?
- **Location** – is the project located in an inundation zone during its lifespan?
- **Adaptive Capacity** – can the project be adjusted to climate change or cope with the consequences of climate change?

San Francisco's Office of Capital Planning provides guidance recognizing that both the lifespan and the location of the project should be evaluated when planning to accommodate or adapt to sea level rise vulnerabilities and risks. During project planning, the selection of the planning horizon often influences the selection of appropriate sea level rise scenario(s) in addition to identified vulnerabilities and risks.

During the planning process, San Francisco's Department of Public Works selected year 2075 as the year for the Islais Creek Bridge Structure's evaluation, assuming a 50-year functional lifespan of the bridge.[5]

---

[3] IPCC, 2018: Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 541-562, doi:10.1017/9781009157940.008.

[4] City and County of San Francisco, Guidance for Incorporating Sea level Rise Into Capital Planning, updated January 3, 2020. Available at: https://onesanfrancisco.org/sites/default/files/inline-files/San_Francisco%20SLR_Guidance%20SLRTC%20REV%20TO%20CPC%20Jan%202020.pdf

[5] City and County of San Francisco, Islais Creek Bridge Rehabilitation Sea level Rise Checklist, December 2021.

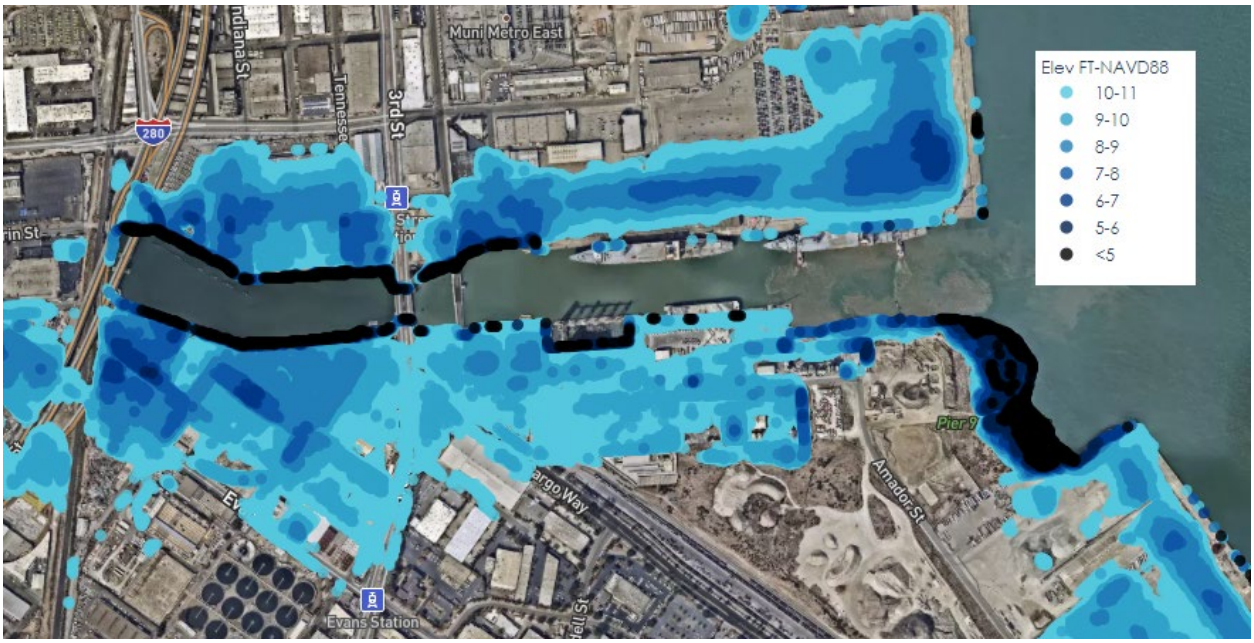
Sea level rise projections beyond the end of the functional lifespan of the structure are not relevant, as the bridge is anticipated to require future replacement beyond that date. At that time and depending on future sea-level-rise conditions and updated projections, a new bridge structure would need to be constructed in concert with larger regional adaptation measures.

Islais Creek Channel Existing Conditions

The proposed Islais Creek Bridge Rehabilitation Project would cross Islais Creek, which is located in the southeast corner of San Francisco. Islais Creek is a historic wetland along the San Francisco Bay and as such, the flow of water in the Islais Creek Channel is almost entirely tidal due to its direct connection to the bay. Islais Creek is generally culverted and covered and the portion upstream of the shoreline, approximately 1,700 feet west of Third Street, feeds directly into the City's combined sewer/stormwater system.

The current outfall from the culverted creek is located between the northbound and southbound elevated structures of the I-280 freeway. The banks of the existing channel east of the culverted creek outfall were artificially created with fill and now form the low-lying topography around the channel.[6] **Figure 1** below shows the area in the vicinity of the channel with elevations of less than 11 feet NAVD88[7] indicated, based largely on 2010/11 LIDAR data.

