Physical Environment

2.8 Hydrology and Floodplain

2.8.1 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 requirements for compliance are outlined in 23 Code of Federal Regulations (CFR) 650 Subpart A.

In order 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 impacted 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.”

2.8.2 Affected Environment

This section is based on the *Floodplain Evaluation Report and Location Hydraulic Study* (March 2013) prepared for the project.

As shown in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Nos. 06059C0427J, 06059C0431J, and 06059C0433J (December 3, 2009), the Interstate 5 (I-5) Widening Project from State Route 73 (SR-73) to El Toro Road is adjacent to/crosses three major floodplains: Aliso Creek, La Paz Channel, and Oso Creek.

Specifically, the Study Area along I-5 is located within the following floodplains:

- 100-year floodplain (Zone AE[1]) of Aliso Creek (FIRM No. 06059C0427J)
- 100-year floodplain (Zone A[2] and AE) and 500-year special flood hazard area (Zone X[3]) of La Paz Channel (FIRM No. 06059C0433J)
- 100-year floodplain (Zone AE) and 500-year special flood hazard area (Zone X) of Oso Creek (06059C0433J)

Within the project limits, Aliso Creek flows west in an earthen trapezoidal channel measuring 40 feet (ft) wide at the bottom and 7.5 ft high before crossing under I-5 between Alicia Parkway and Los Alisos Boulevard. After flowing under the freeway, Aliso Creek is conveyed through a natural channel. The creek drains directly into the Pacific Ocean at Laguna Beach.

La Paz Channel flows south in a natural open channel, concrete rectangular channel, and box culvert within the project limits. It crosses I-5 approximately 1,200 ft south of La Paz Road. From this point, the channel flows parallel to I-5, under Oso Parkway, and confluences with Oso Creek 2,100 ft south of Oso Parkway.

In the Study Area, Oso Creek flows west in a natural channel before crossing under I-5 between Crown Valley Parkway and Oso Parkway. After crossing under I-5, Oso Creek flows south adjacent to I-5 and enters a concrete-lined flood control trapezoidal channel near the I-5/SR-73 interchange. It then flows through a riprap-lined channel before entering a concrete box culvert, crossing under SR-73. Oso Creek then spills into a natural channel, eventually joining Trabuco Creek in San Juan Capistrano.

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[1] Zone AE is defined by FEMA as a special flood hazard areas subject to inundation by the 1 percent annual chance flood (100-year flood) with Base Flood Elevations (water surface elevation of the 100-year flood) determined

[2] Zone A is defined by FEMA as a special flood hazard areas subject to inundation by the 1 percent annual chance flood (100-year flood) with no Base Flood Elevations (water surface elevation of the 100-year flood) determined

[3] Special flood hazard area Zone X is defined by FEMA as areas of 0.2 percent annual chance flood (500-year flood), areas of 1 percent annual chance flood (100-year flood) with average depths of less than 1 foot or with drainage areas less than one square mile, and areas protected by levees from a 1 percent annual chance flood.

Trabuco Creek confluences with San Juan Creek in the City of San Juan Capistrano, and San Juan Creek flows into the Pacific Ocean in the City of Dana Point.

Floodplains and wetlands in their natural or relatively undisturbed state provide natural and beneficial floodplain values including, but not limited to fish, wildlife, plant, open space, natural beauty, scientific study, outdoor recreation, agriculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge. The Natural Environment Study (NES) (April 2013) was reviewed and the following summarizes information related to natural and beneficial floodplain values for floodplains in the project limits.

