

APPENDIX 5.10 BIG-1

HYDROLOGY AND HYDRAULIC DESIGN TECHNICAL REPORT

Barstow International Gateway Hydrology and Hydraulic Design Technical Report

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ACRONYMS AND ABBREVIATIONS

BIG	Barstow International Gateway
BNSF	BNSF Railway
BMP	Best Management Practice
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CGP	California General Permit
CLOMR	Conditional Letter of Map Revision
Caltrans	California Department of Transportation
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CWP	Countywide Plan
DWR	Department of Water Resources
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GSWC	Golden State Water Company
IGP	Industrial General Permit
LID	Low Impact Development
LOMR	Letter of Map Revision
LRWQCB	Lahontan Regional Water Quality Control Board
NFIP	National Flood Insurance Program
NPDES	National Pollution Discharge Elimination System
PG&E	Pacific Gas and Electric
RWQCB	Regional Water Quality Control Board
SBCFCD	San Bernardino County Flood Control District
SGMA	Sustainable Groundwater Management Act
SWRCB	State Water Quality Control Board
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Loads
U.S. EPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey

WSA	Water Supply Assessment for Barstow International Gateway
WQMP	Water Quality Management Plan

1.0 PROJECT SUMMARY

This Report has been prepared to analyze the proposed Barstow International Gateway (“BIG”) and associated off-site improvements. BIG is located in the City of Barstow (“City”) and in unincorporated territory in the County of San Bernardino (“County”), California (see **Figure 1: Regional Vicinity Map** and **Figure 2: Local Vicinity Map**). BIG consists of a rail yard with an intermodal facility¹ and “block swap” facility², a transload warehouse center³, and a solar farm.

Additionally, to serve the proposed rail yard and transload warehouse center, BNSF Railway Company (BNSF) proposes off-site rail improvements (including lead track extensions), and off-site non-rail improvements (including drainage, utilities, and roadways).

BIG’s proposed components are depicted on **Figure 3: Barstow International Gateway Conceptual Site Plan**, **Figure 4: BIG Off-Site Improvements, West** and off-site improvements are depicted on **Figure 5: BIG Off-Site Improvements, East**.

1.1 Project Location and Setting

BIG totals approximately 5,000 acres⁴, and includes approximately 680 acres which would remain ungraded/undisturbed (“Mojave River buffer area”). BIG’s Specific Plan area totals approximately 4,300 acres and is generally bound by the Mojave River to the north, Main Street (also referred to as National Trails Highway or Route 66) to the south, Lenwood Road to the east, and Hinkley Road to the west.

Most of the BIG footprint is within unincorporated County lands, while the remainder is within Barstow City limits. The BIG footprint is generally flat and gradually slopes north to the Mojave River. Off-site improvements are generally within existing BNSF rail and City/County street rights-of-way. The BIG footprint is primarily vacant undeveloped land, which is traversed by an existing BNSF railroad, and which contains scattered residential, commercial, and industrial land uses. This area is mostly devoid of tall vegetation and trees, with structures and other elements of the built environment scattered throughout. Existing land uses within BIG’s footprint are listed in **Table 1: Existing Land Uses**. There are approximately 108 dwelling units and approximately 94,000 square feet of non-residential land uses (i.e., commercial and industrial) within the BIG footprint. Additionally, a private airstrip (“Depue Airport”) is within BIG’s proposed solar farm footprint. Under BIG, this private airstrip would be demolished and replaced with the proposed solar farm.

¹ “Intermodal facility” refers to a rail yard where containerized goods are transferred between trains and trucks. Trucks arrive to either pick up containers from arriving trains or deliver containers for departing trains. However, unlike traditional intermodal facilities, at BIG the majority of containers would arrive by train and be transferred to and from electric hostlers.

² “Block Swap” refers to transferring a block of intermodal train cars between trains. In effect, the entire block of cars remains coupled together and is moved en masse to another train.

³ “Transload” refers to the transfer of goods from one container to another. In this document, it specifically refers to the transfer of goods from 40-foot international containers to 53-foot domestic containers. The transload warehouse center at the BIG is designed to serve goods transported to and from the intermodal facility by rail.

⁴ Although the BIG Specific Plan acreage is 4,335 acres, throughout this technical report, the BIG Specific Plan acreage is referred to as 4,300 acres. Note: all acreages in this report are preliminary and based on GIS data. Acreages will be refined with site survey.

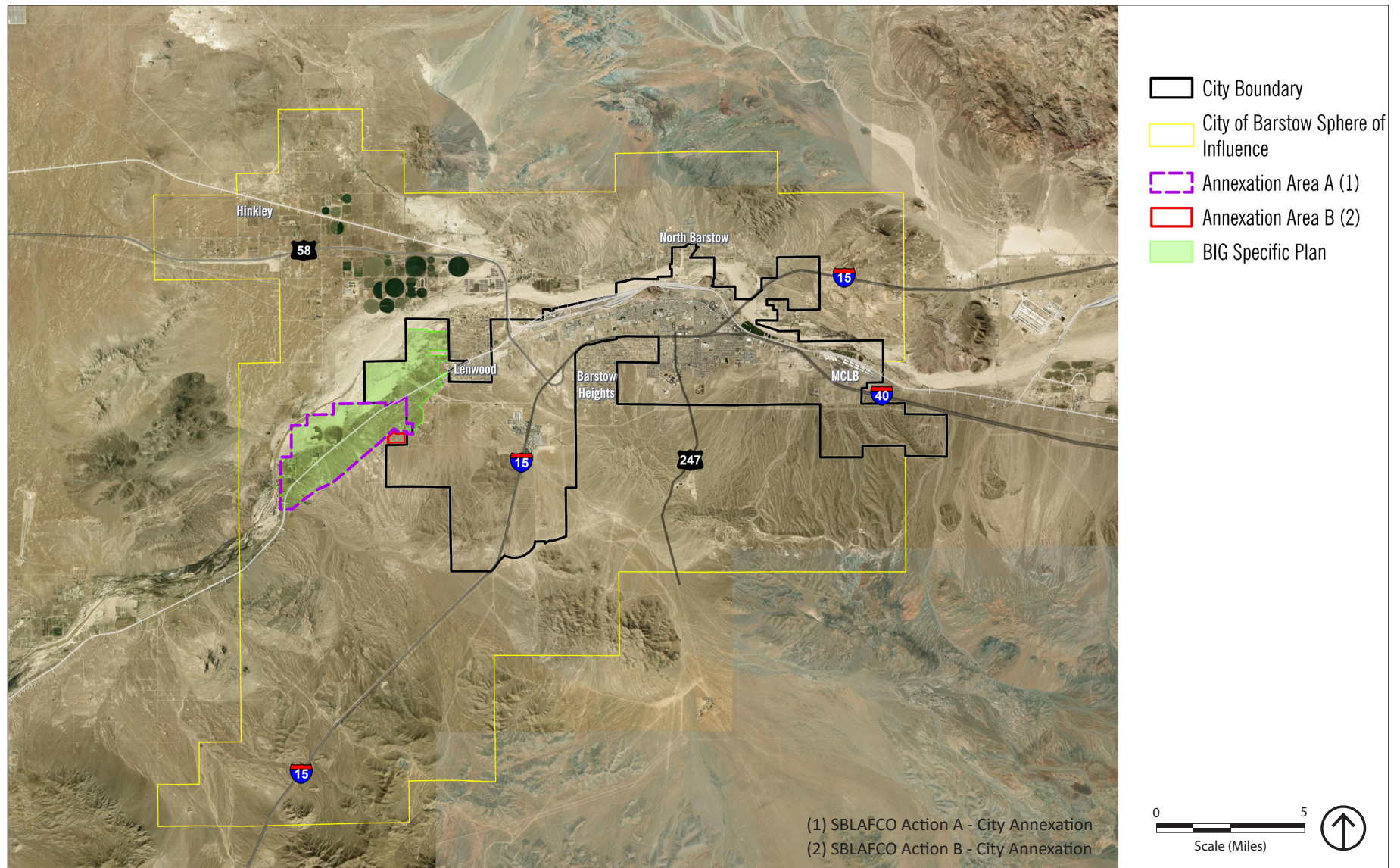
Table 1: Existing Land Uses					
Description	Residential (DU)	Commercial (SF)	Industrial (SF)	TOTAL (DU)	TOTAL (SF)
Existing Land Use	108	85,887	7,837	108	93,724

Regional vehicular access to BIG is provided by Main Street from the south, I-15 from the southeast, and SR-58 from the east. Local access to BIG is primarily provided by Lenwood Road and Hinkley Road from the east and west, respectively, in addition to various unpaved roads along Main Street. Regional rail access is provided from the north by BNSF's Mojave subdivision, from the west by BNSF's Cajon subdivision, and from the east by BNSF's Needles subdivision.



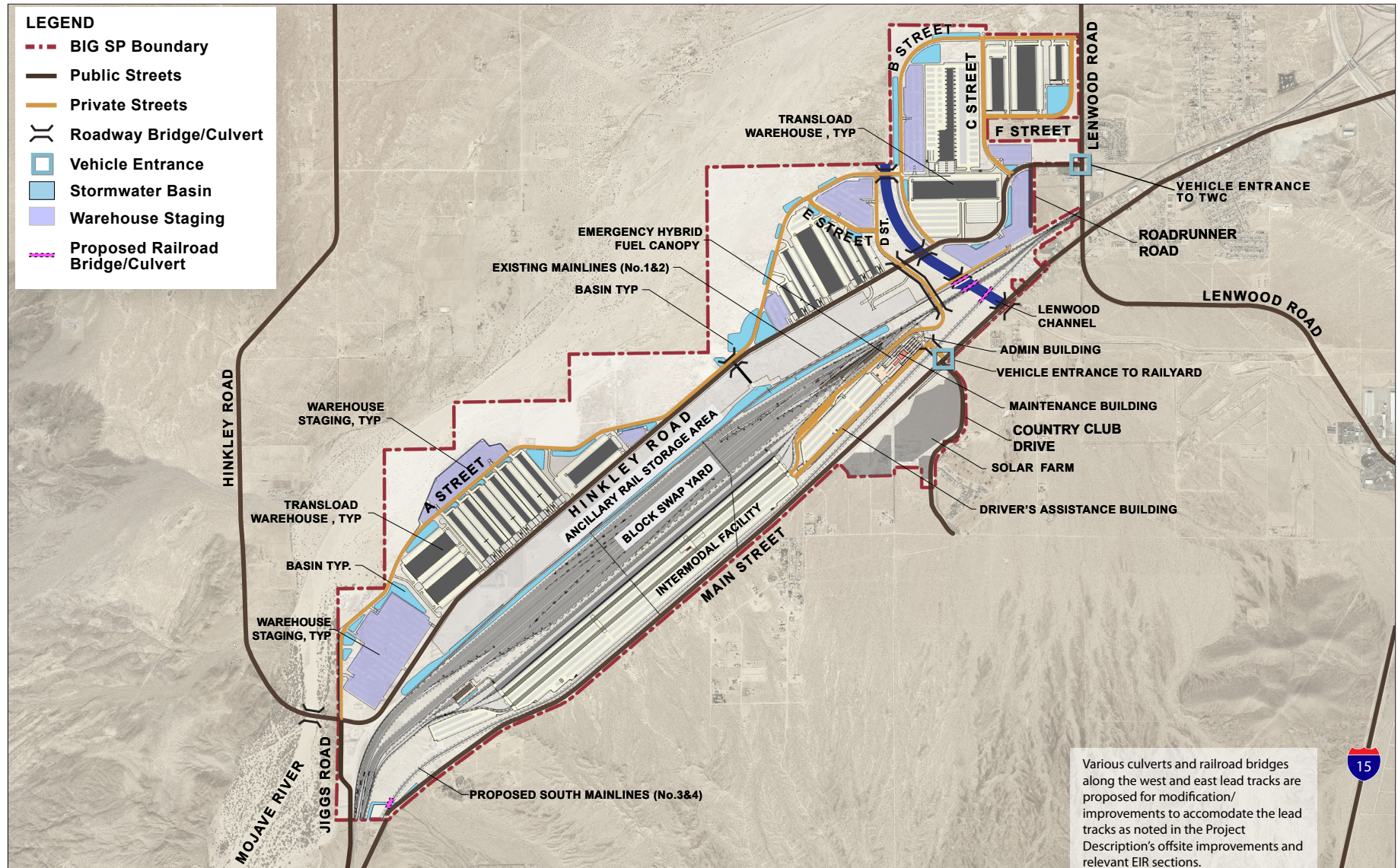
Sources:
City of Barstow , City Boundaries, 2024.

Figure 1
Regional Vicinity Map



Sources:
County of San Bernardino, 2023; City of Barstow, 2024.

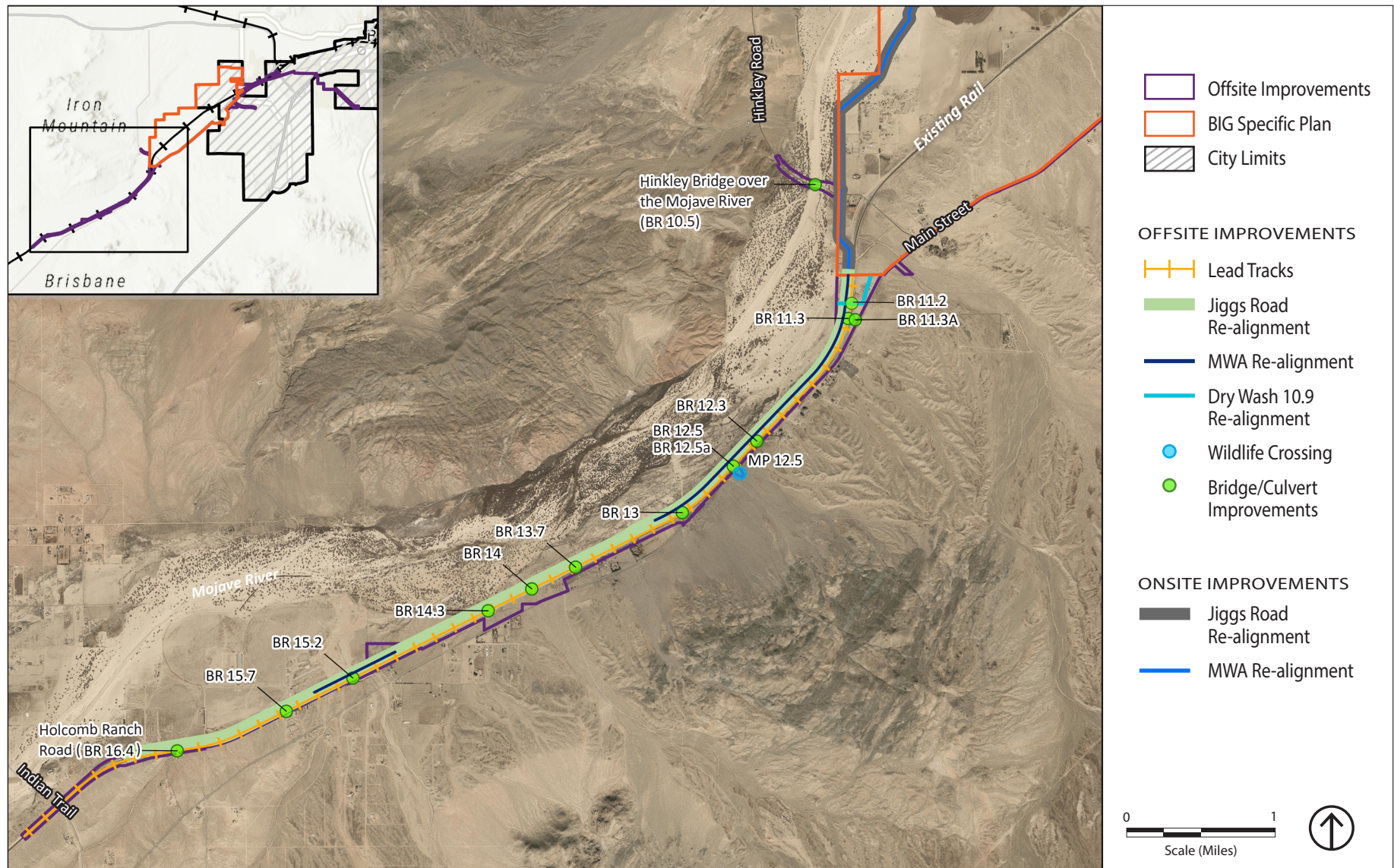
Figure 2
Local Vicinity Map



Sources:
Transsystems, 2025.

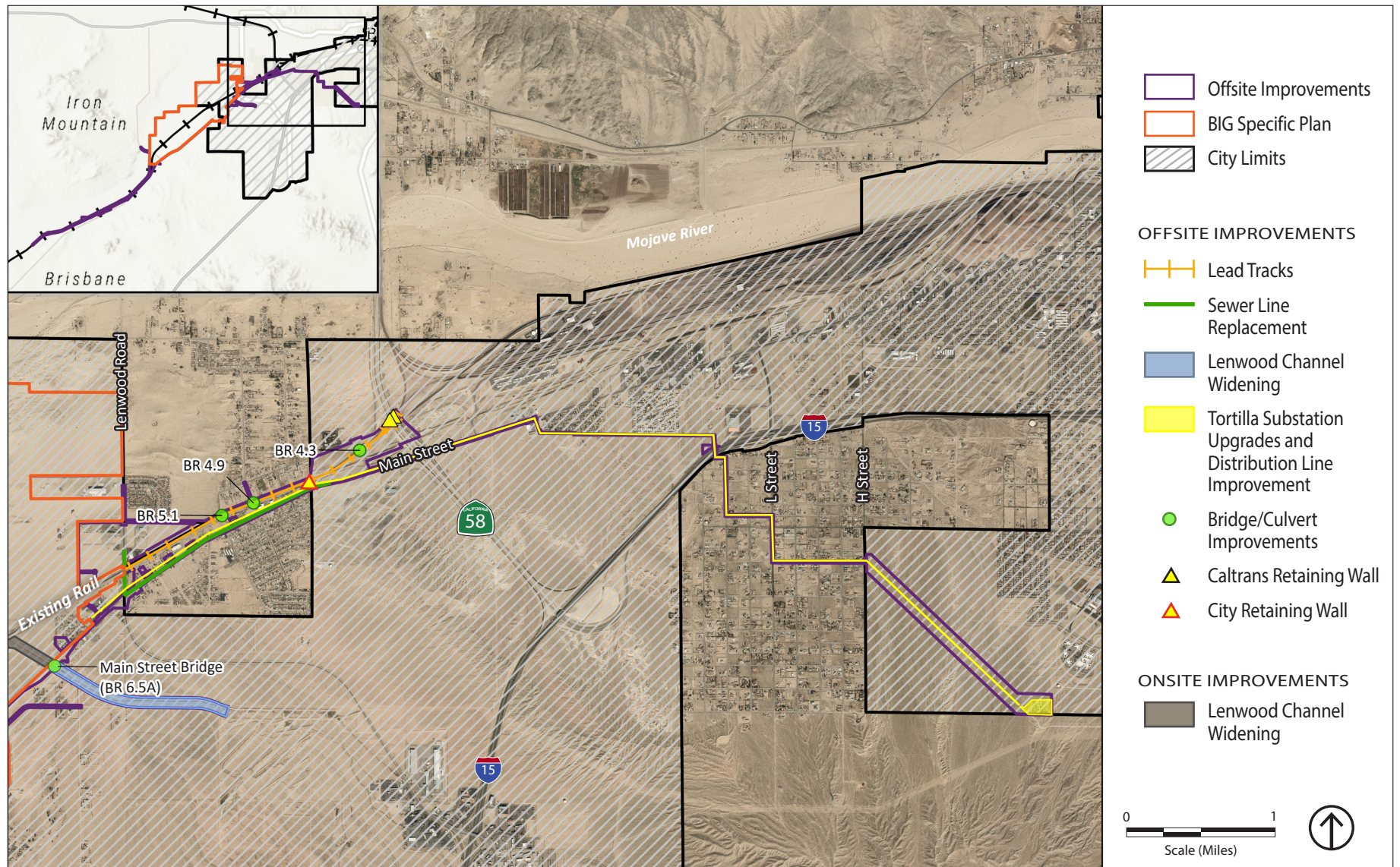
Note: Specific details set forth in the Specific Plan pertaining to the rail yard are considered definitive. The conceptual site plan for the transload warehouse center is for illustrative purposes only. The final site plan presented for entitlement approval may differ based on final design with building square footages not to exceed 9 MSF.

Figure 3
Barstow International Gateway Conceptual Site Plan



Sources:
TransSystems, 2025.

Figure 4
BIG Offsite Improvements, West



Sources:
TransSystems, 2025.

Figure 5
BIG Offsite Improvements, East

1.2 Project Components

Rail Yard

Overview

The rail yard would be generally bound by the existing mainline to the north, Main Street to the south, Lenwood Road to the east, and Hinkley Road to the west. The rail yard would consist of an intermodal facility (i.e., where cross-dock intermodal operations and other intermodal facility operations would occur and where support intermodal facility uses would be located), a block swap yard, and ancillary rail areas (i.e., container yard, chassis storage, and ancillary rail storage area), as described below.

BIG's proposed rail yard would operate 24 hours per day, 365 days per year. The rail yard would have approximately 860 employees during Opening Year (2028), 1,010 employees in Interim Year (2033), and 1,125 employees during Horizon Year (2048)⁵, which would accommodate both the block swap yard and intermodal facility operations. Employees would be split evenly between three shifts.

While the block swap yard would change the number of trains that would arrive or depart BIG by optimizing for end destinations, it would not increase the number of containers. BIG's intermodal facility would, through the cross-dock intermodal operation, add a new volume to the BNSF network, totaling approximately 3.2 trains per day on average in 2028, approximately 4.3 trains per day on average in 2033, and approximately 4.9 trains per day on average in 2048. These train counts include eastbound and westbound trains, and as described elsewhere, trains between the Ports and the BIG intermodal facility would be comprised of dedicated Tier 4 locomotives.

Intermodal Facility

BIG's intermodal facility is proposed at the southern extent of the BIG Specific Plan area and its operations would consist of two types: cross-dock intermodal and "other" operations. BIG's intermodal facility would operate differently than typical intermodal facilities in that most of the containers processed at BIG intermodal facility would not arrive or leave externally by heavy-duty trucks. Instead, almost all of the containers would arrive or leave by train and be processed via BIG's unique "cross-dock intermodal" operation. The intermodal facility's primary purpose would be to transfer containers between railcars and electric hostlers⁶ for cross-dock movements at the on-site proposed transload warehouse center, and vice versa, though a small portion would arrive by heavy-duty truck. The electric hostlers would be used to transport containers within the rail yard, and between the rail yard and transload warehouse center. The electric hostlers would be zero-emission and would not leave BIG. This differs from the operations at a traditional intermodal facility where the primary purpose is to transfer containers from heavy-duty trucks⁷ to railcars, and vice versa (defined as "other" operations). BIG also includes a dedicated fleet of Tier 4 linehaul locomotives⁸ to move containers between the Ports and the BIG intermodal facility.

⁵ A "Horizon Year" is the last year of analysis. BIG's Horizon Year is 20 years after opening.

⁶ Electric hostlers are trucks used for moving trailers and containers short distances within freight terminals, rail yards, and warehouses. Electric hostlers would not use public roadways outside of BIG footprint.

⁷ "Heavy-duty" trucks are conventional highway trucks that travel on public roads and carry containers intra- and inter-state.

⁸ "Tier" refers to emissions standards set by regulatory agencies for engine emissions, with Tier 0 referring to the oldest and having the highest emissions, while Tier 4 is the latest, more stringent standard with the fewest emissions.

BIG's intermodal facility would be composed of various components including railroad tracks, cargo handling equipment, an automated gate system, circulation roadways, yard equipment parking, container parking, stormwater detention ponds, electric vehicle charging stations, and buildings and ancillary rail facilities. Containers would be stored in parking spaces and low stacks at the intermodal facility, along with the ancillary rail area, and transload warehouse center (each described further below). Although electric lift equipment would be utilized to the extent commercially feasible within BIG's intermodal facility, a small 5,000-square-foot fuel canopy would be constructed in the electric hostler maintenance area to accommodate fueling of hybrid equipment. Hybrid and diesel equipment would include rubber-tired gantry cranes, seven air compressors, welders, railcar wheel change machines, and heavy-duty truck transport refrigeration units. The fuel canopy would be served by a 10,000-gallon unleaded fuel aboveground storage tank and a 20,000-gallon diesel fuel aboveground storage tank, with both controlled by an electronic fuel control system. In addition, starting in BIG opening year 2028, BNSF would increase the renewable diesel composition within their existing southern California fueling sites, including the existing fueling sites at the Ports and Barstow classification yard from 1 percent to 10 percent, a 900 percentage point increase in renewable diesel. This would improve the emissions of all BNSF trains fueling at the Ports, including those BNSF trains that would not stop at BIG.

BIG's intermodal facility proposes approximately 134,000 square feet of support buildings and structures, as detailed in **Table 2: BIG Intermodal Facility Structures**. As described below, final building sizes may vary slightly, this EIR conservatively analyzes up to 150,000 SF of support buildings and structures.

Table 2: BIG Intermodal Facility Structures	
Building/Canopy	Square Footage
Administration Building	23,000
Electric Hostler Employee and Maintenance Building	39,000
Drivers Assist Building	5,000
Crane Maintenance Employee and Storage Building	5,000
Crane Maintenance Canopies	22,500
Container Safe Haven Canopies	2,500
Quick Repair Canopy	10,000
AGS Kiosk Canopies	20,000
AGS Portals	2,000
Emergency Fuel Station Canopy for Hybrid Vehicles	5,000
<i>Total</i>	<i>134,000</i>
<i>Assumed Building Total for Final Design</i>	<i>150,000</i>
Note: The square footage described is an estimate and may vary up to 10% depending on the final engineering, therefore, the total square footage for planning purposes is estimated at approximately 150,000 sf.	

Block Swap Yard

The block swap yard is proposed within the middle portion of the BIG Specific Plan area, on approximately 410 acres of the rail yard's total approximately 1,950 acres. The proposed block swap yard would allow for the transfer of multiple railcars, or "blocks" of intermodal rail cars between trains via Tier 4 switcher locomotives. A block is defined as rail cars of a similar type moving to a similar destination that are already connected and can be combined with other blocks intended for similar destinations to produce more efficient train movements. The entire block of rail cars would remain coupled together and be moved en masse, permitting the synchronizing of blocks to their destinations, so that each train would be compiled of rail car blocks travelling to similar destinations. Blocks could be assembled from inbound trains or trains

processed at the intermodal facility carrying containers processed at the transload warehouse center. Certain train blocks may stage at the block swap yard until another train arrives with similar destination. The block swap yard would facilitate switching and transfer of lengthy rail car blocks between tracks for assembling departing trains. Thus, by synchronizing trains to their destinations, the block swap yard would improve train efficiency eastbound and westbound. The rail car blocks within the block swap yard would include containers from BIG's intermodal facility and containers processed at the transload warehouse center, combining as needed based on their destination.

The block swap yard's function is unique compared to a typical classification yard, such as the existing Barstow classification yard. Classification yards are where trains being processed are made up of non-intermodal railcars (i.e., individual boxcars, gondolas, open and closed hopper cars, automobile railcars, and tank cars), rather than intermodal railcars. BNSF designates these types of trains with a different train identification than those that would be processed at BIG. Further, BNSF uses different equipment to process these trains than would be used at BIG. While there is a small intermodal facility component adjacent to the existing Barstow classification yard, that intermodal facility is only used to process overflow from other BNSF intermodal facilities. By contrast, BIG's block swap yard would disassemble and assemble lengthy blocks of railcars with intermodal containers to similar destinations utilizing Tier 4 switcher locomotives. The existing Barstow classification yard also utilizes switcher locomotives as part of its operations, although they are currently Tier 0/0+/1+ switchers. Starting in BIG opening year 2028, BNSF will voluntarily retire all existing Tier 0/0+/1+ switcher locomotives at the unrelated existing Barstow classification yard, and in their place add six Tier 4 switcher locomotives.

Ancillary Rail Area

The ancillary rail storage area is an approximately 400-acre area north of the existing mainline and would be graded and covered with aggregate to be used for numerous purposes, including a container yard, truck chassis storage, and storage of maintenance equipment. A container yard would support the storage of empty containers awaiting loading while chassis storage would be used to provide parking for empty chassis awaiting use for loading, unloading, or draying of containers. The ancillary rail storage area would also be used for storage of spare parts and equipment for track maintenance, including rail, ties, turnouts, and other track material.

Mainline Improvements

BIG would retain the existing two rail mainlines ("north mainlines") within their current alignments, except at bridge crossings, which would be upgraded. BIG also proposes to construct two new mainlines ("south mainlines"), which would traverse the proposed rail yard in an east-west orientation, extending from Lenwood Road on the east to Hinkley Road on the west. During the construction phase, the south mainlines would be used to divert train traffic from the existing mainlines while they are upgraded. During BIG operations, half of the trains which would bypass BIG would use the north mainlines and half would use the south mainlines to balance train counts between the mainlines. BIG would also upgrade various bridge crossings including replacement of the crossing at Lenwood Channel to accommodate the proposed Lenwood Channel widening; removal of existing culverts⁹ to accommodate proposed culverts for the overall rail yard; and replacement of two structures to meet BNSF standards regarding 50- and 100-year flood conditions.

⁹ Culverts are drainage features, typically a pipe or arch, used to convey water under a road or rail tracks.

