APPENDIX G:
HYDROLOGY AND WATER QUALITY

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APPENDIX G-1: 2018 HYDROLOGIC AND WATER QUALITY STUDY

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HYDROLOGIC AND WATER QUALITY STUDY
for the
U.S. Gypsum Company
Supplemental Environmental Impact Study (EIS)
Plaster City, California

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1 INTRODUCTION

This Hydrologic and Water Quality Technical Study ("Study") was prepared for U.S. Gypsum's Plaster City Quarry ("Quarry") at the request of the Lilburn Corporation as part of a Supplemental Environmental Impact Statement (SEIS) for United States Gypsum (USG) Company's Expansion/Modernization Project (Project). The purpose of the Study is to provide engineering and environmental analyses and documentation required to obtain regulatory agency permits for continued development of the Quarry, per the approved Mine Reclamation Plan (Lilburn, 2003).

In 2008, a Final Environmental Impact Report/ Environmental Impact Statement (EIR/EIS; RDT, 2008) was prepared for the U.S. Bureau of Land Management (BLM) and the County of Imperial as Lead Agencies for the United States Gypsum (USG) Company's Expansion/Modernization Project ("Project"). Since the submittal of the Final EIR/EIS, the U.S. Army Corps of Engineers (ACOE) has been included in the Project review process as a cooperating agency, and has requested additional hydrology and water quality studies, which will be required for the issuance of Record of Decision (ROD) by the Lead Agencies. Specifically, the ACOE has requested additional studies identifying the potential impacts of the proposed berm and recent inclusion of the 40-acre Georgia Pacific parcel within the Quarry.

This Study was conducted to model/define both the existing and proposed hydrology and water quality conditions for the Quarry watershed, and to provide an analysis of potential Project impacts to these resources. Dudek has prepared a detailed hydrologic analysis of the Quarry watershed for both the existing and proposed conditions, and a hydraulic analysis was included to assist with determining the proposed impacts to the mapped U.S. ACOE jurisdictional area (HES, 2016). The hydraulic analysis was specifically designed to identify potential impacts related to the proposed berm intended to divert runoff from entering the extraction sites, and included scour and sediment deposition analyses. Analyses were conducted using a spectrum of storm events relevant to jurisdictional delineation in the arid southwest (2-year, 5-year, 10-year), as well as storm events relevant to design assessment (25-year and 100-year).

All existing and proposed components of the Project within the Quarry watershed, including the 40-acre George Pacific property, were included in this Study's analyses. In addition, this Study will provide a review of potential hydrologic impacts related to the proposed quarry water supply improvements. Project plans and specifications found within this Study are not approved for construction purposes.

1.1 Project Description and Activity

USG's Modernization/Expansion Project within the Quarry consists of two activities: 1) the build out of the Quarry as described in the Mine Reclamation Plan (Lilburn, 2003), and 2) the development of an additional groundwater production well and supply line to the Quarry.

1.1.1 Mine Development Activities

USG currently extracts gypsum from geological deposits located in the Anza-Borrego Desert, southwest of the Salton Sea (**Figure 1-1**). Quarrying activities within this watershed have been ongoing since 1921 (with USG operating since 1945). The gypsum is shipped via rail to Plaster City where it is used to produce drywall and drywall products. USG's Quarry holdings total approximately 2,080.4 acres; 2,032.2-acres are owned by USG and 48.2-acres are active unpatented mill site claims. Ongoing development of the Quarry per the approved 2003 Mine Reclamation Plan would develop approximately 1,118.7 acres of USG's 2,032.2 acres of private land. The mine plan includes approximately 48.2 acres comprised of ten existing mill site claims; an additional five mill sites (25 acres) are proposed as part of the SEIS Proposed Action. Approximately 18.1 acres of Public Land under the management of the BLM would be disturbed by the proposed mine development. Build-out of the 2003 Mine Reclamation Plan would result in impacts to a total of 1,136.8 acres on both private and public land.

Since the submittal of the Project's EIR/EIS (RDT, 2008), a 40-acre parcel within the Quarry watershed was acquired by USG. This parcel, formerly referred to as the Georgia Pacific Parcel, falls within the Quarry boundary. There are no proposed disturbances (including mining) for this parcel.

Continued development of the Quarry would be conducted in phases, with the initial work beginning near the existing mining operations activities. Mining will consist of removing gypsum from exposed outcrops and deposits underlying alluvium within the main ephemeral channel of the Quarry watershed. Per the 2003 Mining Plan, up to 100 feet of overburden (maximum depth) will be removed to access the underlying gypsum deposits. Extraction of the underlying gypsum will progress downward from the toe of the overburden strip slope in 25-foot vertical benches at a maximum stable slope of 1H:1V (Horizontal:Vertical) until the bottom of the mineable zone is reached.

An earthen berm is proposed along the western edge of the proposed quarry extent in order to direct surface flows generated within the western half of the Quarry watershed northward to Fish Creek, around quarry activities. This berm will consist of local native material (sand and gravel). The proposed dimensions for the berm are 5 ft tall and 20 ft wide, with side slopes of 1:1.75. The proposed mining activities and earthen berm do cross a number of jurisdictional waters of the

United States Army Corp of Engineers (USACE) within the Quarry watershed. The potential impact of these Project components to jurisdictional waters is the primary focus of this Study.

1.1.2 Quarry Water Supply

USG proposes to drill a water production well (Well No. 3) on USG-privately owned land (within APN 033-020-09) to meet Quarry daily water demands (e.g., plant operations and dust suppression). The existing Quarry wells No. 1 (out of service) and No. 2 (diminishing production; currently down to 8 gallons per minute (gpm) from 20 gpm) cannot meet the daily water requirements for the operation of the Quarry; water is currently shipped in by rail from Plaster City. Well No. 3 should reduce the necessity to ship water by rail, and will be connected to the Quarry via an 8 inch pipeline installed underground alongside of the existing alignment of the narrow-gauge railroad right-of-way (ROW) CALA-040412. In addition, a power service line would be installed underground from the well head to the Quarry gate; power poles will be installed within the Quarry property. The proposed 18,240 linear feet utility line alignment is proposed approximately 30 feet north of the centerline of the existing tram road ROW CALA-040412. All waterline/powerline construction areas will be restored to pre-project conditions following the completion of construction activities. Impacts associated with the waterline/powerline are considered temporary. Impacts related to groundwater production were addressed in the Project’s EIR/EIS (RDT, 2008).

1.1.3 Potential Project Pollutants

During operations and maintenance of the Project facilities, small quantities of hazardous materials may be periodically and routinely transported, used, and disposed. These materials would consist primarily of minor amounts of petroleum products (fuels and lubricating oils) and a small to moderate amounts of explosives used in extracting the gypsum ore. The handling and storage of fuels, lubricants, and explosives within the Quarry follow Mine Safety and Health Administration (MSHA) and Imperial County regulations. Small quantities of additional common hazardous materials may also be used on site, including antifreeze and coolants, latex and oil-based paint, paint thinners and other solvents, cleaning products, and herbicides.

Activities associated with the extraction of the gypsum ore also result in the disturbance/exposure of loose soils and dust, which could contribute to increased sediment loads in stormwater discharge generated from the site. While suspended sediment serve as vehicles for transporting potentially toxic pollutants (by sorption) and can contribute to the degradation of aquatic habitat (e.g., increase turbidity/temperature/EC and reduce dissolved oxygen).

Gypsum

Title 40 of the Code of Federal Regulations, Part 436 pertains to the “Mineral Mining and Processing Point Source Category.” In 40 CFR Part 436 Subpart E – Gypsum Subcategory (436.50-436.52) effluent limitations are established for gypsum mining. Part 436.52 states that process water must be impounded to allow for the normal operating level as well as for the precipitation of a 10-year, 24-hour rainfall event as established by the National Climatic Center. For the Ocotillo 2 weather station located near Plaster City (32.7461°N, -116.0006°E), this amounts to 2.34” of precipitation according to the Precipitation Frequency Data Server maintained by the National Oceanic and Atmospheric Administration (NOAA).

1.1.4 Quarry Reclamation

As part of the 2003 Mine Reclamation Plan, areas disturbed by mining activities will be reclaimed to natural open space once the gypsum is removed. Quarry walls will be blasted to remove benches and smooth the topography to an overall natural slope averaging between 1H:1V to 2H:1V slopes. Upon termination of quarrying activities, equipment and structures will be removed and foundations reduced below grade and covered in place. Minimal infrastructure (e.g., trailer, access roads) will be maintained for ongoing revegetation monitoring and property security. The area will remain gated and off-limits to recreational activities.

1.2 Previous Studies

Extensive groundwater and hydrology studies were conducted and included in the 2008 EIR/EIS. Impacts to natural resources, including groundwater (quantity and quality), surface water, wildlife, and cultural resources, as a result of the Project activities within the quarry, were declared less than significant with appropriate mitigation measures. The impacts to jurisdictional (surface) waters were declared less than significant in the EIR/EIS based off of a 2004 Hydrology Study and Drainage Analysis provided by Joseph Bonadiman & Associates. This study included a rainfall/runoff analysis comparing existing with proposed conditions for the drainage area west of the proposed berm, and provided a conclusion that natural flows could be conveyed safely around the berm within a graded channel with a bottom width of 50 feet (ft) and a berm height of 5 ft (assuming 2 ft of freeboard). As approved in the 2008 EIR/EIS, Mitigation Measure 3.3-7 consists of this berm and the accompanying conveyance channel, and is required to convey flows around the Project. While Bonadiman’s hydrology analysis incorporated the 50 ft-wide channel to convey flows around the Project, this analysis was conducted following the latest grading plans which do not include the conveyance channel. In addition, the 40-acre Georgia Pacific parcel was not included in the Bonadiman hydrology study (as this parcel was included later), but is in this study.

As part of the USG SEIS, Hernandez Environmental Services (HES) conducted a jurisdictional delineation for the Project in 2016 (Appendix A). Jurisdictional features identified by HES in 2016 are referenced throughout this Study.

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2 PROJECT AREA

This section provides site-specific descriptions of the pertinent Project geographic features, local and regional hydrologic characteristics, as well as receiving waterbody beneficial uses and general water quality conditions.

2.1 Project Location

The Project area currently consists of an active exposed gypsum mine within an ephemeral desert wash tributary to Fish Creek in unincorporated Imperial County, approximately 6 miles south of the City of Ocotillo, and 20 miles northwest of Plaster City. Geographically, the Project site is located adjacent to the Imperial Valley; bounded by Anza-Borrego Desert State Park and Split Mountain to the west, Fish Creek to the north, and the Fish Creek Mountains to the south and east. **Figure 1-1** presents the location of the proposed Project from a regional perspective.

2.2 Project Hydrologic Setting

The Project site falls within a 6,734 acre drainage area (Quarry watershed) in the greater Ocotillo Lower Felipe hydrologic area (HA) located within the Anza-Borrego hydrologic unit (HU) in the Colorado River Basin (**Table 2-1**). The Region, HU and HA information presented in **Table 2-1** was obtained from the California Interagency Watershed Map (Calwater 2.2.1, 2004). All existing and proposed components of the Project comprise approximately 1,100 acres.

Table 2-1
Project Hydrologic Characteristics

Region	Hydrologic Unit (HU)	Hydrologic Area (HA)
Colorado River Basin (700.00)	Anza-Borrego (722.00)	Ocotillo Lower Felipe (722.20)

Source: California Interagency Watershed Map (Calwater 2.2.1, 2004)

Figure 2-1 shows the location of the proposed project with reference to the Ocotillo Lower Felipe HA. A comparison of the proposed Project area with respect to the acreage of the Ocotillo Lower Felipe HA is presented in **Table 2-2**. The proposed Project area is approximately 0.34 percent of the area encompassed by the affected HA.

Table 2-2
Project Contribution to Hydrologic Area

Hydrologic Area	Area (Acres)	Approximate Proposed Project Area (Acres)	Estimated Project Contribution (Percent)
Ocotillo Lower Felipe (722.20)	322,686	1,100	0.34%

Source: California Interagency Watershed Map (Calwater 2.2.1, 2004)

The region is characterized by low average annual rainfall (~4.5 inches), high rates of evapotranspiration, and steep rocky terrain sloping to lower-gradient alluvial filled basins. The hydrology of the region is dominated by the brief but high intensity rainfall events that typically occur during the bi-modal winter or summer rainy seasons. The majority of these rainfall events do not produce runoff, but those with sufficient rainfall intensity can, and often result in channel forming flash floods with high scouring energy and sediment loads. Within the steeper slopes of the Quarry watershed, concentrated runoff is collected within single well-defined channels, many of which are deeply incised. Upon reaching the alluvial basin of the Quarry watershed, coarse sediment loads are deposited with loss of streamflow energy, sometimes clogging channels and directing flow into prior channels (relic channels) or creating new channels. This dynamic has led to the development of a system of braided channels within the alluvial basin of the Quarry watershed, most effectively described as a series of compound channels, , where a single dominate low-flow channel meanders through a network of relic channels and terraces, often susceptible to channel relocation during moderate to high discharge events (ACOE, 2008).

Surface flow generated from the Quarry watershed joins Fish Creek Wash just upstream where Split Mountain Road crosses Fish Creek Wash, at the apex of the Fish Creek Alluvial Fan. Similar to when the flows in the steeper Quarry watershed terrain reach the alluvial valley, surface flows that reach the Fish Creek Alluvial Fan apex lose energy and drop heavier sediment loads, often redirecting flows and forming numerous channels across the valley floor. As a typical alluvial fan, flow can be distributed across multiple channels during a single flow event (ACOE, 2008). Surface flows are typically lost to shallow infiltration in the soils adjacent the active channels (and along floodplains) which are then lost to the high evaporative demands of the region. A smaller percentage of the discharge is lost to infiltration through the channel (transmission), which ultimately becomes groundwater recharge. Groundwater recharge is typically highest near the fan apex (Houston, 2002), where the coarser material is deposited. If surface flows are sufficient enough to overcome the losses within the alluvial fan (infiltration, soil tension, evaporation and evapotranspiration), they ultimately coalesce approximately 11 miles downstream near the confluence with San Felipe Creek.

San Felipe Creek resembles a more defined single-thread channel (ACOE, 2008) which drains to the Salton Sea approximately 20 miles east of the confluence with Fish Creek Wash. Fish Creek Wash is an ephemeral drainage downstream from the Project, while San Felipe Creek gains intermittent surface flows approximately 11 miles downstream (northeast) from the Quarry. The perennial surface water in this section of the creek is fed by groundwater discharge, not from the infrequent flows generated in Fish Creek. San Felipe Creek is natural habitat for the endemic *Cyprinodon macularius* (desert pupfish) (Black, 1980).