- **Fish.** Data regarding the historic use of Oso Creek by anadromous fish could not be substantiated; it was determined by Caltrans, the National Marine Fisheries Service (NMFS), and the California Department of Fish and Wildlife (CDFW) that anadromous fish usage of Oso Creek is considered historically absent. Therefore, there is no existing floodplain value in Oso Creek.
- **Plant Communities.** According to the NES, the Biological Study Area (BSA) supports habitat suitable for a variety of special-status plant species and contains important biological resources in or adjacent to an urban environment. The riparian habitats include herbaceous riparian, freshwater marsh, mulefat and willow scrub, and willow woodland. None of the special-status plant species were observed during surveys conducted in 2011, and are all considered absent from the BSA.
- **Wildlife.** The BSA supports habitat suitable for a variety of special-status wildlife species. Based on the literature review, it was determined that 55 special-status wildlife species have the potential to occur in the BSA or in the vicinity of the BSA. A total of 12 of these species are federally and/or State-listed as endangered or threatened, or proposed endangered or threatened, or are considered Fully Protected species by the State of California.
- **Open Space.** Due to the proximity of urban development, the creeks and channel may be the only features that some local wildlife species would have the potential to use in order to obtain food, water, and travel more easily. No wildlife passage areas were identified within the BSA.
- **Natural Beauty.** Aliso Creek has been identified as a stream with a high level of social standing. Oso Creek and La Paz channel have a low level of social standing.

- **Scientific Study.** Aliso Creek has been identified as a stream with a high level of social significance. Oso Creek and La Paz channel have a low level of social significance.
- **Outdoor Recreation.** The channels within the BSA were not identified as a resource in this regard by the NES. The beneficial uses for outdoor recreation are discussed in the San Diego Regional Water Quality Control Board's (RWQCB) Basin Plan, which is described further below.
- **Agriculture.** The channels within the Study Area were not identified as a resource in this regard by the NES.
- **Forestry.** The channels within the Study Area were not identified as a resource in this regard by the NES.
- **Natural Moderation of Floods.** While not specifically discussed by the NES, Aliso Creek, La Paz Channel, and Oso Creek provide for natural moderation of floods by providing a channelized means of conveyance for floodwaters throughout the surrounding portion of the County of Orange (County). Without the flood capacity of the existing channels, the area would be subject to seasonal flooding.
- **Water Quality Maintenance and Groundwater Recharge.** Some of the existing channels within the BSA have a soft-bottom natural channel that have some intrinsic water quality maintenance value and some naturally occurring groundwater recharge.

Beneficial uses of water are defined in the San Diego RWQCB's Basin Plan as those necessary for the survival or well-being of humans, plants, and wildlife. Examples of beneficial uses include drinking water supplies, recreation, industrial and agricultural water supply, and the support of freshwater and marine habitats and their organisms.

Surface water beneficial uses identified in the Basin Plan for Aliso Creek, La Paz Channel, and Oso Creek are shown in Table 2.8-1 and described in more detail below.

Table 2.8-1 Inland Surface Water Beneficial Use Designations

Water Body Name	AGR	IND	REC-1	REC-2	WARM	COLD	WILD
Aliso Creek	E		P	E	E		E
La Paz Channel	E	E	E	E	E	E	E
Oso Creek	E	E	E	E	E	E	E

Source: *Floodplain Evaluation Report and Location Hydraulic Study* (March 2013).
E: Existing Beneficial Use
P: Potential Beneficial Use

- **Agricultural Supply (AGR)** – Includes uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
- **Industrial Service Supply (IND)** – Includes uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.
- **Contact Water Recreation (REC-1)** – Includes uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, whitewater activities, fishing, or use of natural hot springs.
- **Noncontact Water Recreation (REC-2)** – Includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- **Warm Freshwater Habitat (WARM)** – Includes use of water that supports warm water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats; vegetation; and fish or wildlife, including invertebrates.
- **Cold Freshwater Habitat (COLD)** – Includes use of water that supports cold water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats; vegetation; and fish or wildlife, including invertebrates.
- **Wildlife Habitat (WILD)** – Includes use of water that supports terrestrial ecosystems, including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

2.8.3 Environmental Consequences

2.8.3.1 Temporary Impacts

No Build Alternative – Alternative 1

The No Build Alternative would not construct any improvements in Aliso Creek, La Paz Channel, or Oso Creek. Therefore, the No Build Alternative would not result in temporary impacts related to floodplains.