Transload Warehouse Center

The transload warehouse center is proposed at the northern extent of the BIG Specific Plan area, on approximately 1,330 acres of BIG SP's total approximately 4,300 acres. The transload warehouses would be designed to process the contents of containers from cross-dock intermodal operations, with a small percentage dedicated to processing the contents of containers that have a portion destined for the Inland Empire (the remainder of the container's contents would be placed on trains destined eastward). A small percentage of containers processed at the transload warehouse center would arrive/leave by heavy-duty trucks, primarily from/to the Inland Empire. The transload warehouse center would process most of the containers within an on-site "closed loop" operation between BIG's intermodal facility and the transload warehouse center. The transload warehouse center would include approximately 9.0 million square feet of transload warehouses. The transload warehouse center would be fully built during construction, but operations would gradually increase as customers relocate to BIG. Transload warehouse center operations would include approximately 2,767 employees in Opening Year, approximately 3,660 employees in Interim Year, and 4,248 employees in Horizon Year.

The transload warehouse center would be composed of multiple buildings of various configurations and sizes, depending on tenant needs. As such, **Figure 4** provides a conceptual site plan for illustrative purposes showing potential transload warehouse buildings, locations, and sizes. Final transload warehouse buildings, locations, and sizes may differ from those proposed and would be processed with the City, as development occurs. Each transload warehouse would include container parking/storage areas, employee parking, stormwater/hydrology improvements, and landscaping. Finally, emergency generators are proposed throughout the transload warehouse center to provide electric power in the event of a power outage.

There would also be several areas distributed around the transload warehouse center, adding up to approximately 275 acres, for staging/overflow parking of containers accessing the transload warehouse center. These warehouse staging areas would be for truck containers only; truck "hoteling"¹⁰ would not occur, as electric hostlers would transfer containers to/from these areas, thus, heavy-duty truck trailers would not enter or exit these areas.

Hydrology/Stormwater Drainage Improvements

BIG would construct various infiltration/detention basins and drainage outlets to the Mojave River that would be designed for 100-year flood events. Preliminarily, BIG proposes detention ponds of various sizes throughout BIG footprint totaling approximately 165 acre-feet of storage volume, which would accommodate the 100-year flood conditions.

In addition to various ephemeral washes throughout BIG footprint, three other primary hydrologic features traverse BIG footprint, as detailed below.

Unnamed Stream (Milepost 10.9): This feature is a dry wash from Main Street to the Mojave River that includes a sharp western bend. This feature would be realigned to accommodate track mains, sidings, and support tracks and improved with a combination of bridges and box culverts spanning the channel (Bridge 10.9a and Bridge 11.2, respectively).

¹⁰ Truck "hoteling" refers to when a heavy-duty truck parks for the driver to rest within the cab.

Hinkley Road Bridge at Mojave River (Milepost 10.5): The existing Hinkley Road Bridge, which the County owns and maintains, is at a narrowed section of the Mojave River and crosses via a concrete pier structure. Based on discussions with the County, the existing Hinkley Road Bridge over the Mojave River is experiencing structural issues and is at risk of being over-topped from seasonal flooding. Hydrology and hydraulic analyses have indicated the existing bridge is undersized. To maintain a roadway connection to Hinkley Road from the transload warehouse center, BIG proposes to replace the existing bridge with a longer structure to better match the channel width of the Mojave River at that location. The channel beneath, and immediately adjacent to, the existing bridge would be excavated and widened to match the natural channel width more closely. Portions of Hinkley Road immediately east and west of the bridge would be raised to reduce exposure to Mojave River flood events. These proposed improvements at Hinkley Road Bridge would reduce flooding compared to existing conditions. As part of the improvements, the existing at-grade crossing would be abandoned, and vehicles would instead utilize the proposed Hinkley Road extension through the transload warehouse center.

Lenwood Channel (Milepost 6.5): A portion of the BIG footprint along Lenwood Channel is currently within the FEMA 100-year flood zone due to existing flooding concerns. Lenwood Channel is a north-south earthen channel used to convey water from the southeast to the Mojave River and maintained by San Bernardino County Flood District. Lenwood Channel would be widened by approximately 60 to 100 feet throughout the Specific Plan area for a length of 1.1 miles, continuing offsite south of Main Street, for an additional 1 mile. The widened channel would improve flooding compared to existing conditions. Preliminary BIG design requires the Lenwood Channel to be spanned at three locations for additional track east leads, mains, and sidings, as well as three roadway crossings: Main Street, Hinkley Road, and the private road between the intermodal facility and transload warehouse center.

Utility Improvements

To accommodate the proposed rail yard and transload warehouse center, BIG would require both relocations of existing facilities and construction of new/expanded facilities (i.e., water, wastewater, electric power, natural gas, and telecommunications). The utility improvements proposed within BIG's footprint are discussed below.

Water

BIG's construction phase water demand includes non-potable water for construction activities and potable water for on-site construction workers. To provide non-potable water during the construction phase, up to eight new private on-site temporary groundwater wells would be constructed within BIG's transload warehouse center portion.

Temporary aboveground connections from Golden State Water Company (GSWC) existing mains within Main Street to BIG would be constructed to supply potable water to the construction sites. Additionally, Mojave Water Agency owns and operates a 48-inch recharge water line that crosses the BIG Specific Plan area. BIG proposes to relocate this existing line to the north to avoid conflict with rail yard and transload warehouse center improvements.

Operational potable water and fire flow water would be provided by directly connecting to facilities owned and operated by the GSWC. Fire flow would be supplemented by on-site water tanks and fire pumps if necessary to meet the fire flow requirements. Power to water tanks and fire pumps would be supported by the transload warehouse diesel backup generators in the case of an emergency. Water tanks

would be placed entirely within the BIG footprint. The transload warehouse center would connect to an existing water main in Jasper Road on the east end of the BIG Specific Plan area. The rail yard would connect to an existing water main on the east end of the BIG Specific Plan area near Lenwood Road on the south side of Main Street. A new public 12- to 16-inch looped water main would be constructed from the existing connection in Main Street, extending west to the edge of rail yard, north to Hinkley Rd, and then continue east in Hinkley Road to the existing connection point near Lenwood Road. A second connection from the looped water main would be provided at the northeast corner of the Specific Plan at Lenwood Road. The new on-site public water mains total approximately 10 miles in length.

Wastewater

BIG's construction-related wastewater generation would be from construction workers. Temporary portable facilities (i.e., portable restrooms and portable handwash stations) would be utilized during the construction phase.

BIG's operational wastewater generation would be from transload warehouse center and rail yard employees, and the rail yard wash bays and track pans. Wastewater generated by BIG would discharge to the City's existing wastewater system at three connection points. The transload warehouse center would discharge to the proposed new sewer main in Hinkley Road. A new 8-inch wastewater line is proposed within the Hinkley Road extension from the west end of the transload warehouse center to the northeast end of the transload warehouse center and would connect to the existing sewer main in Lenwood Road. Within the transload warehouse center, west of the Lenwood Channel, 8-inch lines would extend north in C Street to serve the transload warehouses connecting to Lenwood Road via B Street. The rail yard would include new wastewater lines and force mains at the southern portion of the rail yard, conveying wastewater to the east and connecting to the existing sanitary sewer main in Main Street near Country Club Drive. BIG's wastewater would be conveyed by gravity flow to and treated at the Barstow Regional Wastewater Treatment Facility (WWTF), which is owned and operated by the City. Wastewater conveyance and treatment would be coordinated with the City.

Electrical Power

BIG construction activities would generate temporary electric power demand from construction equipment, tools, lighting, and other necessary facilities (e.g., temporary offices). The electric power for construction activities would be supplied through connections to existing Southern California Edison (SCE) facilities.

BIG operations would generate permanent electric power demand from the transload warehouse center (lighting, electric vehicle charging for material handling, and forklifts) and rail yard (lighting, buildings, cranes, and electric hostlers (used to move containers between the rail yard and the transload warehouse center)). BIG operational electric power demand would be met through connecting to the SCE Tortilla Substation and supplemented with on-site electrical generation (i.e., an approximately 140-acre, approximately 21 megawatts solar power generation facility (i.e., solar farm), which is described further below. BIG proposes to construct the following on-site electric power facilities to serve BIG:

- Three substations: two substations at the eastern and western extents of the rail yard; and one substation within the solar farm.
- Additional 33kV distribution lines connecting via underground duct banks in a loop around the west end of the intermodal facility and north end of the transload warehouse center. These

proposed 33KV distribution lines would total 23 miles of ductbank within the BIG Specific Plan area.

- An approximately 140-acre solar farm is proposed south of BIG rail yard, at the southwest corner of the Main Street at Country Club Drive intersection. The solar farm is estimated to generate approximately 21 megawatts to serve BIG. The solar farm would include a battery electric storage system and a new substation at the northwest corner to route power from the solar farm to BIG rail yard. The solar farm would be fenced to prevent trespass and would include internal roadways for maintenance vehicles. The solar farm would require minimal grading to level the site as existing topography is utilized wherever possible and excavation limited primarily to stormwater detention to capture runoff. Additionally, BIG would comply with CalGreen regulations requiring that rooftop solar generation be installed on the industrial warehouse rooftops (Title 24, Section 140.10). Based on 9.0 MSF of transload warehouse, BIG would include approximately 6.4 megawatts of rooftop solar generation for Title 24 compliance.
- Emergency diesel generators are proposed at various locations across the rail yard and transload warehouse center to provide backup power in the event of Tortilla Substation service interruptions. Rail yard generators would only be used if a power outage were to occur at nighttime, as the proposed solar farm would provide sufficient power during daytime in the event of a power outage. The rail yard would include up to 10 generators at the far western extent, while the transload warehouse center would include up to 29 generators dispersed throughout. Generators would require up to 50 hours of testing and maintenance operations per year.

Solar farm maintenance would consist of cleaning, inspecting, and replacing solar panels, equipment, and other system components. Maintenance trips associated with these activities would be limited to trucks transporting materials, equipment, and supplies to and from the farm. To maintain uninterrupted power generation for BIG, maintenance activities would occur incrementally. The solar farm would also require vegetative maintenance (e.g., mowing and weeding, and other grass control measures). No grading would occur during solar farm maintenance.

Natural Gas

BIG construction activities would not require construction of new natural gas facilities, although protection in place or relocation of existing natural gas facilities would be required to accommodate BIG.

Stormwater

To collect stormwater runoff, BIG proposes stormwater basins that would detain any stormwater in excess of predevelopment flows then discharge to existing drainageways through stormwater best management practices. BIG would include various outlets to the Mojave River. Exact sizing and locations of transload warehouse center basins would be dependent on final transload warehouse location, layout, and sizing. In addition, Lenwood Channel would be modified as discussed above.

Solid Waste

BIG would result in solid waste generation from construction (demolition debris, broken or excess materials, packaging, and other construction waste), as well as during operations from the rail yard and transload warehouse center. BIG's solid waste would be collected within on-site trash bins and be disposed of at the Barstow Sanitary Landfill, with 65 percent being recycled (for instance, demolished concrete foundations can be crushed and re-used on-site as aggregate).

Telecommunications

Telecommunication lines cross BIG footprint along Lenwood Road and along the southern edge of the existing tracks. Underground utilities may also be present. All underground communication facilities are assumed to have shallow depths except those crossing under existing features such as underpasses and creeks. Lines within BIG footprint may be relocated adjacent to/within existing and proposed rights of way or abandoned. In addition, BNSF Telecommunications would install approximately 12 communication towers with heights generally between 100 - 120 feet, though two communication towers would be 160 feet tall. Additionally, various existing telecommunications lines owned by Frontier Communications and Lumen would be removed from within BIG footprint, and, in their place, new communications line would be run beginning at the Jasper Road at Lenwood Road intersection, running to the western extent of the BIG Specific Plan area, and then running eastward back to Lenwood Road in a “loop.”

On-Site Circulation Improvements

BIG would include various on-site circulation improvements as discussed below.

Hinkley Road Realignment: BIG would vacate Hinkley Road between the south side of the Mojave River bridge crossing and Main Street, closing the existing at-grade rail crossing. Hinkley Road would be realigned beginning at the north side of the Mojave River bridge crossing to connect through the transload warehouse center to the Jasper Road/Lenwood Road intersection. Transload warehouse center employees and heavy-duty trucks destined for the transload warehouse center would enter from the Lenwood Road/Hinkley Road/Jasper Road intersection.

Internal private roadways: In addition to the realigned public Hinkley Road (discussed above), BIG would include four dedicated internal private roadways for electric hostlers (private streets A, B, D, and E), and two internal private roadways for employee, visitor, and truck access (private streets C and F).

Country Club Drive: Country Club Drive would be widened along the solar farm frontage for approximately 400 feet to the proposed realignment of Sweeten Lane. A new stop-controlled intersection is proposed at the Country Club Drive at Sweeten Lane intersection.

Main Street: Rail yard employees and heavy-duty trucks destined for the intermodal facility would enter BIG’s rail yard from a new driveway on Main Street across from Country Club Road. Main Street would be widened from two lanes to four lanes for approximately 0.5 miles east of Country Club, resulting in a consistent four-lane roadway width through Barstow. Additionally, the existing two-lane Main Street over Lenwood Channel low water crossing would be replaced with a new four-lane bridge that accommodates the 100-year flood condition, substantially reducing the existing flood conditions. Main Street would be raised over Lenwood channel, modifying the vertical alignment of Main Street for approximately 0.8 mile. The intent of this design is to keep flood waters contained in Lenwood Channel and convey the flow to the Mojave River under the bridge at MP 6.5, avoiding the overflow of the bank that can occur under existing conditions.

To accommodate BIG, various on-site public rights-of-way within the City and unincorporated San Bernardino County would also need to be vacated.

Off-Site Improvements

In addition to the on-site improvements described above, BIG also proposes off-site rail and non-rail improvements, as discussed below:

Off-Site Rail Improvements

BIG proposes lead track extensions to the east of approximately two miles and lead track extensions to the west of approximately seven miles (“east lead track” and “west lead track”). These off-site rail improvements would be primarily within existing BNSF right-of-way. These improvements would enable trains to safely enter and exit the mainline at mainline speeds, rather than slower “yard” speeds and risk fouling the track.¹¹ BIG east and west lead tracks would require modifications to existing culverts within the footprint; see also *Stormwater Drainage* discussion below.

Off-Site Non-Rail Improvements

BIG proposes ancillary and related stormwater drainage, utility (i.e., water, sewer, electric power, natural gas, and telecommunications), and circulation/roadway improvements and modifications, described below.

Water. North of transload warehouse center, an existing Mojave Water Agency 48-inch recharge line would be relocated. The relocated line would stretch along the north side of the transload warehouse center to the west end of the BIG Specific Plan area, then continue along the north side of the mainline and lead tracks for a total of 8.3 miles.

Wastewater. An existing approximately 27-inch sanitary sewer line is within existing BNSF ROW for approximately 1.6 miles between Lenwood Road and Pettit Road. This line includes multiple north/south lateral connections to serve the land uses between Main Street and the existing BNSF tracks. BIG would relocate this line at Phillips Street south to within Main Street. Additionally, the transload warehouse center will connect to City sewer via a new 27-inch sewer line within Jasper Road extending to north of Paris Avenue.

Electric Power. Electrical demand would be handled through connecting to the Southern California Edison Tortilla Substation, located approximately 0.4 mile south of the Veterans Parkway at Diamond Avenue intersection. Three underground duct banks with electrical conductors would connect BIG to the Tortilla Substation utilizing existing franchise agreements with the City and County on a route following Main Street, Sunrise Road, N Street, and Bonanza Road before utilizing existing easements between Bonanza Road and the substation. This proposed 33KV distribution route would extend approximately 7.1 miles underground from the Tortilla Substation to the intermodal facility’s eastern extent at Country Club drive, then continue overhead approximately 3.5 miles from Country Club Drive to approximately Hinkley Road. For the 33kv line segment from Tortilla Substation to BIG, the 33kv circuits would be in underground utility lines resulting in an approximately 30-foot-wide disturbance to account for construction access and temporary spoils. From Tortilla substation to H Street (approximately 1.2 miles), the 33kv conduit could occur within a 450-foot-wide corridor, inclusive of the existing 150-foot wide SCE easement along Bonanza Road. However, the exact alignment is presently unknown and is being coordinated with SCE. Therefore, this EIR analyzes an approximately 30-foot wide disturbance within the 450-foot wide corridor (“33kv distribution corridor”). This EIR analyzes the “worst-case” environmental impacts within the 33kv distribution corridor. SCE would make modifications, which include constructing new feeders and new power distribution lines. Within the Tortilla Substation’s existing fence line, SCE would also make

¹¹ “Fouling the track” means the placement of an individual or an item of equipment in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment, or in any case is within four feet of the field side of the near running rail (49 CFR Part 214). When a rail network becomes congested, trains can foul the track by moving slower than a train behind them.

modifications to supply the new feeders from their existing 115kV-33kV transformers. Various off-site existing electric power lines could be relocated, modified, or extended to accommodate BIG improvements.

Natural Gas. Various off-site existing natural gas lines could be relocated to accommodate BIG improvements.

Telecommunications. No off-site telecommunications improvements are proposed. Various minor existing telecommunications lines would be relocated toward the eastern end of the lead track improvements. Existing telecommunications lines passing through the intermodal facility and block swap yard would be relocated to the north side of the Main Street ROW.

Stormwater Drainage. As described above, the Lenwood Channel widening would continue offsite, south of Main Street. It would be widened by approximately 60 to 100 feet for a total of approximately 2.1 miles (of which 1 mile would be offsite) to improve flooding compared to existing conditions. At the Main Street crossing at Lenwood Channel, BIG would replace 0.8-mile of the existing Main Street low water crossing of Lenwood Channel with a bridge and raise and widen the road through this stretch west to the new intermodal facility entrance. These improvements accommodate the City/County master plan and improve flooding compared to existing conditions.

Other. To accommodate wildlife crossings from south of Main Street to the Mojave River without potential conflict with vehicular or train traffic, BIG proposes an underground wildlife crossing under Main Street west of the existing Hinkley Road.

Circulation/Roadway. Jiggs Road would be realigned generally from just east of Indian Trail to Hinkley Road to maintain emergency access from Indian Trails to Hinkley Road. In addition, a maintenance road would be constructed alongside the mainline to provide maintenance access to the tracks, generally from just east of Indian Trail to Hinkley Road. Various circulation and roadway improvements and modifications are proposed outside the BIG Specific Plan area. All circulation improvements would be permanent, except a temporary Main Street bypass. The temporary bypass would be constructed to maintain access along Main Street during Lenwood Channel Bridge reconstruction. To maintain access for adjacent residents, the temporary Main Street bypass would include private driveways for adjacent residential uses and would be open for the approximately 18-month bridge reconstruction period. Once the Lenwood Channel Bridge reconstruction is complete, the bypass would be removed and the site restored to its original condition. Additionally, construction of additional lead tracks over Pettit Road (approximately 1,100 feet west of SR-58) would require the road to be lowered by approximately 2.0 feet. BIG would also vacate various ROW within the City and County. Finally, Sweeten Lane would be vacated and realigned to eliminate the existing unimproved intersection with Main Street. A new paved access would extend from Country Club east approximately 1,000 feet and connect to the unimproved Sweeten Lane.

Maintenance Activities

While “light maintenance activities”¹² could occur at BIG, major maintenance activities¹³ would still occur at the existing Barstow classification yard, thus, requiring short-distance trips via BNSF’s existing mainline

¹² “Light maintenance activities” means routine locomotive servicing (e.g., window washing, fueling, inspecting fluid levels and topping off fluids, stocking cabins with crew equipment such as water and trash bags, toilet servicing) and minor railcar servicing (e.g., wheel changes, brake and friction shoes, and loose or missing bolts).

¹³ “Major maintenance activities” means repair of railing and platform, railcar suspension, hitches, engine, etc.

to and from the existing Barstow classification yard for heavy maintenance. Locomotive trips associated with maintenance activities would be based on the number of linehaul locomotives needed to move trains between the Ports and BIG intermodal facility, and the number of switcher locomotives needed to haul rail cars within BIG intermodal facility and block swap yard. All switcher locomotives at BIG would be Tier 4 locomotives, and BNSF would also retire all existing Tier 0/0+/1+ locomotives at the unrelated existing Barstow yard and, in their stead, add six Tier 4 switcher locomotives.

1.3 Project Construction Activities and Phasing

For analysis purposes, construction is anticipated to occur over approximately 34 months beginning in the third quarter of 2025 and ending in the third quarter of 2028. The entirety of BIG’s construction activities, including off-site improvements, are analyzed in this report and described below. The anticipated construction phase timing is shown in **Table 3: BIG Construction Schedule**. However, the current construction schedule anticipates that BIG construction would begin approximately August 2026, and end approximately July 2029, for an approximate 13-month shift from the schedule shown in **Table 3** and analyzed in this technical report. However, construction duration (34 months) would remain unchanged. Further, given fleet turnover and compliance with increased regulatory requirements, construction and operational air quality emissions would improve over time as is reflected in CalEEMod, the California Air Resource Board’s air quality emissions modeling platform.

During peak construction periods, work would be under way at several locations within BIG footprint simultaneously, with overlapping construction of various elements. Construction working hours and the number of workers present at any time would vary depending on the activities being performed. BIG construction would require approximately 8,177 construction workers per year.¹⁴

Table 3: BIG Construction Schedule		
Phase	Start Date	End Date
South Mainlines	8/7/2025	10/2/2026
Intermodal Facility	8/7/2025	1/4/2027
Block Swap Yard	1/22/2026	6/8/2028
North Mainlines	5/27/2027	6/8/2028
Transload Warehouse	2/5/2026	12/6/2027
33 kV Distribution Undergrounding	9/13/2025	5/7/2027
Solar Site	3/20/2026	2/27/2027

Nighttime construction could occur throughout the BIG footprint except where within 300 feet of sensitive receptors (along the 33kv distribution line). To avoid potential noise and vibration impacts from pile driving, BIG proposes to establish a buffer of 1,800 feet for nighttime pile driving and 500 feet for daytime pile driving from sensitive receptors. Additionally, nighttime construction would be necessary for track work adjacent to the existing mainline where lead tracks would tie into the mainline. All construction activities would occur within BIG footprint.

BIG components would involve the following construction activities:

¹⁴ Based on 23,200 construction worker “job years”.

Demolition and Grading

The BIG footprint is primarily vacant, undeveloped land traversed by an existing BNSF railroad and containing scattered residential, commercial, and industrial land uses. Existing land uses within BIG's footprint are listed in **Table 1**. All existing land uses not demolished during acquisition to avoid trespassing and safety concerns would be demolished prior to, or during, mass grading. In addition, existing utilities (underground and aboveground) within BIG footprint would be removed or temporarily relocated as needed.

Six culverts/bridges would need to be demolished within the existing BIG footprint. Demolition would involve excavators to break apart bridge abutments and foundations.

Mass grading would occur in one phase across the BIG footprint and require approximately 26 million cubic yards of cut and fill. Mass grading would be typified by large construction equipment establishing the area's general grading contours. For locations supporting future buildings, roadways, or track, mass grading would include watering and compaction of soil to provide a stable subgrade. Earthwork onsite would be balanced, with excess cut from the rail yard being used as fill within the transload warehouse center.

Fine grading would include site-specific grading for the transload warehouse center, as well as finish grading around buildings, parking areas, curb and gutter, etc.

Construction of Rail Yard (Intermodal Facility and Block Swap Yard)

The likely sequence for BIG rail yard construction (intermodal facility and block swap yard) would include mass grading; compacting the rail bed and internal roadways/parking areas; installing underground improvements/utilities; fine grading; installing crushed rock subballast; laying track and ballast; and installing train signals and communications systems. To reduce construction trucking, BIG would bring rail ties, welded rail, and rail ballast in via train.

Rail yard construction elements would include surface and elevated track work where the track would cross a water feature, a grade-separated roadway crossing for electric hostlers to access (and return from) the transload warehouse center, and installation of an intermodal facility. Major construction activities would include grading and excavation support, underground utility installation, systems construction, bridge construction, and railway systems construction (including trackwork, signaling, and communications). High-mast lights (up to 120 feet in height) would be constructed throughout the rail yard, including foundation work, conduits, and security camera positions. Rail yard construction would also include foundations and tracks for gantry cranes.

Furthermore, the proposed rail yard area would be excavated to result in a nearly-level grade between the east and west ends. With the proposed grading, most of the rail yard would be approximately 30-45 feet below Main Street. Various key BIG elements are also shown below.

Rail materials such as rail ties, welded rails, and ballast would be delivered by train. As noted above, the two existing north mainlines would be protected in place except at the bridge crossings, and two new south mainlines constructed. The south mainlines would be constructed first, and, during the first year of construction, existing rail traffic would use the new south mainlines so that the existing mainlines can be rebuilt and their bridge crossings upgraded. Mainline, rail yard, and lead track construction would utilize a Track-Laying Machine for approximately 20 months to lay track.

Intermodal facility construction would include various administrative and support buildings and substantial paving for the container parking and storage.

Solar Farm Construction

Solar farm construction, which would occur in a single phase, would require minimal grading to level the site as existing topography is utilized wherever possible and excavation limited primarily to stormwater detention to capture runoff. Fencing would be installed around the solar farm's perimeter of the solar farm, internal drive-aisles would be graded and paved, and the proposed substation would be constructed per SCE standards.

Construction of Transload Warehouse Center

Construction elements for the transload warehouse center would include grading, over-excavation,¹⁵ footing and foundation excavation and pouring, tilt-up panel concrete construction, parking lot grading and paving, utility installation and undergrounding, and hydrology/drainage improvements.

Construction of On-Site Bridges and Roadway Improvements

Railroad bridge and roadway construction may use various methods including segmented pre-cast, cast-in-place, box girder or pre-cast, and span-by-span techniques.

Pre-construction activities would occur during final design and would include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures. Two bridges would be constructed over Lenwood Channel (BR 6.5D, 6.5E, and BR 6.5F) to enable traffic to flow from either side of Lenwood Channel.

Construction of Off-Site Rail Improvements

Off-site rail improvements would include clearing and grubbing, bridge crossing construction, ballast placement, track laying, and connection to the mainline. Off-site rail improvements would parallel the existing mainline and primarily be within existing BNSF right-of-way. BIG's rail deliveries of rail ties and ballast would include materials for construction of off-site rail improvement.

Construction of Off-Site Non-Rail Improvements

Off-site non-rail improvements would include construction of drainage, utility, and roadway improvements.

Drainage. Lenwood Channel improvements would consist of scouring and widening the channel. Construction equipment would be within Lenwood Channel in order to accomplish the widening.

Utilities. Additionally, off-site construction would include utility improvements including the 33kv distribution/Tortilla Substation improvements. Construction processes are anticipated to include clearing and grubbing, saw cuts and demolition of existing pavement, excavation to approximately 10 feet below ground surface, installation of temporary shoring, placement of circuits and distribution lines, fill placement and removal of temporary shoring, and roadway repair.

¹⁵ "Over-excavation" refers to removal and re-compaction of soil.

Roadways/Intersections. A bridge over Lenwood Channel for Main Street would be constructed to replace the existing low water crossing and accommodate widening of Main Street in that immediate area. Additionally, BIG proposes roadway/intersection improvements/modifications, including the installation of traffic signals at various intersections.

Typical construction processes for these off-site non-rail improvements would include clearing and grubbing, over-excavation, bridge construction, traffic signals with associated underground conduits and cabling, and restriping and asphalt or concrete pavement placement, where needed.

2.0 LAWS, REGULATIONS, ORDERS

Key federal, state, and local jurisdictional laws and regulations pertaining to hydrologic and hydraulic design that are potentially relevant to BIG are summarized below.

2.1 Federal

Clean Water Act

The Clean Water Act (CWA) (33 U.S.C. § 1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. CWA § 402 establishes the NPDES, which regulates the discharge of pollutants from point sources. The CWA prohibits discharges except in compliance with a NPDES General Permit. In California, NPDES permitting authority has been delegated to, and administered by, nine RWQCBs. Additional information regarding the NPDES program is provided below.

The Stormwater Program regulates some stormwater discharges from three sources (i.e., construction, industrial, and municipal stormwater). As general construction and industrial permits under the CWA are issued and administered by the State Regional Water Quality Control Boards (RWQCB), they are discussed below.

The Municipal Storm Water Program regulates stormwater discharges from Phase I Municipal Separate Storm Sewer Systems MS4s throughout the state. The Municipal Storm Water Program manages the Phase I Permit Program (municipalities over 100,000 people), the Phase II Permit Program (municipalities less than 100,000), and the Statewide Stormwater Permit for the State of California Department of Transportation (Caltrans). Phase I MS4 permits, which are mostly issued to a group of co-permittees encompassing an entire metropolitan area, require the discharger to develop and implement a Storm Water Management Plan/Program with the goal of reducing the discharge of pollutants to the maximum extent practicable.

The CWA:

- § 102 requires the planning agency of each state to prepare a basin plan that sets forth regulatory requirements for the protection of surface water quality, including designated beneficial uses for surface waterbodies, as well as specified water quality objectives to protect those uses.
- § 303(d) requires each state to provide a list of impaired surface waters that do not meet or are expected not to meet state water quality standards, as defined by that section. It also requires each state to develop total maximum daily loads (TMDL).
- Under § 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a dredged or fill material into waters of the U.S. must obtain certification that the discharge of fill would not violate water quality standards, including water quality objectives and beneficial uses.
- Under § 402, all point-source discharges, including, but not limited to, construction-related runoff discharges to surface waters and some post-development discharges, are regulated through the NPDES.
- Under § 404, the U.S. Army Corps of Engineers (Corps) and the United States Environmental Protection Agency (U.S. EPA) regulate the discharge of dredged and fill material into waters of the

U.S. Project sponsors must obtain a permit from the Corps for discharges of dredged or fill materials into jurisdictional waters over which the Corps exerts jurisdiction.

National Pollutant Discharge Elimination System

The NPDES permit program was established by the CWA to regulate municipal and industrial discharges to surface waters of the United States, including discharges from municipal separate storm sewer systems (MS4). Federal NPDES permit regulations have been established for broad categories of discharges, including point-source municipal waste discharges and nonpoint-source stormwater runoff. NPDES permits generally identify effluent and receiving water limits on allowable concentrations and/or mass emissions of pollutants in the discharge; prohibitions on discharges not specifically allowed under the permit; and provisions that describe required actions by the discharger, including industrial pretreatment, pollution prevention, self-monitoring, and other activities.