Figure 1. Elevation Map of Islais Creek Channel



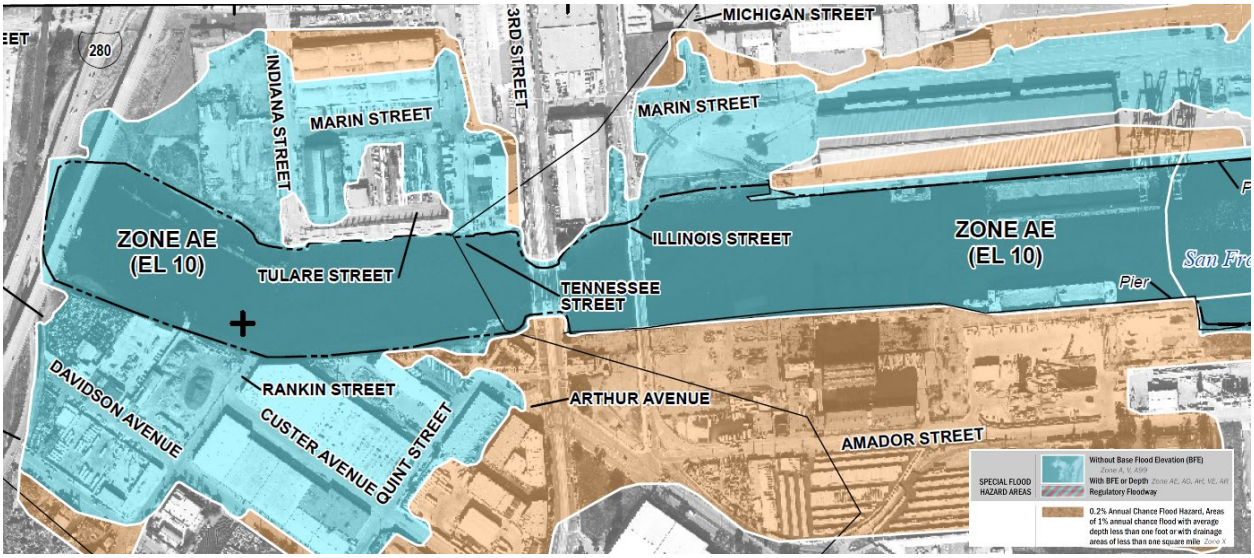
Source: *Ground elevation Interactive maps*. Sea Level Rise Guidance | San Francisco Office of Resilience and Capital Planning. (n.d.). Retrieved December 22, 2022, from https://onesanfrancisco.org/sea-level-rise-guidance

[6] Christopher Richard, Oakland Museum of California (n.d.). Guide to San Francisco Bay Area Creeks. Retrieved December 22, 2022, from http://explore.museumca.org/creeks/index.html

[7] North American Vertical Datum of 1988 (or NAVD88) is the official standard datum of the National Geodetic Survey (the United States federal agency that defines and manages a national coordinate system).

The Federal Emergency Management Agency (FEMA) base floodplain elevation for the channel (Zone AE)[8] is 10 feet NAVD88, meaning there is a 1% annual chance of flooding (refer to Figure 2). Tidal surges associated with king tides[9] and storm surges have resulted in flooding in this area. Additionally, the low-lying land surrounding the creek channel function as a basin that fills with tidal water from below rather than stormwater from above. The existing bridge does not have system that captures stormwater; instead, stormwater falling on the bridge superstructure drains directly to the Islais Creek Channel through the existing open-grate decking. Additionally, there is no component of the existing bridge that displaces incoming tidal waters and rainfall.

Figure 2. National Flood Insurance Program Flood Insurance Rate Map, City and County of San Francisco, California, All Jurisdictions, Panel 232 of 304, detail and portion of legend



Source: *Federal Emergency Management Agency* Flood Maps | FEMA.gov

Islais Creek Channel Future Conditions

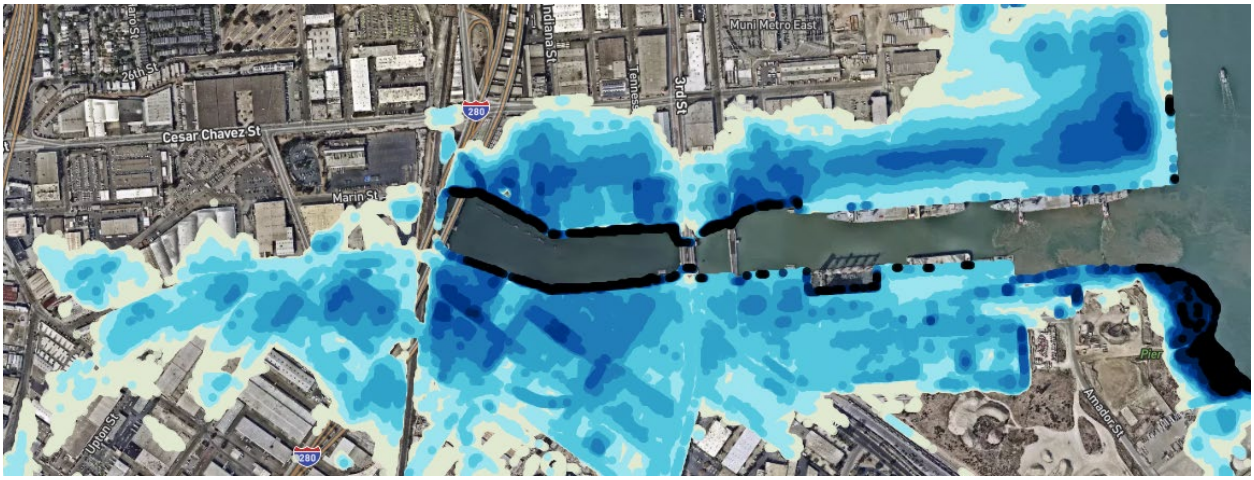
Using the current City guidance for a planning horizon of 2075, sea level rise between 1.9 feet and 4.3 feet is anticipated. This range relies on RCP 4.5 as the "Likely" level as a lower bound estimate and RCP 8.5 as an upper bound estimate.

At the 2075 target year, the RCP 4.5 "likely" scenario (additional 1.9 feet of sea-level rise) would result in some localized flooding in the lowest surrounding areas under current shoreline conditions. In contrast, the RCP 8.5 (additional 4.3 feet of sea-level rise) would result in widespread flooding in the surrounding areas, extending several blocks north and south of the bridge along the Third Street corridor. Flooding under this scenario would affect several lots fronting Islais Creek channel under current shoreline conditions (i.e., many lots surrounding the channel would be subject to inundation). Refer to **Figure 3** below for a depiction of the area that would be affected with 3 feet of sea-level rise. (The darker blue contours represent a higher depth of inundation for flooding anticipation).

[8] Zone AE is designated on the FEMA Flood Insurance Rate Map. It denotes an area with 1% annual chance of inundation where base flood elevation (BFE) is known.

[9] King tides is a term to describe exceptionally high tides that occur during a new or full moon.

Figure 3. The extent of flooding at Islais Creek Channel were water to reach 13 feet NAVD88.