2.3 Existing Floodplain

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) identify flood zones and areas that are susceptible to 100-year and 500-year floods. This flood zone, Zone A, designates special flood hazard areas subject to inundation by the 1% (100-year) annual chance flood but for which no base flood elevations have been determined. The drainage located in the valley of the proposed project is located within a FEMA flood zone as depicted in **Figure 2-2**. Portions of the existing and proposed gypsum mining operations fall within the 100-year flood zone (FEMA, 1984).

2.4 Groundwater

A groundwater basin is defined by the California Department of Water Resources (DWR) as a hydrogeologic unit containing one large aquifer, or a series of stacked aquifers, with definitive lateral and horizontal boundaries (2003). California's Imperial Valley, and the area bordering the Salton Sea, are characterized by one large aquifer composed of numerous smaller interconnected groundwater basins and subbasins. The proposed project is located within the approximately 153,978 acre Borrego Valley Groundwater Basin (7-24), and specifically within the 90,086 acre Ocotillo Wells Sub-Basin (7-24.02), as defined by the California Department of Water Resources (DWR) Bulletin 118.

Two groundwater wells with depth to water information were identified near the project site. Well (12S08E22E001S) located approximately 7 miles north-northwest of the project site, provides groundwater depth data for the past 66 years. Current (2016) groundwater levels at this well indicate that the depth to groundwater is greater than 110 feet. Well 12S9E23D001S, located about 7.5 northeast of the project site, shows groundwater depths greater than 150 feet from 1980 to 2014.

Groundwater quality for well 12S9E23D001S is generally characterized as sodium chlorite-sulfate water. Total dissolved solids (TDS) concentrations range between 1,650 and 1,740 milligrams per liter (mg/L).

2.5 Water Quality

2.5.1 303(d) Listed Water Bodies

Fish Creek Wash and San Felipe Creek are not listed on California's Clean Water Act Section 303(d) list of Impaired Waters for any constituents. San Felipe Creek was evaluated for Selenium impairment but the previous conclusion was reversed after analysis of three fish tissue samples taken from the creek determined that none exceeded the Office of Environmental Health Hazard Assessment (OEHHA) Fish Contaminant Goal.

The Salton Sea is 303d listed for a number of contaminants that include arsenic, low dissolved oxygen (DO), nutrients, salinity, and toxicity. The Imperial Valley Drains are listed for sedimentation/siltation and selenium, in addition to a number of pesticides and herbicides. The 303d list indicates that selenium originates from the upper Colorado River basin, which does not include the San Felipe Creek drainage.

A Total Maximum Daily Load (TMDL) has been established for sedimentation/siltation[1] in the Imperial Valley Drains, which reduced the current load of 11,000 tons per year of sediment to 4,600 tons per year. Sediment loads from Fish Creek Wash and San Felipe Creek do not reach the Imperial Valley Drains as San Felipe Creek discharges directly into the Salton Sea.

2.5.2 Beneficial Uses for Surface and Ground Waters

The Colorado River Basin RWQCB implements the *Water Quality Control Plan for the Colorado River Basin* (Basin Plan), which designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan (California Water Code Sections 13240–13247). The Basin Plan provides quantitative and narrative criteria for a range of water quality constituents applicable to certain receiving water bodies and groundwater basins within the Colorado River Basin. Specific criteria are provided for the larger, designated water bodies within the region, as well as general criteria or guidelines for surface waters and groundwaters. In general, the narrative criteria require that degradation of water quality does not occur due to increases in pollutant loads that will adversely affect the designated beneficial uses of a water body. Surface waters within the Ocotillo Lower Felipe Hydrologic Area (722.20) and groundwaters within the Anza-Borrego Hydrologic Unit (722.00) have been assigned the following beneficial uses in the Colorado River Basin Plan as show in **Table 2-3**.

1 http://www.waterboards.ca.gov/coloradoriver/water_issues/programs/tmdl/tmdl_completed_projects.shtml#imperialvalley

Table 2-3
Beneficial Uses for Surface and Ground Waters

Surface and Ground Water Body	Hydrologic Unit Basin Number	Beneficial Use										
		AQUA	*MUN*	*FRSH*	*AGR*	*GWR*	*IND*	*REC1*	*REC2*	*WRM*	*WILD*	*RARE*
Washes/ Ephemeral Streams (Surface Water – includes Fish Creek)	722.20			●		●			●	●	●	
San Felipe Creek (Surface Water)	722.20			●	●	●		●	●	●	●	●
Salton Sea (Surface Water)		●					P	●	●	●	●	●
Anza-Borrego Hydrologic Unit (Groundwater)	722.00		●		●		●					

Source: Colorado River Basin Plan
Notes:
● = Existing Beneficial Uses
P = Potential Uses

The beneficial uses identified in **Table 2-3** for the surface water bodies in the Ocotillo Lower Felipe Hydrologic Area (San Felipe Creek and ephemeral washes such as Fish Creek) and the groundwater underlying the Anza-Borrego Hydrologic Unit are defined below:

- **Aquaculture (AQUA) –** Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.
- **Municipal and Domestic Supply (MUN) –** Includes uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
- **Freshwater Replenishment (FRSH)** – Uses of water for natural or artificial maintenance of surface water quantity or quality.
- **Agricultural Supply (AGR)** – Includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

- **Ground Water Recharge (GWR)** – Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting salt water instruction into fresh water aquifers.
- **Industrial Service Supply (IND)** – Includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
- **Contact Water Recreation (REC-1)** – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.
- **Non-contact Water Recreation (REC-2)** – Includes the uses of water for recreational activities involving proximity to water, but not where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- **Warm Freshwater Habitat (WRM)** – Includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates. Includes support for reproduction and early development of warm water fish.
- **Wildlife Habitat (WILD)** – Includes uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- **Rare, Threatened, or Endangered Species (RARE) –** Includes uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant of animal species established under state of federal law as rare, threatened or endangered.

3 REGULATORY SETTING

Part of the requirements of the SEIS is to identify potential significant impacts to hydrologic resources which could negatively affect their uses as identified by federal, state, and local policies. Regulations applicable to surface and groundwater impacts as a result of the proposed Project are defined in this section.

3.1 Clean Water Act

Under the federal Clean Water Act (33 U.S.C. 1251 et seq.) and the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) (California Water Code, Section 13000 et seq.), USG is required to maintain the beneficial uses and water quality objectives of the surface water and groundwater impacted by the Project. While the U.S. Environmental Protection Agency (EPA) is responsible for enforcing the CWA, California's State Water Resources Control Board (SWRCB) has been designated the lead agency for implementing the majority of the CWA laws pertinent to the Project. The Colorado River Regional Water Quality Control Board (RWQCB) is the regional branch of the SWRCB which oversees implementation of CWA permitting and develops water quality standards and beneficial uses for the water bodies in Imperial County (per CWA Section 303).

CWA Section 303(d)

Water bodies with specific water quality impairments that cannot be addressed through the implementation of point and non-point source pollution controls (to the maximum extent practicable) are identified under Section 303(d) of the CWA. The Project is required to identify all water bodies that may be impacted water quality standards CWA Section 303 (SWRCB and RWQCB). Potential impacts as a result of the proposed Project must fall within specific numeric endpoints and/or total maximum daily loads (TMDLs) established within the state's 303(d) impaired water bodies list, or the Colorado River RWQCB's Basin Plan, to meet the water quality objectives and preserve the Beneficial Uses for all receiving water bodies.

CWA Sections 401 and 404

Under CWA Section 404, projects must obtain a permit from the ACOE if discharging dredged or fill material into waters of the United States (unless discharge is exempted). Section 401 of the CWA requires that an applicant for any federal permit (including the Section 404 permit) obtain certification from the state that the discharge would comply with other provisions of the CWA and with state water quality standards. For the Project area, the Colorado River RWQCB must provide the water quality certification required under Section 401 of the CWA.

CWA Section 402 and the Industrial General Permit (IGP)

The CWA was amended in 1972 to provide that the discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit (Section 402). Section 402 was amended in 1990 to include stormwater discharges associated with industrial activities. Under this program, the Mineral Mining and Processing Effluent Guidelines and Standards (40 CFR Part 436) cover wastewater discharges from mine drainage, mineral processing operations, and stormwater runoff.

The Proposed Project will be subject to the state's Industrial General Permit (Order #2014-0057-DWQ). Part 436 of this order provides the Mineral Mining and Processing Effluent Guidelines and Standards which pertain to the Project's operations. Under these guidelines/standards, dischargers are required to: eliminate unauthorized non-stormwater discharges; develop and implement SWPPPs (or amend existing to incorporate additional Project components); implement BMPs; conduct monitoring; compare monitoring results to numeric action levels; perform appropriate exceedance response actions when numeric action levels are exceeded; and certify and submit all permit registration documents. Changes under the new IGP compared to the IGP issued in 1997 are that stormwater dischargers are required to implement minimum BMPs; electronically file all permit registration documents via the SWRCB's Storm Water Multiple Application and Report Tracking System; comply with new training expectations and roles for qualified industrial stormwater practitioners; sample to detect exceedance of annual and instantaneous numeric action levels; develop and implement exceedance response actions if annual or instantaneous numeric action levels are exceeded; monitor for parameters listed under CWA Section 303(d); design treatment control BMPs for flow- and volume-based criteria; and understand new criteria, sampling protocols, and sampling frequency for qualifying storm events. The new general order also defines design storm standards for treatment control BMPs, qualifying storm events, and sampling protocols to follow during a design storm event. As of 2018, the Colorado RWQCB has not adopted a municipal permit for the Project area.

3.2 Surface Mining and Reclamation Act (SMARA)

The California Legislature signed SMARA into law in 1975 in order to: 1) assure reclamation of mined lands, 2) encourage production and conservation of minerals, and 3) create and maintain surface mining and reclamation policy (regulations). One of the principal requirements of SMARA is the preparation of Reclamation Plan which includes maintaining air and water quality, minimizing flooding, erosion and damage to wildlife and aquatic habitats caused by surface mining. This plan must be prepared by a mining applicant prior to initiation of mining activities. Reclamation plans must be approved by the SMARA lead agency (usually counties or cities) and the California Department of Conservation, Office of Mine Reclamation. Reclamation plans are subject to environmental review under CEQA. The County of Imperial is the SMARA lead agency for the Project and the CEQA lead agency for this Project.

3.3 Federal Emergency Management Agency (FEMA)

In order to participate in the National Flood Insurance Program (NFIP), a flood-insurance subsidization program, Imperial County is required by FEMA to develop a plan identifying existing issues, goals/objectives and policies addressing flooding in the region. Imperial County's 2007 Flood Management Plan (FMP) provides a comprehensive risk assessment for the region. Flood hazard mitigation strategies defined in the FMP include a requirement for on-site retention (where a 100-year storm must fully drain within 72 hours) and mitigation to stormwater impacts (e.g., existing drainage courses must maintain function post-project). These mitigation strategies should be incorporated into existing land use planning and building codes, including the County's Flood Damage Protection requirements (Title 9 Land Use Ordinance, Division 16), and Section IV-E of the County's General Plan (Engineering Design Guidelines Manual for the Preparation and Checking of Street Improvement, Drainage and Grading Plans within Imperial County).

3.4 California Department of Fish and Wildlife (CDFW)

Under the California Fish and Game Code (Division 2, Chapter 5, section 1600-1616), projects which may impact a body of water by diversion, channel modification, and/or pollution, must procure a Section 1602 Lake or Streambed Alteration Agreement from CDFW. This requirement is a statewide measure to conserve, protect, and manage California's biological resources, and applies to all drainage features that have historically conveyed surface flows (circa 1800 to present) with identifiable physical or biological indicators. This regulation does apply to ephemeral streams such as those within the Project site.

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4 PROJECT HYDROLOGY AND HYDRAULICS

4.1 Existing and Proposed Hydrology

The drainage area being considered for this report encompasses approximately 7,000 acres of primarily barren land. A watershed hydrologic analysis was prepared for the 2-year, 5-year, 10-year, 25-year and 100-year storm return intervals. Existing and proposed drainages (where surface flow concentrates) were delineated using a 10-meter resolution digital elevation model (DEM) provided by the United States Geological Survey (USGS, 2014), and Quarry topography surveyed in 2008 (provided by Lilburn). The peak flowrate corresponding to each of these storm intervals was determined utilizing the Riverside County Flood Control Hydrology Manual. The project site is located in Imperial County, California, however Imperial County does not have a published hydrology manual. Riverside County's hydrology manual was used as the basis for hydrologic analyses because of the similarities in watershed topography, soil types, arid region land uses and storm patterns.

A single area unit hydrograph model was prepared to facilitate the analysis of the watershed using the Riverside County 2011 AES program. All analysis was performed using NOAA Atlas 14 Precipitation Data for a 6-hour storm duration, see Appendix B for NOAA data. The land use is unchanged between the existing and proposed condition, no impervious area is proposed to be added or removed. The proposed condition hydrology reflects the fact that runoff in the existing unnamed ephemeral creek bed will be decreased by the proposed project development plan. The proposed site grading will capture runoff from the easterly portion of the watershed and convey it in a proposed drainage system. This will in affect reduce the flow tributary to the existing creek bed and provide a new flow path within the watershed. For this reason, the proposed condition watershed was analyzed as two separate drainage areas corresponding to two separate drainage paths. Hydrology maps for the existing and proposed (easterly and westerly) conditions are provided in the Exhibits section at the end of the report.

Summary tables displaying peak flow from the unit hydrograph analyses are provided below for existing and proposed conditions. **Table 4-1** displays existing condition results. Results for the proposed condition are shown separately for the east and west side of the berm in **Table 4-2**. All input and results from the hydrology model are provided in Appendix C.

Table 4-1
Existing Condition Unit Hydrograph Peak Flowrate

2-YR (cfs)	5-YR (cfs)	10-YR (cfs)	25-YR (cfs)	100-YR (cfs)
750	1,500	2,200	3,500	5,800

Table 4-2
Proposed Condition Unit Hydrograph Peak Flowrate

Watershed	2-YR (cfs)	5-YR (cfs)	10-YR (cfs)	25-YR (cfs)	100-YR (cfs)
Westerly	450	900	1,300	2,000	3,300
Easterly	350	700	1,011	1,600	2,600

The Georgia-Pacific 40-acre parcel now identified as being within the project site is shown on Exhibit 1. The Georgia-Pacific parcel was included in the hydrology and hydraulic analyses provided in this study. The parcel is part of the undeveloped easterly portion of the watershed that drains to the easterly side of the proposed berm. The land use for the parcel is unchanged in the proposed condition. None of the proposed drainage improvements are located within the 40-acre parcel, therefore no specific analysis or design recommendations have been made in that regard.

4.2 Existing and Proposed Hydraulics

Hydraulic analysis for the existing and proposed conditions was performed using HEC-RAS version 5.0.3 software based on the peak storm runoff flowrates found using methods described in previous sections.