Under the NPDES program, all facilities that discharge pollutants into waters of the United States are required to obtain a NPDES permit. Requirements for stormwater discharges are also regulated under this program. In California, the NPDES permit program is administered by the SWRCB through the nine RWQCBs. The RWQCBs adopt and implement Water Quality Control Plans (Basin Plans), which recognize regional differences in natural water quality, actual and potential beneficial uses, and water quality problems associated with human activities. BIG is within jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB).

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP) to provide subsidized flood insurance to communities that comply with FEMA regulations limiting development in floodplains. FEMA also issues Flood Insurance Rate Maps (FIRMs) that identify which land areas are subject to flooding. These maps provide flood information and identify flood hazard zones in the community. The design standard for flood protection is established by FEMA. FEMA's minimum level of flood protection for new development is the 100-year flood event, also described as a flood that has a 1-in-100 chance of occurring in any given year.

As required by the FEMA regulations, all development constructed within the 100-year floodplain or a Special Flood Hazard Area (as delineated on the FIRM) must be elevated so that the lowest floor is at or above the base flood elevation level. The term "development" is defined by FEMA as any human-made change to improved or unimproved real estate, including but not limited to buildings, other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations, and storage of equipment or materials. Per these regulations, if future development in these areas is proposed, a hydrologic and hydraulic analysis must be performed prior to the start of development to demonstrate that the development does not cause any rise in base flood elevation levels, because no rise is permitted within regulatory floodways. Upon completion of any development that changes existing Special Flood Hazard Area boundaries, the NFIP directs all participating communities to submit the appropriate hydrologic and hydraulic data to FEMA for a FIRM revision, as soon as practicable, but not later than six months after such data becomes available.

Rivers and Harbors Act of 1899 and General Bridge Act of 1946

The Rivers and Harbors Act (33 U.S. Code §§ 401 et seq.) and the General Bridge Act (33 U.S. Code §§ 525 et seq.) are the primary federal laws for regulating activities that may affect navigation on the nation's waterways, including:

- Rivers and Harbors Act § 9 and General Bridge Act § 9 require a U.S. Coast Guard permit for the construction of bridges and causeways over certain navigable waters of the United States to ensure marine traffic is not adversely affected.
- § 10 of the Rivers and Harbors Act requires authorization from the Corps for the construction of any structure in, over, or under any navigable waters of the U.S.
- § 14 of the Rivers and Harbors Act requires the Corps permission for the use, including modification or alteration, of any flood control facility work built by the U.S. to ensure that the usefulness of the federal facility is not impaired.

National Flood Insurance Act and Flood Disaster Protection Act

The purpose of the National Flood Insurance Act (42 U.S. Code §§ 4001 et seq) is to identify flood-prone areas and provide insurance. The act requires purchase of insurance for buildings in special flood-hazard areas.

The Flood Disaster Protection Act (42 U.S. Code §§ 4001 to 4128) requires the purchase of insurance for buildings in special flood hazard areas identified and mapped by FEMA.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) was created by Congress with the passage of the National Flood Insurance Act of 1968 to help provide flood insurance and is administered by the Federal Emergency Management Agency (FEMA). As part of the program flood maps have been created to show a risk of flooding within a community referred to as flood zones. Each flood zone describes the flood risk for a particular area, and those flood zones are used to determine permitting requirements associated with development, insurance requirements and costs. Property owners, insurance agents, and lenders use flood maps to determine flood insurance requirements and policy costs.

With Risk Rating 2.0: Equity in Action, FEMA addresses rating disparities by incorporating more flood risk variables like flood frequency, multiple flood types — river overflow, storm surge, coastal erosion, and heavy rainfall — and distance to a water source, as well as property characteristics such as elevation and the cost to rebuild. Moderate to low-risk flood areas are designated with the letters B, C, and X on the FEMA flood maps. In these areas, the risk of being flooded is reduced, but not completely removed and floodplain permitting requirements are generally reduced. High-risk flood areas begin with the letters A or V on FEMA flood maps. These areas face the highest risk of flooding. Property in a high-risk zone may have a federally backed mortgage and flood insurance as a condition of that loan. Floodplain development permitting requirement typically become more stringent in high-risk flood areas and may require that a detailed hydrologic and hydraulic analysis be performed.

Safe Drinking Water Act of 1974

The Safe Drinking Water Act (42 U.S. Code §§ 300 et seq.) was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The act authorizes the U.S.

EPA to set national health-based standards for drinking water to protect against both naturally occurring and human-produced contaminants that may be found in drinking water. The act applies to every public water system in the U.S.

The Sole Source Aquifer Protection Program is authorized by § 1424I of the act. The Sole Source Aquifer designation is a tool to protect drinking water supplies in areas where there are few or no alternative sources to the groundwater resource and where, if contamination occurred, using an alternative source would be extremely expensive.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act provides the basic authority for the U.S. Fish and Wildlife Service to evaluate impacts to fish and wildlife from proposed water resource development projects. This Act requires that all federal agencies consult with U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and State wildlife agencies (i.e., the California Department of Fish and Wildlife or CDFW) for activities that affect, control, or modify waters of any stream or bodies of water. Under this Act, the U.S. Fish and Wildlife Service has responsibility for reviewing and commenting on all water resources projects. For example, it would provide consultation to the USACE prior to issuance of a Section 404 permit.

An incidental take permit is required if a project may result in the “incidental take” of a listed species. An incidental take permit allows a developer to proceed with an activity that is legal in all other respects but that results in the “incidental taking” of a listed species. A habitat conservation plan must also accompany an application for an incidental take permit. The purpose of a habitat conservation plan is to ensure that the effects of the permitted action on listed species are adequately minimized and mitigated.

2.2 State

California Department of Water Resources

In California, approximately 99 percent of California communities participate in the NFIP. Of the participating communities, approximately 18 percent participate in the Community Rating System Program, which encourages communities to go above and beyond minimum NFIP requirements.

The Department of Water Resources (DWR), on behalf of FEMA, conducts Community Assistance Visits and Community Assistance Contacts to each of the NFIP communities to provide individual technical assistance. The DWR provides statewide NFIP workshops that are designed to interpret and explain the NFIP regulations and to give an overview of the need for community-based floodplain management. The DWR developed the model ordinances to help communities adopt local regulations that are written to work with the flood provisions of the California Building Standards Code (California Code of Regulations Title 24) for buildings and structures in special flood hazard areas.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Water Code §§ 13000 et seq.) requires projects that are discharging, or proposing to discharge, wastes that could affect the quality of the state’s water to file a Report of Waste Discharge with the appropriate RWQCB. The RWQCBs are responsible for implementing the CWA, §§ 401, 402, and 303(d). The act also provides for the development and periodic reviews of Basin Plans that designate beneficial uses of California’s major rivers and groundwater basins and

establish water quality objectives for those waters. Projects primarily implement Basin Plans using the NPDES permitting guidelines to regulate waste discharges so that water quality objectives are met.

The State Water Resources Control Board (SWRCB) and RWQCBs are the principal agencies with responsibility for the coordination and control of water quality under this act. The SWRCB allocates water rights, adjudicates water rights disputes, develops statewide water protection plans, establishes water quality standards, and with the nine regional RWQCBs guides policy in the major watersheds of the state.

Construction Stormwater NPDES Permit

California's Construction General Permit for Stormwater Discharges Associated with Construction and Land Activities (Construction General Permit [CGP]) Order No. WQ 2022-0057-DWQ which superseded Order 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ and 2012-0006-DWQ, issued by the SWRCB is required for construction or demolition activity resulting in land disturbance of equal to or greater than one acre. Construction activities including grading, trenching, excavation, stockpiling, and disturbances to the ground are covered under the CGP. Dischargers must file Permit Registration Documents to the SWRCB via the Stormwater Multi Application and Report Tracking System by the Legally Responsible Person. Permit Registration Documents consist of a Notice of Intent, risk assessment, site map, Stormwater Pollution Prevention Plan (SWPPP), signed certification statement, and annual fee. The RWQCB may require a risk assessment when the site poses a significant risk to water quality.

Under the CGP, responsible parties must address pollutants and their sources, including sources of sediment associated with construction, install effective site best management practices (BMPs) that result in the reduction or elimination of pollutants, including trash pursuant to the Trash Amendments, in stormwater discharges, and either eliminate, control, or treat all non-stormwater discharges. BMPs are designed to reduce impacts to the maximum extent practicable by focusing on pollution prevention and source control.

Pursuant to the CWA, in 2001, the SWRCB issued a Statewide general NPDES Permit for stormwater discharges from construction sites (NPDES CAS000002). Under this Statewide General Construction Activity permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or to be covered by the General Permit. Coverage by the General Permit is accomplished by completing and filing a Notice of Intent with the SWRCB and developing and implementing a SWPPP. Each applicant under the General Construction Activity Permit must ensure that a SWPPP is prepared prior to grading and is implemented during construction. The SWPPP must list BMPs implemented on the construction site to protect stormwater runoff and must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a monitoring plan if the site discharges directly to a water body listed on the State's 303(d) list of impaired waters.

NPDES Industrial General Permit

The Industrial General Permit (IGP) regulates industrial stormwater discharges and authorized non-stormwater discharges from industrial facilities in California. The statewide General Permit for Discharges of Stormwater Associated with Industrial Activities (SWRCB Water Quality Order No. 2014-0057-DWQ, NPDES No. CAS000001) requires qualifying industrial sites to comply with the following provisions, among others:

- Eliminate unauthorized non-stormwater discharges;

- Develop and implement SWPPPs that include BMPs;
- Implement minimum BMPs, and advanced BMPs as necessary, to achieve compliance with the effluent and receiving water limitations of this General Permit;
- Conduct monitoring, including visual observations and analytical stormwater monitoring for indicator parameters;
- Compare monitoring results for monitored parameters to applicable numeric action levels;
- Perform the appropriate Exceedance Response Actions when there are exceedances of the numeric action levels; and,
- Certify and submit all permit-related compliance documents via Stormwater Multi Application and Report Tracking System.

The permit establishes a number of action levels that reflect California Environmental Protection Agency benchmark values for selected parameters, minimum BMP requirements, a revised monitoring protocol, and exceedance response actions if a numeric action level is exceeded.

California Department of Transportation NPDES Statewide Stormwater Permit

The Caltrans permit is applicable to portions of a project that involve modifications to state highways. Caltrans operates under a permit (Order No. 2012-0011-DWQ, NPDES No. CAS000003, as amended by 2014-0006-EXEC, 2014-0077-DWQ, 2015-0036-EXEC, and 2017-0026-EXEC) that regulates stormwater discharge from Caltrans properties, facilities, and activities and requires the Caltrans construction program to comply with the adopted statewide CGP. The permit requires Caltrans to implement a year-round program in all parts of the state to control stormwater and non-stormwater discharges effectively. The Caltrans permit is applicable to portions of a project that involve modifications to state highways.

Cobey-Alquist Flood Plain Management Act

The Cobey-Alquist Flood Plain Management Act (California Water Code §§ 8400 et seq.) encourages local governments to adopt and enforce land use regulations to accomplish floodplain management. The act also provides state assistance and guidance for flood control.

California Fish and Game Code (for Lake and Streambed Alteration)

California Fish and Game Code §§ 1600 et seq. requires notifying the California Department of Fish and Wildlife (CDFW) prior to any project activity that might (1) substantially divert or obstruct the natural flow of any river, stream or lake; (2) substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or (3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. Although not specifically defined in California Fish and Game Code § 1602, jurisdiction in some instances may include adjacent riparian vegetation.

If after this notification CDFW determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will need to be obtained.

Sustainable Groundwater Management Act

The Sustainable Groundwater Management Act of 2014 (SGMA) is a comprehensive three-bill package that was signed into California state law by Governor Jerry Brown in September 2014. The SGMA provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention only if necessary to protect the resource. The plan is intended to ensure a reliable groundwater water supply for California for years to come.

State Water Resources Control Board - General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality

Low-threat discharges, which include small/temporary dewatering projects such as excavations during construction, are regulated under this regional general permit (Low-Threat Discharge General Permit) (Order No. 2003-0003-DWQ). Low-threat construction discharges shall not contain concentrations of pollutants in excess of the Basin Plan ground or surface water quality objectives.

2.3 Regional

Lahontan Regional Water Quality Control Board

The Basin Plan for the Lahontan Region contains water quality standards and control measures for the Lahontan Region's surface and groundwaters. The Basin Plan designates beneficial uses for water bodies and establishes water quality objectives, waste discharge prohibitions, and other implementation measures to protect those beneficial uses. State water quality standards also include a Non-degradation Policy. Water quality control measures include TMDLs.

The Basin Plan for the Lahontan Region is the basis for the Regional Board's regulatory program. It sets forth water quality standards for the surface and groundwaters of the Region, which include both designated beneficial uses of water and the narrative and numerical objectives which must be maintained or attained to protect those uses. It identifies general types of water quality problems, which can threaten beneficial uses in the Region. It then identifies required or recommended control measures for these problems. In some cases, it prohibits certain types of discharges in particular areas.

Mojave Basin Area Adjudication

The Mojave Water Agency was appointed as Watermaster in 1993 pursuant to the Court Judgment in the City of Barstow et al, v. City of Adelanto et al, in the Riverside County Superior Court Case No. CIV208568 (Judgment), which adjudicated the rights to pump groundwater in the Mojave Basin Area. Watermaster's main responsibilities are to monitor and verify water production for approximately 450 parties (1,700 wells), collect required assessments, conduct studies and prepare an annual report of its findings and activities to the Court. Watermaster also acts as the clearinghouse for recording water transfers, maintains records for all such transfers and reports changes in ownership of Base Annual Production rights to the Court. The BIG footprint is located within the Centro Subbasin of the Mojave Basin Area and is covered by the Judgment.

2.4 Local

County of San Bernardino Countywide Plan

The County adopted the Countywide Plan (CWP) in October 2020. The CWP Policy Plan addresses the physical, social, and economic issues facing the County’s unincorporated portions. **Table 4: Countywide Plan Policy Plan Relevant Goals and Policies** includes the hydrology and water quality-related goals and policies relevant to BIG:

Table 4: Countywide Plan Policy Plan Relevant Goals and Policies	
Number	Goal or Policy
INFRASTRUCTURE & UTILITIES ELEMENT	
Goal IU-1	Water supply and infrastructure are sufficient for the needs of residents and businesses and resilient to drought.
Policy IU-1.8	Groundwater management coordination. We collaborate with watermasters, groundwater sustainability agencies, water purveyors, and other government agencies to ensure groundwater basins are being sustainably managed. We discourage new development when it would create or aggravate groundwater overdraft conditions, land subsidence, or other “undesirable results” as defined in the California Water Code. We require safe yields for groundwater sources covered by the Desert Groundwater Management Ordinance.
Goal IU-3	A regional stormwater drainage backbone and local stormwater facilities in unincorporated areas that reduce the risk of flooding.
Policy IU-3.1	Regional flood control. We maintain a regional flood control system and regularly evaluate the need for and implement upgrades based on changing land coverage and hydrologic conditions in order to manage and reduce flood risk. We require any public and private projects proposed anywhere in the county to address and mitigate any adverse impacts on the carrying capacity and stormwater velocity of regional stormwater drainage systems.
Policy IU-3.2	Local flood control. We require new development to install and maintain stormwater management facilities that maintain predevelopment hydrology and hydraulic conditions.
Policy IU-3.5	Fair share requirements. We require new development to pay its fair share of capital costs to maintain adequate capacity of the County’s regional flood control systems.
HAZARDS ELEMENT	
Goal HZ-1	Natural Environmental Hazards. Minimized risk of injury, loss of life, property damage, and economic and social disruption caused by natural environmental hazards and adaptation to potential changes in climate.
Policy HZ-1.2	New development in environmental hazard areas. We require all new development to be located outside of the environmental hazard areas listed below. For any lot or parcel that does not have sufficient buildable area outside of such hazard areas, we require adequate mitigation, including designs that allow occupants to shelter in place and to have sufficient time to evacuate during times of extreme weather and natural disasters. Flood: 100-year flood zone, dam/basin inundation area Geologic: Alquist Priolo earthquake fault zone; County-identified fault zone; rockfall/debris-flow hazard area, medium or high liquefaction area (low to high and localized), existing and County-identified landslide area, moderate to high landslide susceptibility area) Fire: high or very high fire hazard severity zone
Policy HZ-1.3	Floodplain mapping. We require any new lots or subdivisions partially in, and any new development partially or entirely in 100-year flood zones or 100-year flood awareness areas to provide detail floodplain mapping for 100- and 200-year storm events as part of the development approval process.

Table 4: Countywide Plan Policy Plan Relevant Goals and Policies	
Number	Goal or Policy
Policy HZ-1.4	500-year flood zone. We may collaborate with property owners in the Valley region to establish funding and financing mechanisms to mitigate flood hazards in identified 500-year flood zones.
NATURAL RESOURCES ELEMENT	
Goal NR-2	Water Quality. Clean and safe water for human consumption and the natural environment.
Policy NR-2.4	Wastewater discharge. We apply federal and state water quality standards for wastewater discharge requirements in the review of development proposals that relate to type, location, and size of the proposed Project in order to safeguard public health and shared water resources.
Policy NR-2.5	Stormwater discharge. We ensure compliance with the County’s Municipal Stormwater NPDES (National Pollutant Discharge Elimination System) Permit by requiring new development and significant redevelopment to protect the quality of water and drainage systems through site design, source controls, stormwater treatment, runoff reduction measures, best management practices, low impact development strategies, and technological advances. For existing development, we monitor businesses and coordinate with municipalities.
<i>Source: County of San Bernardino. (2020). Countywide Plan. Retrieved from https://countywideplan.com/.</i>	

The CWP Policy Plan includes the following Policy Maps that address hydrology and water quality:

- Policy Map IU-2 Groundwater Basins: This map depicts County areas with:
 - SGMA very low, low, medium, and high Groundwater Basin Prioritization,
 - Over drafted groundwater basins, and
 - Adjudicated groundwater areas.
- Policy Map IU-4 Regional Flood Control Facilities: This map depicts the County’s channels, basins, dams, and Flood Control District Zones.
- Policy Map HZ-3 Dams & Basin Hazards: This map depicts the County’s:
 - Dam inundation areas,
 - Dam jurisdiction areas, and
 - Dams with low, significant, and high hazard potential.
- Policy Map HZ-4 Flood Hazards: This map depicts County areas within a California DWR 100-year flood zone, FEMA 100-year flood zone, and FEMA 500-year flood zone.¹⁶
- Policy Map HZ-11 Wind Erosion Hazards: This map depicts County areas with low, low-medium, medium, medium-high, and high wind erodibility potential.

Codified Ordinances of the County of San Bernardino Municipal Code

The Codified Ordinances of the County of San Bernardino (County Code) regulations addressing hydrology are provided below.

County Code Title 8 Division 5 Chapter 85.07: Flood Hazard Development Reviews and Title 3 Division 5 Chapter 1: Pollutant Discharge Elimination System Regulations. This chapter requires a Floodplain Development Standards Review before approval of a land use application or issuance of a development

¹⁶ The map reflects FEMA flood map data as of April 2017 and is only intended for general reference as part of the CWP.

permit in specified flood areas or where required by the Director of Public Works or the Building Official. Additionally, County Code Title 3, Division 5, Chapter 1, Pollutant Discharge Elimination System Regulations requires any discharger associated with construction activity subject to any NPDES General Permit issued by the U.S. EPA, the SWRCB, or RWQCB, shall comply with all requirements of such permit. Upon demand by County Director, such discharger shall provide County proof of coverage under such permit. Proof of coverage under such permit may also be required prior to issuance of any County permit, including, but not limited to, grading, building, or occupancy permits. Proof of coverage shall be in a form acceptable to the County Director. This Ordinance ensures the protection of health and safety of, and promote the welfare of, the County's inhabitants by controlling non-stormwater discharges to the stormwater conveyance system, and by reducing pollutants in stormwater discharges, including those pollutants taken up by stormwater as it flows over urban areas, to the maximum extent practicable to achieve applicable receiving water quality objective.

Technical Guidance Document for WQMPs

In compliance with the NPDES General Permit for San Bernardino County, the San Bernardino County Areawide Storm Water Program prepared the Technical Guidance Document for Water Quality Management Plans (WQMP) by new development and major redevelopment projects of specific land uses and sizes in the County. A WQMP is required as part of the permit process and commits the Master Developer and/or Site Developer, as applicable, to the implementation of long-term BMPs for use during the operation of a project. It should be noted that WQMPs typically identify permanent BMPs that would be in use during a project's operational life cycle. Individual WQMPs need to identify pollutants of concern based on the proposed land use and site activities, as well as select applicable site design, source control, and treatment control BMPs that would effectively prohibit non-stormwater discharges from entering the storm drain system and that would reduce the discharge of pollutants from stormwater conveyance systems to the maximum extent possible. The WQMP also calls for the on-site retention of stormwater to prevent hydrologic conditions of concern, which refer to flooding, erosion, scour, sedimentation, natural habitat impacts, vegetation stress, slope stability, water quality degradation, and altered flow regime at downstream water channels/bodies that may occur if the storm drainage facilities have not been engineered to their ultimate capacities or if natural conditions are present. However, the Technical Guidance Document also designates "hydrologic conditions of concern-Exempted Areas," which are areas where the hydrologic conditions of concern analysis is not required if the following occurs: a sump condition; predevelopment runoff would equal post-development runoff; stormwater is diverted to a storage area; disturbance is less than one acre; or the watershed area is built out (i.e., 90 percent developed).

San Bernardino County Municipal Separate Storm Sewer System Permit

In compliance with the requirement to develop a Stormwater Management Program, San Bernardino County has developed a Stormwater Management Program for the Mojave River area, in conjunction with the Town of Apple Valley and the cities of Victorville and Hesperia. The Phase II MS4 covers the watershed's urbanized area, including the City of Barstow. The Stormwater Management Program was developed under NPDES General Permit Number CAS000004 requirements. The purpose of the program is to keep the Mojave River clean to the maximum extent practicable utilizing BMPs to reduce stormwater runoff and non-stormwater runoff flowing in the Mojave River. The plan also serves to keep contamination, such as sediment, non-sediment solids, nutrients, pathogens, oxygen-demanding substances, petroleum hydrocarbons, heavy metals, floatables, polycyclic aromatic hydrocarbons,

pesticides, herbicides, and trash from entering the storm drain system pursuant to the Trash Amendments.

The City of Barstow obtains coverage under the County's Phase II MS4 permit. The City is individually responsible for complying with the County's Stormwater Management Program requirements including, but not limited to, establishing a stormwater management plan, implementing BMPs, conducting regular inspections, ensuring compliance with TMDLs and local stormwater ordinances, and filing annual reports and monitoring data to the State Water Board.

City of Barstow 2020 General Plan

The City adopted the City of Barstow 2015-2020 General Plan (2020 General Plan) in February 2015. The 2020 General Plan is the overarching guide for implementation of the Development Code, which defines development regulations and establishes zoning districts throughout the City.

Table 5: 2020 General Plan Relevant Goals and Policies – Hydrology and Water Quality includes the hydrology-related goals and policies relevant to BIG:

Table 5: 2020 General Plan Relevant Goals and Policies – Hydrology and Water Quality	
Number	Goal or Policy
RESOURCE CONSERVATION AND OPEN SPACE ELEMENT	
Goal 1	Ensure protection of water quality and quantity for the community by working in cooperation with all water purveyors in the area to preserve, augment, capture and purify all waters in the Mojave River system.
Policy 1 A	Ensure a water supply system capable of meeting normal and emergency demand through cooperation between the City and water purveyors.
Policy 1 B	Ensure protection of water quality and quantity for the community by working in cooperation with all water purveyors in the area to preserve, augment, capture and purify all waters in the Mojave River system.
Policy 1 C	Strive to ensure that adequate water remains available to the community in order to maintain continued growth.
Policy 1 E	Maintain a storm drainage system adequate to protect the lives and property of Barstow residents.
<i>Source: City of Barstow. (2014). City of Barstow General Plan. Retrieved from https://www.barstowca.org/departments/community-development-department/planning/general-plan-and-master-environmental-impact-report</i>	

Code of the City of Barstow

The Code of the City of Barstow (Barstow Code) regulations addressing hydrology and water quality are provided below.

Barstow Code Chapter 13.40: Water Conservation Plan. This chapter applies to all water users; water users being those persons, customers and property served within the incorporated boundaries of the City. Water users are deemed to have under control at all times their water distributions and facilities and to know the manner and extent of their water use and excess runoff. This chapter lists water uses prohibited and new development standards as well as exceptions and penalties. New development standards include the suggested and encouraged use of drought tolerant plant species for landscaping purposes and encouragement to large water users to implement water recycling and reuse processes.

Barstow Code Chapter 15.14: Stormwater and Urban Runoff Pollution Control. The purpose of this chapter is to ensure the future health, safety and general welfare of the citizens of the city and the water

quality of the receiving waters and surrounding areas by: (1) Reducing pollutants in stormwater discharges to the maximum extent practicable; (2) Regulating illicit connections and illicit discharges and thereby reducing the level of contamination of stormwater and dry weather runoff into the MS4; and (3) Regulating non-stormwater discharges to the MS4. Prohibited activities are listed as are requirements for industrial/commercial and construction activities.

Barstow Code Chapter 15.16: Floodplain Management. This chapter applies to all special flood hazard areas as defined in this chapter within the jurisdiction of the City. This chapter includes provisions for flood hazard reduction including standards of construction; standards for utilities; standards for subdivisions and other proposed development; standards for manufactured homes and recreational vehicles; and for floodways. Since floodways are an extremely hazardous area due to the velocity of floodwaters, which carry debris, potential projectiles, and erosion potential, the following provisions of Barstow Code § 15.16.050(f) apply:

- (1) Until a regulatory floodway is adopted, no new construction, substantial development, or other development (including fill) shall be permitted within Zones A1-30 and AE, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other development, will not increase the water surface elevation of the base flood more than one foot at any point within the City.
- (2) Within an adopted regulatory floodway, the city shall prohibit encroachments, including fill, new construction, substantial improvements, and other development, unless certification by a registered civil engineer is provided demonstrating that the proposed encroachment shall not result in any increase in flood levels during the occurrence of the base flood discharge.
- (3) If subsections (f)(1) and (2) of this section are satisfied, all new construction, substantial improvement and other proposed new development shall comply with all other applicable flood hazard reduction provisions of this chapter.
- (4) Prohibit the placement of any manufactured home, temporary or permanent.

3.0 METHODOLOGY FOR EVALUATING IMPACTS

This section identifies the methods used to evaluate the effects of BIG on the hydrologic and hydraulic parameters associated with the Mojave River, Lenwood Channel, and the Unnamed Tributary to the Mojave River passing through the existing BNSF mainline at Bridge 10.9. The Lenwood Channel and Unnamed Tributary to the Mojave River water features are the main jurisdictional conveyance locations for runoff flowing toward the Mojave River through BIG. The reconstruction of the Hinkley Road bridge over the Mojave River is an off-site improvement that is also analyzed in this section.

3.1 Definition of BIG footprint

The BIG footprint is the area that would be physically affected by BIG construction, operations, and maintenance (including temporary disturbance) and the location of permanent improvements, including exiting railroad alignment, column sites for aerial structures, road overcrossing and undercrossing sites, construction-related facility sites, such as equipment staging area, borrow and disposal areas, access roads, and utility yards or components. BIG includes the limits of cut-and-fill plus all access roads and areas required for operating, storing, and refueling construction equipment and areas for construction. Within BIG are the elements needed to construct, operate, and maintain all permanent project features.

BIG footprint includes the area where BIG could directly or indirectly and temporarily or permanently affect the hydraulic parameters associated with the main jurisdictional conveyance locations. This includes the capacity of hydraulic structures and channels as well as drainage patterns for BIG and the anticipated impact on local area residences and businesses.

3.2 Definition of Study Area

The study area is the geographic area(s) in which potential effects on environmental resources are described and for which the environmental investigations were conducted specific to each resource topic. The analysis considers resources within the study areas defined **Table 6: Definition of Study Areas**.

Table 6: Definition of Study Areas	
Study Area	Study Area Boundary
Surface Water Study Area --Surface Water Quality; Erosion/ Siltation; Flood Hazard; Tsunami; and Seiche Zones	BIG footprint, plus 250-foot buffer, and downstream water resources that receive runoff and sediment from BIG footprint.
Groundwater Study Area -- Groundwater Quality; Supplies; Groundwater Management	BIG footprint and aquifer(s) underlying BIG footprint.
Flooding and Stormwater Drainage Study Area -- Flooding; Stormwater Drainage Capacity; Flood Flows	BIG footprint, plus 250-foot buffer
Note: ¹ FEMA = Federal Emergency Management Agency	

3.3 Methodology for Impact Analysis

Surface and Ground Water Quality

Concerning BIG's potential to violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality, the analysis was conducted through

review of available water quality standards and from professional judgement from qualified individuals in accordance with the project design features and BMP implementation. Temporary (construction) and permanent (operational) BMP design was considered with regard to this analysis. Specifically, the characteristics and the means and methods of these BMPs were considered along with potential pollutants and stormwater volumes within BIG footprint.

Groundwater Supply and Recharge

Concerning BIG's potential to decrease groundwater supplies or interfere with groundwater recharge, the analysis was conducted through review of available groundwater data from the local water district and the USGS as well as professional judgement from qualified individuals in accordance with project design features and BMP implementation. Temporary (construction) and permanent (operational) BMP design was considered with regard to this analysis. Additionally, impervious and pervious surface construction and infiltration capacity of BIG's features were analyzed. Specifically, the characteristics of and the means and methods of these BMPs were considered, including the conceptual sizing and location of detention basins.