Build Alternatives – Alternative 2 (Preferred Alternative) and Alternative 3

During construction of Build Alternatives 2 and 3, construction equipment would operate in the floodplain at the I-5 bridge over Aliso Creek, the La Paz Channel at the I-5 Crossing, and the I-5 bridge over Oso Creek (Locations 1, 2, and 4 on Figure 2.8-1).

Construction activities have the potential to impact the natural and beneficial floodplain values of the Aliso Creek, La Paz Channel, and Oso Creek, discussed above in Section 2.8.2, by impacting water quality. As discussed in detail later in Section 2.9, potential impacts to water quality could occur during construction of the proposed project due to increased erosion or accidental spills. As discussed in Section 2.9, Erosion Control, Sediment Control, and Good Housekeeping Best Management Practices (BMPs) would be implemented in compliance with the requirements of the Construction General Permit.

As specified in Measure HY-1, work within Aliso Creek, La Paz Channel, and Oso Creek will be scheduled to occur within the dry season (May to September). As specified in Measure HY-2, the Orange County Flood Control District maintains the Aliso Creek, La Paz Channel, and Oso Creek channels for flood control purposes. Work within the County right of way (ROW) would require an Encroachment Permit from the Orange County Flood Control District. The Encroachment Permit typically has conditions that must be met for the duration of the work within the channel, such as maintaining the existing flows year round and keeping falsework, shoring, tiebacks, stockpiles, and equipment out of the active channel or directing flow away from construction activities.

2.8.3.2 Permanent Impacts

No Build Alternative – Alternative 1

The No Build Alternative would not result in any construction in Aliso Creek, La Paz Channel, or Oso Creek. Therefore, the No Build Alternative would not result in permanent adverse impacts related to floodplains.

Build Alternatives – Alternative 2 (Preferred Alternative) and Alternative 3

As shown in Figure 2.8-1, Build Alternatives 2 and 3 cross a floodplain in five locations. As described in detail below, Build Alternatives 2 and 3 would encroach in the floodplain at the I-5 bridge over Aliso Creek, the La Paz Channel at I-5 Crossing,