A separate field effort was conducted for this SEIS by Juan Hernandez, Principal Biologist, at Hernandez Environmental Services in 2016, which mapped all the jurisdictional waters within the Project boundaries and delineated the Ordinary High Water Mark (OHWM). The OHWM was identified primarily from field evidence such as change in sediment, vegetation, and break in slope, and is shown on **Figure 4-1**.

The first goal of the hydraulic analysis was to determine and map the floodplain boundary corresponding to the 2-yr, 5-yr, and 10-yr storm return intervals for the existing and proposed site conditions for use in jurisdictional delineation. Existing and proposed flow paths were determined based on the topographic data provided by the Lilburn Corporation (2016). The proposed berm was modeled in HEC-RAS as a levee, which directs the program to assume that the berm will not fail or be overtopped. The flood stage estimated by the 10-year HEC-RAS model run was compared to the OHWM determined by Hernandez Environmental Services (2016).

Results of the HEC-RAS10-year hydraulic analysis for the existing and proposed condition are provided in Appendix D and in Exhibits 4 through 7. A map that compares the existing and proposed water surface extents can be seen in Exhibit 6. All input and results from the HEC-RAS model runs hydraulics model are provided in Appendix D. HEC-RAS results for the 10-

year storm (existing conditions) are mapped against the OHWM identified in the field by Hernandez Environmental Services (**Figure 4-1**).

The second goal of the hydraulic analysis was to provide an assessment of the design of the proposed berm. Design storms corresponding to the 25-year and 100-year storms were modeled in HEC-RAS to evaluate critical design parameters for the berm. The results of the 25-year and 100-year hydraulic analyses for the existing and proposed condition are provided in Appendix D. Results of the hydraulic analyses to the berm are discussed in Section 5.3.

4.2.1 Scour Calculations

Scour calculations were performed for the westerly side of the proposed berm, based on a 100-year storm event. Scour calculations look at expected scour that could occur along the main flow path for the proposed condition, approximately 23,000 feet. A work map was prepared to show the subject reach, the location of the model cross sections, limits of flooding and provide model results. The Scour and Floodplain Work Map is included as Exhibit 7. The components of scour used to determine the total maximum expected scour for a 100-yr storm event are low flow incisement, bed form scour and general scour. Each component is described in detail below.

Low-Flow Incisement scour is caused by nuisance runoff that originates from small storms that do not produce enough flow to fill the whole channel. Instead, the smaller flows create their own small channel through the main flow path, which is known as a low flow channel. Low Flow Incisement Scour was estimated based on the depth of the existing low-flow incisement throughout the flow path as indicated by the topographic contours.

Bed Form Scour is a kind of scour that develops dunes and anti-dunes, which look like peaks or troughs respectively, that occur on the channel floor. Bed Form Scour was estimated using methods developed by Simon and Li for dune and antidune formations in sand bottom washes.

General Scour describes the kind of scour that is not localized but occurs across the majority of the channel when there are no flow obstructions, such as piers. General Scour was calculated using the Blench (1969) and Lacey (1930) Regime Equations. Local scour elements were not included in the calculation because the watershed does not contain bridges. Detailed scour calculations can be found in Appendix E.

The total scour for a given cross section was taken as the sum of three scour components: Bed Form Scour, General Scour and Low-Flow Channel Incisement. A factor of safety of 1.3 was added to the total scour calculated. Scour results can be found in Table 4-3.

Table 4-3
Scour Results

Cross Section	Low Flow Incisement (ft)	Bed Form Scour (ft)	General Scour (ft)	Total Scour (ft)
23000	3	0.7	4	10
22500	3	13.9	9	34
22000	3	1.6	5	12
21500	3	2.5	6	15
21000	3	2.9	6	16
20500	3	6.8	8	24
20000	3	0.4	3	9
19500	1	2.1	4	10
19000	1	0.5	3	6
18500	1	3.4	6	13
18000	1	0.5	3	6
17500	1	0.9	4	8
17000	1	0.5	3	6
16500	1	0.8	4	7
16000	1	0.7	4	7
15500	1	1.3	4	9
15000	1	1.3	5	9
14500	1	2.3	5	11
14000	1	0.9	3	6
13500	1	0.9	3	7
13000	1	1.0	4	8
12500	1	0.7	4	7
12000	1	0.8	4	8
11500	1	0.4	3	6
11000	1	0.9	4	8
10500	1	0.6	4	7
10000	1	0.5	4	7
9500	1	0.9	4	8
9000	1	0.5	4	7
8500	1	0.7	4	8
8000	1	0.6	4	7
7500	1	3.4	5	12
7000	1	0.6	4	7
6500	1	1.5	5	9
6000	1	0.7	4	7
5500	1	0.6	4	7
5000	0.5	0.6	4	6
4500	0.5	0.3	3	5
4000	0.5	0.4	3	6

Table 4-3
Scour Results

Cross Section	Low Flow Incisement (ft)	Bed Form Scour (ft)	General Scour (ft)	Total Scour (ft)
3500	0.5	0.3	3	5
3000	0.5	0.4	3	6
2500	0.5	0.4	3	6
2000	0.5	0.2	3	5
1500	0.5	0.4	3	6
1000	0.5	0.3	4	6

4.2.2 Sediment Deposition Calculations

An evaluation of expected total sediment deposition was performed for the Project's proposed conditions at the request of the ACOE. Total sediment deposition is the amount of sediment that can be expected to reach the base of the watershed and is based on total soil loss and a sediment delivery ratio for the given watershed. The sediment deposition calculations were conducted using methods described in the United States Department of Agriculture Natural Resource Conservation Service's (NRCS) *National Engineering Handbook*, and assumed that all flows generated within the westerly drainage area are conveyed around the proposed berm.

Total soil loss is estimated using the Universal Soil Loss Equation that consists of the following factors: rainfall, erodibility, topographic, cover and support practice. The rainfall factor is selected using an average annual rainfall erosion index for a given area based on 22 years of storm data compiled by the NRCS. The erodibility factor is selected using the NRCS Soil-Erodibility Nomograph for a given soil type. The topographic factor is estimated using the NRCS Slope-Effect Chart that estimates a topographic factor using a combination of the slope and length of slope. The cover factor is selected based on land use and the type of plant cover in the area. The support practice factor is selected based on the different control practices implemented that reduce erosion potential and drainage patterns. If erosion control practices are not implemented on the site, the support practice factor is omitted.

Sediment delivery ratio is estimated based on the size of the drainage area. A figure showing the relationship between the sediment delivery ratio and drainage area can be found in the NRCS *National Engineering Handboo*k. Detailed sediment deposition calculations can be found in Appendix F.

The total sediment deposition for the proposed westerly drainage area was estimated by multiplying total soil loss calculated by the sediment delivery ratio. The sediment delivery ratio is a measure of the fraction of soil eroded and maintained in suspension compared to that which will settle out along the flow path. The sediment delivery ratio can be affected by a number of factors including sediment source, texture, nearness to the main stream, channel density, basin area, slope, length, land use/land cover, and rainfall-runoff factors. The relationship established for sediment delivery ratio and drainage area is known as the SDR curve. Coarser texture sediment and sediment from sheet and rill erosion have more chances to be deposited or to be trapped, compared to fine sediment and sediment from channel erosion. Thus the delivery ratios of sediment with coarser texture or from sheet and rill erosion are relatively lower than the fine sediment or sediment from channel erosion. A small watershed with a higher channel density has a higher sediment delivery ratio compared to a large watershed with a low channel density. A watershed with steep slopes has a higher sediment delivery ratio than a watershed with flat and wide valleys. Sediment deposition results are provided in **Table 4-4**.

Table 4-4
Sediment Deposition Results

Total Erosion (tons per year)	Sediment Delivery Ratio	Total Sediment Deposition (tons per year)
43,512	0.2	8,702

5 POTENTIAL IMPACTS AND PROPOSED ACTIONS

This section discusses the Project's potential significant impacts to water resources, and provides applicable mitigation measures for operation and management of Project conditions. Mitigation measures include structural and non-structural best management practices (BMPs) for basic Project operations, and recommendations for managing surface flows that develop west of the proposed berm.

5.1 Potential Significant Impacts and Proposed Mitigation

An analysis of the impacts identified using the hydrologic and hydraulic modeling results should be preceded by a discussion of an important modeling assumption and constraint. The development of the Quarry watershed's hydrologic parameters for this Study was based off of the most recent topographic data available (see Section 4.1). The existing channels identified in this topographic dataset are treated as static concentrated flows in the model. Based on the nature of compound drainage systems in arid regions (see Section 2.2), dominate flow paths often shift after moderate and high intensity runoff events. As this Study provides an assessment of how the additional Quarry phases and berm are going to impact the watershed's current hydrology based off of the most recent topographic dataset, it should be understood that future drainage patterns may naturally shift within and upstream the Quarry.

In addition, the geographic extent of the hydrologic and hydraulic modeling was also confined to the Quarry watershed boundary. The assessment of the proposed Quarry water supply line, as well as Project impacts to downstream hydrologic regimes (Fish Creek and San Felipe Creek), are based off of existing studies for the Project (RDT, 2008; HES, 2016) and the historical documentation of compound channel and alluvial fan hydrologic functions in the arid southwest (ACOE, 2008; Sutfin et al., 2014).

5.1.1 Hydrologic Resources

As a result of the region's infrequent but high-intensity runoff events, sparse vegetation, and steep topography, the natural hydrologic regime of the Quarry watershed consists of high scour and sediment transport potential. Surface flows generated within the Quarry watershed are typically lost to evaporation and infiltration through the coarse substrate in the alluvial basin and the downstream Fish Creek Alluvial Fan. While the proposed Project will permanently impact 134.08 acres of drainages within the Quarry watershed (Hernandez, 2016), the watershed's overall hydrologic functions can be preserved with sufficient mitigation (see Table 5-1).

Downstream, the Project will likely result in the reduction of surface flow and sediment loading to the Fish Creek Alluvial Fan (**Figure 2-1**). The potential reduction in accompanying groundwater recharge at the apex of the Fish Creek Alluvial Fan will likely be offset by increased recharge within the coarse alluvium of the Quarry watershed, and is overall considered minimal with the Project area contributing less than 1% of the total Ocotillo Lower Felipe HA land cover (see Section 2.2). As the perennial surface waters in the lower San Felipe River are not dependent on surface flows from Fish Creek Wash, the Project will have no impacts on the *C. macularius* habitat.

As addressed in the Project's EIR/EIS (RDT, 2008), the proposed groundwater production from the Quarry Well No. 3 will have a less than significant impact on the perennial waters supporting the *C. macularius* habitat. The Quarry well will draw from a deeper aquifer than what discharges to San Felipe Creek, and the presence of the San Jacinto Fault, which separates the Borrego Valley Groundwater Basin (Quarry) from the Ocotillo-Clark Valley Groundwater Basin (Lower San Felipe Creek), may serve as an additional barrier not captured in the modeling effort (RDT, 2008).

Lastly, the potential impacts to ephemeral streams along the proposed Quarry water supply line, and to downstream water bodies, were identified as less than significant. Construction activities consist of temporary excavation and filling in approximately 0.21 acres of drainages along the proposed water supply line (Hernandez, 2016), but drainage features will return to natural conditions upon completion. A complete list of potential hydrologic impacts and proposed mitigation is provided in **Table 5-1**.

5.1.2 Water Quality Resources

Potentially significant impacts to downstream water quality conditions are considered minimal due to the following:

- Runoff from the Project area will be retained in the excavation pits, thus reducing the overall discharge from the Quarry watershed. This will reduce the downstream sediment carrying capacity of flows through the Fish Creek Alluvial Fan that reach San Felipe Creek.
- There is no known presence of arsenic or selenium in the Project area, which are sources of impairments to the Salton Sea and Imperial Valley Drains.
- The Project will not generate nutrients, pesticides or herbicides, which are also listed as impairments for the Salton Sea and/or Imperial Valley Drains.
- Groundwater elevations from the nearest well (~7 miles north-northwest of the Project area) are approximately 400 feet below the lowest point in the Project area. Impacts to groundwater quality from increased localized infiltration during the infrequent storm events are considered negligible.

The potential impact to downstream water quality conditions related to the dust generated from mining activities is also not significant due to Project dust control measures and County dust control requirements. Any potentially significant impacts are reduced by the incorporation of recommendations identified in the 2008 EIR/EIS (Resource Design Technology). Per the EIR/EIS, the Project is required to follow the Imperial County Air Pollution Control District (ICAPCD) revised rule 800, General Requirements for Control of Fine Particulate Matter (PM_{10}). The EIR/EIS provides control measures that will ensure that the Project complies with the ICAPCD requirements.

Table 5-1
Potential Project Impacts and Mitigation Measures

Potential Hydrology/Water Quality Impact		Project Detail	Level of Significance Before Mitigation	Mitigation Measure	Level of Significance After Mitigation
Surface Hydrology (Section 5.1.1)	Increase Flooding	Project will impound flows from the eastern section of the Quarry watershed, thus reducing flows downstream.	Less than Significant	N/A	N/A
	Reduce Groundwater Recharge	Recharge to the Ocotillo Wells Sub-Basin should remain comparable after Project implementation.	Less than Significant	N/A	N/A
	Increase Scouring	While current berm design could fail and increase localized scouring at those locations, this does not exceed the natural scouring potential within the Quarry watershed.	Less than Significant	N/A	N/A
	Alter Drainage Pattern (Quarry Watershed)	The current berm does not adequately convey surface flows generated within the wester section of the Quarry watershed to Fish Creek Wash. Flow will be impounded at a number of locations.	Significant	MM 3.3-7 (2008 EIR/EIS) + Armoring (Section 5.3) The inclusion of a 50 foot-wide conveyance channel west of the proposed berm, with appropriate rip-rap armoring, will effectively convey flows to the Fish Creek Wash.	Not Significant
	Alter Drainage Pattern (Water Supply Line) Based on 2016 Jurisdictional Delineation Report (HES, 2016) and 2008 EIR/EIS	Impacts will be spatially and temporarily confined to the construction activities related to installing the waterline/powerline along the access road. The existing drainage patterns along the proposed waterline/powerline will be preserved (e.g., no anticipated fill).	Less than Significant	N/A	Less than Significant

Table 5-1
Potential Project Impacts and Mitigation Measures

Potential Hydrology/Water Quality Impact		Project Detail	Level of Significance Before Mitigation	Mitigation Measure	Level of Significance After Mitigation
	Provision of Habitat (WRM) 2008 EIR/EIS	The perennial waters of San Felipe Creek, which provide habitat for the endemic pup fish, are driven by local groundwater elevations and not surface flows from the Fish Creek Wash watershed. Impacts related to groundwater production from the Quarry well are not considered significant (2008 EIR/EIS)	Less than Significant	N/A	N/A
Water Quality (section 5.1.2)	Discharge Pollutants (see Section 1.1.3)	Through the implementation of proper waste and hazardous material management protocol (Sections 1.1.3 and 5.2), the Project will not be a potential source of pollutants for surface waters.	Less than Significant	N/A	N/A
	Increase Sediment Transport	The Project will ultimately reduce the amount of sediment discharged from the Quarry watershed to the downstream Fish Creek Wash.	Less than Significant	N/A	N/A
	Groundwater Quality	Impacts to groundwater quality resultant from operations at the surface are not anticipated. Significant impacts associated with groundwater production are also not anticipated (2008 EIR/EIS).	Less than Significant	N/A	N/A

5.2 Best Management Practices

To address water quality issues as identified in Section 11.3 and **Table 5-**1, storm water BMPs will be implemented during the operation and management of the Project. Runoff and erosion control BMP's shall be appropriately implemented for the Project in accordance with the Imperial County Improvement Standards (ICIS). BMPs are recommended based off of the preliminary Project plans (**Table 5-2**).