Alteration of Drainage Pattern

Effects related to hydrology and hydraulic variables have been analyzed, based on alterations to existing drainage patterns, which could result in erosion or siltation, on- or off-site flooding, exceedances of stormwater drainage system capacities, and impedance/redirection of flood flows (refer to **Section 5.0: Environmental Setting** and **Section 7: Hydraulics Analysis**). The analysis was conducted through the thorough review of published information for BIG, in-house engineering analysis, and professional judgment in accordance with the current standard of care for hydraulic engineering and the hydrology design manual for San Bernardino County, California. The analysis of impacts considers both temporary (construction) and permanent (operational) effects for each impact criteria. The impact conclusions consider the potential for changes in the environmental conditions and compliance with the federal, state, regional, and local regulatory framework.

Qualitative and quantitative analyses included review of primary and secondary hazard effects. Analysis included review and assessment of published maps, professional publications, and reports pertaining to BIG hydrology and hydraulics to describe the affected environment and evaluate BIG's potential environmental effects on existing flood flows and the potential to alter said flows. Additionally, infiltration and flood control capacity of water courses to be improved would be analyzed. The following summarizes the sources used in this analysis to evaluate potential effects:

- U.S. Geological Survey (USGS) 1/3 arc-second National Elevation Data
- FEMA NFIP Flood Insurance Study Volumes 1-4 for San Bernardino County California and Incorporated Areas
- Natural Resources Conservation Service soils maps and data
- 2017 San Bernardino County LiDAR

Pollutant Release due to Inundation

Analysis of BIG's location relative to flood hazards such as floodplains and dam inundation areas as well as features that could cause tsunami or seiche were analyzed. Data within the public domain, such as maps and data from FEMA and the Army Corps of Engineers were utilized to determine inundation areas while satellite imagery was utilized to determine BIG's proximity to open waters, such as the Pacific Ocean,

and lakes or ponds. This information was then used to analyze BIG's ability to release pollutants resultant of construction or operational practices when considering the temporary and permanent BMPs that would be implemented.

Obstruction of Applicable Plans

Concerning BIG's potential to conflict with or obstruct the implementation of a Basin Plan or sustainable groundwater management plan, the analysis was conducted through the thorough review of Project plans, applicable laws, rules, and ordinances, and data available from public agencies. Specifically, Project specific construction document requirements were reviewed and entitlement level design documents were considered when evaluating BIG's potential impacts.

3.4 Determining Significance Criteria under CEQA

California Environmental Quality Act (CEQA) significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as hydrology and water quality. According to State CEQA Guidelines Appendix G, a project would normally result in a significant effect on the environment if it would impact the hydrology and hydraulic thresholds listed below:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?
- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
 - result in a substantial erosion or siltation on- or off-site;
 - substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
 - create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
 - impede or redirect flood flows?
- In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?
- Conflict with or obstruct implementation of a Basin Plan or sustainable groundwater management plan?

In addition to the questions identified under Hydrology and Water Quality in the Environmental Checklist Form this section also addressing one question under the Utilities and Service Systems section of the Environmental Checklist Form. As such, the Project would have a significant effect on the environment if it would:

- Require or result in the relocation or construction of new or expanded stormwater facilities, the construction or relocation of which could cause significant environmental effects.

4.0 ENVIRONMENTAL SETTING

This section describes the existing major water features impacted by BIG and is organized to discuss the hydrologic variables, hydraulic parameters, and floodplain setting within BIG footprint for Lenwood Channel, Milepost (MP) 10.9 - Unnamed Tributary to the Mojave River, and the Mojave River at Hinkley Road.

4.1 Floodplain Setting

BIG is in southern California, an arid region in the Mojave Desert where the average annual rainfall is approximately 5.7 inches per year. It is located at the confluence of the Mojave River floodplain and the Lenwood Channel floodplain. The topography is relatively flat between the existing main lines and Mojave River with low relief. The terrain between the existing mainline and Nation Trails Highway has moderate relief with Main Street being higher in elevation.

The BIG footprint would intersect regulatory floodplains in the vicinity of Lenwood Channel. There are no regulatory floodways located within BIG component footprint. The regulatory floodplain crossing locations were identified based on the Flood Insurance Study (FIS) for San Bernardino County, California and Incorporated Areas. Geographic Information System software was used to overlay BIG extents with the most currently available FEMA Digital Flood Insurance Rate Maps. The existing floodplain for Lenwood Channel is not contained within the manmade channel and inundates populated areas of Lenwood and Barstow. Hydraulics analysis for the Lenwood Channel improvements is provided in Section 6 of this report.

The western half of BIG is situated in a Zone D floodplain as delineated by the County of San Bernardino, California and the Incorporated Areas FIS. Zone D is defined in the FIS as the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible. Hydraulic analyses were not performed for this area as part of the FIS; therefore, published base flood elevations were not identified.

The Lenwood Channel crossing in the eastern half of BIG is designated as a Zone AE flood zone without a defined floodway. Zone AE is defined in the FIS as an area that corresponds to the one-percent annual chance floodplain determined using detailed methods. Overbank areas in the vicinity of Lenwood Channel are designated as Zone AO which indicates areas of shallow flooding where the average depth is between 1 and 3 feet.

Hydrology

Surface water features are present within BIG and generally flow in a south to north direction toward the Mojave River. The Mojave River lies north of BIG but is outside of BIG. Delineations identified water features in BIG that are potentially jurisdictional to the Corps, RWQCB, and CDFW. BIG supports approximately 142.36 acres (301,452 linear feet) of potential non-wetland waters of the U.S./State jurisdictional by the U.S. Army Corps of Engineers (USACE) and Regional Water Quality Control Board (RWQCB), respectively, and approximately 594.42 acres of vegetated streambed, 55.13 acres of unvegetated streambed (301,452 linear feet of vegetated and unvegetated streambed combined), and 75.47 acres of watercourse jurisdictional by the California Department of Fish and Wildlife (CDFW).. No Section 10 navigable waters of the U.S. were identified within BIG, refer to the Rivers and Harbors Act in **Section 2.0: Laws, Regulations, Orders** (33 U.S. Code [U.S.C.] § 403). All features were described as non-

wetland waters. Refer to the **Appendix 5.4 BIG-1: Barstow International Gateway Biological Resources Technical Report**.

The Mojave River lies north of BIG and transects the surface water study area from the west and southwest to the east. The Mojave River headwaters originate on the San Bernardino Mountains' northern slope, continue through surface and subsurface flow through the Mojave Desert, and terminate at Soda Lake near Baker (Lahontan Regional Water Quality Control Board, 2019).

Multiple Lenwood Channel discharges were evaluated as part of this analysis including the published FEMA FIS discharges and a bulked 100-year discharge approved by San Bernardino Flood Control District (SBCFCD) and the City of Barstow.¹⁷ Lenwood Channel has a contributing drainage area of 140 square miles. The 100-year discharge presented in the FIS was evaluated in accordance with the NFIP to identify impacts associated with the development. The FIS discharge compares favorably to supporting data provided by the SBCFCD for the original construction of the existing Lenwood Channel and the existing BNSF Bridge 6.5 design. The unbulked 100-year discharge was used to design bridge crossing and size the channel and a 20 percent bulking factor was applied to determine a bulked discharge due to the basin characteristics upstream. This bulked discharge was analyzed to determine how the proposed channel geometry and bridge configurations would accommodate a flood event of that magnitude to meet the needs of the SBCFCD and ensure that outages in service would be minimized in those conditions.

Peak discharges for the 38.5-square-mile drainage area associated with the Unnamed Tributary to the Mojave River at MP 10.9 were not included in the FEMA FIS. Therefore, discharges for this crossing and the unbulked discharge described for Lenwood Channel were estimated using the unit hydrograph and flood hydrograph routing features within CivilDesign software as recommended by the SBCFCD. Rainfall distributions were generated with rainfall data obtained from National Oceanic and Atmospheric Administration Atlas 14. Basin Lag times were calculated within the CivilDesign software using the lag equation. Curve numbers were calculated for Land Cover with values obtained from Table C-3 in the San Bernardino County Hydrology Manual. Depth area reductions were applied withing the software and are based on SBC Hydrology Manual.

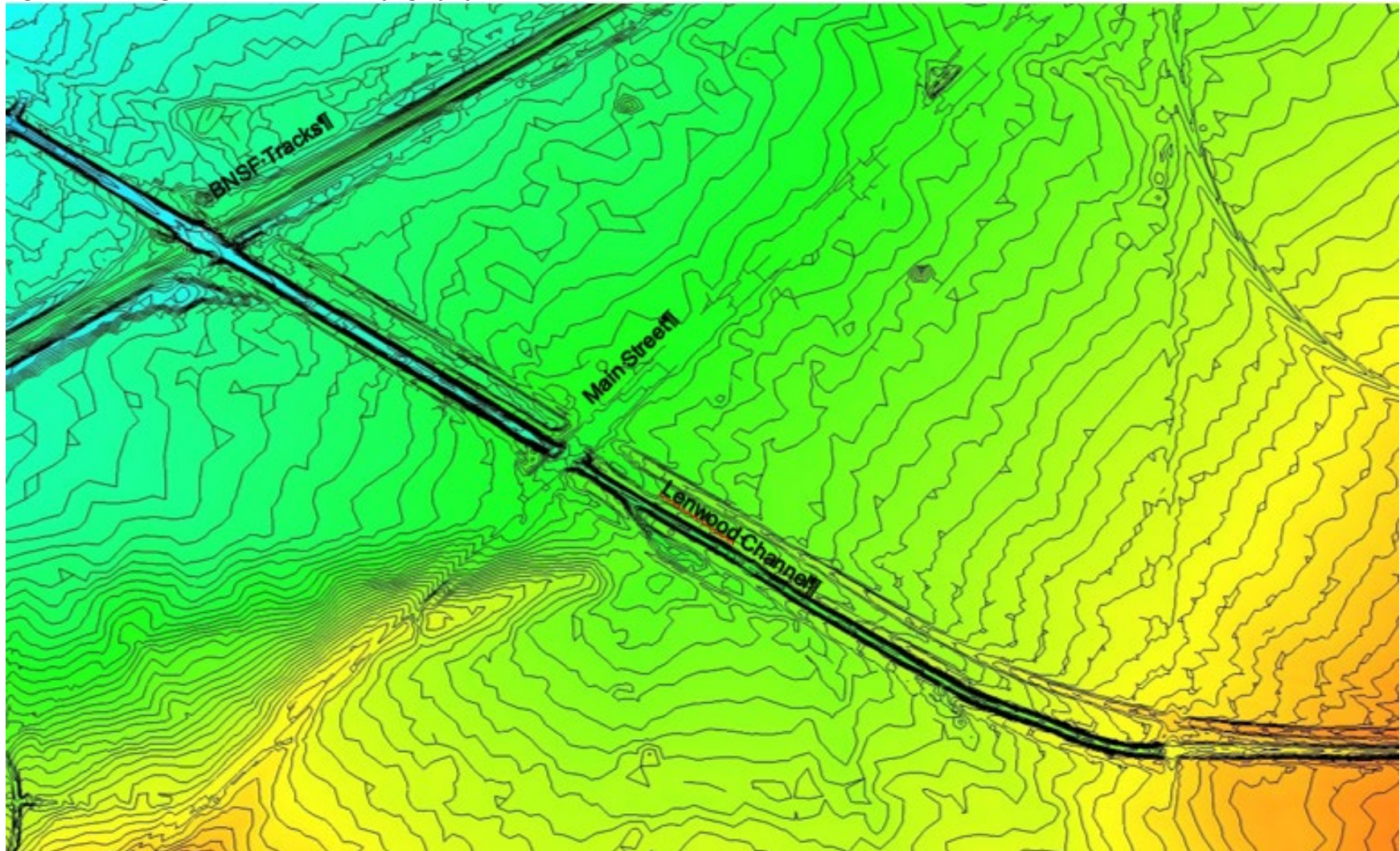
Lenwood Channel

Lenwood Channel is a relatively straight, levied channel, maintained by the San Bernardino Flood Control District and was constructed in 1977. The existing main channel is trapezoidal with an average bottom width of 25 feet and average depths of 6 – 10 feet. The existing railroad bridge spanning Lenwood Channel at MP 6.5 consists of a 4-span, 118-foot-long Ballast Deck Prestressed Concrete Bridge. The bridge is supported by standard H-pile bents with concrete caps, aligned with flow and skewed to the track alignment. Lenwood Channel has a mapped FEMA floodplain (without floodway) that is over 3 miles wide, extending from approximately MP 4.0 to MP 7.1. The model received from FEMA consists of HEC-2 code and does not directly simulate the interconnected overflow structures (MP 7.0, MP 5.1, and MP 4.9) with the main channel at MP 6.5 and therefore was not well suited to evaluate the cumulative project impacts for Lenwood Channel. Due to the floodplain complexity and interconnected nature of the structures, a 2-dimensional hydraulic model was created using SRH-2D software. SRH-2D software is well suited for

¹⁷ Bulk discharges refer to the discharge of water when considering sediment-laden waters. Unbulked discharge considers clear water. Discharges estimated using standard rainfall-runoff procedures typically do not account for the presence of sediment in the flow. At high sediment loads, the total volume of the water/sediment mixture, and thus, the peak design discharges, can be substantially higher than the corresponding clear-water values.

scenarios with complex floodplains, flow diversion, multiple channel systems, and interconnected hydraulic structures. The 2-dimensional hydraulic model was developed based on available data, including project survey supplemented with 2013 LiDAR obtained from the San Bernardino Flood Control District. Surface-water Modeling System version 13.0 software by Aquaveo was utilized to generate output data for the SRH-2D software. **Figure 6: Existing Lenwood Channel Topography** shows the existing topography in the vicinity of Lenwood Channel.

Figure 6: Existing Lenwood Channel Topography



Source: 2013 San Bernardino County LIDAR

The main channel passes through MP 6.5; however, a significant portion of flow is conveyed by BNSF Bridge 7.0 located west of the main channel. Additionally, diversion from the main channel occurs upstream of BIG with flow passing over Lenwood Road and eventually reaching culverts at MP 5.1 and 4.9 located east of the main channel. Hydraulic modeling shows the existing structures are undersized and track overtopping occurs during a 100-year event near MP 7.0. The structure beneath Main Street that conveys Lenwood Channel consists of a series of pipes that allow the location to function as a low water crossing with frequent overtopping during rain events. A portion of the flow conveyed through MP 7.0 is a result of this overtopping as the runoff is forced out of the Lenwood Channel. The 2-dimensional hydraulic model was used to determine the actual existing floodplain extents experienced with the FEMA FIS discharges. Figures depicting floodplain are presented in **Appendix B: Lenwood Channel Analysis Exhibits**.

Unnamed Tributary to Mojave River at MP 10.9

Bridge 10.9 is located over an unnamed tributary to the Mojave River and a FEMA designated Zone D area. Zone D signifies areas where there are possible but undetermined flood hazards. No hydraulic models were available for this area from FEMA. The main channel near BNSF mainline is trapezoidal with an average bottom width of 30 feet and average depths of 4-7 feet. The existing railroad bridge consists of a four span Ballast Deck Prestressed Concrete approximately 114 feet long with vertical concrete spill slope abutments. The bridge is a ballast deck structure supported by concrete piers as shown in **Figure 7: Existing Mainline Bridge 10.9**. Due to the floodplain complexity and interconnected nature of the structures, a 2-dimensional hydraulic model was created using SRH-2D software in a similar manner to what was described for Lenwood Channel.

Runoff from the basin flows over Main Street as shallow concentrated flow and that becomes well defined between the highway and BNSF Railway's mainline track. A manmade berm channelizes flow and directs it more efficiently to the bridge at MP 10.9. During large flood events this berm is inundated and flow bypasses toward the mainline overtopping the tracks near MP 10.7 where no hydraulic structure is present. The channel upstream of Main Street consists of shallow flow with multiple small channels draining high relief topography. A portion of the flow diverts to the south, by both overland flow and flow down Main Street, to BNSF Culvert 11.3. The 2-dimensional hydraulic model was used to determine the existing floodplain extents. Figures depicting existing floodplain are presented in **Appendix C: Unnamed Tributary to the Mojave River (MP 10.9) Analysis Exhibits**.

Figure 7: Existing Mainline Bridge 10.9



Source: TranSystems, 2023

Mojave River at Hinkley Road

Hinkley Road crosses the Mojave River just west of BIG. This reach of the Mojave River is designated by FEMA as a Zone D area. Zone D signifies areas where there are possible but undetermined flood hazards. No hydraulic models were available for this area from FEMA. The San Bernardino County has indicated that the Hinkley Road bridge over the Mojave River has experienced structural issues in the past. The roadway approaches on both sides act as overflow banks during moderate flood events. The Mojave River channel beneath the existing bridge is approximately 120 feet wide. A 2-dimensional hydraulic model was used to determine the existing floodplain extents. Figures depicting existing floodplain are presented in **Appendix D: Mojave River (Hinkley Road) Analysis Exhibits**.

The existing Hinkley Road Bridge has less than a 10-year level of service. This is due in part to the roadway northwest of the Hinkley Road Bridge having a lower elevation than at the bridge. In addition, the roadway northwest of the bridge is on grade and has no raised roadway embankment, so any overbank flow goes over the roadway. The existing Mojave River floodplain extends approximately 1,200 feet northwest of the bridge (measured along the road).

Floodplains

CWP Policy Map IU-4: Regional Flood Control Facilities depicts County channels, basins, dams, and Flood Control District Zones. This map shows that BIG would be within the boundaries of Flood Control District 4. The Flood Control District is managed by the Public Works Department of the County. Flood Control District 4 consists of 1,783 square miles and includes the Mojave River Valley from the San Bernardino Mountains to Silver Lakes. This includes the cities/towns of Adelanto, Apple Valley, Barstow, Hesperia, and Victorville and all or portions of the communities of Baker, Baldy Mesa, Daggett, Desert Knolls, El Mirage, Helendale, Hinkley, Hodge, Lenwood, Oro Grande, Phelan, Pinon Hills, Silver Lakes, Spring Valley Lake, Wrightwood, and Yermo (County of San Bernardino Department of Public Works, N.D). Additionally, BIG is included on FEMA Flood Insurance Rate Map (FIRM) Panels 06071C4507H and 06071C4526H (August 28th, 2022). These maps identify BIG existing within Zones AO, AE, and D.

Zone AO is defined by FEMA as a river or stream flood hazard areas, and areas with a 1 percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

Zone AE is defined by FEMA as the base floodplain where base flood elevations are provided on the FIRM.

Zone D is defined by FEMA as an area with possible but undetermined flood hazards. No flood hazard analysis has been conducted for these areas.

Lenwood Channel crosses the floodplain study area at the northeastern extent of BIG. Lenwood Channel at the location of the crossing is designated as a Zone AE flood zone without a defined floodway. Zone AE is defined in the Flood Insurance Study as an area that corresponds to the one percent annual chance floodplain determined using detailed methods.

Surface Water Quality

Existing Surface Water Quality

This section identifies existing water quality within the surface water study area that may be affected by BIG implementation. BIG is in a largely rural setting, with agricultural land uses within BIG and near the southern limit and commercial and residential land uses within BIG and near the northern limit in Barstow. Pollutant sources in BIG's surface water study area include the following:

- Agricultural fields
- Parking lots and streets
- Residential, commercial, and industrial development
- Exposed earth at construction sites
- Un-landscaped, undeveloped areas
- Petroleum-fueled railroads

Additionally, the existing BNSF railroad corridor traverses the surface water study area. Petroleum-fueled trains braking on the railroad release brake dust, which consists of fine metal particulates—primarily iron—but may also include copper, silicon, calcium, manganese, chromium, and barium (Moreno et al, 2014). Although brake dust from existing trains consists primarily of particulate metals, some of these metals could become dissolved in stormwater. Brake dust is generated primarily in locations where trains reduce travel speed, such as approaches to existing stations, turns, and elevation changes; this would occur within BIG on the far northern portions where trains would be slowing as they pass through the City, and within the far southern portions where smaller turn radii on the existing rail lines exist. Once dissolved in stormwater some metals can be mobilized to a storm drain or waterbody or infiltrate into the ground. Braking that occurs where the existing rail crosses a waterbody, such as the Lenwood Channel on the northern portion of BIG or other crossings on the southern portion of BIG, can lead to brake dust being discharged into the waterbody.

The BIG footprint is within the jurisdiction of the Lahontan RWQCB and its Basin Plan. The Basin Plan has identified the beneficial uses, applicable TMDLs, and § 303(d) listings, which are discussed the **Section 5.2** below.

Surface Water Beneficial Uses

The water quality of surface water features within BIG's surface water study area is regulated under the Basin Plan. To protect these features, the Lahontan RWQCB has established the beneficial uses supported by each feature, both present and potential. The Lahontan RWQCB has also established the Basin Plan's water quality objectives, which are the limits or levels of water quality constituents or characteristics that are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area. When beneficial uses are impaired by a pollutant that chronically exceeds its water quality objective, the RWQCBs place the waterbody and pollutant on the CWA § 303(d) list of water quality impairments. Once a waterbody is placed on the § 303(d) list, the RWQCBs must begin developing a TMDL program that provides a programmatic response to the impairment in order for the waterbody to meet the water quality objective and continue to support its beneficial uses.

The existing beneficial uses for the Middle Mojave Hydrologic Area identified in the Basin Plan are listed below (LRWQCB, 2021):

- MUN: Waters used for community, military, or individual water supply systems
- AGR: Waters used for farming, horticulture, or ranching
- GWR: Waters used for natural or artificial recharge of groundwater
- FRSH: Waters used for natural or artificial maintenance of surface water quantity or quality
- POW: Waters used for hydroelectric power generation
- REC-1: Waters used for recreational activities involved body contact with water where ingestion of water is reasonably possible
- REC-2: Waters used for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible
- COMM: Waters used for commercial or recreational collection of fish or other organisms
- WARM: Waters that support warm water ecosystems
- COLD: Waters that support cold water ecosystems
- WILD: Waters that support wildlife habitats
- RARE: Waters that support habitat necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened, or endangered
- WQE: Waters that support natural enhancement or improvement of water quality in or downstream of a water body
- FLD: Riparian wetlands in flood plain areas and other wetlands that receive natural surface drainage and buffer its passage to receiving waters.

Table 7: Beneficial Uses of Potentially Affected Waterbodies and Beneficial Use Definitions summarizes the types of beneficial uses of waterbodies in the Middle Mojave Hydrologic Area, in which BIG and the surface water study area are within. Minor surface waters include wetlands, springs, streams, lakes, and ponds.

Table 7: Beneficial Uses of Potentially Affected Waterbodies and Beneficial Use Definitions

Beneficial Use	Definition	Mojave River (Middle Mojave Hydrologic Area)	Minor Surface Waters	Minor Wetlands
MUN	Municipal and Domestic Supply. Beneficial uses of waters used for community, military, or individual water supply systems including, but not limited to, drinking water supply.	X	X	X
AGR	Agricultural Supply. Beneficial uses of waters used for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, and support of vegetation for range grazing.	X	X	X
PRO	Industrial Process Supply. Beneficial uses of waters used for industrial activities that depend primarily on water quality.			
IND	Industrial Service Supply. Beneficial uses of waters used for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection, and oil well re-pressurization.			
GWR	Groundwater Recharge. Beneficial uses of waters used for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.	X	X	X
FRSH	Freshwater Replenishment. Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).			X
NAV	Navigation. Beneficial uses of waters used for shipping, travel, or other transportation by private, military, or commercial vessels.			
POW	Hydropower Generation. Beneficial uses of waters used for hydroelectric power generation		X	
REC-1	Water Contact Recreation. Beneficial uses of waters used 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, white water activities, fishing, and use of natural hot springs	X	X	X
REC-2	Noncontact Water Recreation. Beneficial uses of waters used 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, and aesthetic enjoyment in conjunction with the above activities.	X	X	X
COMM	Commercial and Sportfishing. Beneficial uses of waters used for commercial or recreational collection of fish or other organisms including, but not limited to, uses involving organisms intended for human consumption.	X		

Table 7: Beneficial Uses of Potentially Affected Waterbodies and Beneficial Use Definitions

Beneficial Use	Definition	Mojave River (Middle Mojave Hydrologic Area)	Minor Surface Waters	Minor Wetlands
AQUA	Aquaculture. Beneficial uses of waters used for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, and harvesting of aquatic plants and animals for human consumption or bait purposes.			
WARM	Warm Freshwater Habitat. Beneficial uses of waters that support warm water ecosystems including, but not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.	X	X	X
COLD	Cold Freshwater Habitat. Beneficial uses of waters that support cold water ecosystems including, but not limited to, preservation and enhancement of aquatic habitats, vegetation, fish, and wildlife, including invertebrates.	X	X	X
SAL	Inland Saline Water Habitat. Beneficial uses of waters that support inland saline water ecosystems including, but not limited to, preservation and enhancement of aquatic saline habitats, vegetation, fish, and wildlife, including invertebrates			
WILD	Wildlife Habitat. Beneficial uses of waters that support wildlife habitats including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.	X	X	X
BIOL	Preservation of Biological Habitats of Special Significance. Beneficial uses of waters that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, and Areas of Special Biological Significance (ASBS), where the preservation and enhancement of natural resources requires special protection.			
RARE	Rare, Threatened, or Endangered Species. Beneficial uses of waters that support habitat necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened or endangered.			X
MIGR	Migration of Aquatic Organisms. Beneficial uses of waters that support habitats necessary for migration, acclimatization between fresh and salt water, or temporary activities by aquatic organisms, such as anadromous fish.			
SPWN	Spawning, Reproduction, and Development. Beneficial uses of waters that support high quality aquatic habitat necessary for reproduction and early development of fish and wildlife.			
WQE	Water Quality Enhancement. Beneficial uses of waters that support natural enhancement or improvement of water quality in or downstream of a water body including, but not limited to, erosion control, filtration and purification of naturally occurring water pollutants, streambank stabilization, maintenance of channel integrity, and siltation control.			X

Table 7: Beneficial Uses of Potentially Affected Waterbodies and Beneficial Use Definitions				
Beneficial Use	Definition	Mojave River (Middle Mojave Hydrologic Area)	Minor Surface Waters	Minor Wetlands
FLD	Flood Peak Attenuation/Flood Water Storage. Beneficial uses of riparian wetlands in flood plain areas and other wetlands that receive natural surface drainage and buffer its passage to receiving waters.			X
Source: Lahontan RWQCB. (Amended 2021). Water Quality Control Plan for Lahontan Region, Chapter 2 – Present and Potential Beneficial Uses. Table 2-1. Beneficial Uses of Surface Waters of the Lahontan Region. Retrieved from https://www.waterboards.ca.gov/lahtontan/water_issues/programs/basin_plan/docs/2022/ch2-bu.pdf .				

Water Quality Impairments

The SWRCB develops and updates a list of waterbodies (designated as 303(d) water quality limited waterbodies) that are impaired and do not meet water quality objectives. CWA § 303(d) specifies the requirements for listing impaired waterbodies. TMDLs are developed for listed waterbodies to provide pathways for restoration of waterbody quality. The Final 2024 California Integrated Report (CWA § 303(d) List/305(b) Report) includes 303(d) stream listings and indicates there are none in BIG surface water study area or its immediate vicinity.

- Deep Creek (below lake) for Chloride, Dissolved Oxygen, Phosphate, Sodium, Sulfates, Total Dissolved Solids;
- Holcomb Creek for Fluoride, Sulfates, Total Dissolved Solids;
- Crab Creek for Dissolved Oxygen, Total Dissolved Solids;
- Sheep Creek for Nitrogen, Nitrate, Dissolved Oxygen, Total Dissolved Solids;
- Mojave River (Mojave Forks Reservoir outlet to Upper Narrows) for Fluoride, Sodium, Sulfates;
- Mojave River (Upper Narrows to Lower Narrows) for Fluoride, Manganese, Dissolved Oxygen, Sodium, Sulfates, Total Dissolved Solids; and
- West Fork Mojave River below Silverwood Lake for Chloride, Sodium, Sulfates, Total Dissolved Solids

4.2 Groundwater

Main Subbasin

The Middle Mojave River Valley Groundwater Basin (No. 6-041) (Groundwater Basin) is the main basin in which BIG is located (DWR, 2019). The Groundwater Basin is approximately 211,321 acres, of which approximately 206,613 acres (97.77 percent) are adjudicated (DWR, 2018).

The Mojave River is unreliable for direct water supply along its 100-mile reach, except for a short reach of perennial flow and periods of flow after intense storm events (Stamos et al., 2001). Average precipitation varies across the Groundwater Basin from 4 to 11 inches with the average near 6 inches (DWR, 2003).

Existing Groundwater Quality

Natural recharge of the Groundwater Basin occurs from precipitation, streamflow, and Mojave River surface and subsurface flows. Human-influenced recharge includes percolation of wastewater and septic tank effluent, as well as irrigation water infiltration. The Mojave Water Agency estimated the 1997 to 1998 water year recharge totaled 45,000 acre-feet (DWR, 2003).

Volatile organic compounds, salts, and nitrates have leached into the local groundwater from the Lenwood Landfill. The local Groundwater Basin may also be affected by irrigation with effluent from the Barstow Wastewater Treatment Plant, along with naturally occurring nitrates and salt. Exceedance of TMDL for nitrate near the Community of Hodge and fluoride near the Community of Lenwood have been detected during readings (Ibid.).

Existing Groundwater Levels

Because the Groundwater Basin is over drafted from long-term groundwater production, efforts to manage water levels in the Basin were initiated in the 1990's (Stamos et al., 2001). Basin groundwater levels are monitored by the USGS.

Data from the USGS provides current information on groundwater depths below the ground surface. The available data indicates depth to groundwater generally deepens to the northeast toward Lenwood Road at BIG's eastern extent.

4.3 Existing Local Drainage

Site drainage within the surface water study area is important to water quality especially when the project site must be mitigated due to the regulatory framework discussed in **Section 3 Laws, Regulations, Orders**, particularly requirements set forth by the CGP and the MS4 permit. This section discusses the existing impervious percentage within BIG. This information is important in determining water quality mitigation volumes and flow rates when applicable.