Source: *Ground elevation Interactive maps*. Sea Level Rise Guidance | San Francisco Office of Resilience and Capital Planning. (n.d.). Retrieved December 22, 2022, from https://onesanfrancisco.org/sea-level-rise-guidance

The City and County of San Francisco is currently developing an Islais Creek Adaptation Strategy to address sea level rise and coastal flood risk. San Francisco's Sea Level Rise Action Plan addresses the flooding risk associated with sea level rise at the Islais Creek channel and identifies multiple adaptation strategies to protect existing structures and assets along the channel.[10] It is anticipated that these adaptation strategies would be implemented over the next 30-50 years and as described below, the Islais Creek Bridge Rehabilitation design takes into account these adaptation strategies as part of the project's design.

Islais Creek Bridge Rehabilitation Design

Design Constraints and Sea-Level Rise Adaptation

Public Works designed the Islais Creek Bridge to account for projected sea level rise and evaluated the project's design to determine if there is capacity to adapt to future sea level rise.[11] The existing lowest point of entry to the counterweight pits at the girder slots of the Islais Creek bridge is currently at approximately 9.9 feet NAVD88, meaning that it is below the base floodplain elevation.[12] The existing top of deck is at 15.7 feet. This would mean that if the current deck configuration were maintained, the machinery pits and bottom of steel girders that support the deck would be submerged between 1.8 feet (under RCP 4.5) and 4.2 feet (under RCP 8.5) during flooding by 2075.

The Islais Creek Bridge Rehabilitation project would raise the bridge deck elevation as far as the geometric factors as determined by site conditions allow. Geometric factors constraining the bridge deck elevation include:

[10] *Islais Creek Southeast Mobility Adaptation Strategy*. San Francisco Planning Department, June 30, 2021. Available at https://default.sfplanning.org/Citywide/Islais/IslaisCreek_FinalReport_August2021.pdf.
[11] Islais Creek Bridge Rehabilitation Sea level Rise Checklist. December 2021.
[12] Base Floodplain Elevation (BFE) represents the elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year.

- **Deck Elevation**: The maximum elevation to which the deck can be raised is the maximum height to which traversable ramps can be constructed on the approaches on Third Street to the deck.
- **Bridge Abutments**: Factors limiting the distance that the bridge can be raised are 1) the distances from the bridge abutments to the points at which right-of-way interactions determine the feasible limits of the project, and 2) the lengths of vertical curves necessary to allow changes in Muni Metro track elevation to be traversable by light rail.
- **Right of Way Constraints**: To the north of the project on Third Street, the limiting point is the first driveway north of the channel, as the roadway cannot be elevated such that the access to that property is reduced.
- **Railroad track crossing**: To the south of the project, the Union Pacific railroad tracks crossing Third Street and access to Fire Station 25 constrain the existing roadway elevation. Height adjustments to railway track require a long distance to construct traversable inclines. Any increased elevation of the deck would require a substantially larger project footprint.

Applying the tightest vertical transitional curve radii from Muni specifications to the distances available, the bridge deck would be raised between 2.5 feet and 3 feet, pending final design. This would achieve a soffit and top of deck minimum elevation of 15.2 feet and 18.6 feet NAVD88, respectively, meaning that the new bridge's sofit and top of deck elevation would be approximately 5.2 feet and 3.0 feet higher, respectively, than the existing bridge. Raising the bridge much more than this would not yield additional benefit without additional major intervention to the areas surrounding the bridge (i.e., the area surrounding the bridge is low lying and would also need to be built up to accommodate raising the bridge more). **Figure 2** below shows the extent of flooding were the base floodplain to rise to 13 feet NAVD88. Even if the bridge deck were higher than this point, much of the surrounding ground could be flooded potentially rendering the approaches on Third Street not traversable.

Given the geometric and site constraints, the Islais Creek Bridge Rehabilitation Project would reduce the likelihood of flooding of the bridge from sea level rise events. For San Francisco Capital Planning purposes, a 50-year design life was assumed; however, if the assumptions used for RCP 8.5 by San Francisco Capital Planning are extended outward in time, the bridge deck at elevation 18.6 feet would still be above water level in the year 2100.

The Islais Creek Bridge Rehabilitation design is also consistent with future planning efforts as part of the Islais Creek Adaptation Strategy and is designed at a compatible elevation to align with future shoreline armoring measures on the channel banks adjacent to the bridge without requiring additional augmentation of the bridge.

Bridge Structures in Islais Creek

The Islais Creek Bridge Rehabilitation Project would retain and reuse the existing bridge abutments; the project would not place any new structures in the channel that could impede the flow of water in any direction or exacerbate existing flooding conditions. As such, the Islais Creek Bridge Rehabilitation Project would not exacerbate flood conditions associated with future sea level rise scenarios, such that people or other structures would not be exposed to a significant risk from flooding under existing or future conditions.

Bridge Surface Stormwater Run-off

The Islais Creek Bridge Rehabilitation would also alter the existing drainage pattern of the bridge. Currently, stormwater falling on the bridge superstructure drains directly to the Islais Creek Channel through the existing open-grate decking. Future stormwater falling on the solid deck of the proposed

new superstructure would be captured and conveyed to the combined sewer/stormwater system through either existing or upgraded sewer lines under Third Street, which would have the capacity to accept it. The relatively small footprint of the bridge superstructure would have a negligible increase in added stormwater-runoff from the solid bridge deck diverted to the combined sewer system. In contrast, rain on the existing bridge drains through the open-grid deck directly into the Bay below it.

All of the landside scope of the project is on areas currently paved so the project would not increase impervious surfaces above existing conditions.

Conclusion

The Islais Creek Bridge Rehabilitation Project has been designed to adapt to inundation or flooding under future sea level rise conditions and would not exacerbate existing flooding conditions such that people or other structures would be exposed to a significant risk from flooding under existing or future conditions.

Attachments:

Attachment A: Islais Creek Bridge Rehabilitation Project Sea Level Rise Checklist

Attachment B: Islais Bridge Rehabilitation Project Advanced Planning Study – General Plan and Elevations

London Breed
Mayor

NAOMI M. KELLY
City Administrator

BRIAN STRONG
Director, Office of Resilience and Capital Planning

ONESF
Building Our Future

CAPITAL PLANNING PROGRAM

Guidance for Incorporating Sea Level Rise into Capital Planning in San Francisco
Sea Level Rise Checklist *(Version 3.0 Nov 2020)*

This checklist should be used in conjunction with the Sea Level Rise (SLR) Guidance document ("Guidance") for use by City departments to guide the evaluation of capital planning projects with respect to sea level rise.