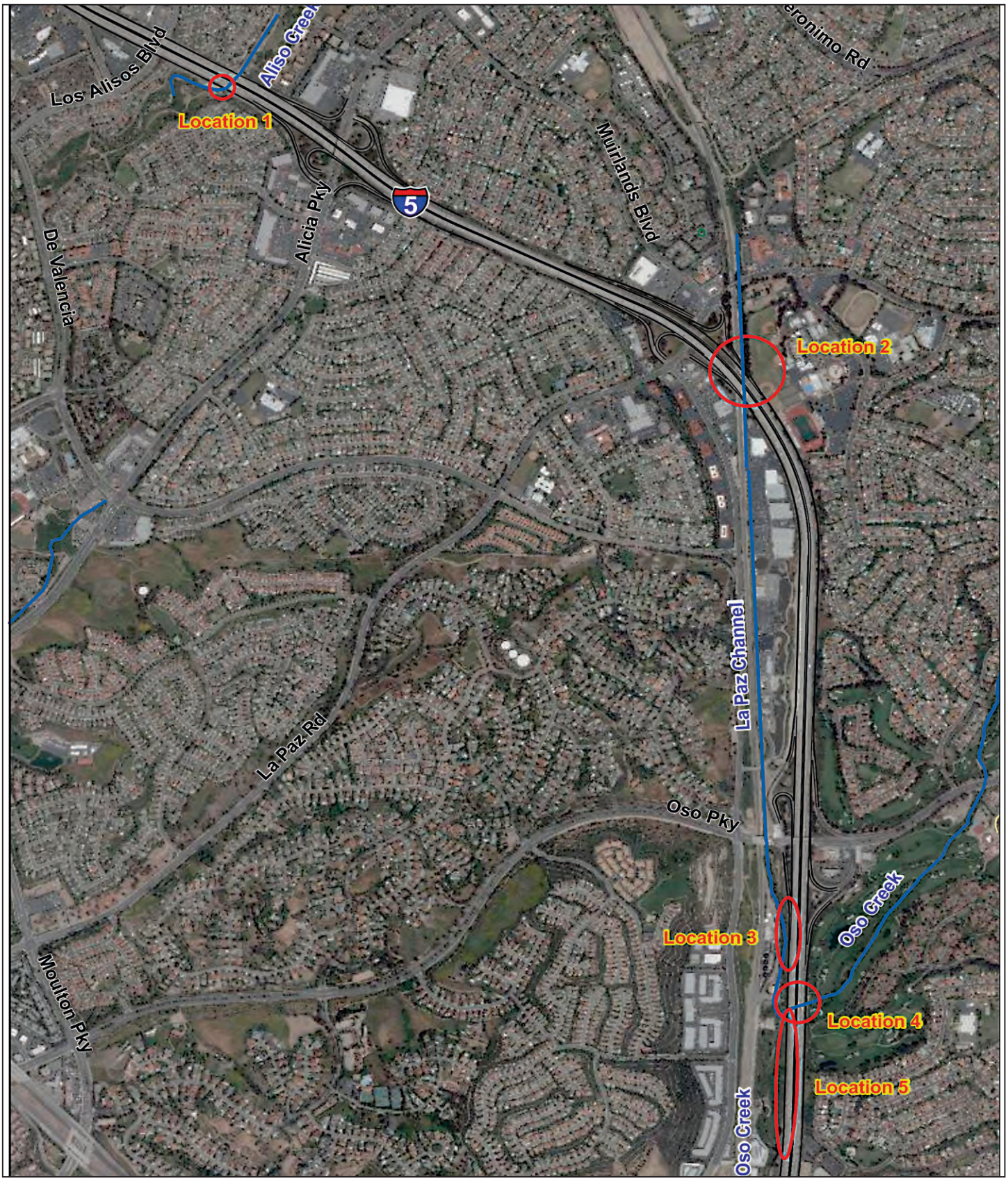

FIGURE 2.8-1

I-5 Widening Project: El Toro Rd to SR-73

Floodplain Encroachment Locations

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and the I-5 bridge over Oso Creek (Locations 1, 2, and 4). Although the alignments of the Build Alternatives cross the floodplain at Locations 3 and 5, no project structures would encroach in the floodplain at these locations. The proposed improvements and/or encroachments at these five locations are described in greater detail below.

Location 1: I-5 Bridge over Aliso Creek

At this location, the existing southbound I-5 bridge would be extended up to 40 ft over Aliso Creek (depending on the Build Alternative). It is assumed that the bridge geometry would be similar to the existing condition. However, the existing bridge abutments would be widened, which would encroach on the floodplain. The existing bike path and the stream invert would be realigned to allow for this widening. Drop structures and gabions would be added to protect the side slopes from scour.

The maximum change in water surface elevation compared to existing conditions would be 1.03 ft, which exceeds the 1.0 ft of water surface elevation increase allowed by NFIP. However, as specified in Measure HY-5, during final design, the project design at La Paz channel would be refined to ensure that the increase is reduced to less than 1.0 ft. The water surface elevation would remain within the channel banks with adequate freeboard[1] per flood control requirements. The velocities in both the existing and proposed condition are erosive (above five ft per second). As described above, within the Caltrans right-of-way, scour protection is provided by using drop structures and gabions in the proposed condition. The presence of velocities having potential for scour upstream and downstream of the Caltrans right-of-way is a regional drainage issue and is outside the scope of this project.

Location 2: La Paz Channel at I-5 Crossing

The Build Alternatives propose widening the mainline to the east and replacing the northbound off-ramp to La Paz Road, also to the east. Proposed abutments and piers for the widened freeway would be placed in the floodplain. In addition, the existing reinforced concrete box culverts (two triple 6 x 5 ft reinforced concrete box culverts) under I-5 would be extended up to 100 ft northward into La Paz Channel. The culvert geometry would be similar to the existing condition. The channel invert would be filled (where it is eroded in the existing condition) and protected from scour with

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[1] Freeboard is the distance between the water surface and the lowest point of the bridge or roadway.

riprap lining upstream of the proposed culvert entrance. Minor grading would be performed at this location.