Impervious Area Percentage

The impervious surface area was assessed for existing conditions based on site reconnaissance and aerial imagery. The analysis was performed based on the permanent features identified in BIG footprint. The data sources and assumptions are documented below along with the results of the analysis.

Existing Conditions Over BIG Footprint

2016 National Land Cover Database and aerial photography was used to assess the impervious area and land cover under the existing conditions. The land cover data was evaluated for the permanent BIG footprint. The existing land cover within BIG footprint consists primarily of shrub and unpaved access roads. See **Table 8: Existing Condition Impervious Area Assumptions** below. Overall, considering the amount of this land cover, the existing impervious percentage of the BIG footprint is approximately 5 percent.

Table 8: Existing Condition Impervious Area Assumptions		
Land Cover	Percent Impervious (percent)	Percent Pervious (percent)
Shrub	0	100
Asphalt Roadway	90	10
Unpaved Roadway	0	100
Mainline Track	70	30

4.4 Dam Inundation

Mojave River Dam

The Mojave River Dam is in the San Bernardino Mountains, approximately 32 miles upstream of BIG. In 2018, the Corps performed a periodic assessment and found that during an extreme flood event, water could exceed the design capacity of the dam and overtop it. This could potentially result in dam failure, flooding the communities of Hesperia, Apple Valley, Victorville, and Barstow, adjacent to the Mojave River (Corps, 2019). As a result, the Corps changed the dam's risk characterization from low to high urgency of action. The Corps is evaluating interim risk-reducing measures.

Cedar Springs Dam

Cedar Springs Dam is approximately 34 miles upstream of BIG. BIG is within the inundation boundary for the Cedar Springs Dam. Cedar Springs Dam is a high hazard potential dam and was constructed in 1971. The dam consists of an earth and rockfill type dam. Should dam failure occur, flooding of the communities of Hesperia, Victorville, Apple Valley, Barstow, and other communities adjacent to the Mojave River may occur (DWR, ND). A high hazard potential dam is a dam whose failure or mis-operation would cause loss of human life and significant property destruction.

New Lake Arrowhead Dam

New Lake Arrowhead Dam is approximately 52 miles upstream of BIG. BIG is within the inundation boundary for the New Lake Arrowhead Dam (Ibid.). The New Lake Arrowhead Dam is a high hazard potential dam and was constructed in 1976. The dam is an earthen dam. Should dam failure occur, flooding of the communities of Hesperia, Victorville, Apple Valley, Barstow, and other communities adjacent to the Mojave River may occur (Ibid.).

CWP Policy Map HZ-3: Dams & Basin Hazards depicts the County's dam inundation areas, dam jurisdiction areas, and dams with low, significant, and high hazard potential. The map depicts BIG being within a dam inundation area of the Cedar Springs and Mojave River dams.

5.0 IMPACT ANALYSIS

5.1 Introduction

This section presents the impact analysis relating to hydrology and hydraulic design for BIG. This analysis reviews both the temporary construction phase of BIG and the permanent operation of BIG and the potential for both to directly or indirectly cause potential substantial adverse impacts, including the risk of loss, injury, or death.

5.2 Impacts

Impact 5.10-1 Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Due to the nature of BIG, associated pollutant generation would consist primarily of sediment with other potential contaminants including heavy metals, organic compounds, trash and debris, oxygen demanding substances, and oil and grease from operation and processing equipment/activities. Per the discussion in **Section 3**, BIG would be subject to applicable NPDES water quality requirements of the CGP and the RWQCB Basin Plan. Conformance with these requirements would involve the use of appropriate BMPs during and after construction to address potential impacts associated with the described contaminants as outlined in **Section 6.0**. Additionally, the vehicle maintenance and vehicle cleaning areas of operation would be covered under the IGP.

Construction

BIG construction is anticipated to occur over approximately 34 months, starting third quarter of 2025 and ending in the third quarter of 2028, and would involve civil and site work, bridge and box culvert construction, intermodal infrastructure construction, solar farm construction, shoofly track construction to allow for continued operation of existing rail track, track and signal construction, off-site infrastructure construction, and road reconstruction.

BIG's construction-related activities would include demolition, excavation, grading/earth moving, and trenching, which would displace soils and temporarily increase the potential for soils to violate water quality standards or waste discharge requirements. Any exposed and stockpiled soils could be subject to wind and water erosion, and conveyance into nearby storm drains. On-site water activities for dust suppression could contribute to pollutant loading in runoff from the site. Additionally, BIG construction activities, such as construction equipment maintenance/operation and handling/storage/disposal of materials could contribute to pollutant loading in stormwater runoff from the construction site.

Construction controls to minimize potential water quality impacts would be implemented through compliance with the existing regulatory framework, including the CGP via the NPDES, BIG components not annexed to the City (i.e., remaining in the County) would be subject to NPDES, County Code Title 3, Division 5, Chapter 1, Pollutant Discharge Elimination System Regulations, and areas to be annexed into the City would be subject to Barstow Code Chapter 15.14, Stormwater and Urban Pollution Control, as discussed below. These regulations provide guidance for construction operations and establish

requirements to implement BMPs on site that reduce contamination to surface waters by filtering and settling pollutants and by reducing erosion.

In accordance with NPDES requirements, BIG is required to obtain coverage under the CGP as it would disturb more than one acre of soil. To obtain coverage under the CGP, BIG Applicant (Master Developer and/or Site Developer, as applicable) would be required to file with the State Water Board the Permit Registration Documents, which include a Notice of Intent and other compliance-related documents. The CGP requires development (by a Qualified SWPPP Developer) and implementation of a SWPPP and monitoring plan. These must include erosion-control and sediment-control BMPs that would meet or exceed measures required by the CGP to control potential construction-related pollutants. Erosion-control BMPs are designed to prevent erosion, whereas sediment control BMPs are designed to trap sediment once it has been mobilized. During normal construction operations, the SWPPP and monitoring plan are enforced and inspected by a Qualified SWPPP Practitioner to ensure that adequate protections are in place and maintained throughout construction.

The types of required BMPs would be based on the amount of soil disturbed, the types of pollutants used or stored at the construction site, and proximity to water bodies. The following structural BMPs would be implemented during construction to mitigate water quality degradation. Additional details pertaining to each of the structural BMPs are identified in **Section 7**.

- Silt fence
- Fiber rolls
- Gravel bag berm
- Sandbag barrier
- Tracking controls
- Storm drain/inlet protection
- Sediment basin
- Sediment trap
- Stockpile management
- Check dam
- Diversion berms and drainage swales
- Velocity dissipation devices

The following non-structural BMPs would be used during construction to mitigate water quality degradation. These BMPs would be incorporated into construction site operations and mostly consist of preventative measures that reduce the potential for harmful water quality impacts.

- Scheduling
- Material delivery and storage
- Material use
- Spill control
- Solid waste management
- Hazardous materials/waste management
- Contaminated soil management
- Sanitary/septic waste management
- Liquid waste/drilling fluid management
- Dewatering operations
- Vehicle and equipment fueling
- Concrete waste management
- Temporary stream crossing
- Preservation of existing vegetation
- Hydraulic mulch
- Hydroseeding
- Soil binders
- Straw mulch
- Geotextiles
- Dust control

- Paving operations
- Vehicle and equipment washing
- Soil preparation
- Street/parking lot sweeping

BIG components not annexed to the City (i.e., remaining in the County) would be subject to County Code Title 3, Division 5, Chapter 1, Pollutant Discharge Elimination System Regulations, which provides guidance for construction operations and establish requirements to implements BMPs onsite that reduce contamination to surface waters by filtering and settling pollutants and by reducing erosion. BIG components within City limits (existing and proposed annexation) would be subject to Barstow Code Chapter 15.14, Stormwater and Urban Pollution Control, which protects and enhances the quality of receiving waters in a manner pursuant to and consistent with applicable federal, state, and local laws, regulations, and permits.

Additionally, portions of construction would be required in areas which are jurisdictional to the USACE pursuant to § 404 of the CWA and the RWQCB pursuant to § 401 of the CWA. BIG's impacts to these jurisdictional features and measures to be implemented are discussed in detail in **Appendix 5.4**. Further, should dewatering be required, BIG would be required to comply with the SWRCB General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality (Low-Threat Discharge General Permit).

Following compliance with the established regulatory framework as presented above, which includes compliance with NPDES and CGP requirements (i.e., implementation of a SWPPP with BMPs as required for construction or demolition activities resulting in land disturbance of equal to or greater than one acre), and includes compliance with County Code and Barstow Code requirements, BIG construction would not violate any water quality standards or waste discharge requirements, or otherwise substantially degrade surface or groundwater quality during construction. Therefore, a less than significant impact would occur in this regard, and no mitigation is required.

Operations

BIG operations would involve the operation of a rail yard, new mainlines, an intermodal facility, a block swap yard, a solar farm, and other appurtenant uses. During normal operations of these uses there may be materials, fluids, or other pollutants which may be captured within stormwater runoff and transferred into surface water reaches.

Stormwater pollutants that would be produced during BIG operation would consist primarily of sediment with other potential contaminants including heavy metals, organic compounds, such as polycyclic aromatic hydrocarbons from diesel combustion, trash and debris, oxygen demanding substances, and oil and grease from operation and processing equipment/activities and petroleum-based vehicles. New potential sources of pollutants may be introduced in the footprint for BIG through the addition of locomotives, railcars, and parked vehicles.

Brake dust would be generated by rail braking, which would result in heavy metals being introduced within BIG's footprint and surrounding area. Additional impervious surfaces could lead to runoff of these pollutants into the surrounding environment, including waterbodies in the vicinity, specifically the Mojave River. Numerous Phase II Environmental Site Assessments were conducted within the BIG footprint (see **Appendix 5.9**). As discussed in **Appendix 5.9**, there are no exceedances of rail-related pollutants except for isolated point sources (i.e., a petroleum canister at an existing commercial use within the BIG footprint).

Therefore, existing rail operations do not result in exceedances of rail-related pollutants. While BIG would result in increased rail operations within the BIG footprint, potential water quality impacts would be minimized through detention and treatment basins which would include oil/water separators and other physical barriers and components to screen or treat runoff.

The presence and use of petroleum-based vehicles, such as locomotives, maintenance vehicles, and heavy-duty trucks, would also increase the potential for associated hydrocarbon contaminants to occur on-site. BIG would construct hazardous waste pits, which would be incorporated into loading dock designs, to temporarily store and dispose of associated THP waste from heavy-duty diesel trucks. The trucks would enter the loading dock onto a leaky container pit at a downward slope so that any leaks would drain into the drain and valve feature of the hazardous waste pit. The hazardous waste pit would also include a leaky container pit retaining wall to further protect THP waste from being released on-site. Refer to **Appendix 5.9**, for discussion of hazardous waste disposal. Specifically related to the refueling of switcher locomotives, a direct-to-locomotive fueling process would occur. Direct-to-locomotive fueling would occur within two designated locations in the BIG rail yard and would include design features such as drainage liners and sluice gates with shut-off valves to minimize potential impacts in the event of a fuel spill. Direct-to-locomotive fueling being restricted to specific locations within the rail yard would ensure that BMPs are in place to capture, treat, and manage any pollutants resultant of fueling that may be captured by stormwater runoff.

As it is not currently quantifiable, it is assumed that the total concentration of pollutants produced as a result of braking and diesel combustion and operation and maintenance of petroleum-based vehicles which could be discharged into surface and ground waterbodies would be significant; however, a WQMP would be prepared for the BIG project in accordance with the San Bernardino Technical Guidance Document for Water Quality Management Plans. With the implementation of use-specific BMPs, to be incorporated into the WQMP, all pollutants captured would be treated prior to discharge so that concentrations would be within acceptable limits and would not violate applicable water quality standards. The total amount of brake dust, polycyclic aromatic hydrocarbons, and petroleum hydrocarbons generated by the Project would be a function of the total train/locomotive activity within the BIG footprint. As discussed in **Section 3.0: Project Description** of this Draft EIR, the block swap yard would process approximately 250 inbound and 209 outbound trains over an average 2-week period in Opening Year 2028, and 364 inbound trains and 317 outbound trains over an average 2-week period in Horizon Year 2048. However, the actual generation of pollutants would be determined by multiple factors including but not limited to the number of times a train moves throughout the site, maintenance regularity of train cars and locomotives and petroleum-based vehicles, environmental conditions, among others. However, with the implementation of the WQMP, target pollutant loads would be determined and use-specific BMPs would be developed to treat these pollutant loads on-site. The factor of removal of pollutants from surface water runoff is dependent on the concentrations of the contaminants in the contaminated waters and on the efficacy and type of the BMPs employed by BIG.

Heavy metals that bioaccumulate within aquatic environments result in acute toxicity within aquatic plant and animal species which results in adverse effects on aquatic life, such as reproductive and genetic damage. On-site stormwater and runoff from operations covered under the industrial general permit (discussed below) (e.g., washdown, maintenance, etc.) would be required to implement treatment BMPs to treat runoff prior to infiltration or discharge. Considering that BIG would use treatment BMPs to reduce the concentration of pollutants and improve the quality of runoff generated on all new impervious

surfaces, BIG would minimize potential water quality effects from brake dust to the maximum extent feasible using the best available technology. Further, BIG would include BMPs to treat and regulate on-site petroleum hydrocarbons generated during operations. For a WQMP to be approved, the BMPs must adequately mitigate potentially significant impacts of on-site pollutants on water quality to less-than-significant-levels. BIG would be required to implement BMPs as part of the WQMP that source-control and stormwater treatment BMPs that specifically treat and maintain petroleum hydrocarbon pollutants from entering runoff. With the incorporation of BMPs to regulate on-site pollutants resulting from brake dust, diesel combustion, and operations of petroleum-based vehicles, the pollutants would not substantially degrade surface or groundwater quality. On-site stormwater and runoff from operations covered under the industrial general permit (discussed below) (e.g., washdown, maintenance, etc.) would be required to implement treatment BMPs to treat runoff prior to infiltration or discharge. The following structural BMPs may be used during operations of BIG. These would be a permanent part of the facilities and would be maintained by BNSF. See **Section 6** of this TR for more information.

- Surface infiltration basin
- Subsurface infiltration system
- Seasonal dry detention pond
- Sand and media filter
- Rain barrel
- Infiltration trench
- Hydrodynamic separation device

The implementation of these permanent BMPs would reduce the discharge of sediment and sediment-bound pollutants into surface and groundwaters and minimize the exposure of toxic materials (e.g., metals, petroleum hydrocarbons) to surface waters.

BIG may implement other forms of Low Impact Development (LID), which is a sustainable practice that benefits water supply and contributes to water quality protection. Unlike traditional stormwater management, which collects and conveys stormwater runoff through storm drains, pipes, or other conveyances to a centralized stormwater facility, LID takes a different approach by using site design and stormwater management to maintain the site's pre-development runoff rates and volumes. The goal of LID is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to the source of rainfall. LID has been a proven approach in other parts of the country and is seen in California as an alternative to conventional stormwater management. The exact types of LIDs to be implemented by BIG are not currently known, however this will be determined as part of BIG design, specifically through the design and development of the WQMP at a later date. Further development of BIG design would be required.

Furthermore, BIG would be required to obtain and maintain an IGP under the SWRCB. Specifically, the areas of operations that include vehicle maintenance and vehicle cleaning operations would be covered under the IGP. The IGP would identify BMPs and other measures that would need to be implemented and which types of pollutants would need to be controlled to prevent polluted stormwater runoff. Specific operations that would be controlled include vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication. Other uses could be covered under the permit and would be determined at the time of the issuance of the permit. Adherence to the conditions of the permit would ensure that operational activities would not be a violation of water quality standards or otherwise cause a degradation of surface waters via the discharge of polluted stormwater from BIG. The IGP would require BIG to sample and test stormwater flows from industrial activity areas to determine compliance with the maximum contaminant

levels of specific pollutants that may be produced during BIG operations. Further, the IGP requires that stormwater flows from industrial activity areas must be treated prior to infiltration into the soil or discharge into watercourses. BIG proposes to construct an earthen stormwater conveyance ditch to convey stormwater from the large industrial activity areas (rail yard, vehicle maintenance facility, etc.) to the treatment basins. Water would be allowed to infiltrate through the bottom of this earthen ditch prior to treatment of the stormwater. Under existing operations of the rail corridor there has been no documented contamination of ground or surface waters without the use of BMPs. It is reasonable to assume that the concentration of rail activities to a generalized location and the implementation of project-specific and designed BMPs, as required by the IGP and WQMP, that the maximum contaminant levels would not be exceeded, and a less than significant impact would occur.

Additionally, BIG maintenance activities may require the use of herbicides or pesticides to control weeds and vermin within the permanent BIG footprint and railroad right-of-way. This use would be periodic and ongoing and would be considered a permanent intermittent impact. Applications of pesticides would adhere to label directions for application rates and methods, storage, transportation, mixing, and container disposal. The owner would use contracted applicators appropriately licensed by the state. Where necessary, staff would coordinate with the San Bernardino County Agricultural Commissioners and obtain any required licenses and permits prior to herbicide application.

BIG is located in proximity to the Hinkley community, which was affected by well-known and high-profile groundwater contamination by hexavalent chromium (Cr[VI]) from Pacific Gas and Electric (PG&E). The PG&E contamination plume is not located within the BIG footprint and BIG would not construct wells within this contamination plume and would otherwise not interact with this site. Further, the contamination plume flows to the north (away from BIG) and has been shrinking as a result of existing remediation efforts by PG&E; see **Appendix 5.9**. BIG and this contamination plume are not hydraulically connected with respect to surface water or groundwater flows as the Mojave River is located between BIG and the contamination site. As such, any potential pollutants generated by BIG would not interact with or worsen the conditions/degrade the water quality of the PG&E contamination plume.

Overall, per the laws and regulations identified in **Section 3**, BIG would be subject to applicable NPDES water quality requirements of the CGP and the LRWQCB Basin Plan. Conformance with these requirements would involve the use of appropriate BMPs during operations to address potential impacts associated with the described. Specifically, conformance with the IGP would entail preparing and implementing an approved SWPPP (construction) and WQMP (operations) to address potential issues including erosion/sedimentation and the discharge of operational contaminants. While the development and design of a project-specific WQMP is still pending, BIG would be required to comply with the IGP and implement use-specific BMPs and treatment infrastructure to accommodate pollutants and contamination that would be generated as a result of BIG implementation. Further, as BIG proposes rail uses similar to the existing rail operations and would implement BMPs onsite, it is assumed that water quality impacts associated with operational activities would be less than significant and no mitigation is necessary. .

Level of Significance: Impact 5.10-1 would have a less than significant impact.

Impact 5.10-2 *Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?*

Depending on the occurrence of local groundwater and the amount of associated inflow to the Mojave River, significant impacts could potentially result in association with groundwater accumulation (flooding) and related hazards to people or structures. These potential impacts would be avoided through proposed BIG design measures and BMP implementation as outlined in this report (refer to **Section 5.17: Site Drainage Concepts and BMPs**).

Construction

Please note that the data presented in this analysis is provided within the *Water Supply Assessment for Barstow International Gateway* (“WSA”) prepared by EKI Environment & Water; see **Appendix 5.17 BIG 2**. As the WSA is a draft version, information is subject to change prior to final approval by GSWC. The existing BIG footprint is largely undeveloped with agricultural land use near the central limit and minimal commercial and residential land uses near the northern limit in Barstow; as such, existing impervious surface is limited. Existing impervious surfaces generally consist of only roadways and small residential/commercial buildings. Areas of pervious surface are widespread throughout BIG. Construction of BIG would increase the amount of impervious surface area the BIG footprint by a significant degree. Currently, storm or surface waters percolate through the soil to enter the groundwater supply as it sheet-flows across BIG to the Lenwood Channel or the Mojave River. Alternatively, localized low points would hold water and allow for percolation.

According to the WSA, BIG would require a total of 311 AFY of potable water during construction. Additionally, BIG would require non-potable water for other construction needs (concrete mixing, dust control, site cleaning, etc.). BIG would construct temporary wells for use during construction, which would be removed once construction water demands have been met. Therefore, BIG construction-related impacts to groundwater supplies would be less than significant impact, and no mitigation is required.

Operations

As previously stated, temporary wells would be constructed for construction use only and would be decommissioned prior to BIG operations. As such, there would not be a direct draw of groundwater resources during BIG operations. According to the WSA prepared for BIG, there are enough water resources to service BIG. Regarding groundwater recharge, as previously stated, BIG’s footprint is generally undeveloped and contains large amounts of pervious surfaces. The WSA identified that during operations, BIG would require 404 AFY while the GSWC Barstow’s water supplies for 2025 are 15,128 AF. There is adequate supply within the GSWC Barstow’s supply to support the Project.

Regarding groundwater recharge, as previously stated, BIG’s footprint is generally undeveloped and contains large amounts of pervious surfaces. A drilled well nearby BIG encountered groundwater at depths between 15 and 50 feet below ground surface. Data available from the USGS NWIS indicate that groundwater is as shallow as 8 feet and as deep as 123 feet below grade within BIG. Generally, groundwater at these depths would follow the flow path of the Mojave River and inflow to the Mojave River downstream. BIG would construct stormwater basins to capture and retain the 100-year storm events and allow stormwater and runoff from operations (e.g., washdown, maintenance, etc.) to infiltrate

into the groundwater such that a significant portion of BIG would not be removed from the possible areas of groundwater recharge.

According to Figure IU-4: Regional Flood Control Facilities of the CWP, there are two flood control facilities near BIG: the Lenwood Spreading Grounds to the south and the Waterman Road Basin to the northeast. However, drainage from BIG would not be conveyed to these facilities, but to on-site detention basins located on the western boundary and adjacent to the transload warehouse center and on-site detention basins located on the solar farm site. Overflows from these basins would be directed toward Lenwood Channel, to be improved by BIG, and the Mojave River. With the installation of these on-site detention basins, all stormwater and surface flows (including operational runoff [e.g., washdown, maintenance, etc.]) up to the 100-year storm events would be captured on site and allowed to infiltrate into the ground, allowing it to recharge groundwater flows, or be inflow into the Mojave River. While BIG operations would consist of a large amount of impervious surfaces, such as roadways, concrete, buildings, etc., these on-site stormwater basins would collect all stormwater runoff and runoff from operations (e.g., washdown, maintenance, etc.) within the BIG footprint and allow any rain water/runoff to percolate and infiltrate into the ground. As previously stated, once the water has percolated into the ground, it would generally flow underground toward the Mojave River. Additionally, the solar farm portion of BIG would generally remain as pervious soils and would allow for percolation during sheet flow and shallow concentrated flow toward the on-site detention basins that would then allow runoff to percolated into the groundwater reservoirs. As such, operational impacts would be less than significant, and no mitigation measures are required.

Level of Significance: Impact 5.10-2 would have a less than significant impact.

Impact 5.10-3	<i>Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:</i> <i>i. result in a substantial erosion or siltation on- or off-site?</i>
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The overall existing surface drainage patterns and flow directions previously described would not be altered by construction of BIG, although several small, ephemeral on-site drainages would be affected during BIG operations. BIG construction activities would not alter the course of a stream or river such that they would substantially alter the BIG footprint's existing drainage pattern. All new impervious surfaces would be designed to flow into detention/retention basins in order to mitigate increases in runoff leaving the site in accordance with San Bernardino County design criteria.

Construction

BIG construction activities would not alter the course of a stream or river or add impervious surfaces, such that they would substantially alter the BIG footprint's existing drainage pattern. Runoff would continue to flow generally from south to north toward the Mojave river and increases in runoff associated with new impervious surfaces would be mitigated with multiple detention facilities as described in **Section 7.4**. The discharge point into the Mojave River would be limited to one outfall location as depicted in the drainage exhibit provided in **Appendix E: Site Drainage and Detention Exhibits**. Grading, excavations, and trenching required for BIG construction could result in soil erosion and siltation if exposed to heavy rainfall events. The potential for more surface water runoff exists during construction when existing vegetation

is removed, and the unprotected soils are exposed to water erosion. Increased surface water runoff and siltation could also result from temporary, impermeable work surfaces. If exposed soils are not protected from water erosion, such as when vegetation is cleared for work areas and material stockpiles, both the exposed work areas and any stockpiles could erode and result in decreased water quality and increased erosion and siltation. However, as concluded in **Impact 5.10-1** above, BIG construction activities would comply with all measures identified in the project-specific SWPPP and all requirements of the relevant RWQCB permits for construction. The effects associated with soil erosion would be minimized with design measures in the erosion control plan and that include the use of BMPs and adherence to the relevant transportation and building agency guidelines and standards that would take into account soil properties and minimize soil erosion and siltation hazards.

BIG construction would generally begin with site preparation and grading. Once grading operations are complete, the drainage areas for BIG would be established and would not change once construction has completed, with the exception of the permanent structural BMPs and stormwater infrastructure being in place. BIG would construct temporary BMPs which may include swales with check dams and other diversionary trenches as identified in the SWPPP. These temporary BMPs would be constructed in the location that permanent features would be located and would not generally disrupt the overall drainage pattern that exists on site.

As construction progresses, more and more impervious surface area would be constructed which would increase the peak flow of stormwater runoff and shorten the time of concentration of surface water runoff flows. However, as more and more impervious surface area is constructed, the associated permanent storm drain infrastructure, on-site detention basins, and other stormwater infrastructure would be constructed simultaneously to accommodate the increased runoff resultant of construction of BIG. Furthermore, the implementation of the BMPs, as required by the SWPPP (e.g., rock check dams, rip rap pads, straw wattles, silt fence etc.) would be implemented concurrently to provide temporary benefits while permanent stormwater infrastructure is developed. The overall drainage pattern of BIG's footprint would not be altered significantly, water would generally continue to flow from the southeast to the northwest across BIG's footprint toward the Mojave River. Standard construction practices would be followed to reduce the potential for erosion and siltation. These could include soil stabilization, perimeter silt fences, check dams within the flow path of aboveground drainage swales, and sediment basins. As previously stated, implementation of local and state regulations would be followed in the design and construction of BIG. These measures would reduce runoff and siltation from the site and hold topsoil in place during grading activities.

Design methods would minimize water erosion through adoption of BMPs, including use of stabilizers, mulches, revegetation, and covering areas with biodegradable geotextiles. In addition, BNSF would document the incorporation of specific guidelines and standards, as identified by relevant transportation and building agencies and codes, into design and construction in accordance with the best available practices. In complying with these guidelines and standards, BNSF would take soil properties into account for design and construction and reduce the potential for effects associated with water erosion and siltation during construction.

The BMPs included in the SWPPP created for BIG would also minimize potential impacts from erosion and siltation. The types of required BMPs would be based on the amount of soil disturbed, the types of pollutants used or stored at the construction site, and proximity to water bodies. Further, a soils engineering report and engineering geology report required as part of the City's grading requirements

(Chapter 15.12 of Barstow MC) would also be implemented to further minimize potential siltation and erosion effects. Standard construction practices in addition to implementation of dust control measures along with other BMPs included in the SWPPP would reduce potential environmental effects from erosion or siltation, and impacts would be less than significant, and no mitigation is required.

Additionally, portions of construction would be required in areas which are jurisdictional to the USACE pursuant to § 404 of the CWA and the RWQCB pursuant to § 401 of the CWA. BIG's impacts to these jurisdictional features and measures to be implemented are discussed in detail in **Appendix 5.4**. Further, should dewatering be required, BIG would be required to comply with the SWRCB General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality (Low-Threat Discharge General Permit).

Operations

As previously discussed, BIG would construct and operate on-site detention basins for surface water. These basins would be located on the western boundaries between the warehousing and the Mojave River and other basins would be located within the solar farm site. No drainages, ephemeral or permanent, exist on the solar field site, as such, stormwater and other flows would sheet flow across the solar fields into the various detention basins. These basins would be designed to accommodate the 100-year storm events and collect runoff for storage. As there would be no channelization of stormwater and other runoff, the overall hydraulic energy of the stormwater sheet flowing across the site would not be substantial and could not contribute to significant amounts of erosion or siltation. For the warehousing portion of BIG, stormwater flows and operational runoff (e.g., washdown, maintenance, etc.) from the buildings, parking lots, heavy-duty truck maneuvering courts, and other impervious areas, would be conveyed into an on-site stormwater network consisting of catch basins, underground storm drain, and outlets into the on-site detention basins. Surfaces and stormwater infrastructure in these areas would be reinforced impervious areas (e.g., concrete, asphaltic concrete, non-pervious pipes). As these flows would be across and through paved or other impervious surfaces, they would not interact with unpaved areas to facilitate erosion or siltation. As such, operational impacts related to erosion or siltation would be less than significant.

Additionally, flows within the intermodal facility parking lots, block swap yard areas, and roadways would drain to detention ponds and either infiltrate into the groundwater table or reenter existing off-site drainage courses or facilities (the same as existing conditions) moving toward the Mojave River. Based on the described conditions, BIG would not substantially alter existing drainage patterns or result in substantial downstream erosion/siltation. Potential impacts would be less than significant.

Level of Significance: Impact 5.10-3 would have a less than significant impact.

Impact 5.10-4	<i>Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:</i>
	<i>ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?</i>

There would be an increase in runoff potential through construction of additional impervious area such as parking lots, buildings, and paved areas. The increase of impervious area associated with BIG would be

mitigated with the implementation of multiple detention facilities and overall peak discharges leaving the property would not be increased.

Construction

BIG would include the development of approximately 4,936 acres of largely undeveloped land. The existing drainage pattern for BIG's footprint and the general area is characterized by sheet flow and shallow concentrated flow. Under existing conditions, BIG's footprint naturally drains from the southeast to the northwest towards the Mojave River, which is located on the north side of BIG.

Construction of BIG would generally begin with site preparation and grading. Once grading operations are complete, the drainage areas for BIG would be established and would not generally change significantly once construction has completed, with the exception of the permanent structural BMPs and stormwater infrastructure being in place. BIG would construct temporary BMPs which may include swales with check dams and other diversionary trenches as identified in the SWPPP. These temporary BMPs would be constructed in the location that permanent features would be located and would not generally disrupt the overall drainage pattern that exists on site.