Pre-Checklist Conditions

The checklist is only required if the following 3 conditions are ALL met. If the answer is 'No' to ANY of these questions, do not complete the SLR checklist at this time. Retain page 1 of the checklist for your project records.

1. ***Project has a location identified*** *(some projects are so early in planning that they do not yet have a specific location within CCSF)* Yes ☒ No ☐
2. ***Project is within the SLR Vulnerability Zone*** Yes ☒ No ☐
   (Please review the "SLR Vulnerability Zone Map" at: https://data.sfgov.org/SLR-Vulnerability-Zone/)
3. ***Anticipated total project costs[1] equal or exceed 5 million dollars*** Yes ☒ No ☐

Only projects answering 'Yes' for questions 1, 2 AND 3 must complete the following checklist. ***As noted above, if the answer to questions 1, 2 OR 3 is 'No', the SLR checklist does not need to be submitted.*** *However, it is recommended that the project manager* ***retain this document in their project records.***

Preparer and Project Information

Reset Form

Department Name:	SAN FRANCISCO PUBLIC WORKS
Project Name:	ISLAIS CREEK BRIDGE REHABILITATION PROJECT
Project ID:	10031502
Name of Project Mgr:	THOMAS ROITMAN
Name of Preparer:	THOMAS ROITMAN, OLIVER IBERIEN, B. SHRESTHA
Dept. Director:	ALBERT KO
Date prepared:	12/20/2021

[1] Project costs include planning, design, and construction costs.

Checklist for projects meeting all 3 Pre-Checklist conditions above:

Project Information

1. **What is the project location?** *(Please provide the street address or GIS coordinates):*

   NISHKIAN BRIDGE, ON THIRD STREET OVER ISLAIS CREEK (37.74734° N, 122.38733° W)

2. **What type of asset or project is being proposed?** *(e.g., new construction, rehabilitation or modification of existing structure, building(s), roadway structure, utility structure, park, etc.):*

   REPLACEMENT OF BRIDGE STRUCTURE

Functional Lifespan / Useful Life of Project

3. **Use the table below to select an appropriate useful life, and support your selection in Question 4.**
   (A resilient facility should be built to withstand, or recover quickly from, natural hazards. This includes performing its intended design standard(s) throughout its functional lifespan or useful life in a changing climate. Meeting this goal requires designing or rehabilitating facilities to withstand the climate conditions protected to occur by the end of the facilities full useful life.)

Guidance for determining a project's or facility's useful life		
< 20 years	Temporary or rapidly replaced assets	• Interim and deployable flood protection measures • Asphalt pavement, pavers, and other ROW finishing • Green infrastructure • Street furniture • Technology components (e.g., telecommunications equipment, batteries, solar photovoltaics, fuel sells)
20 – 50 years	Facility improvements, and components replaced on regular replacement cycles	• Electrical, HVAC, and mechanical components • Most building retrofits (substantial improvements) • Concrete paving • Infrastructural mechanical components (e.g., compressors, lifts, pumps) • Outdoor recreational facilities • At-site energy equipment (e.g., above ground fuel tables, conduit, emergency generators) • Stormwater detention systems
60 – 80 years	Long-lived buildings and infrastructure	• Most buildings (e.g., public, office, residential) • Piers, wharfs, and bulkheads • Plazas • Retaining walls • Culverts • On-site energy generation / co-generation plants
> 80 years	Assets that cannot be relocated	• Major infrastructure (e.g., tunnels, bridges, wastewater treatment plants) • Monumental buildings • Road reconstruction • Subgrade sewer infrastructure (e.g., sewers, catch basins, force mains, transport / storage boxes outfalls)

Source: NYC Climate Resiliency Design Guidelines, September 2020, Version 4.0

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available): 10031502 *Date prepared:* 12/20/2021

4. What is the functional lifespan / useful life of the project?
(Refer to the guidance in Question 3)

Construction completion year: 2025
Functional lifespan / useful life *(in years)*: 50

(Please provide a justification for the functional lifespan / useful selected. The justification should be consistent with the guidance provided in Question 3.

This is the minimum design life acceptable to Caltrans for bridge rehabilitation for this facility for the previous iteration of project design.

5. What is the planning horizon?
(The construction completion year + functional life span = planning horizon year; e.g., 2030 construction completion year + 60 year functional life span = 2090.)

Planning horizon year: 2075

Existing Site Elevation and Coastal Hazards Information

6. Has the site historically been flooded due to high tides/and or storms?
(If yes, please describe conditions: e.g., extreme high tide, storm surge, rainstorm event)

☒ Yes ☐ No The bridge's machine rooms regularly flood, and are emptied by sump pumps.

7. What is the lowest ground elevation at your project location (in feet NAVD88)?
(Please download the Digital Elevation Model Visualization Tool for the neighborhood where your project is located, and select the lowest elevation on the project site. Record the lowest elevation, latitude, and longitude of the selected point.)

9.9 **feet NAVD88**

37.747600 **Latitude** -122.387430 **Longitude**

This is the approximate elevation of the bottom of the bridge soffit.

8. What is the Mean Higher High Water (MHHW) elevation closest to your project location?
(Please download the Tidal Datum Visualization Tool and select the closest point to your project location and record the year 100-year extreme tide elevation).

MHHW Elevation (year 2000): 6.4 **feet NAVD88**

9. What is the 100-year extreme tide elevation (in feet) closest to your project location?
(Please use the Tidal Datum Visualization Tool and select the closest point to your project location and record the year 100-year extreme tide elevation).

100-year extreme tide elevation (in feet): 9.9 **feet NAVD88**

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available) 10031502 *Date prepared:* 12/20/2021

10. Is the project located within 100 ft of the shoreline?
(The Tidal Datum Visualization Tool includes the 100-foot shoreline buffer. If the project is located within this zone, the 100-year total water level -- which includes wave hazards at the shoreline -- must be considered.)

☒ **Yes** (Go to Question 11). ☐ **No** (Go to Question 12).

11. If the project is within 100 ft of the shoreline, what is your 100-year total water level elevation?
(Please use the Tidal Datum Visualization Tool and select the closest point to your project location and record the year 100-year extreme tide elevation).