The maximum change in water surface elevation compared to existing conditions would be 1.19 ft upstream of the culvert, which exceeds the 1.0 foot of water surface elevation increase allowed by NFIP. However, as specified in Measure HY-5, during final design, the project design at La Paz channel would be refined to ensure that the increase is reduced to less than 1.0 ft. The water surface elevation overtops the right channel bank in both the existing and proposed condition. However, the increase in the water surface elevation would be contained in the channel floodplain, and the risk to property and roadway is low. In addition, the proposed condition velocities within the proposed improvements are lower than in the existing condition. Due to the adjacent embankment slopes (between 2:1 and 4:1), the rise in water surface elevation does not materially affect the size or boundary of the floodplain. The operation of the railroad, the school, and I-5 would not be impacted by the change to the water surface elevation. With design modifications during final design to reduce the increase in water surface elevation to less than 1.0 ft, there are no apparent risks to property, roadway, or railway.

Location 3: Longitudinal Crossing of La Paz Channel at I-5

Approximately 20 ft of widening for the southbound Oso Parkway on-ramp would encroach longitudinally over the La Paz Channel floodplain. The widening at this location includes adding general-purpose lanes outside of the southbound lane. The base flood elevation is 305 ft, and the adjacent I-5 freeway is approximately 324 ft. In addition, no structures would be placed in the floodplain. The roadway widening at this location appears to be a longitudinal encroachment. However, the project includes a retaining wall at this location and would not cause a change to the toe of slope location. Therefore it is unlikely the roadway widening would encroach on the floodplain.

Location 4: I-5 Bridge over Oso Creek

The I-5 bridge over Oso Creek would be extended up to 30 ft (depending on the Build Alternative) to the south and north. It is assumed that the bridge geometry would be similar to the existing condition. However, the existing abutments on all four corners of the bridge would be extended within the existing floodplain. In addition, foundations for additional piles would be provided to protect it from soil liquefaction.

The maximum change in water surface elevation compared to existing conditions would be 0.45 ft. The water surface elevation in both the existing and proposed condition exceeds the existing incised channel banks and flows in the overbank area in the channel floodplain. This floodplain is developed as a golf course that lies within the mapped FEMA floodplain. The extent of the flooding is within the floodplain and the amount of increase in the water surface elevation is within the allowable limits of the National Flood Insurance Programs. Therefore, the risk to property and roadway is low.

Location 5: Longitudinal Crossing of Oso Creek at I-5

I-5 would also be widened longitudinally over the Oso Creek floodplain and floodway. The widening at this location would include adding general-purpose lanes outside of the northbound and southbound lanes. The base flood elevation is 299 ft, and the adjacent I-5 freeway is approximately 307 ft. In addition, no structures would be placed in the floodplain. The roadway widening at this location appears to be a longitudinal encroachment. However, the project includes a retaining wall at this location and would not cause a change to the toe of slope location. Therefore it is unlikely the roadway widening would encroach on the floodplain.

Potential Risk to Life and Property

The hydraulic results discussed above indicate that there is a minimal increase in water surface resulting from the Build Alternatives. This localized increase in flow depth is contained within the existing creeks (Aliso Creek and Oso Creek) and floodplains (La Paz Channel). The potential for traffic disruptions due to the influences of the Build Alternative on the river hydraulics is nominal. There is no anticipated interruption in traffic due to the minimal increase in water surface elevations. Therefore, the potential risk to life and property remains unchanged as a result of the proposed improvements.

Potential Risk to Natural and Beneficial Floodplain Values

The results of the hydraulic analysis discussed above indicate that there would be a minimal increase in water surface resulting from the Build Alternatives. As previously described, the localized increase in flow depth is contained within the existing channels and floodplain. The hydraulic influences to the natural and beneficial floodplain values are as follows:

- Living resource values (e.g., fish, wildlife, plant species): The effect on the creeks and the channel hydraulics due to the proposed improvements would have a short

duration following a severe storm. Permanent changes to the living resource values are not anticipated.