As construction progresses, more and more impervious surface area would be constructed which would increase the peak flow of stormwater runoff and shorten the time of concentration of surface water runoff flows. However, as more and more impervious surface area is constructed, the associated permanent storm drain infrastructure, on-site detention basins, and other stormwater infrastructure would be constructed simultaneously to accommodate the increased runoff resultant of construction of BIG. Furthermore, the implementation of the BMPs, as required by the SWPPP (e.g., rock check dams, rip rap pads, straw wattles, silt fence etc.) would be implemented concurrently to provide temporary benefits while permanent stormwater infrastructure is developed. The overall drainage pattern of BIG's footprint would not be altered significantly, water would generally continue to flow from the southeast to the northwest across BIG toward the Mojave River. As such, a less than significant impact would occur, and no mitigation is required.

BIG would construct bridges and channel improvements to the Lenwood Channel, an unnamed tributary to the Mojave River at MP 10.9, and at a bridge over the Mojave River at Hinkley Road. During construction, impacts to existing flows may occur should a rain event occur during construction. Widening of Lenwood Channel and the tributary would occur as part of the improvements. The widening and vertical alignment adjustments that would occur to Lenwood Channel would improve the flood flow capacity of the creek and would occur prior to the construction of the bridge and box culvert construction. Refer to Section 6.0 of this technical report for information regarding flow and capacity changes. As a result, the construction operations that would occur within these water courses would not be significantly impacted as the overall flood flow capacity of these waterways would be improved prior to bridge and culvert construction. As such, a less than significant impact would occur, and no mitigation is required.

Operations

BIG proposes the construction of new public roads that would be constructed with appropriate stormwater conveyance facilities such as curb and gutter. Flows from 10-year storm events would be contained within the street curb to curb width, and 100-year storm events would be contained within the right-of-way. These public roads would add new shallow channelized flow paths for runoff. Runoff contained within the public right-of-way, including curb and gutter, would flow into underground public

storm drain facilities that in turn would flow to the detention basins across the BIG footprint. Stormwater runoff from property outside the public right-of-way would be collected onsite, conveyed by underground storm drainpipes to detention basins where stormwater quality volumes are detained and infiltrated into the ground. Larger storm events would pass through these detention basins, be conveyed by storm drain facilities through the detention basin and discharged into the Lenwood Channel or the Mojave River.

Additionally, and as previously discussed, improvements to Lenwood Channel and the unnamed tributary to the Mojave River at MP 10.9, and to the bridge over the Mojave River at Hinkley Road would occur.

Lenwood Channel. Lenwood Channel was constructed around 1977 to aid with flooding in the area. BNSF Bridge 6.5 was initially constructed to convey the newly constructed channel. Prior to construction of the channel and bridge, flood flows in the area were primarily conveyed through the structures at MP 7.0 and MP 5.1. The channel and bridge provided benefit but did not completely eliminate flood hazards associated with the 100-year flood event. With construction of BIG, significant improvements to the channel and Bridge 6.5 would be needed to ensure that BNSF infrastructure would remain accessible and not be damaged during a 100-year flood event. The intent of this design is to keep flood waters contained in Lenwood Channel to the extent possible and convey the flow to the Mojave River through the Bridge at MP 6.5, avoiding the allowance of significant overbank flow to occur in an uncontrolled manner. As such, channel grading and additional bridge capacity is required to convey flood flows through BIG extents and into the Mojave River north of BIG site.

New bridge crossings would be constructed over Lenwood Channel upstream (south) of the existing mainline to accommodate new tracks required in supporting BIG as well as roadways for vehicle access to BIG. The roadway bridges would carry a new road providing access to the facility from Lenwood Road that would cross Lenwood Channel upstream of Main Street. Main Street's existing low water crossing would also be replaced with a bridge that provides 100-year level of service for overtopping. The intent of this design is to keep flood waters contained in Lenwood Channel and convey the flow to the Mojave River through the Bridge at MP 6.5, avoiding the allowance of significant overbank flow to occur.

Lenwood Channel would be graded to have a variable width, 100 to 150-foot, bottom width with 3:1 side slopes that would provide the capacity in the channel necessary to accommodate the 100-year FEMA published discharge with freeboard and the unbulked discharge with no freeboard. Figures depicting floodplain are presented in **Appendix B: Lenwood Channel Analysis Exhibits**. This channel cross-section would be carried from the downstream confluence with the Mojave River (approximately 4,200 feet downstream of the existing BNSF mainline) and terminate immediately downstream of the existing spreading fields (approximately 6,800 feet upstream of the existing BNSF main line). Bridge crossings over Lenwood Channel were sized to accommodate the approved unbulked discharge calculated for the channel and are listed below:

- Improved BNSF Main line Bridge 6.5
- New BNSF Lead Track Bridge on South side of existing main line
- New BNSF Main line 3 & 4 Bridge on South side of existing main line
- Improved Main Street Bridge on South side of existing main line
- Private Road on North side of existing main line
- Hinkley Road on North side of Existing main line
- Warehouse access road on North side of existing main line

Unnamed Tributary to the Mojave River at MP 10.9. The Unnamed Tributary to the Mojave River at Bridge 10.9 enters the Mojave River immediately downstream of the existing mainline. Under current conditions, flow overwhelms the manmade berm intended to direct flow to Bridge 10.9 and floods the area adjacent to MP 10.7 where no structure exists and in extreme events may overtop the tracks. The impact associated with BIG here consists of significant channel grading, increasing bridge capacity at the existing mainline, and constructing new bridges to accommodate tracks supporting BIG. Additionally, a new bridge would be constructed to carry additional mainline capacity across the Unnamed Tributary. Riprap would be placed along the channel banks through each of the bridges and extend 100 feet upstream and downstream. Riprap channel lining would be placed along the channel reach adjacent to Main Street to prevent the shallow concentrated flow overtopping the highway at this location from eroding the channel banks as it enters. The increase in channel capacity and bridge capacity at this location is important to eliminate the potential for flood flow to inundate BIG near MP 10.7. Figures depicting floodplain conditions are presented in **Appendix C: Unnamed Tributary to the Mojave River (MP 10.9) Analysis Exhibits**.

Hinkley Road Bridge at Mojave River. The existing Hinkley Road Bridge is at a narrowed section of the Mojave River and crosses via a concrete pier structure. Based on discussions with the County, the existing Hinkley Road Bridge over the Mojave River is experiencing structural issues and is at risk of being overtopped from seasonal flooding. Hydrology and hydraulic analyses have indicated the existing bridge is undersized. To maintain a roadway connection to Hinkley Road from the transload warehouse center, BIG proposes to replace the existing bridge with a longer structure to better match the channel width of the Mojave River at that location. The channel beneath, and immediately adjacent to, the existing bridge would be excavated and widened to match the natural channel width more closely. Portions of Hinkley Road immediately east and west of the bridge would be raised to reduce exposure to Mojave River flood events. These proposed improvements at Hinkley Road Bridge would reduce flooding compared to existing conditions. As the bridge would follow the existing roadway alignment of Hinkley Road, there would not be a significant increase of impervious surfaces which would increase surface run-off of stormwater. However, with the improvement of the bridge, the surface elevation of backwater at the bridge would be reduced, and the redesigned bridge would result in a net-positive impact on flood flows and inundation. Figures depicting floodplain conditions are presented in **Appendix D: Mojave River (Hinkley Road) Analysis Exhibits**.

Based on the above discussion pertaining to drainage and flood flows at Lenwood Channel, Unnamed Tributary to the Mojave River at MP 10.9, and the Mojave River at Hinkley Road, BIG would not substantially increase the rate or amount of surface run-off in a manner that would result in flooding on- or off-site. A less than significant impact would occur, and no mitigation is required.

BIG Footprint. Implementation of BIG would include the inclusion of a significant amount of impervious surface area within the BIG footprint. This increased amount of impervious surface area would increase the flow rate of stormwater runoff and runoff from operations (e.g., washdown, maintenance, etc.) within the BIG footprint. As such, permanent stormwater infrastructure would be required for BIG to not have a significant impact. However, this infrastructure is required under existing building code and would be implemented regardless of the amount of additional impervious surface area that would be constructed as part of BIG. Permanent stormwater infrastructure that would be constructed and operated include curb and gutter in roadways, underground stormwater conveyance infrastructure, inlets and catch basins, and on-site detention basins. This stormwater conveyance infrastructure would be designed according to

the 100-year storm event. As BIG would be designed to accommodate these flood flows and would be required to maintain this infrastructure, impacts would be less than significant, and no mitigation is required.

Level of Significance: Impact 5.10-4 would have a less than significant impact.

Impact 5.10-5 Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

iii. create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Stormwater discharge leaving BIG would be routed through detention facilities and other BMPs as deemed practical to treat stormwater prior to entering receiving waterways. The facilities would attenuate flows such that the receiving waterway capacity would not be exceeded.

Construction and Operations

BIG would cross several surface water features within the study area on different types of structures. The waterbodies potentially affected by BIG, along with other surface water resources in the surface water study area, are subject to degradation from agricultural runoff and pollutants discharged from transportation sources such as streets, highways, and railroads.

Construction of BIG would generally begin with site preparation and grading. Once grading operations are complete, the drainage areas for BIG would be established and would not generally change significantly once construction has completed, with the exception of the permanent structural BMPs and stormwater infrastructure being in place. BIG would construct temporary BMPs which may include swales with check dams and other diversionary trenches as identified in the SWPPP and WQMP. These temporary BMPs would be constructed in the location that permanent features would be located and would not generally disrupt the overall drainage pattern that exists on site (refer to **Impact 5.10-3**).

BIG construction would require excavation, grading, and establishment of construction staging areas. Grading would occur throughout the 4,936-acre BIG footprint, except for approximately 606 acres within the Mojave River, which would remain ungraded. BIG would not require any import or export of soil; all required cut and fill would be provided from within the site, a total of 26 million cubic yards of grading would occur. Construction activities that remove vegetation and expose soil to erosion (such as grading) could contribute to accelerated erosion rates, which could result in runoff containing sediment and pollutants that ultimately flow into surface waters. Pollutants in runoff could include sediment, oil and grease, hydrocarbons (e.g., fuels, solvents), heavy metals, organic fertilizers and pesticides, pathogens, nutrients, and debris. These effects on runoff quality would be greatest when stormwater runoff volumes are highest and in areas most susceptible to soil erosion. BIG would incorporate erosion and sedimentation control BMPs in the SWPPP and WQMP to stabilize disturbed soils and prevent erosion from occurring along slopes and to prevent sediments from entering nearby waterbodies. Effects on surface water quality would be minimized because construction would not result in changes to surface water quality that would contribute to a violation of regulatory standards or waste discharge requirements. Substantial additional sources of polluted runoff would be avoided, and so water quality

degradation would be avoided through the implementation of stormwater management practices and BMPs (see **Impact 5.10-1**).

BIG would introduce new features into the surface water study area including a rail yard with intermodal facility and block swap yard, and a transload warehouse center. Additionally, to serve the proposed rail yard and transload warehouse center, off-site rail improvements including lead track extensions and off-site non-rail improvements including roadways and infrastructure are proposed. New and replaced impervious surfaces would collect pollutants from BIG operations, including sediment, oil and grease, hydrocarbons (e.g., fuels, solvents), heavy metals, organic fertilizers and pesticides, pathogens, nutrients, and debris. These pollutants are mobilized by runoff during storm events and conveyed into a surface water either directly or through drainage systems. Therefore, BIG could result in permanent effects on surface water quality. Erosion and sedimentation controls would be implemented to stabilize disturbed soils and prevent erosion from occurring along slopes or sediments from entering nearby storm drainage. See **Impact 5.10-1** for BIG BMPs.

New potential sources of pollutants may be introduced in the BIG footprint through the addition of locomotives, railcars, and parked vehicles. Specifically, dust generated by braking would be continuously generated and released by trains. Brake dust consists of particulate metals (primarily iron) but may also include copper, silicon, calcium, manganese, chromium, and barium. Although brake dust consists primarily of particulate metals, some of these metals could become dissolved in rainwater. As brake dust is generated by rail braking, it would be produced within the BIG footprint by BIG operations. The amount of brake dust that could be produced by BIG operations is not quantifiable at this time. Brake dust would not be generated in equal amounts throughout the BIG footprint. The primary locations where brake dust would be generated are areas where the trains must reduce their travel speed, such as approaches to loading and unloading areas, turns, and elevation changes (primarily descents), of which there are few. Long stretches of flat terrain with a straight rail alignment would generate less brake dust than other areas. In addition, brake dust is generally anticipated to be retained in track ballast and would be susceptible to release of pollutants during inundation. Heavy metals and other sediment (non-dissolved pollutants) would be captured by retention basins and other use specific BMPs onsite as identified in a WQMP. However, there is an existing rail corridor through the BIG footprint and as such, this would not constitute an additional source of polluted run-off.

Heavy metals that bioaccumulate within aquatic environments result in acute toxicity within aquatic plant and animal species which results in adverse effects on aquatic life, such as reproductive and genetic damage. As previously discussed above in **Impact 5.10-1**, BIG would install permanent post-construction BMPs which would capture and treat stormwater runoff and runoff from operations (e.g., washdown, maintenance, etc.) that would be laden with contaminants such as heavy metals, sediments, oils, greases, etc. These BMPs would be regularly maintained by BNSF and would improve the quality of stormwater runoff prior to discharge from BIG site. Considering that BIG would use treatment BMPs to reduce the quantity and improve the quality of runoff generated on all new and replaced impervious surfaces, BIG would minimize potential water quality effects from brake dust to the maximum extent feasible using the best available technology. The BMPs would be required to be designed and constructed such that BIG would comply and conform to the NPDES requirements of the IGP and LRWQCB Basin Plan. As such, BIG would not result in an additional source of polluted run-off.

On-site stormwater and runoff from operations covered under the IGP would be required to implement treatment BMPs to treat runoff prior to infiltration or discharge. The implementation of these permanent

BMPs would reduce the discharge of sediment and sediment-bound pollutants into surface waters and minimize the exposure of toxic materials (e.g., metals, petroleum hydrocarbons) to surface waters. As a result, the operation of BIG would not contribute to a violation of regulatory standards or waste discharge requirements, create, or contribute substantial runoff water that would provide substantial sources of polluted runoff, or otherwise substantially degrade water quality.

As discussed previously, BIG must comply with the requirements of the NPDES General Permit, which helps control water pollution by regulating point and non-point sources that discharge pollutants into receiving waters. BIG would include the development of new stormwater conveyance facilities, to include surface drainage swales, underground storm drain, on-site detention basins, among others, and would be designed to account for the 100-year storm events as required by City Municipal Code and the County Development Code. Flows in excess of the 100-year storm events would overflow into the Mojave River and Lenwood Channel.

As previously discussed, BIG would construct and install various stormwater infrastructures that would accommodate the 100-year storm events (see **Section 2.0**). These would be constructed in a location of the City and County where very limited stormwater infrastructure currently exists. Currently, stormwater runoff generally sheet flows across BIG site and drain into the Mojave River, Lenwood Channel, or into unnamed tributaries of either feature. BIG's proposed stormwater infrastructure would generally maintain these drainage patterns and would be able to accommodate the 100-year storm events. Stormwater infrastructure that may be implemented on site includes catch basins, storm drain, curb and gutter, above-ground retention/detention basins, vegetative swales, and concrete swales, among other. This infrastructure would be designed to accommodate the 100-year design storm event. All stormwater flows not captured in on-site detention basins would be discharged to the Mojave River, so while BIG would require the construction and operation of a large amount of stormwater infrastructure, it would not require the construction and operation of a significant amount of off-site capital infrastructure to facilitate the implementation of BIG, therefore impacts would be less than significant.

Level of Significance: Impact 5.10-5 would have a less than significant impact.

*Impact 5.10-6 Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

impede or redirect flood flows?*

BIG would include widening of Lenwood Channel for approximately 11,000 linear feet from the confluence with the Mojave River to the spreading fields (refer to **Section 1.0**). The new channel would contain the FEMA discharges within the bank and dramatically improve existing flood conditions for the Community of Lenwood and the City of Barstow. This alteration would be captured in a Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) submittal to the FEMA NFIP, to revise FEMA's maps showing floodplain and flood flow elevations, and all other existing drainage patterns would be maintained. This would establish new FEMA FIRMs for the area impacted by the improvements. The CLOMR/LOMR process is not required for Project approval; a CLOMR is required prior to the issuance of grading permits for specific developments within the floodplain that would alter the floodplain, while a LOMR is required prior to the issuance of certificates of occupancy to verify the alterations to the floodplain.

Construction

Construction of BIG would require temporary fill inside of 100-year floodplains regulated by FEMA, which could result in temporary effects on the vertical profile and horizontal extent of existing 100-year floodplains. Construction activity could also result in temporary effects on the existing beneficial floodplain values. Temporary fill within floodplains during construction could include temporary structures such as formworks (temporary molds for new concrete structures), falseworks (temporary supports for new structures), trestles (temporary elevated working surfaces), and cofferdams (temporary structures to isolate work from receiving waters); construction equipment, including excavators and pumps; and construction materials, as well as construction contractor personnel. Temporary fill could reduce the storage capacity of the floodplain, resulting in localized changes in waters surface elevation, flow velocity, or extents of the floodplain to areas that may not have previously experienced flooding. The severity of the effect would be directly related to the volume of temporary fill because the volume of temporary fill would displace an equal volume of floodwaters and how much rain BIG's disturbance area receives.

Construction of BIG would generally begin with site preparation and grading. Once grading operations are complete, the drainage areas for BIG would be established and would not generally change significantly once construction has completed, with the exception of the permanent structural BMPs and stormwater infrastructure being in place. BIG would construct temporary BMPs which may include swales with check dams and other diversionary trenches as identified in the SWPPP and WQMP. These temporary BMPs would be constructed in the location that permanent features would be located and would not generally disrupt the overall drainage pattern that exists on site (refer to **Impact 5.10-3**).

The proposed design may include construction staging areas in the floodplains that BIG would cross. Although construction activities would be temporary, a construction staging area may be active for several months. Structures stored within staging areas would be small compared to the surrounding areas and would not result in a large obstruction to surface flows. Consistent with typical SWPPP requirements, the person or persons responsible for water quality monitoring or the stormwater monitoring plan (specifically a Qualified SWPPP Practitioner [QSP], or appropriate designee [QSD]) are required to monitor forecasted weather conditions for heavy storms. Under the requirements of the permit, the QSD would be involved throughout the life of the project, there would be additional inspections and visual observations to ensure compliance with the plan, and there is an increased requirement to document and implement site corrective actions when conditions are not compliant with the plan or permit.

Construction could result in a short-term increase in the potential for flooding because materials or structures could temporarily impede or obstruct waters during a storm event. Implementing flood protection measures during construction, such as storm monitoring and efficiently moving construction equipment out of the floodplain prior to heavy storms would prevent BIG from placing construction equipment and staged materials within the 100-year flood-hazard area that would impede or redirect flood flows during a storm event during the construction phase. Flood flows and floodplain conditions during construction of BIG would be similar to existing conditions of the BIG footprint.

Operations

The floodplain study area includes the FEMA-mapped floodplain crossed by BIG. The northern portion of BIG is in FEMA Zones AO and AE. The central and southern portions are in FEMA Zone D, where flood

hazards are undetermined, but possible. Much of BIG lies outside of the FEMA-designated 100-year floodplain.

Zone AO is defined by FEMA as a river or stream flood hazard areas, and areas with a 1 percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage.

Zone AE is defined by FEMA as the base floodplain where base flood elevations are provided on the FIRM.

Zone D is defined by FEMA as an area with possible but undetermined flood hazards. No flood hazard analysis has been conducted for these areas.

BIG operations could require periodic in-water bridge maintenance activities; however, BIG operations would occur in different parts of the 100-year floodplain. These activities could require the temporary placement of vehicles and other equipment for the maintenance of bridge and drainage structures; however, operations and maintenance would not typically require excavation, cut-and-fill construction, or obstruction within the floodplain during the wet season. In addition, the person or persons responsible for water quality monitoring or the stormwater monitoring plan, usually a Qualified SWPPP Practitioner, would monitor weather conditions for heavy storms (and potential flood flows) during maintenance activities. This would allow the maintenance crew to relocate construction equipment that could impede flows and increase flood risks, to minimize the potential flood risk. Additionally, as previously discussed, Lenwood Channel would be improved and widened for approximately 11,000 linear feet from the confluence with the Mojave River to the spreading fields to the east. This new channel improvements would contain FEMA discharges within the bank and dramatically improve existing flooding conditions for the Lenwood Community and the City. These alterations would be captured in a Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) submittal to FEMA. Therefore, BIG design would avoid effects of operations on floodplains and flood risk.

Flood planning and protection measures and stormwater management, which would avoid impeding or redirecting flood flows, would be implemented during BIG operations. Therefore, a less-than-significant impact would occur, and no mitigation is required.

Level of Significance: Impact 5.10-6 would have a less than significant impact.

Impact 5.10-7 Would the project, in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

The Mojave River Dam, Cedar Springs Dam, and the New Lake Arrowhead Dams are located upstream and dam failure at this location would not exceed the Mojave River channel capacity at BIG. The facility is being designed for a 100-year level of service from a stormwater perspective and Lenwood Channel is being designed to pass the bulked discharges provided by the SBCFCD without interruptions in rail service.

Construction and Operations

The floodplain study area is not susceptible to inundation by a tsunami from the Pacific Ocean because of distance (approximately 90 miles), in addition various topographical features exist between BIG and the Pacific Ocean that would serve as physical barriers (San Gabriel Mountains, San Bernardino Mountains, etc.). There are no large, enclosed waterbodies immediately adjacent to BIG, and there is no immediate risk of seiche in the floodplain study area.

BIG would be susceptible to potential flooding from dam failure during operation. BIG would not exacerbate this existing condition or potential for flooding as a result of dam failure. Portions of BIG are within the flood inundation boundary of the Mojave River Dam, the Cedar Springs Dam, and the New Lake Arrowhead Dam. In the unlikely event of a catastrophic failure of any of these dams, water would be released downstream into the Mojave River. Depending on the volume of water released, there could be flooding effects at the river crossing that could result in inundation of portions of the BIG footprint. In the event of maximum dam release from any of the previously mentioned dams, portions of the BIG footprint could be inundated, specifically at the transload warehouse center site; however, the water would take several hours to arrive, so there would be sufficient warning available to the public by the dam owner in coordination with emergency service providers. Furthermore, the final floor elevation (FFE) and overall foundation pad for buildings and structures to be developed by BIG within the BIG footprint would be elevated above the FEMA floodplain zone. This would reduce the risks of BIG inundation and would minimize the possibility of the release of pollutants during such events. It is worth noting that the building FFEs may raise BIG out of the dam inundation zones, however, flood depths in the event of dam failure are not known and it is not possible to say for certain whether this would be the case. In addition to the grading operations raising the FFE, BIG would improve bridge crossing over the Mojave River and Lenwood Channel. These improvements to the bridges and roadways would also improve the hydrologic characteristics of the Mojave River under these bridges. In its existing conditions, the Hinkley Bridge narrows the Mojave River, increasing flow velocities. BIG would widen the span of the Hinkley Bridge and allow for a slower velocity of flow which would reduce Mojave River flow's capability for scouring and further abate flood flows in this area.

As previously discussed, building within the FEMA floodplain as well as the grading operations would raise the FFE of all construction structures to one foot above the FEMA floodplain and above the dam inundation areas, requiring a CLOMR and LOMR action. This would cause a revision to the FEMA FIRMS impacts and would demonstrate that the risk of flooding and inundation in the affected areas of the BIG footprint would be minimized. As such, a less than significant impact would occur, and no mitigation is required.

Level of Significance: Impact 5.10-7 would have a less than significant impact.

Impact 5.10-8	<i>Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?</i>
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Construction and Operations

As discussed above, BIG is within the Mojave subbasin. The site's related construction and operational activities would be required to comply with the Basin Plan for the Lahontan Region, North and South Basins by preparing and adhering to a SWPPP and WQMP. BIG would be required to show conformance prior to any approval. Implementation of BIG would not conflict with or obstruct the Basin Plan, North and South Basins and impacts would be less than significant. BIG is within the Mojave Basin – Centro Subarea, which is an adjudicated groundwater basin. Adjudicated basins, like the Mojave Basin – Centro Subarea, are exempt from the SGMA because such basins already operate under a court-ordered management plan to ensure the long-term sustainability of the Subbasin. Therefore, none of BIG's components would obstruct or prevent implementation of the management plan for the Mojave

Groundwater Basin. As such, construction, and operation of the BIG footprint, would not conflict with any sustainable groundwater management plan. Impacts would be less than significant.

Level of Significance: Impact 5.10-8 would have a less than significant impact.

Hydraulics Analysis

This section presents the impact to major water features by BIG and is organized to discuss the proposed hydraulic parameters and floodplain setting for BIG extents, Lenwood Channel, MP 10.9 - Unnamed Tributary to the Mojave River, and the Mojave River at Hinkley Road. As described in **Section 5.0**, 2-dimensional hydraulic models were utilized to determine floodplain extents for the existing topography and the topography associated with BIG construction. All other drainage patterns would be maintained with existing conditions.

Unnamed Tributary to the Mojave River at MP 10.9

The Unnamed Tributary to the Mojave River at Bridge 10.9 enters the Mojave River immediately downstream of the existing mainline. Under existing conditions, flow overwhelms a manmade berm intended to direct flow to Bridge 10.9 and floods the area adjacent to MP 10.7 where no structure exists. This causes potential subgrade inundation and track overtopping during large flood events. The impact associated with BIG here consists of significant channel grading and increasing capacity at the existing mainline by constructing new concrete box culverts to replace the existing bridge at MP 10.9 (refer to **Section 1.0**). The RCBs are preferred to accommodate several tracks for mainline traffic and leads to the intermodal facility. Additionally, a new bridge would be constructed to carry the new south mainlines across the Unnamed Tributary (refer to **Section 1.0**). Riprap would be placed along the channel banks through each of the bridges and extend 100 feet upstream and downstream. Additionally, riprap channel lining would be placed along the channel reach adjacent to Main Street to prevent the large amount of shallow concentrated flow overtopping the highway at this location from eroding the channel banks as it enters. The 2-dimensional hydraulic model was used to determine the proposed floodplain extents. Figures depicting the revised floodplain are presented in **Appendix C**.

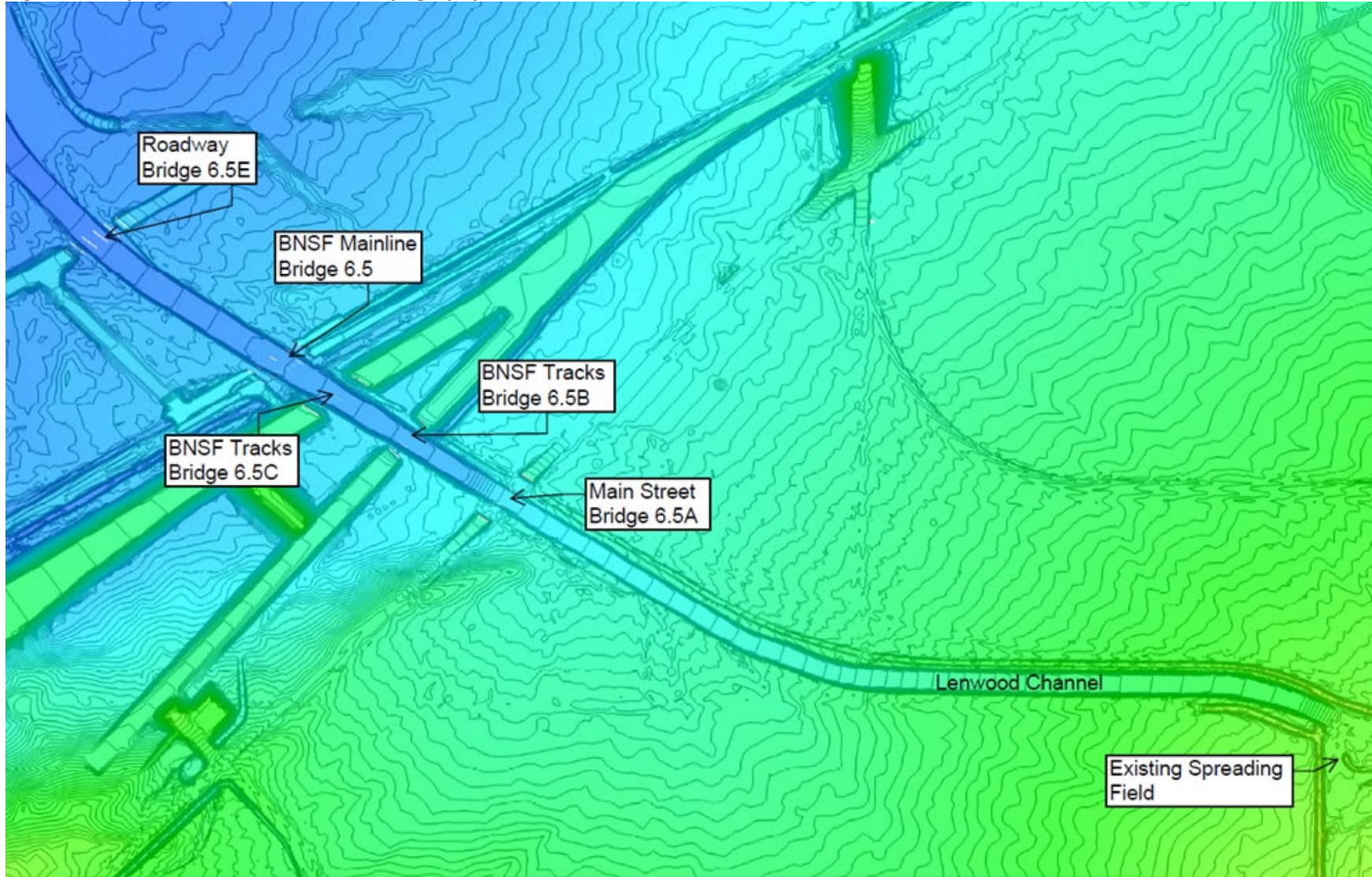
The proposed conditions water surface elevations are significantly improved from existing conditions with the channel grading and the additional hydraulic capacity provided through the BNSF mainline. The increase in channel capacity and bridge capacity at this location is important to eliminate the potential for flood issues within this area of the facility.