100-year total water level elevation (in feet): 13.3 **ft NAVD88**

SECTION I - Vulnerability Assessment for Potential Projects in the SLR Vulnerability Zone

A. Exposure (see SLR Guidance for additional information):
Assess if the project site or asset could be subjected to sea level rise inundation, temporary coastal flooding, or wave hazards. Some fields below will auto-calculate based on the information entered.

Future Sea Level Rise Calculations

12. Calculate projected sea level rise at the end of the planning horizon year 2075 **(from Question 4.)**
(If your project is within 500 feet of the shoreline, or if it provides a critical service, please select RCP 8.5 for all following calculations. If RCP 4.5 is selected, please provide justification for this selection below. The Tidal Datum Visualization Tool includes the 500-foot shoreline buffer.)

☐ RCP 4.5
a) 22 in inches and 1.9 in feet -- likely value
b) 44 in inches and 3.7 in feet -- 1-in-200 chance value

☐ RCP 8.5
c) 27 in inches and 2.2 in feet -- likely value
d) 51 in inches and 4.3 in feet -- 1-in-200 chance value

Assess Project Vulnerability to *Permanent Inundation* from Sea Level Rise

13. Subtract MHHW (8) from the Project elevation (7)

Difference in feet: 3.5 ft
(If the answer is negative, the project is below MHHW and could be vulnerable today.)

a) Is the project vulnerable to permanent inundation during the functional lifespan using the likely SLR scenario? *(Is the answer to Question 12a greater than the answer to Question 13?).*

☐ Yes: The project could be inundated by likely sea level rise and will require adaptation strategies.
☒ No: Not vulnerable.

b) Is the project vulnerable to permanent inundation during the functional lifespan using the 1-in-200 chance SLR scenario? *(Is the answer to Question 12b is greater than the answer to Question 13).*

☒ Yes: The project could be inundated by 1-in-200 chance sea level rise and adaptation strategies are recommended.
☐ No: Not vulnerable.

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available): 10031502 *Date prepared:* 12/20/2021

Assess Project Vulnerability to *Temporary Flooding* from 100-year Coastal Flood

14. Subtract 100-year extreme tide elevation (9) from the Project elevation (7):

Difference in feet: 0.0 ft

(If the answer is negative, the project could be vulnerable to temporary flooding by the 100-year extreme tide event today.)

a) Is the project vulnerable to temporary coastal flooding coupled with likely sea level rise during the functional lifespan? *(Is the answer to Question 14 less than the answer to Question 12a?)*

☒ Yes: The project could be inundated by a 100-year extreme tide coupled with likely sea level rise. Flood-proofing adaptation strategies may be required.

☐ No: Not vulnerable.

b) Is the project vulnerable to temporary coastal flooding coupled with 1-in-200 chance sea level rise? *(Is the answer to Question 14 less than the answer to Question 12b?)*

☒ Yes: The project could be inundated by a 100-year extreme tide coupled with 1-in-200 chance sea level rise. Flood-proofing adaptation strategies are recommended.

☐ No: Not vulnerable.

15. For projects within 100 ft of the shoreline *(If project is not within 100 ft of the shoreline, go to Question 16.)*

Subtract 100-year total water elevation (11) from the Project elevation (7):

Difference in feet: -3.40 ft

(If the answer is negative, the project could be vulnerable to wave inundation if the 100-year total water level can overtop the adjacent shoreline under existing conditions.)

a) Is the project vulnerable to potential wave inundation with likely sea level rise during the functional functional lifespan? *(Is the answer to Question 15 less than the answer to Question 12a?)*

☒ Yes: The project could be inundated by wave hazards with likely sea level rise. Adaptation strategies may be required.

☐ No: Not vulnerable.

b) Is the project vulnerable to potential wave inundation with 1-in-200 chance sea level rise? *(Is the answer to Question 15 less than the answer to Question 12b?)*

☒ Yes: The project could be inundated by wave hazards with 1-in-200 chance sea level rise. Adaptation strategies are recommended.

☐ No: Not vulnerable.

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available): 10031502 *Date prepared:* 12/20/2021

B. Sensitivity (see SLR Guidance for definition):

16. Is the project/asset(s) sensitive to inundation (i.e., is it physically or functionally impaired if it gets wet?)

- [x] **Low Sensitivity**: sea level rise and temporary flooding would have little or impact on the project asset(s) physically or functionally.
- [ ] **Moderate Sensitivity:** sea level rise and temporary flooding would have an impact on the project/ assets(s) physically or functionally, but the project would recover quickly one floodwaters subside. The project would retain partial function while inundated.
- [ ] **High Sensitivity:** sea level rise and storm surge inundation have a significant influence on the project/asset(s) physically or functionally, and the project would not recover quickly once floodwaters subside. The project would lose major function while inundated.

Please explain briefly*:

Existing deck would be ~50-80% submerged with SLR. Would be inoperable as drawbridge, eventually rendered unsafe by corrosion. Project proposes corrosion-resistant deck at higher elevation.

**(If more space is required, please provide on separate page)*

C. Adaptive Capacity (see SLR Guidance for definition):

17. Does the project/asset(s) have adaptive capacity (i.e., can it easily be adapted to mitigate potential damage or functional impairment, or does it have redundancy to minimize potential consequences?)

- [ ] **High Adaptive Capacity:** Project/asset(s) has little inherent capacity to adapt to future inundation or flooding without additional capital investments.
- [ ] **Moderate Adaptive Capacity:** Project/asset(s) has some inherent capacity to adapt to inundation or flooding without additional capital investments (e.g., the project includes redundancy, or a reasonable alternate route is available).
- [x] **High Adaptive Capacity:** Project/asset(s) has substantial capacity to adapt to inundation or flooding without additional capital investments (e.g., the ability to adapt to higher sea level rise has been designed into the project, such as automatic flood barriers on doorways).

Please explain briefly*:

Project proposes concrete bridge structure elevated as far as feasible above base floodplain elevation (BPE currently 10', up to 14.3 as projected with SLR).