Table 5-2
Recommended Best Management Practices

Design Concept	Description Applicable to the Proposed Project
Erosion and Sediment Control	• Structures/material within flood zones should be designed to withstand anticipated scouring forces. • Minimize disturbance of natural terrain and/or compaction of soils where feasible. • Where loose soils are exposed to rainfall, consider grading designs that will minimize contact with concentrated flows. • Reduce the total hydrograph volume by increasing local storage (soil stability and evapotranspiration).
Dust Control	• Phase work to minimize disturbed areas • Apply water to or chemical stabilizer to heavily used roads/access areas • Management of bulk material shall comply with ICAPCD Rule Book Rules 800 *et seq*. • Minimize disturbance of natural terrain/biome communities.
Stormwater Management	• Runoff generated east of the proposed berm will be collected within excavated pits and conveyed through a series of depressions connecting the pits (if flows exceed pit storage). • Runoff generated west of the proposed berm will be conveyed naturally downstream. • Final berm design should consider armoring sections exposed to potential high scour (see Section 5.3).
Vehicle and Equipment Wash Areas	• When possible, dry methods of washing vehicles and equipment shall be applied. • When the use of wet methods, or acid-based solvents are required for equipment cleaning, direct application techniques will be used to limit non-stormwater discharges and other potential impacts to the drainage area.
Hazardous Waste Management	• Waste debris (e.g., petroleum products, concrete, paint) shall be stored on site in such a manner that precludes their transport into air, water, or soil.
Employee Integrated Pest Management (IPM) Principles	• Develop a pest management plan that reduces/eliminates pesticides potentially harmful to downstream aquatic habitats.

5.3 Berm Reinforcement

A complete berm design incorporating MM 3.3-7 will require, at the minimum, a 50 foot-wide conveyance channel on the western side of the berm. To assist with the conveyance of surface flows around the berm, Dudek suggests that any new berm design include armoring the westerly bank of the berm with rock riprap to decrease the likelihood and severity of erosion damage to the berm for flows generated by a 25-yr design storm. The 25-yr storm was selected because the berm is not intended to protect life, property, or civil improvements. In a larger storm event, it would be expected that the riprap armoring would fail and the berm would suffer significant damage or failure. Dudek computed the recommended berm riprap size using the computer software *Riprap Design System.* The riprap sizing methodology used by the software program is described in Section 4.1 of the Federal Highway Administration's *Hydraulic Engineering Circular No. 11: Design of Riprap Revetment*. In order to simplify the riprap section design, the westerly creek flow path was grouped into three reaches with representative slopes. The results for the riprap design calculations are provided in terms of a rock gradation by percentage lighter than the stated weight. For example, W100 means 100 percent of the rock should weigh less than the stated weight and W50 means 50% of the rock should weigh less than the stated weight. The recommended riprap gradation for a 25-yr design storm is provided below in **Tables 5-3**, **5-4**, and **5-5**. Detailed calculations can be found in Appendix G.

The rock riprap armoring section should be designed by a qualified Civil Engineer. At a minimum, the riprap armoring section should extend below grade to the calculated scour depth. The minimum section thickness is provided in the analyses summary in **Table 5-6** shown below.

Table 5-3
Riprap Design Results – Sta. 210+00 through Sta. 230+00

Percent Lighter by Weight	Mean Riprap Particle Weight (lb.)
W100	3900
W50	1400
W15	580

Table 5-4
Riprap Design Results – Sta. 150+00 through Sta. 205+00

Percent Lighter by Weight	Mean Riprap Particle Weight (lb.)
W100	200
W50	70
W15	30

Table 5-5
Riprap Design Results – Sta. 10+00 through Sta. 145+00

Percent Lighter by Weight	Mean Riprap Particle Weight (lb.)
W100	25
W50	10
W15	3

Table 5-6
Riprap Design Results – Layer Thickness

Percent Lighter by Weight	Mean Riprap Particle Weight (lb.)
210+00-230+00	4.00
150+00-205+00	1.50
10+00-145+00	0.75

5.4 Project Alternatives

No alternative berm designs have been pursued in this study as the current berm design impacts the least amount of jurisdictional (drainage) features required to access the remaining gypsum reserves (minus the 'no-project' alternative; RDT, 2008). Alternative berm placements suitable for conveying runoff around the proposed Project operations would require impacting additional jurisdictional features west of the current berm alignment.

6 CONCLUSION

While the proposed Project will permanently modify the existing natural stormwater conveyance system within the Quarry watershed, through proper mitigation measures (see **Table 5-1**) these impacts are not considered significant. This conclusion is based on the understanding that the main components of the region's arid hydrologic regime will be maintained, where the overall endpoint for excess rainfall in the Quarry watershed will remain the same (evaporation and groundwater recharge). The Project's current alignment of the proposed berm intersects flow channels draining the western half of the Quarry watershed which may lead to berm failure and discharge into the Project's excavation pits. To prevent this, and to fully comply with Mitigation Measure 3.3-7 (RDT, 2008), a 50 foot-wide conveyance channel will need to be included on the western side of the final berm design. Additional berm armoring is suggested to further improve the longevity of the storm water feature (Section 5.3).

Downstream from the Quarry watershed, loss of surface flow to the Fish Creek Alluvial Fan is not considered a significant impact. The Fish Creek Alluvial Fan is a series of braided ephemeral streams that do not depend on surface flows from Quarry watershed for maintaining hydrologic functions. The Quarry watershed's hydrologic connectivity to San Felipe Creek is also severely limited, where only discharge from large (i.e., infrequent) events could reach it, and the Quarry watershed only comprises 0.34% of the San Felipe Creek watershed. In addition, the *C. maculariu*s habitat within San Felipe Creek is sustained by groundwater discharge; aquatic habitat in San Felipe Creek is not dependent on surface flow from the Quarry watershed.

Impacts related to the proposed groundwater extraction from the Quarry Well No. 3 were covered in detail in the 2008 EIR/EIS, where it was concluded that there will be less than significant impacts to groundwater quality and groundwater discharge to San Felipe Creek. The installation of the proposed water supply line to the Quarry will result in temporary construction related impacts to a number of ephemeral drainages, but these impacts are less than significant as the anticipated impacts will not modify the existing drainages.

Proposed Project activities will need to be covered under the state's Industrial General Permit which requires the development and implementation of storm water pollution prevention programs (SWPPPs) for activities that can potentially impact water quality. Permanent Project impacts will require Section 401, 404, and 1602 permits from the RWQCB, the ACOE, and CDFW (see Section 3).

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Figures

Source: ESRI Basemap

DUDEK

Vicinity Map

U.S. Gypsum Hydrologic and Water Quality Study

Figure 1-1

Hydrologic Setting

U.S. Gypsum Hydrologic and Water Quality Study

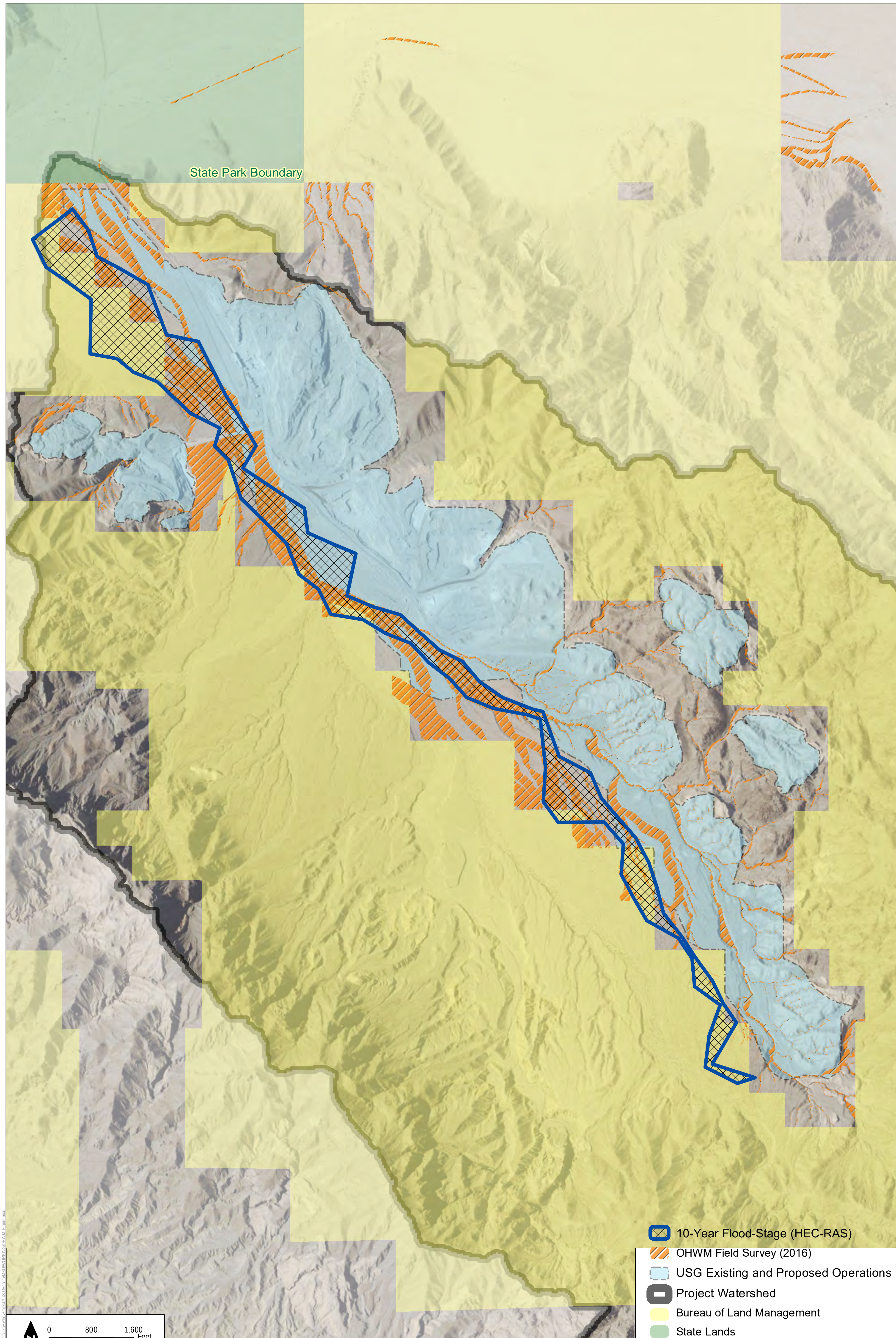
Figure 2-1

DUDEK

U.S. Gypsum Hydrologic and Water Quality Study

FEMA 100-Year Floodplains

Figure 2-2



DUDEK

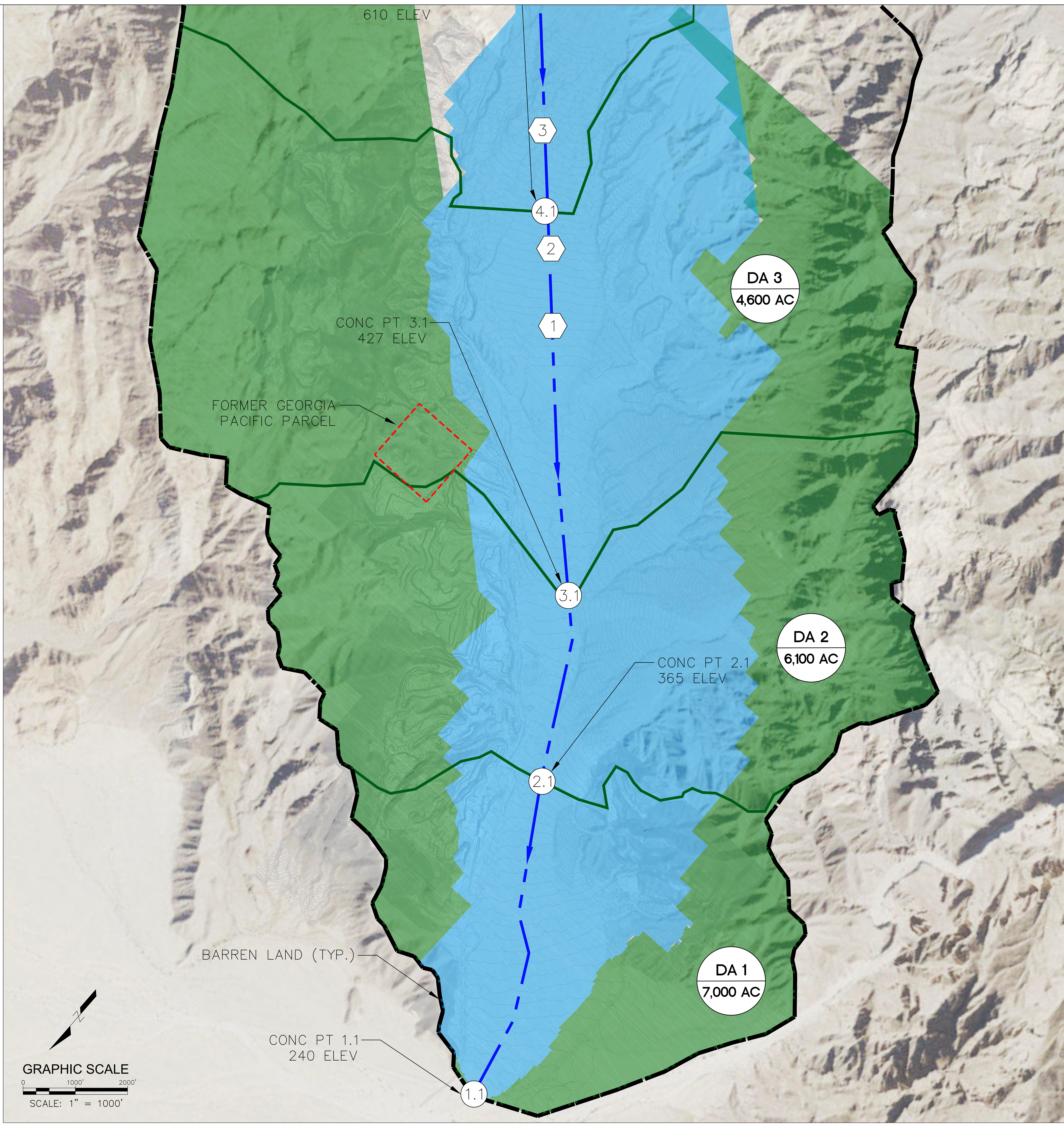
SOURCE: ESRI World Maps; USGS NHD Database