Lenwood Channel

Review of available information indicates that Lenwood Channel was constructed around 1977 to help with flooding in the area. BNSF Bridge 6.5 was initially constructed to convey the new channel. Prior to that construction, flood flows in the area were primarily conveyed through the structures at MP 7.0 and MP 5.1. This provided benefit but did not completely eliminate flood hazards associated with the 100-year event. With construction of BIG, significant improvements to the channel would be necessary to ensure that BNSF infrastructure would remain accessible and not be damaged during a 100-year flood event. The intent of this design is to keep flood waters contained in Lenwood Channel to the extent possible and convey the flow to the Mojave River via the channel alone as opposed to allowing significant overbank flow to occur in an uncontrolled manner. As such, channel grading and additional bridge capacity is required to convey flood flows through BIG extents and into the Mojave River. The proposed topography

in the vicinity of Lenwood Channel that was utilized in the 2-dimensional modeling is shown in **Figure 8: Proposed Lenwood Channel Topography** below.

Figure 8: Proposed Lenwood Channel Topography



Source: 2013 San Bernardino County LiDAR

The existing mainline bridge at MP 6.5 would be removed and new bridge crossings would be constructed over Lenwood Channel upstream and downstream of the existing mainline to accommodate new tracks required in supporting the facility as well as roadways for vehicle access to the facility. The roadway bridge would include the replacement of the existing Main Street low water crossing with a bridge that provides 100-year level of service for overtopping.

Lenwood Channel would be graded to have a 100-foot bottom width transitioning to a 150-foot bottom width with consistent 3:1 side slope which would provide the capacity in the channel necessary to accommodate the 100-year FEMA published discharge with freeboard and the approved unbulked discharge with no freeboard. The 150-foot channel cross-section would be carried from the downstream confluence with the Mojave River (approximately 4,200 feet downstream of the existing BNSF mainline) through the existing mainline. Then the channel would transition to the 100-foot width which would continue upstream and terminate immediately downstream of the existing spreading fields (approximately 6,800 feet upstream of the existing BNSF mainline). Bridge crossings over Lenwood Channel were sized to accommodate the approved unbulked discharges in the channel and are summarized as follows.

- **Main Street (Bridge 6.5 A):** The existing low water crossing at Main Street would be replaced with a roadway bridge to allow for unimpeded access to BIG in the event of a major flood. The proposed bridge configuration consists of 5 spans and a total bridge length of 332 feet. This would eliminate roadway overtopping during a 100-year flood event in Lenwood Channel and promote flow to remain in the channel. The existing levees along the east bank of Lenwood Channel would tie into the proposed bridge abutment to prevent inundation of pavement near the east tie in. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.
- **New BNSF Additional Mainline (Bridge 6.5 B):** This railroad bridge would be constructed to carry additional mainline capacity around BIG north of the Main Street crossing. The proposed bridge configuration consists of 4 spans and a total length of approximately 366 feet. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.
- **New BNSF Lead Track (Bridge 6.5 C):** This railroad bridge would be constructed to provide train access to and from BIG immediately south of the existing mainline. The proposed bridge configuration consists of 4 spans and a total length of approximately 402 feet. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.
- **Existing BNSF Mainline (Bridge 6.5):** The existing railroad bridge at MP 6.5 would be removed and replaced with proposed Bridge 6.5. The new mainline bridge would consist of 9 spans and a total length of approximately 370 feet. This would allow for additional hydraulic capacity in Lenwood Channel. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.
- **Private Road (Bridge 6.5 D):** This private roadway bridge would provide access for traffic between the transload warehouse center and would not carry public traffic. The proposed bridge configuration consists of 9 spans and a total length of approximately 370 feet to convey the discharge within Lenwood Channel. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.

- **Hinkley Road Bridge over Lenwood Creek (Bridge 6.5 E):** This public roadway bridge would provide access for traffic along the North side of the existing mainlines south of the warehouse center. The proposed bridge configuration consists of 9 spans and a total length of approximately 370 feet to convey the discharge within Lenwood Channel. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.
- **Warehouse Access Road on North side of existing mainline (Bridge 6.5 F):** This roadway bridge would be constructed to provide access to the facility from Jasper Road on the north side of the existing mainline. The proposed bridge configuration consists of 6 spans and a total length of approximately 455 feet to convey the discharge within Lenwood Channel. Riprap would be placed along the channel banks through the bridge and extend 100 feet upstream and downstream of the structure.

The 2-dimensional hydraulic model was used to determine floodplain extents associated with Lenwood Channel. Figures depicting the revised floodplain are presented in **Appendix B**.

The proposed conditions in all locations are significantly improved from existing conditions with the Lenwood Channel improvements and the additional hydraulic capacity provided through Main Street and the BNSF mainline. This is intended to accommodate the 100-year flood event and prevent interruptions in service due to major flood events.

Mojave River at Hinkley Road

In order to maintain a secondary access point to the facility, the roadway approaches would be raised through the floodplain above the 100-year water surface elevation and the bridge replaced with a structure capable of passing a 100-year event. The proposed bridge configuration consists of 6 spans and a total length of approximately 358 feet to convey the discharge within the Mojave River without roadway overtopping. Additionally, the Mojave River Channel, which is currently approximately 120 feet wide, would be widened to match the proposed bridge length and provide the additional conveyance needed to offset the reduction in flow associated with the elimination of roadway overtopping. The 2-dimensional hydraulic model was used to determine the proposed floodplain extents. Figures depicting the revised floodplain are presented in **Appendix C**.

The proposed conditions are improved from existing conditions with the channel grading and the additional hydraulic capacity provided through the Hinkley Road bridge. The increase in channel capacity and bridge capacity at this location is important to eliminate the potential for roadway overtopping impacting service to the facility.

Site Drainage Concepts and BMPs

Hydrology and drainage within the BIG footprint is important to water quality especially when impacts associated with BIG site must be mitigated due to the regulatory framework discussed in **Section 3**. This section presents the approximated proposed impervious percentage within BIG along with the hydrology and drainage concepts pertaining to the track alignment, parking lots, transload facility, block swap yard area, and solar field. This section also presents different types of water quality BMPs that may be required. Site specific analyses including detention volumes and discharge rates from detention facilities would be refined and updated throughout the design process.

Proposed Conditions over Footprint

The permanent features within the BIG footprint were used to assess the proposed conditions impervious percentage. The impervious percentage assumptions are documented in **Table 9: Proposed Condition Impervious Area Assumptions**. Final conditions for some of the proposed elements are still under design and values could change.

Table 9: Proposed Condition Impervious Area Assumptions		
Permanent Feature within BIG Footprint	Assumed Impervious	Justification/Assumptions
Unpaved Access Roadway	0%	Similar assumption as unpaved roadways under existing conditions
BIG Intermodal Parking	90%	Fully impervious
Grading	5%	Undeveloped graded areas
Mainline or Lead Tracks	70%	Consists mostly of railroad right-of-way, which is mostly ballast over compacted subgrade
Block Swap Yard	70%	Tracks within the intermodal facility, mostly ballast over compacted subgrade
Transload Facility	90%	Building roof and parking lots
Paved Roadway	90%	Concrete or asphalt paved roadway
Solar Panel Field	70%	Solar panel coverage of overall area
<i>Source: Caltrans, 2020</i>		

An impervious area of 70 percent was assumed for new track and the block swap yard area. The track would consist of ballast over compacted subgrade which may increase runoff potential but would not act as fully impervious material. Parking lots, paved roads, and the transload facility was assigned an impervious area of 90 percent. The 140-acre solar field would require an associated detention volume covering approximately 5 acres. The bulk of the solar field would be constructed on existing ground with minimal regrading required except for some low areas and the detention.

In order to analyze the impact on runoff and the amount of volume necessary to mitigate increases in impervious surfaces within BIG, Bentley PondPack software was utilized. This software is capable of analyzing detention and retention ponds that are interconnected while accounting for infiltration rates and complex outlet structure configurations. The infiltration rate used for this analysis was 2-inches per hour which is based on geotechnical testing performed at various locations and depths throughout the site. Based on the assumptions documented above, the proposed impervious percentage within the BIG footprint would be increased over existing conditions. Although an increase in impervious cover is shown, the peak outflow discharges contributing to the Mojave River would not increase significantly, as detention facilities would be implemented which control peak discharges for large flood events.

The existing site has 3 locations where runoff from the area within the site and off-site drainage can pass through the existing BNSF mainline to the Mojave River. These are located at MP 8.2 (Point of Interest A), MP 8.9 (point of Interest B), and MP 10.06 (Point of Interest C) as shown in the exhibit provided in **Appendix E**. As BIG would necessitate the placement of various infrastructure and detention facilities associated with the development, these 3 locations would be combined into one where runoff would be

conveyed into the Mojave River. This location would be near MP 7.79 (Point of Interest D). All runoff within BIG would be routed to this location via storm drain systems, drainage swales, and detention facilities.

There are multiple ponds proposed within BIG providing approximately 165 acre-feet of storage volume for a 100-year rainfall event that would mitigate increases in impervious area. As previously mentioned, these ponds are interconnected and would ultimately drain to BIG's outfall prior to entering the Mojave River.

Table 10: BIG Site Detention/Project Outfall Summary				
Rainfall Event	Pre-Development Conditions Discharge [A+B+C] (cfs)	Post-Development Conditions Discharge [D] (cfs)	Δ Q (cfs)	% of Existing Discharge
2-year Post (2-year Pre)	319.55	62.76	-256.79	20%
10-year Post (5-year Pre)	515.2	214.7	-300.5	67%
25-year Post (10-year Pre)	688.1	350.9	-337.2	51%
100-year Post (25-year Pre)	945.9	674.7	-271.2	71%

The values presented in **Table 10: BIG Site Detention/Project Outfall Summary** represent the total peak release rates for the entire drainage basin. The pre-development hydrographs for each existing point of interest (Point A, Point B, and Point C) were calculated and summed together to determine the total peak discharge for pre-development conditions. This value was used to compare to the peak discharge associated with the post-development outfall (Point D). In accordance with San Bernardino County guidelines the post-development release rates must be no greater than 90% of pre-development conditions as follows.

- Post-Development 2-year compared to 90% of Pre-Development 2-year
- Post-Development 10-year compared to 90% of Pre-Development 5-year
- Post-Development 25-year compared to 90% of Pre-Development 10-year
- Post-Development 100-year compared to 90% of Pre-Development 25-year

Appendix E contains figures showing the pre-development and post development conditions. As previously mentioned, off-site runoff would be routed through the facility to the outfall location (Point D) unattenuated. All on-site runoff would be directed to a detention basin prior to being routed to the outfall (Point D).

Maintenance Facilities

There would be maintenance facilities within BIG for an electric hostler repair garage, crane maintenance pads, track pans on train repair tracks. Discharge associated with these facilities would be treated with an industrial oil/water separator prior to entering into the sanitary sewer system. No stormwater runoff from these facilities would enter the Mojave River.

Best Management Practices

The term BMP is used to describe acceptable practices that would be implemented to protect water quality consistent with the CGP. BMPs can be structural or non-structural (i.e., institutional). This section provides BMP examples that would be implemented to address water quality concerns both during construction (i.e., temporary) and post-construction (i.e., permanent). BMPs are selected based on their applicability, mitigation requirements, and site constraints.

Temporary Construction BMPs

Construction BMPs are temporary and used during construction to address typical pollutants generated due to construction activities. BIG would implement construction BMPs to avoid negative water quality impacts during construction. This section presents various structural and non-structural BMPs typically used during construction based on the type of work being done.

Structural BMPs

Structural BMPs would be used during construction to mitigate negative water quality impacts. Additional details pertaining to each of the structural BMPs identified are included below. The proposed improvements would be assessed during the final design to determine which BMPs are to be implemented at a given location.

- Silt fence
- Fiber rolls
- Gravel bag berm
- Sand bag barrier
- Tracking controls
- Storm drain/inlet protection
- Sediment basin
- Sediment trap
- Stockpile management
- Check dam
- Diversion berms and drainage swales
- Velocity dissipation devices

Silt Fence

Silt fences are temporary linear sediment barriers made of permeable fabric that lets water through and prevents the majority of sediment from discharging from the site. Silt fences also act by intercepting and slowing the flow of sediment-laden runoff and allowing sediment to settle from the runoff before water leaves the construction site. Silt fences shall be placed, as applicable, below the toe of exposed erodible slopes, down-slope of exposed soil areas, around temporary stockpiles, along streams and channels, and along the perimeter of a project.

Fiber Rolls

A fiber roll (straw waddle) consists of straw, flax or other similar materials that are rolled and bound into a roll. The fiber roll lets water through and prevents the majority of sediment from discharging from the site. Fiber rolls also act by intercepting and slowing the flow of sediment-laden runoff and allowing sediment to settle from the runoff before water leaves the construction site. Fiber rolls can be used in place of silt fences in the scenarios described above. They can additionally be used at grade breaks of exposed and erodible slopes and to protect storm drain inlets.

Gravel Bag Berm

A gravel bag berm consists of at least a single row of gravel bags that are installed end-to-end to form a barrier across a slope to intercept runoff. A gravel bag berm is used for similar reasons as silt fences and fiber rolls, as described above. Gravel bag berms are commonly used to protect ditches, swales, and storm drain inlets. They are also used for perimeter site control, around stockpiles, and at grade breaks.

Sandbag Barrier

A sandbag barrier is a temporary linear sediment barrier consisting of at least one row high of sandbags placed end-to-end, designed to intercept and slow sediment-laden runoff. Sandbag barriers allow sediment to settle from runoff before water leaves the construction site. Sandbag barriers tend to block and pond stormwater flows. Sandbag barriers are used to divert or direct flow away from disturbed slopes, along the perimeter of the site or stockpile areas, down slope of exposed and erodible soils, and across channels to serve as a barrier as necessary.

Tracking Controls

Tracking controls consist of constructed/manufactured steel plates (rumble plates) and/or gravel. Tracking controls reduce off-site tracking of sediment and other pollutants by providing a stabilized entrance at defined soil disturbance activity site entrances and exits with materials that aid in removing sediment from vehicles, especially their tires or tracks. Controls can also consist of providing methods to clean-up sediment or other materials to prevent them from entering a storm drain, such as sweeping or vacuuming. Tracking controls can also include implementing tire washing. Stabilized entrances and/or sweeping is typically implemented where dirt or mud is tracked onto public roads, adjacent to water bodies, and where dust is a problem during dry-weather conditions.

Storm Drain/Inlet Protection

Storm drain/inlet protection BMPs may include a combination of BMPs at storm drain or other drainage inlets to protect against the discharge of sediment-laden runoff from construction activities. The BMP slows or ponds the flows, giving the sediment time to settle out before discharging to the storm drain. These controls shall be implemented at onsite and downstream inlets that have the potential to be impacted during construction. A series of check dams (gravel bag berms) can be constructed along the drainage path and/or fiber rolls or filter fabric can be used at the inlet. Storm drain/inlet protection must be removed prior to a projected rain event once the site has been protected to allow storm flows to properly drain.

Sediment Basin

Sediment basins are temporary basins formed by excavation or by constructing an embankment to temporarily detain sediment-laden runoff, allowing sediment to settle out before discharging from the site. Sediment basins can be used on sites ranging from five to 75 acres assuming there is adequate space. In general, the basin depth must be no more than three feet with additional freeboard depth. The basin must include an overflow or bypass so that flows can leave the site during larger storm events. Rock, vegetation, or other erosion control measures must be used to protect the basin inlet, outlet, and slopes from erosion.

Sediment Trap

Sediment traps are small, temporary containment areas used for the same reason sediment basins are used, to address sediment-laden runoff prior to discharge. Sediment traps typically have a gravel outlet and are used to mostly remove large and medium-sized soil particles. Sediment traps can be used on sites smaller than five acres and should have side slopes of approximately three (horizontal) to one (vertical). As with sediment basins, an overflow/bypass must be provided.

Stockpile Management

Stockpile management consists of placing temporary BMPs, such as secured covers, over the piles, and/or placing berms, silt fences, fiber rolls, sand/gravel bags or straw bale barriers around the perimeter of stockpiles. Soil stabilizers/binders may also be used to augment stockpile management.

Check Dam

Check dams are small barriers constructed of rock, logs, gravel bags, sandbags, fiber rolls, or other suitable materials, placed across a swale or drainage ditch. Check dams create small pools and reduce the effective slope of the channel, reducing scour and erosion by reducing flow velocity and increasing residence time within the channel. Check dams promote sediment trapping. Check dams are typically used in small open channels to reduce slope and velocities and in temporary ditches.

Diversion Berms and Drainage Swales

A diversion berm is a temporary berm of compacted soil used to direct runoff water to a desired location. A drainage swale is a shaped and sloped soil depression used to convey runoff to a desired location. Diversion berms and drainage swales divert off site runoff around the construction site, divert runoff from flowing onto stabilized and disturbed areas, and direct runoff into sediment basins or traps. A diversion berm or swale itself does not control erosion or remove or trap sediment from runoff. Diversion berms/drainage swales are typically used at the tops of slopes to divert run-on from adjacent or undisturbed slopes, at bottom and mid-slopes, below steep grades, and along roadways and facility improvements subject to flooding.

Velocity Dissipation Devices

Velocity dissipation devices are composed of rock, riprap, grouted riprap or concrete rubble, placed at the outlet of a pipe or channel to prevent scour and erosion caused by concentrated high velocity flows. There are many types of dissipation devices. Velocity dissipation devices should be considered at outlets of pipes, drains, culverts, storm drains, diversion ditches/swales, and channels, at outlet locations at the bottom of mild to steep slopes, at outlets subject to short, intense water flows, and at points where lined conveyances discharge to unlined conveyances.

Non-Structural BMPs

Non-structural BMPs would be used during construction to mitigate negative water quality impacts. These BMPs are incorporated into the operation of the construction site and mostly consist of preventative measures that reduce the potential for harmful water quality impacts. The proposed improvements would be assessed during the final design to determine which BMPs are to be implemented.

- Scheduling
- Material delivery and storage
- Material use
- Spill control
- Solid waste management
- Hazardous materials/waste management
- Contaminated soil management
- Sanitary/septic waste management
- Liquid waste/drilling fluid management
- Dewatering operations
- Paving operations
- Vehicle and equipment washing
- Vehicle and equipment fueling
- Concrete waste management
- Temporary stream crossing
- Preservation of existing vegetation
- Hydraulic mulch
- Hydroseeding
- Soil binders
- Straw mulch
- Geotextiles
- Dust control
- Soil preparation
- Street/parking lot sweeping

Post-Construction Permanent BMPs

In order to mitigate the increase in impervious area associated with BIG, permanent BMPs would be designed and implemented. These would be designed to mitigate water quality impacts and attenuate increases in peak discharge leaving the site.

BMPs would be used following construction. These would be a permanent part of the facilities and would be maintained by BNSF. The proposed improvements would be assessed during the final design to determine which BMPs are to be implemented. Potential BMPs to be implemented are as follows:

- Surface infiltration basin
- Subsurface infiltration system
- Seasonal dry detention pond
- Sand and media filter
- Rain barrel
- Infiltration trench
- Hydrodynamic separation device

Surface Infiltration Basin

Surface infiltration basins make an important contribution towards groundwater management. A key characteristic of these basins is placement over alluvial soils that allow rapid drawdown following a storm event. Careful planning, along with multiple infiltration tests, should be conducted to verify site specific infiltration capabilities. Surface infiltration basins require a larger footprint on the surface than other BMPs. Maintenance of surface infiltration facilities typically requires removal of accumulated sediment and maintenance of vegetation.

Subsurface Infiltration System

In areas where infiltration is favorable, a similar cistern design can be used, except the geotextile is omitted so that the runoff may infiltrate into the ground below the cistern and be naturally filtered before

recharging the groundwater table. Multiple infiltration tests should be conducted to verify site specific infiltration capabilities, as this BMP requires adequate infiltration to allow the system to drain within 72 hours to avoid vector concerns. These systems can be implemented with little to no surface area available, which is often desirable when there is limited open space.

Seasonal Dry Detention Pond

Seasonal detention ponds are an effective method for detaining runoff so that it can be metered out through secondary treatment, such as a bioswale, sand filter, or media filter. They are also effective in avoiding damage associated with hydromodification or flooding due to limited downstream conveyance capacity. Maintenance for detention ponds consists of sediment removal and vegetation management.

Sand and Media Filter

Surface, or Austin sand filters, are at ground-level and typically earthen. They are easy to maintain but have a large footprint. Perimeter, or Delaware, sand filters consist of two parallel trench chambers located in concrete vaults below an impervious surface, such as a parking lot. Media filters detain and treat stormwater via filtration and adsorption of pollutants to the filter media. Media filters containing both organic and mineral filtration materials generally have greater ion exchange capacity than sand filters and therefore can more effectively remove soluble metals and other dissolved pollutants. This renders media filters particularly effective for roadways and highly industrial sites that contribute higher concentrations of metals to stormwater runoff, particularly zinc and copper. Maintenance of sand and media filters requires sediment and debris removal and replacement of the filters as necessary.

Rain Barrel

Rain barrels hold roof runoff, usually delivered by rain gutters and downspouts, and store the water for later use. Screen installations at the downspout inlets prevent sediment, leaves, debris and mosquitoes from entering the rain barrel. Rain barrels are easily constructed for aesthetic purposes to compliment adjacent structures. Overall, maintenance requirements are minimal and include frequent visual inspections during the storm season and removal of accumulated sediment or debris. When effectively designed to capture and contain the runoff from a rooftop structure, a rain barrel can prevent runoff from small frequency storm events from ever leaving the property. This would reduce on-site water usage and the amount of pollutants that may potentially be carried offsite. This LID BMP can be implemented throughout residential areas.

Infiltration Trench

An infiltration trench is a shallow impoundment over permeable soil that holds and stores runoff until infiltration can occur, using the natural filtering ability of the soil, or other media such as gravel/sand, to filter out pollutants. Infiltration testing would need to be performed to verify infiltration is feasible. This LID BMP is effective at retaining sediment associated pollutants, but can become clogged, requiring removal of the upper media. Use of a vegetated swale would extend the systems longevity and reduce maintenance costs.

Hydrodynamic Separation Device

Hydrodynamic separation devices such as a continuous deflection system (CDS) unit can be used to remove trash from runoff and serve as a pretreatment device for many of the BMPs previously discussed.

A CDS unit effectively screens, separates, and traps debris, sediment, oil, and grease from stormwater and urban runoff. As flows travel through the system, a very fine screen deflects the pollutants, which are captured in a litter sump in the center of the system. The water velocities within the swirl chamber continually shear debris off the screen to keep it clean. CDS units are ineffective in removing soluble pollutants and smaller, less-settleable solids. It is recommended that the CDS unit be inspected at least once every thirty days after the wet season. Floatables should be removed and the sump cleaned out. It is also recommended that the CDS systems be pumped out and the screen inspected for damage at least once per year.

6.0 CUMULATIVE IMPACTS

Cumulative impacts to hydrology and water quality are impacts that would result from incremental changes that degrade water quality or contribute to drainage and flooding problems within the study area. Generally, development introduces additional impervious surface areas that can increase runoff rates and decreasing the potential of water to be intercepted and captured prior to discharge.

Although BIG in combination with other cumulative projects in the study area represents an incremental change in regional drainage patterns and additional developed surfaces, BIG as well as other cumulative projects are required to construct a number of on- and off-site facilities that would mitigate cumulative drainage and flooding conditions, as well as mitigate potential water quality impacts, as discussed throughout this section. With the Project Design Features proposed to minimize potential impacts to hydrology and water quality and the regulatory requirements applicable to all development within the study area, BIG would not significantly contribute to cumulative or regional drainage or water quality impacts. In fact, BIG would make significant improvements to the local and regional hydrology and movement of storm flows throughout the study area.

7.0 MITIGATION MEASURES

BIG would significantly improve flood conditions locally as well as within the Lenwood community and the City of Barstow. No mitigation is required.

8.0 REFERENCES

- Association of American Railroads. (2022). *Freight and Preserving the Environment*. Retrieved from <https://www.aar.org/wp-content/uploads/2020/06/AAR-Sustainability-Fact-Sheet.pdf>.
- California Department of Water Resources. (2019). *Groundwater Basin Boundary Assessment Tool*. Retrieved from <https://gis.water.ca.gov/app/bbat/>.
- California Department of Water Resources. (2018). *Draft 2018 SGMA Basin Prioritization Process and Results. Appendix 4. Breakdown of area in basins with adjudications used during evaluation of component 8.c.3*. Retrieved from https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Basin-Prioritization/Files/2018-SGMA-Basin-Prioritization-Process-and-Results-Documents/Appendix_4.pdf.
- California Department of Water Resources. (2003). *Middle Mojave River Valley Groundwater Basin*. Retrieved from https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-Basin-Descriptions/6_041_MiddleMojaveRiverValley.pdf.
- California Water Resources Control Board. (2024). *2024 California Integrated Report*. Retrieved from: https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2024-integrated-report.html.
- City of Barstow. 2015. *City of Barstow General Plan*. Retrieved from <https://www.barstowca.org/departments/community-development-department/planning/general-plan-and-master-environmental-impact-report>.
- City of Barstow. (2015). *2015-2020 General Plan*. City of Barstow Planning Department.
- County of San Bernardino. (ND). *Flood Control District Zones*. Retrieved from <https://dpw.sbcounty.gov/flood-control/district-zones/>.
- County of San Bernardino. (2022). *San Bernardino Countywide Plan*. Retrieved from <https://countywideplan.com/policy-plan>.
- Federal Emergency Management Agency (FEMA). (2015a) *FEMA's Flood Map Service Center*. Retrieved from <https://msc.fema.gov/portal>.
- . (2015b). *Executive Order 11988: Floodplain Management*. Retrieved from <https://www.fema.gov/executive-order-11988-floodplain-management>.
- . (2015c). *FEMA's Flood Map Service Center*. Retrieved from <https://msc.fema.gov/portal>.
- . (2015d). *The National Flood Insurance Program*. Retrieved from <http://www.fema.gov/national-flood-insurance-program>.
- . 2016. *Flood Insurance Study for San Bernardino County, California and Incorporated Areas. Volumes 1-4. Flood Insurance Study Number 06071CV001D*.
- Lahontan Regional Water Quality Control Board (LRWQCB). (2002). *Watershed Management Initiative*. Retrieved from www.waterboards.ca.gov/lahtontan/water_issues/programs/watershed_management/docs/final_02_mr25.pdf.

- Lahontan RWQCB. (2021). *Water Quality Control Plan for Lahontan Region, Chapter 2 – Present and Potential Beneficial Uses*. Table 2-1. Beneficial Uses of Surface Waters of the Lahontan Region. Retrieved from https://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/docs/2022/ch2-bu.pdf.
- Natural Resource Conservation Service (NRCS). (2022). *Web Soil Survey*. Retrieved from <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>.
- Port of LA. (undated). *On-Dock Rail Service, the Alameda Corridor and Intermodal Yards*. Retrieved from <https://www.portoflosangeles.org/business/supply-chain/rail>.
- San Bernardino County. (1987). *Detention Basin Design Criteria for San Bernardino County*.
- Stamos, C., Martin, P., Nishikawa, T., & Cox, B.F. (2001). *Simulation of Ground-Water Flow in the Mojave River Basin, California*. Retrieved from https://pubs.usgs.gov/wri/wri014002/pdf/wrir014002_ver3.pdf.
- United States Army Corps of Engineers (USACE). (2015). *Hydrologic Engineering Center HEC RAS*. Retrieved from <http://www.hec.usace.army.mil/software/hec-ras/>.
- United States Bureau of Reclamation (USBR). (2019). *SRH-2D Software*. Retrieved from <https://www.usbr.gov/tsc/techreferences/computer%20software/models/srh2d/index.html>.