**(If more space is required, please provide on separate page).*

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available): 10031502 *Date prepared:* 12/20/2021

SECTION 2 – Risk Assessment for Projects identified as vulnerable to sea level rise or temporary coastal flooding.

18. What is the anticipated level of **DAMAGE** to the project/ asset(s)?

- [x] **Low Damage:** Asset(s) could be repaired/ partially replaced
- [ ] **Moderate Damage:** Asset(s) would require complete replacement or very costly repairs
- [ ] **High Damage:** Asset(s) would not repairable or replaceable in the existing location
- [ ] Unknown

Please explain briefly*:

Elevated to avoid SLR impacts. Under "likely" scenario, bridge freeboard sufficient to pass 100-year flood.

19. What is the level of **DISRUPTION?**

- [x] **Low:** no or little disruption in service or function
- [ ] **Moderate:** disruption in service or function that doesn't threaten public health & safety (non-critical)
- [ ] **High:** disruption of service and/or function that threatens public health & safety (critical)
- [ ] Unknown

Please explain briefly*:

Bridge remains traversable. Under 1:200 scenario, deck could be partially submerged by end of design life, depending on eventual design elevation.

20. What are the **COSTS** (to replace/repair or for health & safety)?

- [x] **Low:** no or little cost to return asset(s) or minor secondary service disruption costs
- [ ] **Moderate:** moderate costs to repair/ replace asset(s)
- [ ] **High:** high costs to fully replace asset(s) in new location and/ or high secondary costs attributed to asset being out of service
- [ ] Unknown

Please explain briefly*:

Elevating deck and change of material to concrete makes maintenance feasible (no corrosion, no coating of steel needed, soffit accessible).

If all answers to Section 2, Questions 18, 19, and 20 are Low, project likely has sufficient adaptation planning. If any answers are Medium, additional adaptation planning may be required. If any answers are High, alternatives should be considered.

21. Please briefly summarize sea level rise adaptation measures associated with this project or program*:

22. Additional Comments*:

**(If more space is required, please provide on separate page)*

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available): 10031502 *Date prepared:* 12/20/2021

SECTION 3 – Department Certification Submittal

(This section is for the Dept's Director and Deputy Director level only. Please submit signed copy to the Capital Planning Program for processing.)

SAN FRANCISCO PUBLIC WORKS (Dept Name) certifies that the information provided herein is complete and is consistent with CCSF Sea Level Rise Guidance.

Dept. Director: ALBERT KO

Signature[2]: _____ Date: _____

SECTION 4 – Capital Planning Committee

(This section is for City Engineer, Capital Planning Committee, or Designee completion only.)

This project is certified as consistent with the CCSF Sea Level Rise Guidance and

- ☐ will not be exposed to expected sea level rise and related flooding impacts during its functional lifespan
- ☐ is exposed but is not vulnerable due to low sensitivity or high adaptive capacity
- ☒ is exposed, is vulnerable, but includes sufficient adaptation planning to address sea level rise
- ☐ will require additional adaptation planning

Comments: Recommended for signature, B. Deunert, Regulatory Affairs Manager. B. Deunert 12/20/21

City Engineer Name (please type/print): ALBERT KO

Signature[2]: _____ Date: 12/20/21

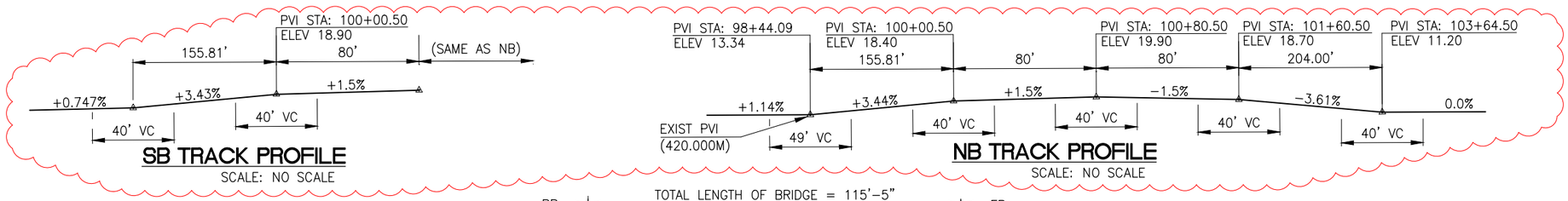
Capital Planning Committee Chair Name (please type/print): Carmen Chu

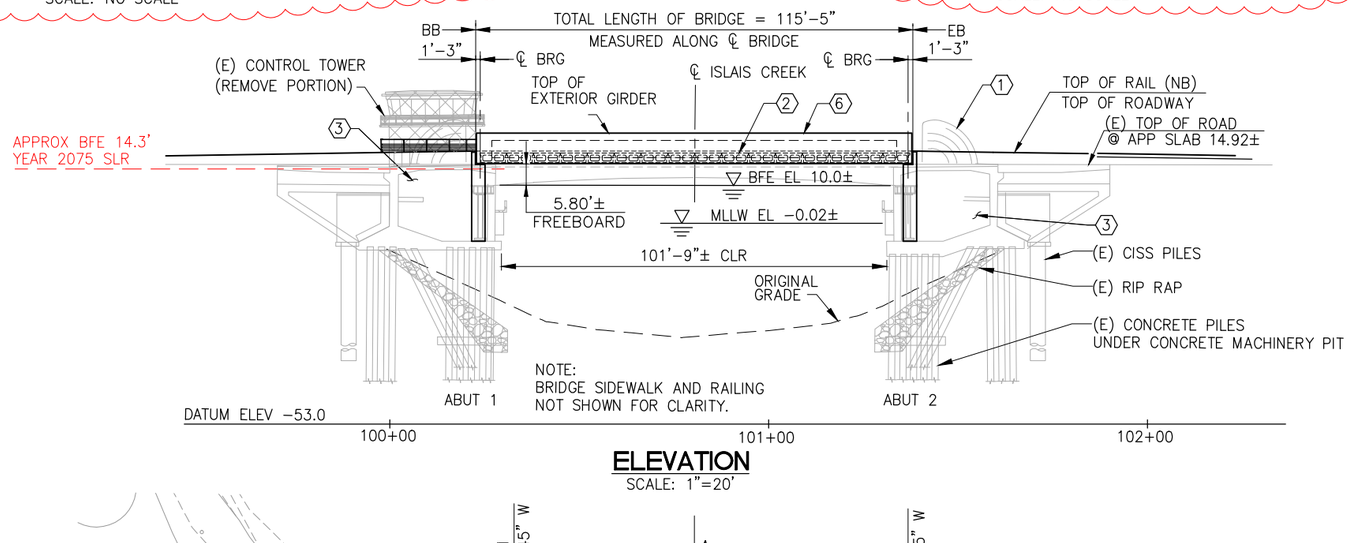
Signature[2]: For Carmen Chu Date: 12/20/22