Existing Ordinay High Water Mark (OHWM) and Modeled 10-Year Flood Stage

U.S. Gypsum Hydrologic and Water Quality Study

Figure 4-1

Exhibits



LEGEND

- FORMER GEORGIA PACIFIC 40-ACRE PARCEL
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW LINE
- DA X — WATERSHED NAME
- XX AC — WATERSHED AREA
- X.X — CONCENTRATION POINT
- X — WATERSHED CENTROID
- HYDROLOGIC SOIL GROUP A
- HYDROLOGIC SOIL GROUP D

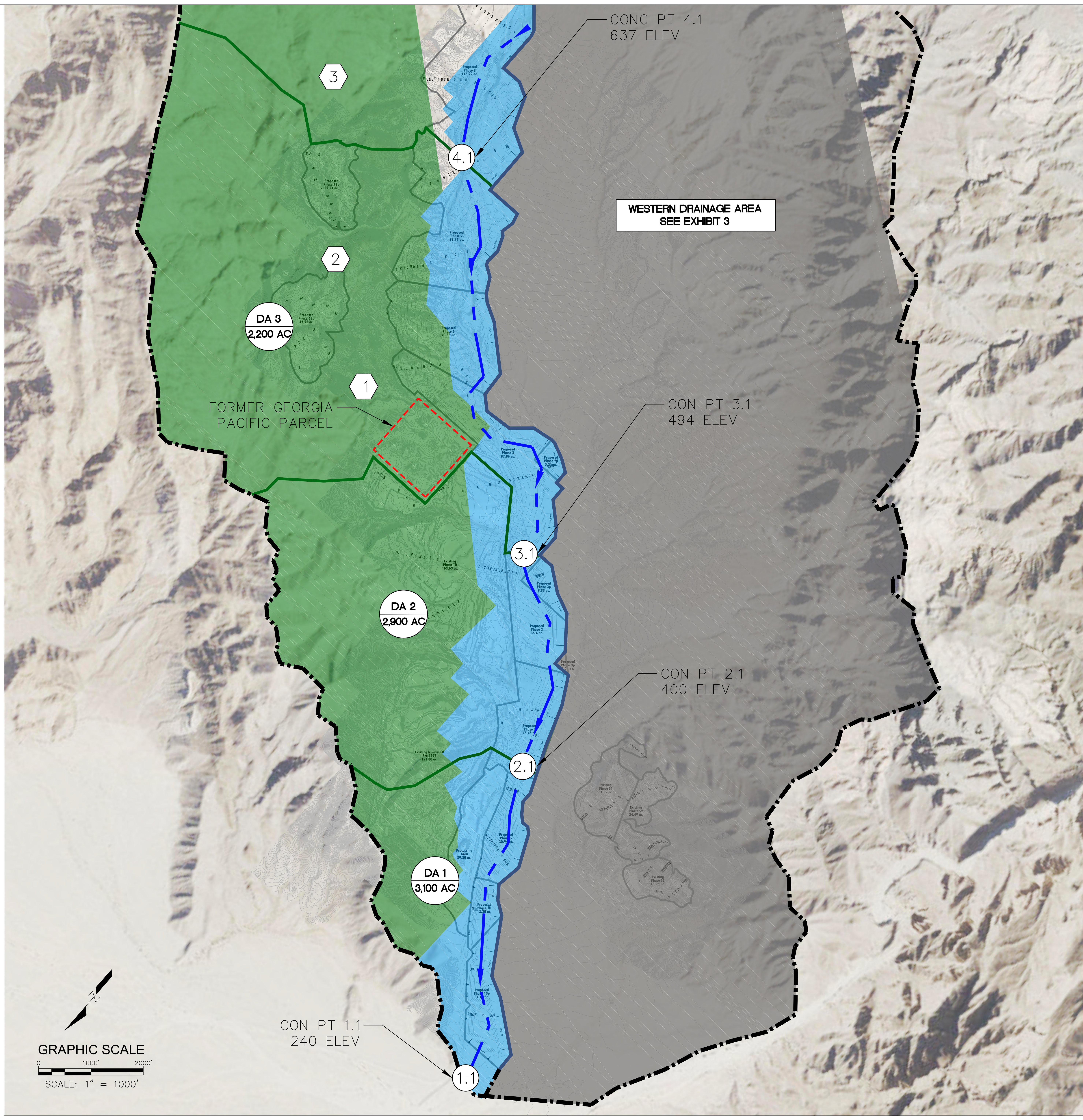
UNIT HYDROGRAPH PEAK FLOW RATE (CFS)

CONCENTRATION POINT	2 YR 6 HR	5YR 6 HR	10 YR 6 HR
1.1	750	1500	2200
2.1	800	1500	2200
3.1	600	1200	1800
4.1	300	550	800

NOTE: WATERSHED AREAS ARE CUMULATIVE AND INCLUDE ANY LABELED WATERSHED AREA UPSTREAM OF THE RESPECTIVE WATERSHED CONCENTRATION POINT.

EXHIBIT 1
EXISTING CONDITION HYDROLOGY MAP
US GYPSUM

DUDEK



LEGEND

- FORMER GEORGIA PACIFIC 40-ACRE PARCEL
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- PROPOSED BERM
- FLOW LINE
- DA X / XX AC — WATERSHED NAME / WATERSHED AREA
- X.X — CONCENTRATION POINT
- X — WATERSHED CENTROID
- HYDROLOGIC SOIL GROUP A
- HYDROLOGIC SOIL GROUP D

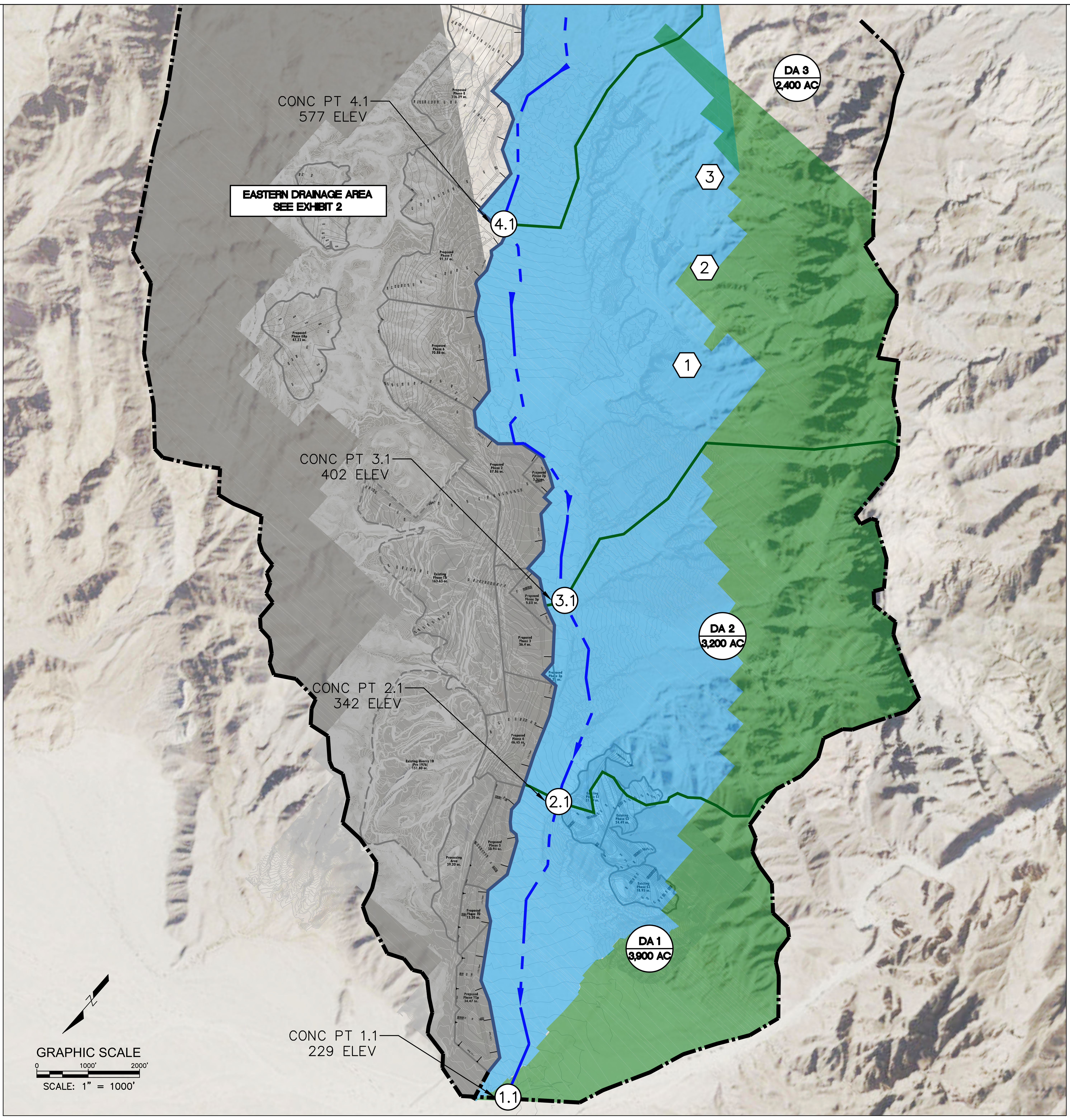
UNIT HYDROGRAPH PEAK FLOW RATE (CFS)

CONCENTRATION POINT	2 YR 6 HR	5 YR 6 HR	10 YR 6 HR
1.1	350	700	1,000
2.1	350	700	1,000
3.1	300	600	850
4.1	200	400	500

NOTE: WATERSHED AREAS ARE CUMULATIVE AND INCLUDE ANY LABELED WATERSHED AREA UPSTREAM OF THE RESPECTIVE WATERSHED CONCENTRATION POINT.

EXHIBIT 2
EASTERN DRAINAGE AREA
PROPOSED CONDITION
HYDROLOGY MAP
US GYPSUM

DUDEK



LEGEND

WATERSHED BOUNDARY

SUB-WATERSHED BOUNDARY

PROPOSED BERM

FLOW LINE

DA X / XX AC — WATERSHED NAME / WATERSHED AREA

X.X — CONCENTRATION POINT

X — WATERSHED CENTROID

HYDROLOGIC SOIL GROUP A

HYDROLOGIC SOIL GROUP D

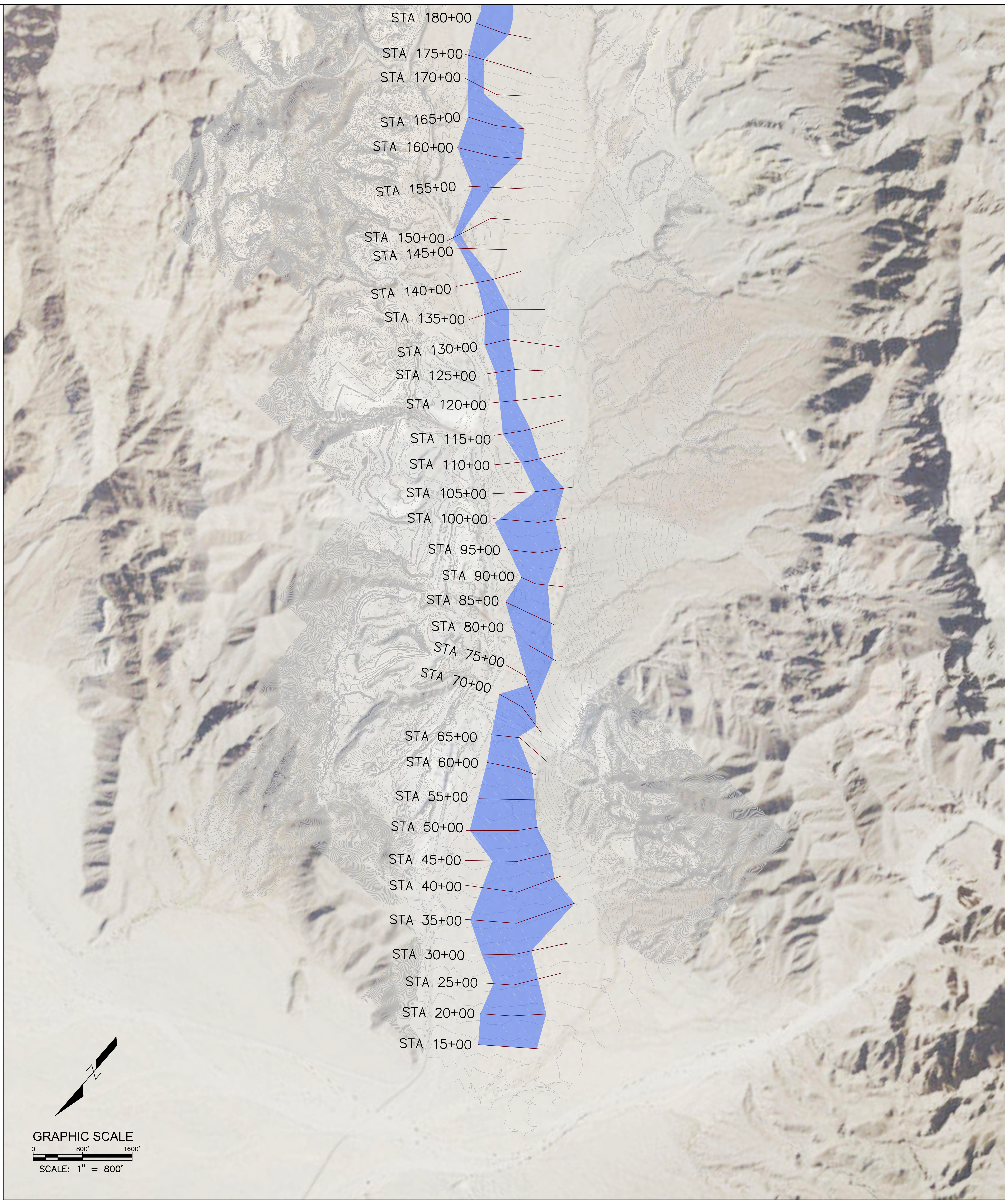
UNIT HYDROGRAPH PEAK FLOW RATE (CFS)

CONCENTRATION POINT	2 YR 6 HR	5 YR 6 HR	10 YR 6 HR
1.1	450	900	1,300
2.1	450	800	1,200
3.1	350	650	950
4.1	100	200	300

NOTE: WATERSHED AREAS ARE CUMULATIVE AND INCLUDE ANY LABELED WATERSHED AREA UPSTREAM OF THE RESPECTIVE WATERSHED CONCENTRATION POINT.