8.1 Persons and Agencies Consulted

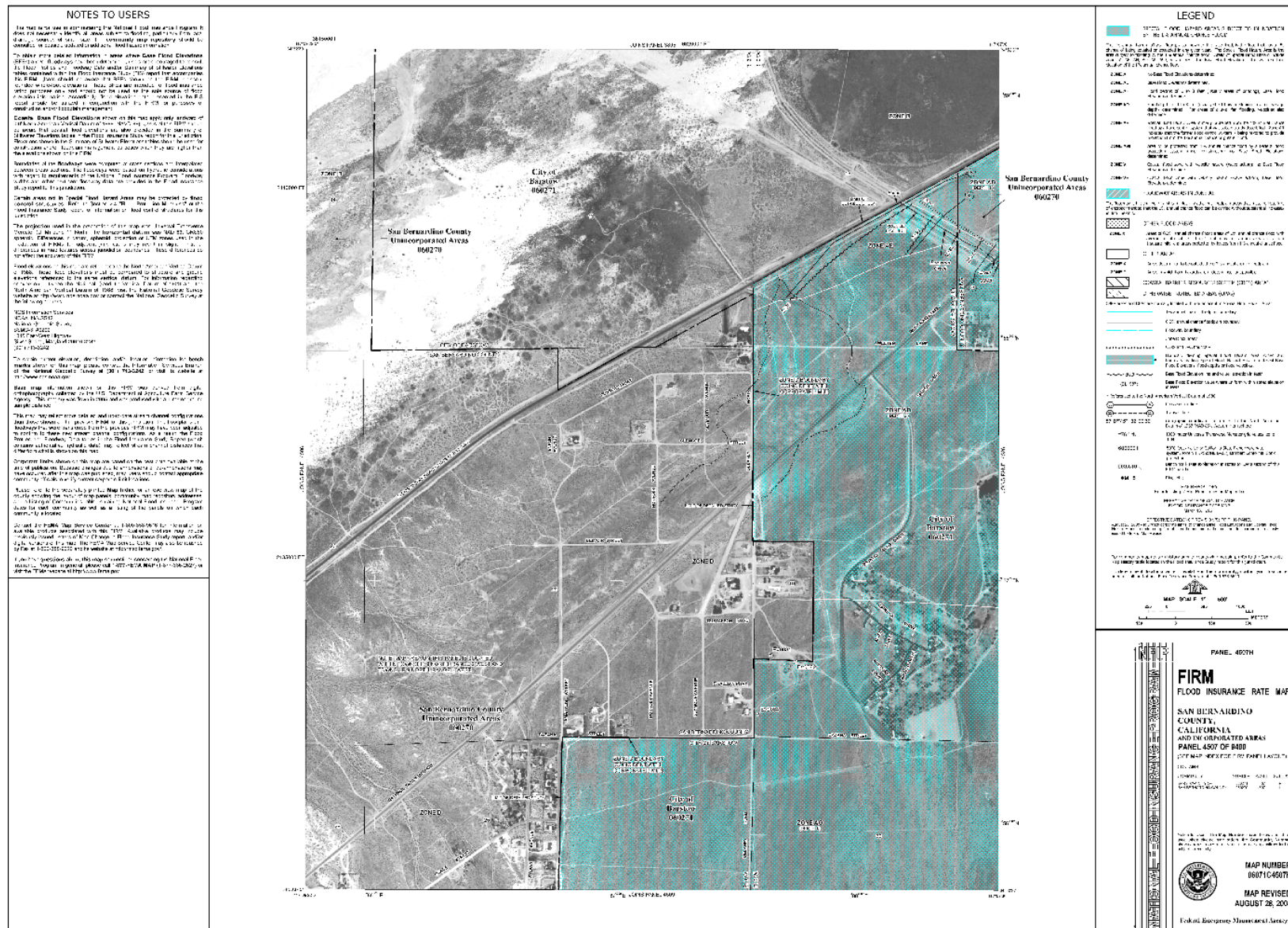
San Bernardino County Flood Control District
January 12th, 2023, at the SBCFCD main office

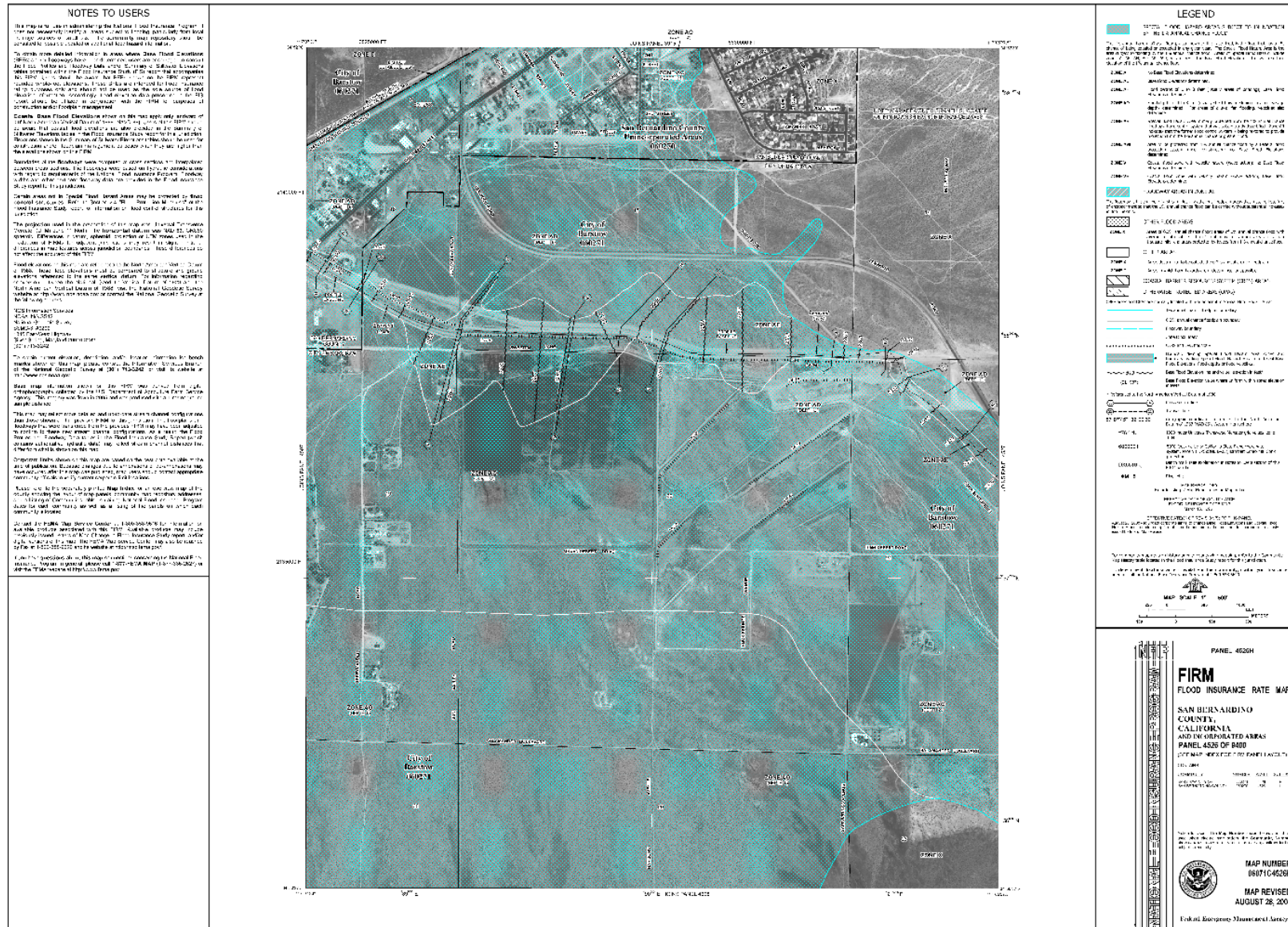
8.2 Preparer Qualifications

Preparer	Qualifications
Aaron Moore, PE Licensed Civil Engineer TranSystems	16 years of experience B.S. in Civil Engineering, University of Missouri-Kansas City M.S. in Civil Engineering/Water Resources, University of Missouri-Kansas City
Gary Kimball, PE Licensed Civil Engineer TranSystems	18 years of experience B.S. in Civil Engineering, University of Missouri-Kansas City
Kevin Thomas, CEP Kimley-Horn	39 years of experience B.A. in Environmental Engineering, University of California, Los Angeles
Miles Eaton, PE Licensed Civil Engineer Kimley-Horn	7 years of experience B.S. in Environmental and Ecological Engineering, Purdue University-West Lafayette
Sabrina Marquez, MS Kimley-Horn	3 years of experience B.S. in Biological Sciences, California State University-Fullerton M.S. in Environmental Policy, University of Denver

Appendix A

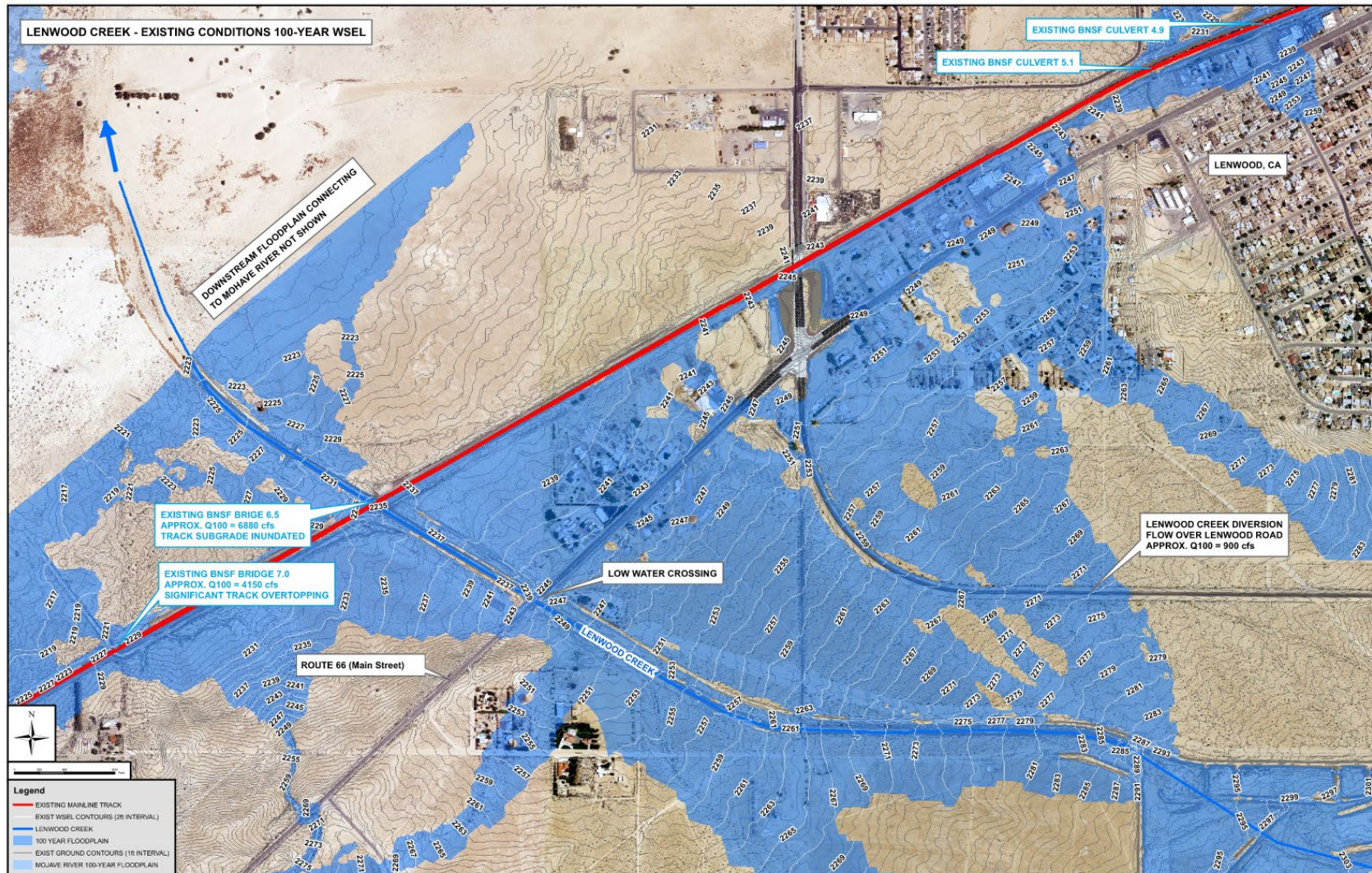
FEMA FIRM Panels

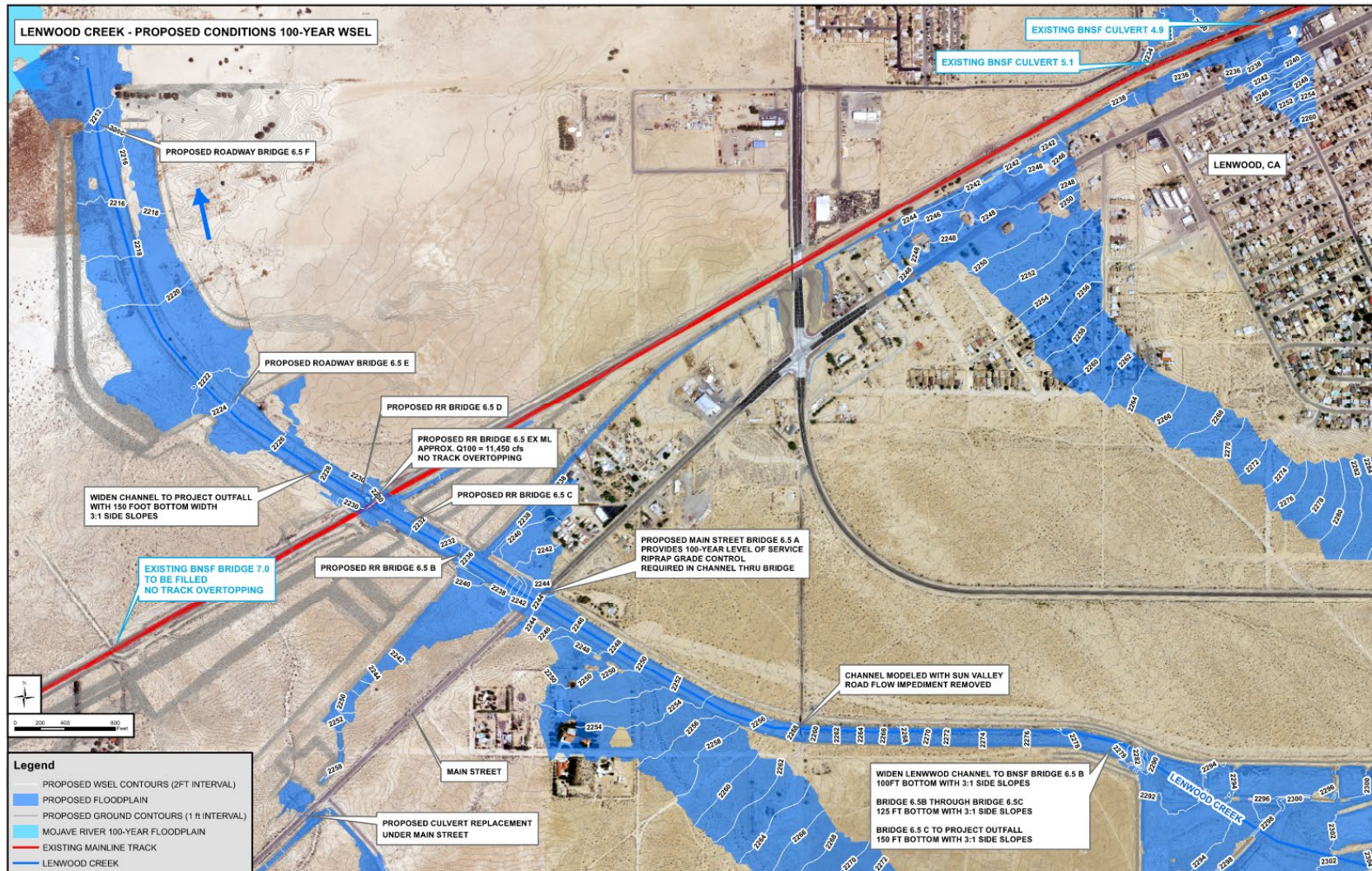




Appendix B

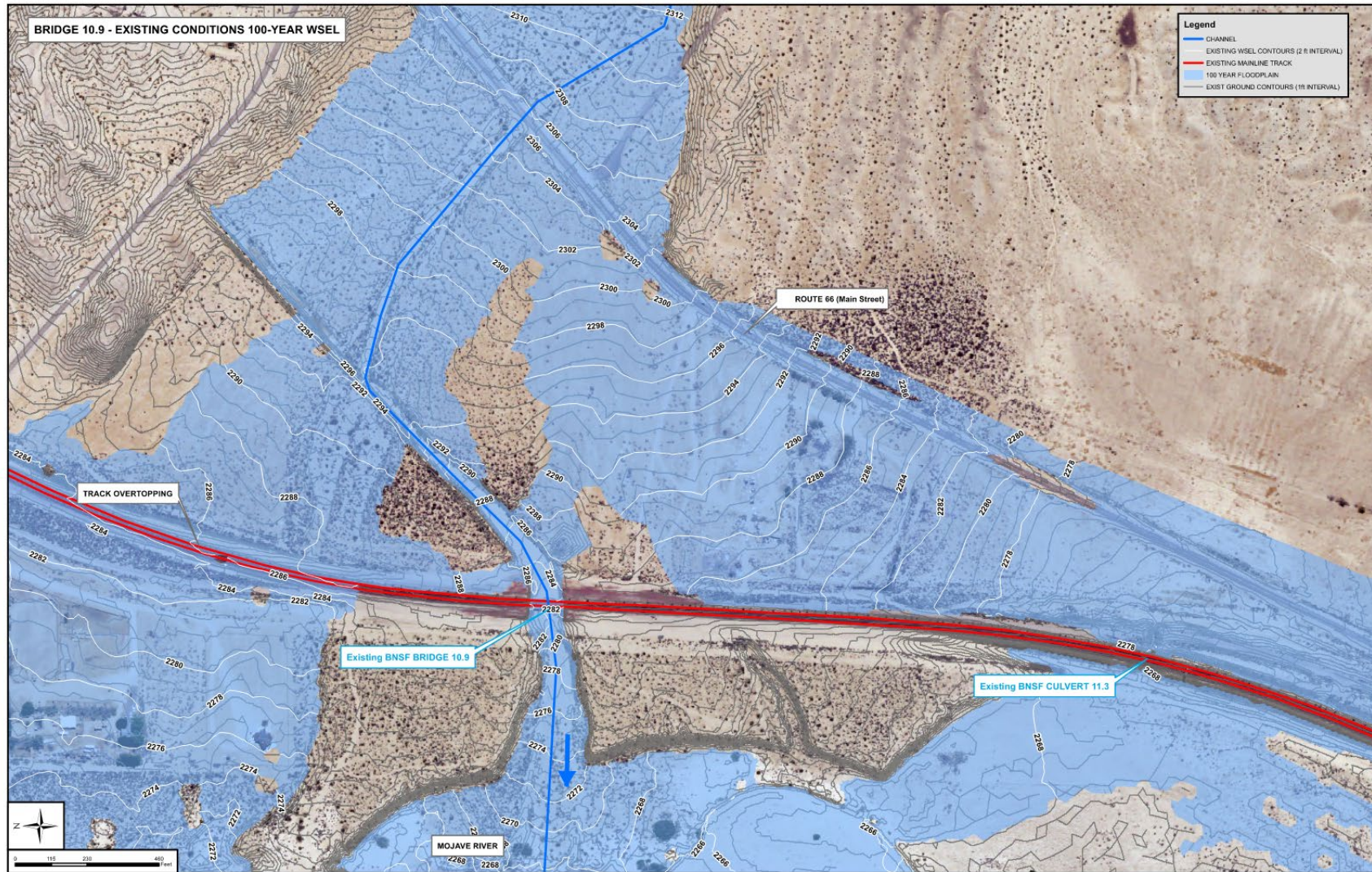
Lenwood Channel Analysis Exhibits

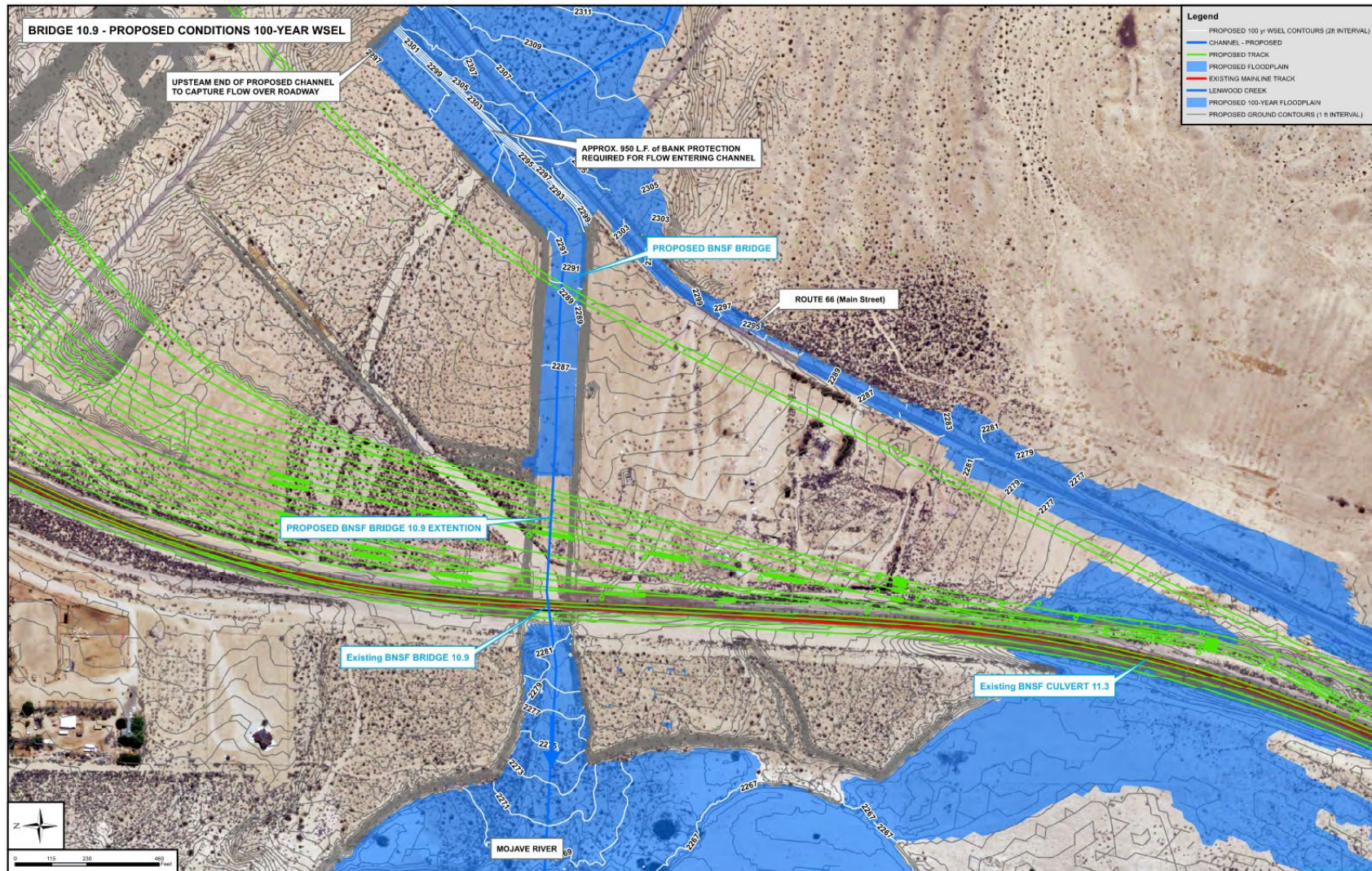




Appendix C

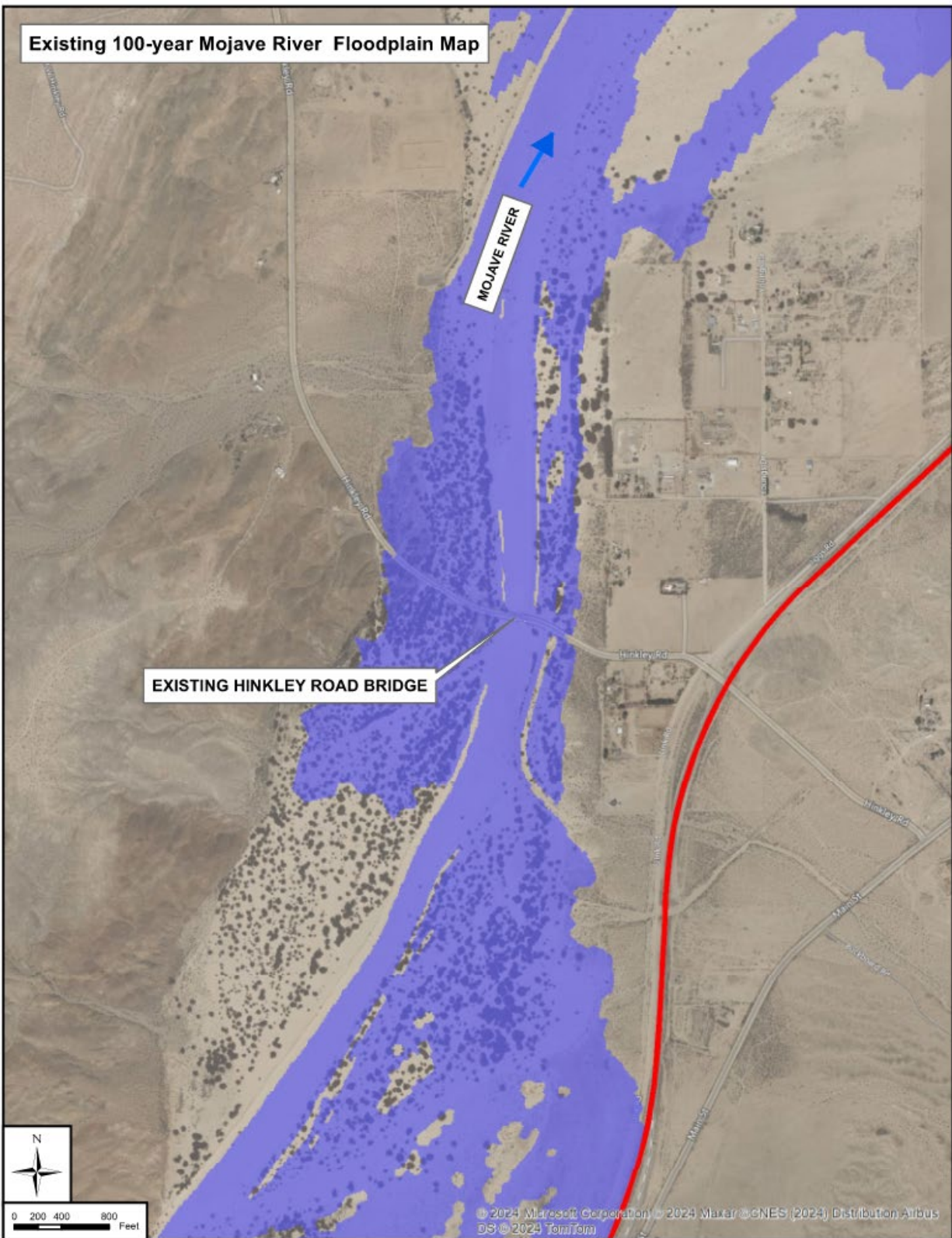
Unnamed Tributary to the Mojave River (MP 10.9) Analysis Exhibits

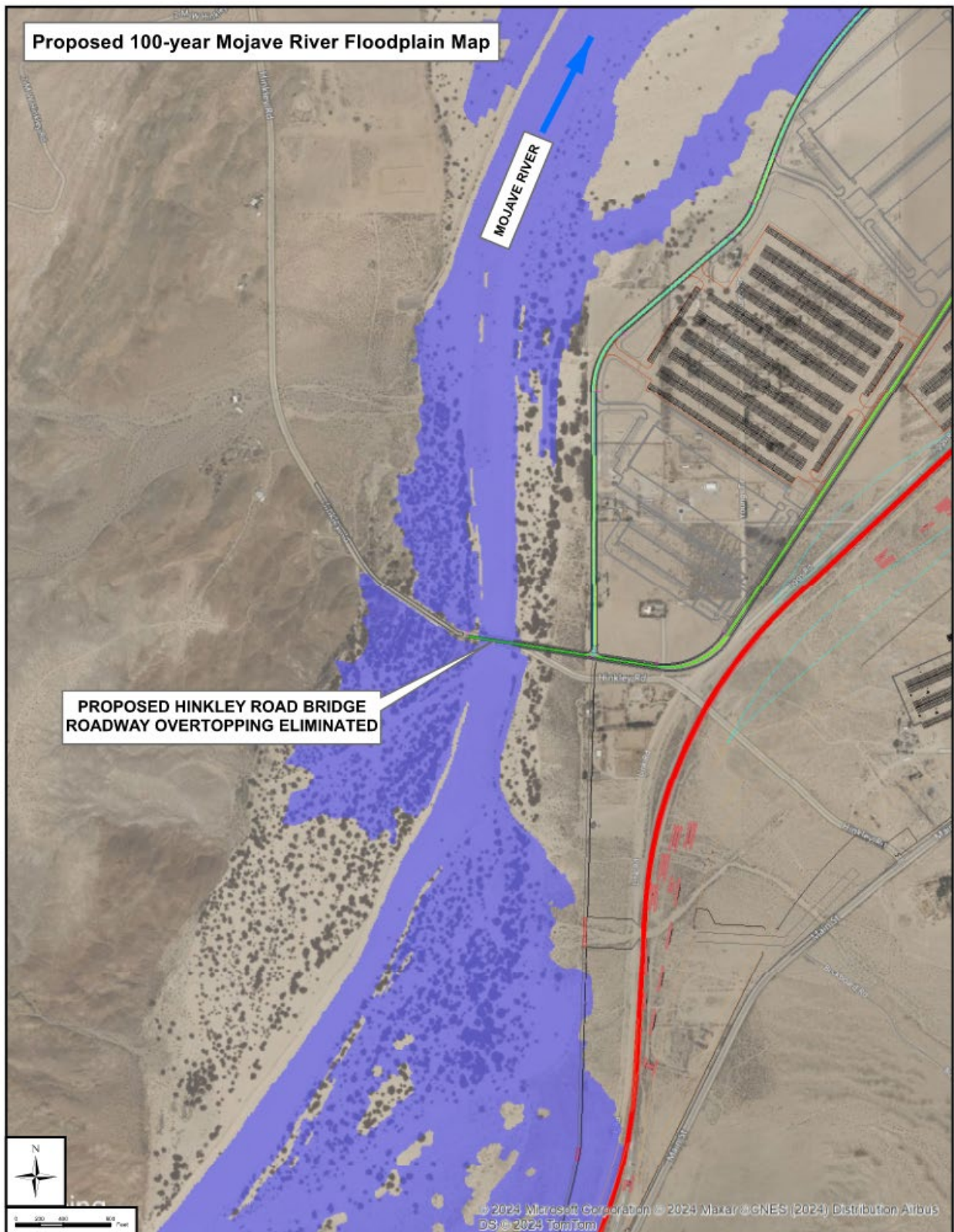




Appendix D

Mojave River (Hinkley Road) Analysis Exhibits





Appendix E

Site Drainage and Detention Exhibits