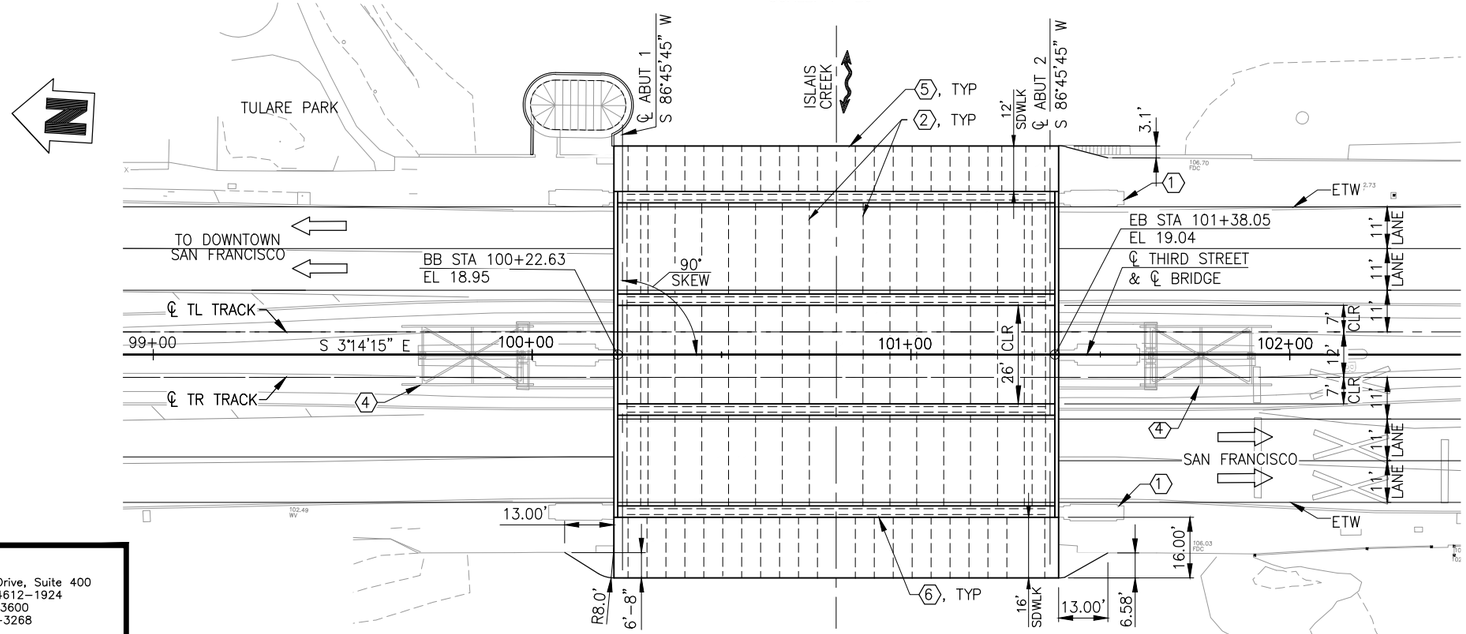
[2] *(Digital Signatures are preferred; if this file needs to be printed and scanned for signatures, please ensure high resolution document print and scan for legibility. Thank you.)*

Department Name: SAN FRANCISCO PUBLIC WORKS
Project ID (if available): 10031502 *Date prepared:* 12/20/2021

Attachment B







Location	Datum Elevation [ft]			Fixed Structure Elevations
	Old City	Mission Bay	NAVD88	
Top of Road at Center	4.30	104.05	15.48	19.33
Top of Road at Abutment Face	4.00	103.75	15.18	Abut 1 18.98 Abut 2 19.07
Top of Road at Approach Slab	3.74	103.49	14.92	Abut 1 18.63 Abut 2 18.75
Bottom of Access Hatch	-3.25	96.50	7.93	N/C
Center of Trunnion	0.92	100.67	12.10	N/C
Top of Concrete at Abutment Center Girder	-1.50	98.25	9.68	N/C
Top of Concrete at Abutment Side Girder	-1.50	98.25	9.68	N/C
Bottom of Girder at Center	1.08	100.84	12.27	15.78
Bottom of Girder at Abutment	-1.00	98.75	10.18	Abut 1 15.73 Abut 2 15.82
Top of Machinery Pit Platform	-4.50	95.25	6.68	N/C
Bottom of Inside Machinery Pit	-16.00	83.75	-4.82	N/C
Bottom of Pile Cap	-20.00	79.75	-8.82	N/C
Bottom of Foundation	-18.00	81.75	-6.82	N/C
Top of Concrete at Abutment Walkway Hanger	-5.65	94.10	5.53	N/C

NOTE:
N/C = NO CHANGE

NOTES

1. CONTRACTOR SHALL VERIFY ALL CONTROLLING DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.
2. SFMTA MUNI TRACKS IN MEDIAN

LEGEND

1. REMOVE EXISTING BASCULE SUPERSTRUCTURE
2. PC/PS FLOOR SYSTEM
3. REMOVE EXISTING MACHINERY
4. REMOVE EXISTING OVERHEAD CONTACT SYSTEM (OCS)
5. SIDEWALK AND RAILING
6. PC/PS CONCRETE GIRDER

PRELIMINARY
NOT FOR CONSTRUCTION

AECOM
300 Lakeside Drive, Suite 400
Oakland, CA 94612−1924
Tel: 510−893−3600
Fax: 510−874−3268

NO.	DATE	DESCRIPTION	BY	APP.