EXHIBIT 3
WESTERN DRAINAGE AREA
PROPOSED CONDITION
HYDROLOGY MAP
US GYPSUM

DUDEK

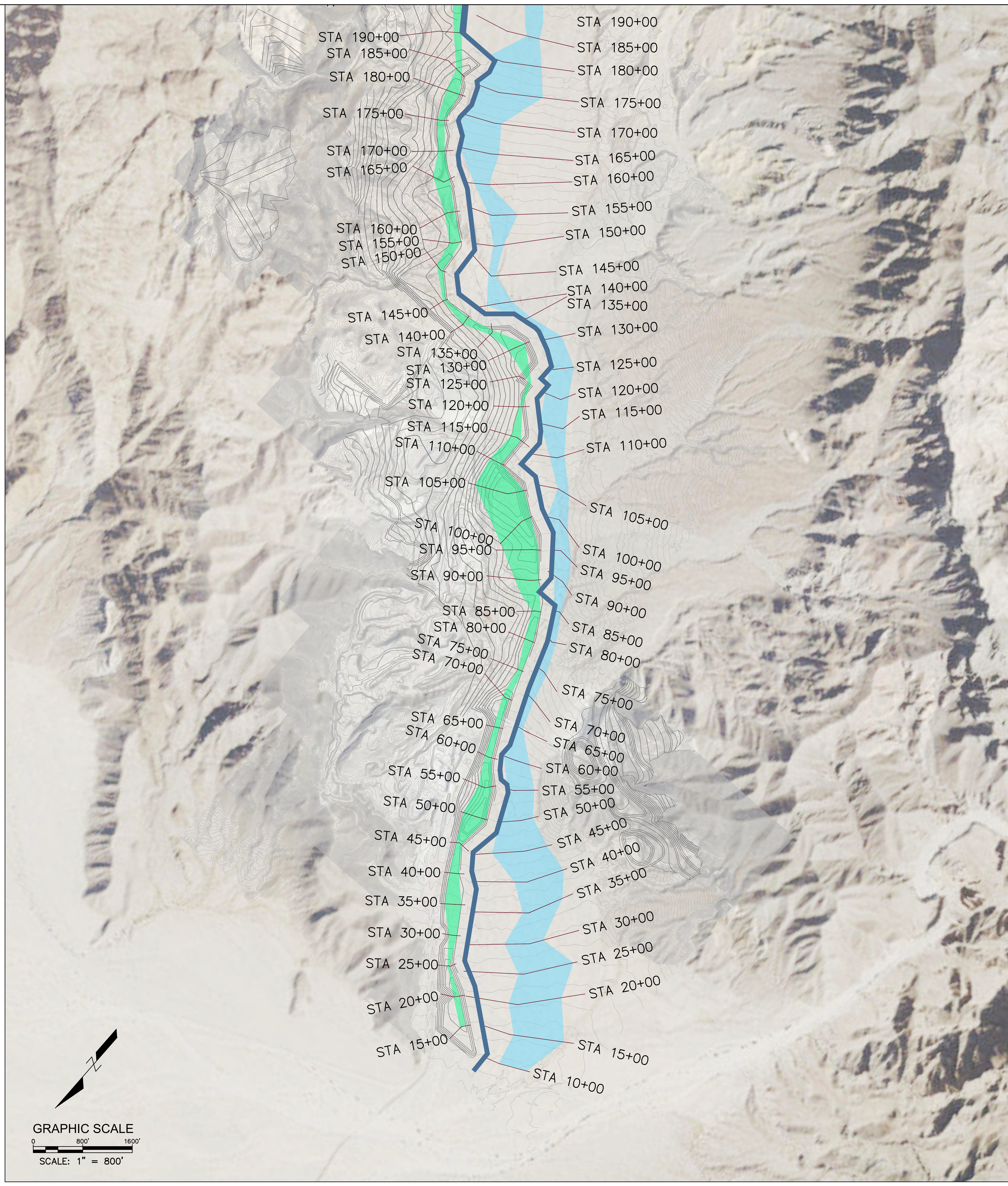


LEGEND

10-YEAR MAX WSE EXTENTS

EXHIBIT 4
EXISTING CONDITION
FLOOD PLAIN MAP
US GYPSUM

DUDEK

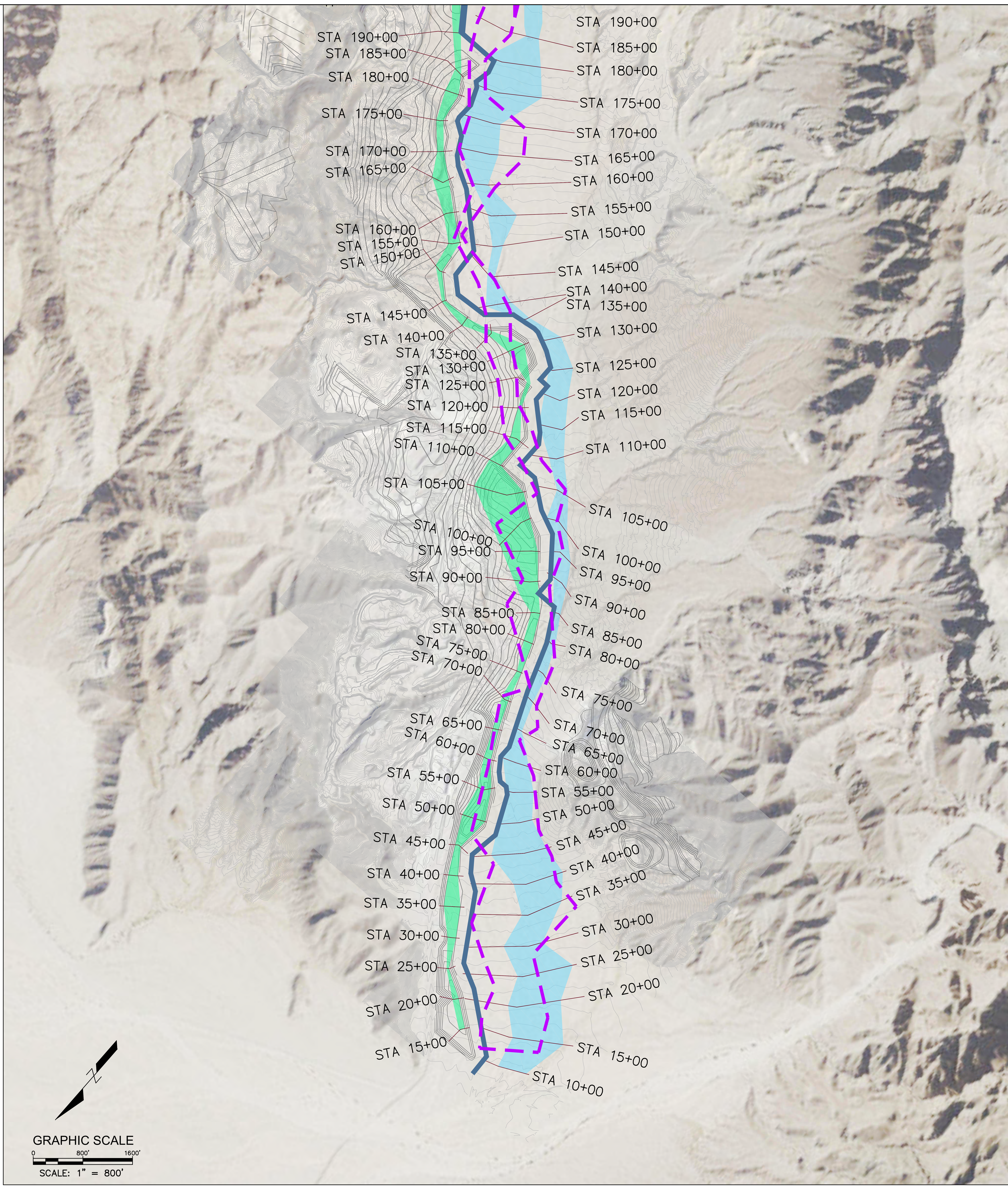


LEGEND

(green)	10-YEAR MAX WSE EXTENTS – PROPOSED EAST DRAINAGE AREA
(blue)	10-YEAR MAX WSE EXTENTS – PROPOSED WEST DRAINAGE AREA
(line)	PROPOSED BERM

EXHIBIT 5
PROPOSED CONDITION
FLOOD PLAIN MAP
US GYPSUM

DUDEK



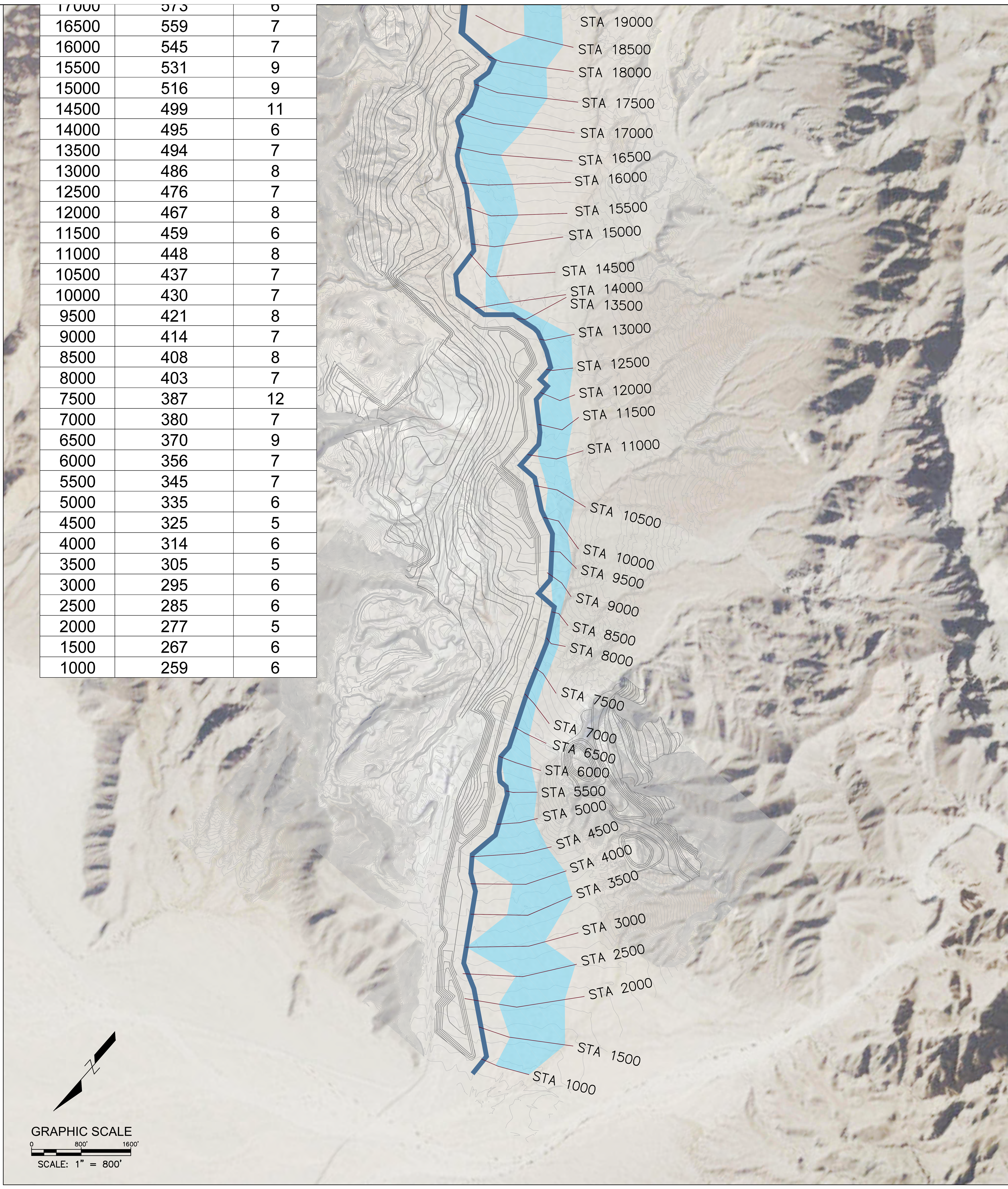
LEGEND

- 10-YEAR MAX WSE EXTENTS - EXISTING
- 10-YEAR MAX WSE EXTENTS - PROPOSED EAST DRAINAGE AREA
- 10-YEAR MAX WSE EXTENTS - PROPOSED WEST DRAINAGE AREA
- PROPOSED BERM

EXHIBIT 6
COMPARISON OF PROPOSED AND EXISTING FLOOD PLAIN MAP
US GYPSUM

DUDEK

17000	573	6
16500	559	7
16000	545	7
15500	531	9
15000	516	9
14500	499	11
14000	495	6
13500	494	7
13000	486	8
12500	476	7
12000	467	8
11500	459	6
11000	448	8
10500	437	7
10000	430	7
9500	421	8
9000	414	7
8500	408	8
8000	403	7
7500	387	12
7000	380	7
6500	370	9
6000	356	7
5500	345	7
5000	335	6
4500	325	5
4000	314	6
3500	305	5
3000	295	6
2500	285	6
2000	277	5
1500	267	6
1000	259	6



LEGEND

100-YEAR MAX WSE EXTENTS - PROPOSED WEST DRAINAGE AREA

PROPOSED BERM

EXHIBIT 7
PROPOSED CONDITION SCOUR AND 100-YR FLOOD PLAIN MAP
US GYPSUM

DUDEK

APPENDIX A

JURISDICTIONAL DELINEATION
FOR
UNITED STATES GYPSUM COMPANY

Hernandez Environmental Services, 2016

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FIGURES

APPENDICES

EXECUTIVE SUMMARY

Hernandez Environmental Services was contracted by Lilburn Corporation to prepare a Jurisdictional Delineation as part of the Supplemental EIR Process for the United States Gypsum Company (USG) Plaster City Expansion/Modernization Project. The approximate 2,080.4-acre Plaster City Quarry is located in the northwestern portion of Imperial County adjacent to the San Diego County line, approximately 17 miles from Interstate 8 and 6.5 miles from Highway 78. The proposed USG Expansion/Modernization Project includes the expansion of quarrying activities to approximately 682 acres of private lands and 18.1 acres of public lands; the replacement of the existing 8-inch diameter water pipeline from USG's wells in Ocotillo to the Plant site; the installation of a new production water well, approximately 20,719 linear feet of water pipeline and power service line to serve the well pump; and, ultimately, reclamation of the disturbed areas to a state of natural open space.