- Plant Communities: Neither Build Alternative would result in direct permanent impacts to coastal sage scrub habitat. Permanent indirect impacts are not expected to exceed existing conditions; however, such impacts are expected to extend into the surrounding natural habitat by approximately the same distance that I-5 is being widened. Site design, source control, and treatment BMPs would be incorporated into the project to help reduce potential indirect adverse impacts to coastal sage scrub due to increased traffic, noise, and impervious surface area.
- Cultural resource values (e.g., open space, natural beauty, scientific study, outdoor education, recreation): The increase in water surface resulting from the I-5 Widening Project is minimal. Therefore, it is unlikely that the minimal increase in the water surface elevation in the vicinity would have a detrimental effect on cultural resource values.
- Natural moderation of floods: The ability of the existing floodplains to moderate the floods would not be adversely reduced.
- Water Quality Maintenance and Groundwater Recharge: These values are not further influenced by the localized changes to the 100-year water surface elevation resulting from the proposed project.

For these reasons, the potential risk to natural and beneficial floodplain values as a result of the proposed improvements is minimal.

Potential Risk for Support of Incompatible Floodplain Development

Public documents from adjacent cities impacted and the Orange County Transportation Authority (OCTA) Master Plan of Arterial Highways (MPAH) have been reviewed and found to be consistent with this project. The I-5 Freeway alignment is consistent with that shown on the 2012 MPAH Map. In addition, the project meets all FEMA National Flood Insurance Programs (NFIP) requirements. Therefore, the Build Alternatives would not support incompatible floodplain development.

Assessment of Level of Risk

As discussed above, the changes to the channel hydraulics resulting from the Build Alternatives do not pose any appreciable risk to the traffic disruption, loss of life and property, or natural and beneficial floodplain values risk factors; therefore, the combined assessed level of risk is “low risk.”

2.8.4 Avoidance, Minimization, and/or Mitigation Measures

With implementation of the measures below and the measures outlined in Section 2.9, potential construction impacts and long-term operational impacts on hydrology and floodplains would be avoided, minimized, and/or mitigated and there would not be a significant encroachment on a base floodplain.

HY-1 During construction, the construction contractor will schedule work within Aliso Creek, La Paz Channel, and Oso Creek to occur during the dry season (May to September).

HY-2 Prior to construction within Aliso Creek, La Paz Channel, and Oso Creek, the California Department of Transportation (Caltrans) will obtain an encroachment permit from the Orange County Flood Control District. The construction contractor will comply with all requirements specified in the encroachment permit.

HY-3 During final project design, the California Department of Transportation (Caltrans) will process a Conditional Letter of Map Revision (CLOMR) for the Aliso Creek, La Paz Channel, and Oso Creek 100-year floodplains through the Cities of Laguna Hills, Laguna Niguel, and Mission Viejo and the Federal Emergency Management Agency (FEMA). The project improvements within the Aliso Creek, La Paz Channel, and Oso Creek 100-year floodplain will not be constructed until the CLOMR is approved by the Cities of Laguna Hills, Laguna Niguel, Mission Viejo and FEMA.

HY-4 Upon completion of construction, the California Department of Transportation (Caltrans) will process a Letter of Map Revision (LOMR) for the Aliso Creek, La Paz Channel, and Oso Creek 100-year floodplains through the Cities of Laguna Hills, Laguna Niguel, Mission Viejo and Federal Emergency Management Agency (FEMA).

HY-5 During the Project Specifications and Estimates (PS&E) phase, the California Department of Transportation (Caltrans) will ensure that the project engineer prepares a Hydraulic Study based on final design plans. The project engineer will design, implement, and confirm proper function of proposed design refinements at La Paz Channel and Aliso Creek to ensure that the increase in water surface elevation

attributable to the project is less than the 1.0 foot, as required by the National Flood Insurance Program (NFIP).