TABLE OF REVISIONS
THIS DRAWING WAS LAST MODIFIED: 09/06/22 12:37, BY: WaltzT

REFERENCE INFORMATION & FILE NO. OF SURVEYS

THE CITY AND COUNTY OF SAN FRANCISCO

SAN FRANCISCO PUBLIC WORKS

DESIGN & ENGINEERING
PUBLIC WORKS
CITY & COUNTY OF SAN FRANCISCO
30 VAN NESS AVENUE, 5TH FLOOR
SAN FRANCISCO, CA 94102 - 6028

Section Mgr: Date:
Deputy Division Mgr:
Division Mgr:

DESIGNED: T. BARNARD DATE:
DRAWN: T. WALTZ DATE:
CHECKED: DATE:

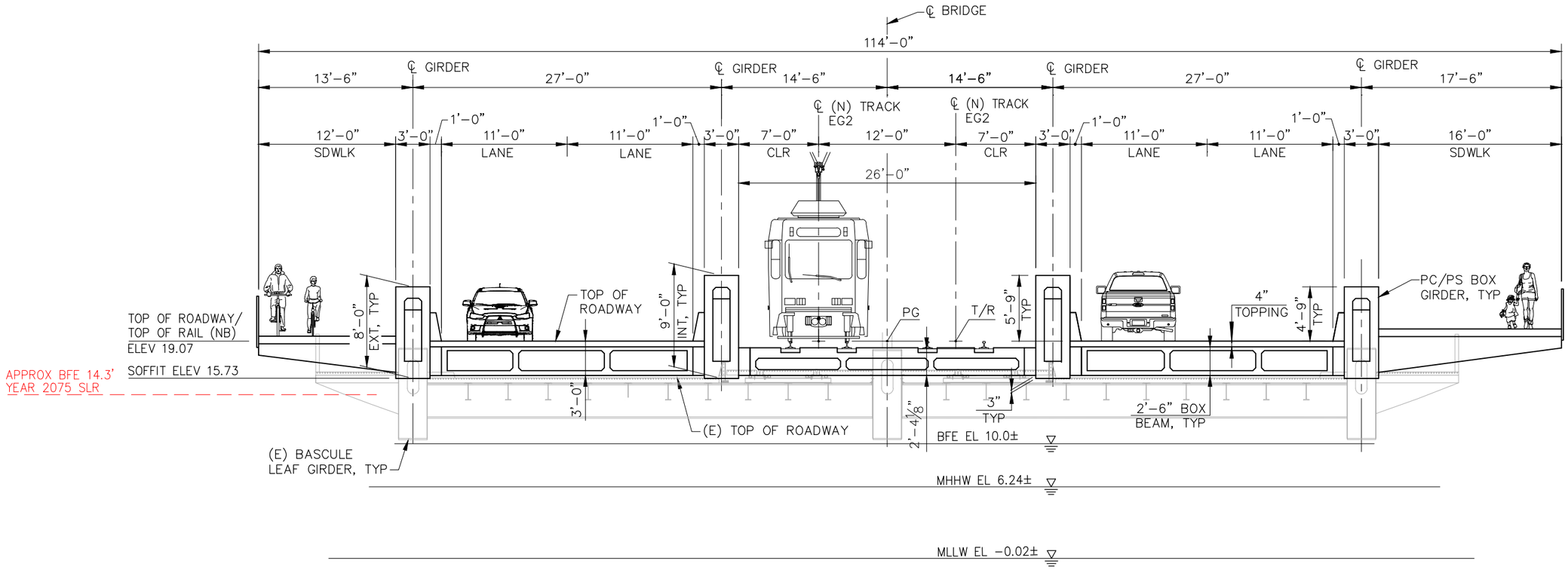
REGISTERED PROFESSIONAL ENGINEER
THOMAS R. BARNARD
No. C46384
Exp. 03-31-23
CIVIL
STATE OF CALIFORNIA

SCALE: 1"=20'
SHEET OF SHEETS: 1 OF 2

DESIGN AND ENVIRONMENTAL SERVICES FOR ISLAIS CREEK BRIDGE REPLACEMENT PROJECT

ADVANCED PLANNING STUDY
BRIDGE GENERAL PLAN AND ELEVATION
PC/PS THROUGH GIRDER

CONTRACT NO.
DRAWING NO. S001
FILE NO. S001.DWG
REV. NO.



TYPICAL SECTION - PC/PS THROUGH GIRDER

SCALE 1"=5'

AECOM
300 Lakeside Drive, Suite 400
Oakland, CA 94612–1924
Tel: 510–893–3600
Fax: 510–874–3268

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	DATE	DESCRIPTION	BY	APP.

TABLE OF REVISIONS
THIS DRAWING WAS LAST MODIFIED: 09/06/22 12:37, BY: WaltzT

REFERENCE INFORMATION & FILE NO. OF SURVEYS

SAN FRANCISCO PUBLIC WORKS
DESIGN & ENGINEERING
PUBLIC WORKS
CITY & COUNTY OF SAN FRANCISCO
30 VAN NESS AVENUE, 5TH FLOOR
SAN FRANCISCO, CA 94102 - 6028

Section Mgr: Date:
Deputy Division Mgr:
Division Mgr:

DESIGNED: T. BARNARD DATE:
DRAWN: T. WALTZ DATE:
CHECKED: DATE:

REGISTERED PROFESSIONAL ENGINEER
THOMAS R. BARNARD
No. C46384
Exp. 03-31-23
CIVIL
STATE OF CALIFORNIA

SCALE: 1"=5'
SHEET OF SHEETS: 2 OF 2

DESIGN AND ENVIRONMENTAL SERVICES FOR
ISLAIS CREEK BRIDGE REPLACEMENT PROJECT

ADVANCED PLANNING STUDY
TYPICAL SECTION
PC/PS THROUGH GIRDER

CONTRACT NO.
DRAWING NO. S002
FILE NO. S002.DWG
REV. NO.

Drawing Path: C:\Cad\Islais Creek 60526895 06.05.01\Sheets\S002.dwg, Login: WaltzT
Plot Time: Tue, 18 Oct 2022 – 4:44pm
Dimension Scale: 5.333
Model Units: Undefined
Measurement Units are English
Xrefs:

aecom.com