Field surveys of the proposed USG Expansion/Modernization Project areas were conducted on April 19, 2016 through April 21, 2016. Field surveys were conducted to delineate jurisdictional drainages and wetland resources associated with jurisdictional drainages. The proposed project areas contain a total of 327.55 acres of unnamed streambeds that ultimately flow into the Salton Sea. The streambeds are all characterized as ephemeral with little or no vegetation. Sparse vegetation found in the drainages include: **s**moke tree *(Psorothamnus spinosus),* white bursage *(Ambrosia dumosa),* catclaw acacia, *(Acacia greggii)* brittlebush *(Encelia farinose),* ocotillo *(Foquieria splendens),* and Schott's indigo bush (*Psorothamnus schotti)*.

The proposed USG Expansion/Modernization Project areas contain approximately 327.55 acres of ephemeral drainages that fall under the jurisdiction of the California Department of Fish and Wildlife, U.S. Army Corps of Engineers, and the Regional Water Quality Control Board, Colorado River Basin Region. The proposed project areas contain no wetlands or vernal pools as defined by the 1987 Corps of Engineers Wetland Delineation Manual.

Full build-out of the Plaster City Quarry would result in permanent impacts to approximately 134.29 acres of streambeds within the jurisdiction of the California Department of Fish and Wildlife, U.S. Army Corps of Engineers, and the Regional Water Quality Control Board. Activities associated with the Plaster City Plant water supply pipeline replacement would result in temporary impacts to approximately 1.55 acres of jurisdictional drainages USG will be required to obtain a 1602 Streambed Alteration Agreement from the California Department of Fish and Wildlife for impacts to California Department of Fish and Wildlife jurisdictional streambeds. Further, USG will be required to obtain a 404 Permit from the U.S. Army Corps of Engineers, and a 401 Water Quality Certification from the Regional Water Quality Control Board for impacts to Waters of the U.S. prior to commencing the proposed USG Expansion/Modernization Project.

1.0 INTRODUCTION

1.1 PURPOSE OF JURISDICTIONAL DELINEATION

The purpose of this jurisdictional delineation is to assess the impacts of the proposed United States Gypsum Company (USG) Expansion/Modernization Project, on any State or federally regulated streams, rivers or lakes.

The following tasks were completed and are presented herein:

1. Delineation of all state or federal jurisdictional waters present within the project property;
2. Determination of impacts associated with the USG Expansion/Modernization Project on jurisdictional waters;
3. Determination of applicable state or federal regulatory permits necessary for project activities within these jurisdictional areas;
4. Recommendation of mitigation measures to offset impacts to state or federal jurisdictional waters.

1.2 PROJECT LOCATION

The USG Expansion/Modernization Project activities are proposed at two locations: (1) at the Plaster City Quarry and (2) at the Plaster City Plant (Figures 1 through 4). The location of the two areas is described below.

Plaster City Quarry

The Plaster City Quarry is located in the northwestern portion of Imperial County adjacent to the San Diego County line, approximately 17 miles from Interstate 8 and 6.5 miles from Highway 78 (Figure 2). The site is located at the northwest end of the Fish Creek Mountains, east of Split Mountain and south and east of the Fish Creek Wash. Specifically, USG's properties and unpatented placer claims and mill sites are located in portions of Sections 19, 20, 28, 29, 30, 32, and 33 of Township 13 South, Range 9 East, and portions of Section 4, Township 14 South, Range 9 East (San Bernardino Baseline and Meridian) and found on the U.S. Geological Survey Borrego Mountain Southeast Quadrangle and Carrizo Mountain Northeast Quadrangle. The Plaster City Quarry site is bounded by the Anza Borrego Desert State Park on the west and northwest, the Fish Creek Mountains Wilderness Area on the east and to the south, and public lands administered by the U.S. Bureau of Land Management (BLM) to the south. Access to the Plaster City Quarry is via State Highway 78 from both San Diego and Imperial counties.

Plaster City Plant

The Plaster City Plant is located on a 473-acre site at 3810 West Highway 80 (Evan Hewes Highway) in Plaster City, California approximately 18 miles west of El Centro in Imperial County (Figure 3). Access to the Plant is via Highway 80 immediately north of I-8.

1.3 BACKGROUND

The United States Gypsum Company (USG) owns and operates an existing wallboard manufacturing Plant and gypsum Quarry in Imperial County, California. Both the Plant and Quarry were the subject of the 2006 *United States Gypsum Company Expansion/Modernization Project Draft Environmental Impact Report/Environmental Impact Statement* (2006 Draft EIR/EIS) and 2008 *United States Gypsum Company Expansion/Modernization Project Final Environmental Impact Report/Environmental Impact Statement* (2008 Final EIR/EIS). In compliance with CEQA, the Imperial County Board of Supervisors certified the Final EIR/EIS, adopted findings of fact, a statement of overriding considerations, and a mitigation monitoring program in March 2008. The federal Lead Agency was the U.S. Bureau of Land Management (BLM). To date, the BLM has not issued a Record of Decision and no aspects of the federal actions as analyzed in the 2006 and 2008 EIR/EIS documents have been implemented.

Presently, USG is in the process of preparing a Supplemental EIS to update technical information in the 2008 United States Gypsum Company Expansion/Modernization Project Final Environmental Impact Report/Environmental Impact Statement and to include the USACE as a cooperating agency based on USACE's jurisdiction by law and special expertise pursuant to Section 404 of the Clean Water Act (33 USC 1344).

This JD has been prepared to provide technical information regarding jurisdictional water resources within the Action Area and in response to a USACE Additional Information Request dated August 15, 2014.

1.4 PROPOSED ACTION

The USG Plaster City Expansion/Modernization Project proposes activities at two different locations: at the Plaster City Quarry and at the Plaster City Plant. For purposes of organization, aspects of the Proposed Action at the USG Plaster City Quarry ("Quarry") and at the USG Plaster City Plant ("Plant") are described separately.

1.4.1 Plaster City Plant

Proposed Water Pipeline Replacement

The proposed Project includes the replacement of an existing 8-inch diameter water pipeline from USG's groundwater storage tank in Ocotillo to the Plant site. The existing pipeline would be replaced with a new 10-inch diameter water pipeline. The 2006 Draft EIR/EIS describes the 8-inch water pipeline as nearing the end of its useful life. Due to its age, the pipeline does not provide a reliable water supply for the Plant. Under existing conditions, the line experiences surges due to air in the line and water hammer caused by rapid changes in flow such as a sudden closure of a water control valve. The proposed 10-inch pipeline would provide a more reliable water supply, minimize line surges and associated leaks/rupture, provide faster water system recovery after water pipeline breaks/leaks or maintenance, and improve fire protection at the Plant.

As described in the BLM application CACA-044014 the proposed replacement waterline would be installed within a 75-foot wide right-of-way south of the Evan Hewes Highway centerline and approximately 50 feet south of the highway centerline. The existing pipeline would be abandoned in place.

USG would require access for equipment along the entire length of the pipeline, approximately 8.77 miles from the USG groundwater storage tank in the community of Ocotillo east to the Plaster City Plant. Construction equipment would include but not be limited to service trucks, tractors, backhoes, graders for excavation of a trench and installation of the replacement pipeline. Installation of the pipeline would include excavation of a trench, placement of the new pipeline, and fill/compaction, or material to pre-project conditions. The proposed final depth of the pipeline range from two (2) to six (6) feet below ground surface.

1.4.2 Plaster City Quarry

The Expansion/Modernization Project includes two activities proposed at the Quarry: (1) installation of an approximately 20,719 linear foot (LF) waterline/powerline from Quarry Well No. 3 located on Assessor's Parcel Number (APN) 033-020-09 to the Quarry; and (2) build out the of the Plaster City Quarry as described in the Mine Reclamation Plan (Lilburn 2003).

Proposed Plaster City Quarry Water Supply

USG proposes to install a waterline/powerline extending from the Quarry to Quarry Well No. 3. Water from the well would be transported to the Quarry via a proposed pipeline installed alongside of the existing alignment of the narrow-gauge railroad right-of-way (ROW) CALA-040412 to the Quarry site. In addition, a power service line would be installed underground from the well head to the Quarry gate; power poles will be installed within the Quarry property. The proposed 20,719 LF water pipeline and power line alignment is proposed approximately 30 feet north of the centerline of the existing tram road ROW CALA-040412 between the railroad and the existing railroad access/maintenance road within Sections 16, 17, 18, and 19 Township 13 South, Range 9 East. The proposed locations of these facilities are depicted on Figure 2. The proposed utility line will be 12 inches or less in diameter. A trench, approximately five (5) feet wide and seven (7) feet deep would be excavated between the railroad and maintenance road for installation of the utilities. Material would be temporarily stockpiled along the alignment and used as backfill. Import of fill material is not anticipated. Access for equipment will be provided on the existing railroad maintenance road. Construction is expected to occur within a 30-foot wide area along the length of the alignment. All waterline/powerline construction areas will be restored to pre-project conditions following the completion of construction activities. Impacts associated with the waterline/powerline are considered temporary.

Plaster City Quarry – Mine Development Activities

USG's Quarry holdings total approximately 2,080.4 acres; 2,032.2-acres are owned by USG and 48.2-acres are active unpatented mill site claims. Ongoing development of the Quarry per the approved 2003 Mine Reclamation Plan would develop approximately 1,118.7 acres of USG's 2,032.2 acres of private land. The mine plan includes approximately 48.2 acres comprised of ten existing mill site claims; an additional five mill sites (25 acres) are proposed as part of the SEIS Proposed Action. Approximately 18.1 acres of Public Land under the management of the BLM would be disturbed by the proposed mine development. Build-out of the 2003 Mine Reclamation Plan would result in impacts to a total of 1,136.8 acres on both private and public land.

Mining activities would be conducted in phases as outlined in Table 1 below.

Table 1
2016 Existing and Planned Disturbance
Plaster City Quarry Mine Plan

Phase & Areas	USG Private Lands			BLM Lands		
	Acreage	Existing Disturbance (Approximate Acres)	Planned New Disturbance (Approximate Acres)	Acreage	Existing Disturbance (Approximate Acres)	Planned New Disturbance (Approximate Acres)
Processing Area	39.2	39.2	0			
Phase 1A	163.6	163.6	0.0			
Phase 1B	151.8	151.8	0.0			
Phase 2	87.9	18.5	69.4			
Phase 2p	5.3	0.0	5.3			
Butte Mill Site				5.0	0.0	0.9
Phase 3	36.4	5.0	31.4			
Phase 3p	1.2	0.0	1.2			
Phase 4	46.4	15.3	31.1			
Phase 5	29.8	7.4	22.4			
Annex Mill Site #4				5.0	0.0	2.5
Annex Mill Site #3				5.0	0.0	0.3
Phase 6	78.9	1.7	77.2			
Phase 6Bp	47.2	0.0	47.2			
Haul Road to 6Bp	9.1	0.0	9.1			
Phase 7Bp	32.5	0.0	32.5			
Haul Road to 7Bp	5.8	0.0	5.8			
Phase 7	90.3	1.8	88.5			

Phase & Areas	USG Private Lands			BLM Lands		
	Acreage	Existing Disturbance (Approximate Acres)	Planned New Disturbance (Approximate Acres)	Acreage	Existing Disturbance (Approximate Acres)	Planned New Disturbance (Approximate Acres)
Phase 8	114.3	0.0	114.3			
Cactus Mill Site				5.0	0.0	3.2
Phase 9	54.2	0.0	54.2			
Desert Mill Site				5.0	0.0	0.1
Phase 10	13.2	2.1	11.1			
Phase 10p	34.2	0.0	34.2			
Shoveler Haul Road		2.1	0.0			
Annex Mill Site #1				5.0	1.1	0.0
Phase S1	31.9	21.5	10.4			
Phase S2	24.5	3.2	21.3			
Phase S3	18.9	3.5	15.4			
Peoria Mill Site				3.4	0.0	0.0
Springfield Mill Site				4.8	0.0	0.0
Anchorage Mill Site				5.0	0	0
Annex Mill Site #2				5.0	0	0
Future Mill Site 1				5.0	0.0	0.4
Future Mill Site 2				5.0	0.0	3.2
Future Mill Site 3				5.0	0.0	1.8
Future Mill Site 4				5.0	0.0	4.9
Future Mill Site 5				5.0	0.0	0.8
TOTALS	**1,118.7**	**436.7**	**682.0**	**73.2**	**1.1**	**18.1**

Alluvial Quarrying and Ephemeral Drainages

As shown in the 2003 Mine Plan, as quarrying of gypsum outcrops extends southward in the mine plan area, the gypsum underlying alluvial overburden will be developed and extracted. Quarrying of the alluvial wash deposits will progress downward and westward to a maximum overburden depth of 100 feet. Extraction of the underlying gypsum will progress downward from the toe of the overburden strip slope in 25-foot vertical benches at a maximum stable slope of 1H:1V (Horizontal:Vertical) until the bottom of the mineable zone is reached. The depth of each Plaster City Mine Quarry phase will vary based on the bottom limit of gypsum.

An earthen berm will be constructed along the west side of the developed quarry in order to preserve the natural drainage pathway. The proposed berm would work as a natural earth channel, with one side of the channel that will preserve the existing characteristic of the drainage area to the west and will protect the quarry operations to the east from floodwaters. A hydrology study and drainage analysis (Joseph E. Bonadiman & Associates Inc., July 2004) determined that a 5-foot high by 20-foot wide retention berm that includes two feet of freeboard would adequately divert flows towards Fish Creek Wash.

Phases or portions of phases in the alluvial wash will require the stripping of alluvial material or overburden to expose the gypsum. As overburden is stripped a portion will be pushed to the east bank of the wash and the furthest south limits of the planned disturbance to form a permanent retention berm. The purpose of the berm is to divert sheet flow from the Quarry operations in the event of storm runoff. A second berm consisting of the top one foot of surface alluvium will be pushed over the western wash quarry slopes and used as surface soil upon reclamation. Remaining overburden may be stockpiled for a short period of time but will typically be pushed into the adjoining mined out areas for reclamation of the slopes such that overburden from Phase 3 will be used in Phase 2, overburden from Phase 4 will be used in Phase 3, and so forth.

Plaster City Quarry Reclamation

The Mine Reclamation Plan is divided into areas based upon the current geological data, quantity and quality of gypsum, market demand and proximity to the Plant. Following the removal of gypsum, the disturbed areas would be reclaimed to a state of natural open space. Reclamation activities are described in the Mine Reclamation Plan (Lilburn 2003); reclamation activities associated with restoration of drainages are summarized herein.

As described in the Mine Reclamation Plan, on-site hillsides and outcrops are erosional features of the landscape and are expected to continue to erode throughout mining and reclamation. This process would continue to sculpt the Quarry benches, eroding the manmade lines of the bench faces. Pre-mining drainages would be maintained where possible. Disturbance would be limited in these drainages. If necessary, standard erosion control measures such as rip-rap would be placed in the drainages to reduce flow and erosion. Surface flows would be directed around the quarry phases and into the main quarry wash by the proposed Quarry berm.

The Mine Plan would retain drainage within the main quarry wash with berms created from overburden materials. Ultimately, the wash would be lowered along its eastern edge, extending from Phase 9 of the Mine Plan at the uppermost elevation to Phase 10 at the lowest. Phase 10 would be mined contiguous with Phase 5 at its upstream end and to grade at its downstream end. Surface flow that exits the ultimate reclaimed channel would merge with the existing wash at the foot of Phase 10 in buildout conditions.

2.0 REGULATORY FRAMEWORK

2.1 CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE STREAMBED ALTERATION AGREEMENT

The California Department of Fish and Wildlife (CDFW) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the California Fish and Game Code (F&GC), requires that the CDFW be consulted if a proposed development project has the potential to detrimentally effect a stream and thereby wildlife resources that depend on a stream for continued viability (F&GC Division 2, Chapter 5, section 1600-1616). A Section 1602 Lake or Streambed Alteration Agreement is required, should the CDFW determine that the proposed project may do one or more of the following:

- Substantially divert or obstruct the natural flow of any river, stream or lake;
- Substantially change or use any material from the bed, channel or bank of any river, stream, or lake; or
- Deposit debris, waste or other materials that could pass into any river, stream or lake.

For the purposes of clarification, a stream is defined by CDFW as “a body of water that flows perennially or episodically and that is defined by the area in which water currently flows, or has flowed, over a given course during the historic hydrologic regime, and where the width of its course can reasonably be identified by physical or biological indicators.” The historic hydrologic regime is defined as circa 1800 to the present (CDFW 2010).

2.2 REGIONAL WATER QUALITY CONTROL BOARD 401 CERTIFICATION/WASTE DISCHARGE REQUIREMENTS

The Regional Water Quality Control Board (RWQCB) regulates activities pursuant to Section 401(a)(1) of the federal Clean Water Act (CWA) as well as the Porter Cologne Act (Water Code section 13260). The USG Expansion/Modernization Project is within the jurisdiction of the Colorado River Basin Regional Board. Section 401 of the CWA specifies that certification from the State is required for any project requesting a federal license or permit to conduct any activities including, but not limited to, the construction or operation of facilities that may result in any discharge into navigable waters. The certification shall originate from the State in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable water at the point where the discharge originates or will originate. Any such discharges will comply with the applicable provisions of sections 301, 302, 303, 306, and 307 of the CWA. The Porter Cologne Act requires “any person discharging waste, or proposing to discharge waste, within any region that could affect the waters of the state to file a report of discharge. Discharge of fill material into “waters” of the State which does not fall under the jurisdiction of the United States Army Corps of Engineers (USACE) pursuant to Section 404 of the Clean Water Act, may require authorization through application of waste discharge requirements or through waiver of Waste Discharge Requirements.

2.3 UNITED STATES ARMY CORPS OF ENGINEERS CLEAN WATER ACT 404 PERMIT

The United States Army Corps of Engineers (USACE) regulates "discharge of dredged or fill material" into wetlands and waters of the United States, which includes tidal waters, interstate waters, and "all other waters, interstate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce or which are tributaries to waters subject to the ebb and flow of the tide" (33 C.F.R. 328.3(a)), pursuant to provisions of Section 404 of the Clean Water Act.

The USACE requires that the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratories, 1987) be used for delineating wetlands and waters of the United States. To qualify for wetlands status; vegetation, soils, and hydrologic parameters must all be met. "Waters" of the U.S. are delineated based upon the "ordinary high water mark" (OHWM) as determined by erosion, the deposition of vegetation or debris, and changes in vegetation within rivers and streams and described in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (August 2008).

For the purposes of this section, the term "fill" is defined as: material placed in waters of the United States where the material has the effect of:

- Replacing any portion of a water of the United States with dry land; or
- Changing the bottom elevation of any portion of a water of the United States.

Examples of such fill material include, but are not limited to: rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and materials used to create any structure or infrastructure in the waters of the United States. The term fill material does not include trash or garbage.

The definition of "discharge of dredged material" is defined as: any addition of dredged material into, including redeposit of dredged material other than incidental fallback within, the waters of the United States. The term includes, but is not limited to, the following:

- The addition of dredged material to a specified discharge site located in waters of the United States;
- The runoff or overflow, associated with a dredging operation, from a contained land or water disposal area; and
- Any addition, including redeposit other than incidental fallback, of dredged material, including excavated material, into waters of the United States which is incidental to any activity, including mechanized land clearing, ditching, channelization, or other excavation.

The term discharge of dredged material does not include the following:

- Discharges of pollutants into waters of the United States resulting from the onshore subsequent processing of dredged material that is extracted for any commercial use (other than fill). These discharges are subject to section 402 of the Clean Water Act even though the extraction and deposit of such material may require a permit from the Corps or applicable State.
- Activities that involve only the cutting or removing of vegetation above the ground (e.g., mowing, rotary cutting, and chain-sawing) where the activity neither substantially disturbs the root system nor involves mechanized pushing, dragging, or other similar activities that redeposit excavated soil material.
- Incidental fallback.

3.0 PROJECT SETTING

3.1 VEGETATION COMMUNITY

Plaster City Quarry

The Plaster City Quarry is located in the arid Colorado Desert. The vicinity is characterized by sparse desert shrubland dominated by creosote bush (*Larrea tridentata*) with white bursage (*Ambrosia dumosa*), hollyleaf bursage (*Franseria ilicilolia*), brittlebush (*Encelia farinosa*), cheesebush (*Hymenoclea salsola*), pygmy cedar (*Peucephulum schottii*), catclaw acacia (*Acacia greggii*), indigo bush (*Psorothamnus schottii*), and smoketree (*Psorothamnus spinosus*); as well as several varieties of cactus such as barrel cactus (*Ferocactus acanthodes*), beavertail cactus (*Opuntia basilaris*), silver cholla (*Opuntia echinocarpa*), and ocotillo (*Foquieria splendens*).

Undisturbed uplands on the site support desert shrubland of the creosote bush series, creosote bush – white bursage series, and (on metamorphic bedrock) ocotillo series. Dominant plants include creosote bush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), brittlebush (*Encelia farinosa*), and pygmy cedar (*Peucephyllum schottii*). Gypsum outcrops have pygmy cedar and are almost devoid of vegetation.

The dominant drainage feature at the Plaster City Quarry is the alluvial wash in the valley formed by the Fish Creek Mountains. The alluvial wash is made up of a braided channel network and is generally covered by creosote bush, and creosote bush–white bursage series. In the braided channels, there is little or no ocotillo. Drainage channels had a higher occurrence of cheesebush and indigo bush than the upland areas. The larger braided channels also support catclaw acacia, smoketree, and desert lavender (*Hyptis emoryi*).

Other drainage features at the Plaster City Quarry consist of upland drainages located in the gypsum outcrops. These drainages are characterized by fast draining channels with vegetation that is similar to the surrounding upland areas. The dominant vegetation at the Gypsum outcrops is pygmy cedar. Plant species associated with the gypsum outcrops include white bursage, creosote bush, brittlebush, and cheesebush.

Plaster City Plant

The proposed 8.77 miles of replacement waterline which runs from the USG groundwater storage tank in the community of Ocotillo east to the Plaster City Plant, is located in the arid Colorado Desert. The vicinity is characterized by desert shrubland dominated by creosote bush with white bursage, hollyleaf bursage, brittlebush, cheesebush, pygmy cedar, catclaw acacia, indigo bush, and smoketree; as well as several varieties of cactus such as barrel cactus, beavertail cactus, silver cholla, and ocotillo. Some areas of the waterline replacement area have been disturbed by activities associated with road maintenance and recreational OHV use. Dominant vegetation in the area is four-wing saltbush (*Atriplex canescens*), cattle spinach (*Atriplex polycarpa*), big sagebrush (*Atriplex lentiformis*) and cheesebush.

3.2 HYDROLOGY

Plaster City Quarry

The Colorado Desert has a typical arid desert climate with low rainfall and extreme temperature ranges. Average annual rainfall in El Centro is approximately three inches. At the Anza Borrego State Park headquarters, located in a canyon along the east side of the Peninsular Range, rainfall can average as high as six to seven inches per year.[1] Most of the rain falls in December through March but August and September can experience severe thunderstorms associated with monsoon conditions bringing moisture from the Gulf of California. During these episodes, it is not uncommon for thunderstorms to drop several inches of rain in just a few hours, causing severe flash flooding, washing out roads, scouring washes and uprooting vegetation. Average rainfall for the Plaster City Quarry and Fish Creek Wash is approximately three inches per year.

The USG Plaster City Quarry is identified by the National Hydrography Dataset to be located in HUC12-181002030602. The sub-watershed is 35.314 square miles. Rain waters flow from the Fish Creek Mountains located to the east and south and from the Split Mountain located to the west. Flows move in a north, northeasterly direction forming Fish Creek Wash. The flows eventually enter the Salton Sea located 18 miles northeast of the Plaster City Quarry.

The Plaster City Quarry is located in the Colorado River Basin Plan, the Anza Borrego and Imperial hydrologic units, and the Ocotillo Lower Felipe, Brawley, Coyote Wells hydrologic areas (Figure 5).

Plaster City Plant

The USG Plaster City Plant is identified by the National Hydrography Dataset to be located in HUC12-181002041004 and HUC12-181002041008. The Plaster City Plant is located within the Anza Borrego and Imperial hydrologic units (Figure 5). Hydrologic flows travel east through Coyote Wash and northeast through the New River. The flows eventually enter the Salton Sea located approximately 22 miles northeast of the Plaster City Plant.

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[1] Schoenherr, Allen A, *A Natural History of California*, University of California Press, 1992.

3.3 SOILS

Plaster City Quarry

Soils at the Plaster City Quarry and in the vicinity consist predominantly of beds of gypsum dated from the Miocene age. The gypsum beds are part of a conformable sequence consisting of Miocene non-marine Split Mountain Formation, Fish Creek Gypsum, and Pliocene Marine Imperial Formation. The gypsum beds in the Plaster City Quarry area are 100–200 feet thick, and are exposed continuously on the surface for a distance of about 2.5 miles. Structurally, they form the northeast limb of a northwest trending syncline, the axis of which lies in the broad valley to the west. The general strike of the gypsum beds is north 10–20 degrees west and dip 25-35 degrees southwest. Locally, the beds are warped into minor folds. The material is a light buff-gray, fine to medium-grained compact, equi-granular rock composed almost entirely of gypsum. Minor amounts of anhydrite are present in some parts of the deposit mainly as thin beds and lenses. Very minor shreds of biotite occur disseminated in the beds along with a finely divided opaque material, which is probably iron and manganese oxides.

The following descriptions of the geologic units in the Plaster City Quarry area and vicinity are summarized from the Draft Environmental Impact Report/Environmental Impact Statement for the USG Plaster City Expansion/Modernization Project (Resource Design 2006).

Granitic Bedrock (Kgr)
Granitic bedrock of tonalite composition is exposed along the eastern side of the mapped area. The tonalite is coarse-grained and dark gray to black, with minor felsic dikes and sills. Foliation is moderately developed, with no preferred orientation observed. In many places, the rock grades to granitic gneiss. Natural slopes include some rounded boulders. These rocks are Cretaceous and older.

Split Mountain Conglomerate (Tsm)
This unit consists primarily of massive, well-consolidated conglomerate with subrounded clasts up to approximately 10 feet in maximum dimension. Clast types are largely tonalite in the mapped area. Weathered exposures are dark reddish brown and contrast with the dark gray color of fresh exposures. This unit rests on the tonalite and is a basal conglomerate derived from it. In the Split Mountain Gorge area to the west, the conglomerate is overlain by a lens of rock slide megabreccia, but the megabreccia is not present in the mapped area. In the mapped area, the uppermost portion of the Split Mountain Conglomerate consists of fine-grained sandstone with minor shale. The fine-grained beds grade upward into the Fish Creek Gypsum. The thickness of the Split Mountain Conglomerate decreases from at least 600 feet in the northern part of the mapped area to less than approximately 100 feet in the southern portion.

Fish Creek Gypsum (Tfc)
The Fish Creek Gypsum is up to 200 feet thick and averages about 125 feet in thickness in the mapped area. The gypsum is generally greater than 95 percent pure, with minor impurities consisting of clays, carbonate and detrital minerals. The color is variable, but is generally light gray to white, with patches of red and black. The gypsum is an evaporite deposit, formed in a shallow marine environment in Miocene time. As exposed in outcrop and in Plaster City Quarry

faces, the gypsum is generally very dense, hard and massive. Blasting is required for efficient excavation. Where thinly bedded exposures are present, the bedding is often highly contorted on a small scale, similar to other evaporite deposits. The deformation is attributed to plastic flow due to gravity and volumetric expansion associated with the change from anhydrite to gypsum. However, the deformation is internal to the gypsum bed. The underlying clastic material does not display similar deformation.

Older Alluvium (Qoa)

The broad wash that traverses the mapped area includes a number of relatively stable and elevated erosion surfaces (geomorphic surfaces), particularly in the southern third of the site. The stability of these surfaces is evidenced by various factors including the degree of soil development, the presence of desert pavements and the local topography. The desert pavements are identified by the concentration of surficial clasts and the presence of varnish on the top sides of clasts and rubification (reddening) on the bottom sides. Bar and swale topography is present in these areas, suggesting a long period of gradual dissection. Where exposed in the sides of active drainages, these soils exhibit strong carbonate and gypsum cementation in their upper horizons. All of these factors indicate a long period of subaerial exposure, probably at least 20,000 years and up to approximately 200,000 years. As such, the stable, uplifted surfaces were mapped as older alluvium of late Pleistocene age. Many surfaces of varying ages are present, but all were mapped as older alluvium.

The older alluvium consists of gray to brown, gravelly sands with silt, cobbles and boulders. Clasts are largely subangular tonalite, but metamorphic and gypsum rock clasts are present.

Observation of steep side slopes in incised drainages in the southern third of the site indicates that the older alluvium is only a thin veneer above a relatively planar erosion surface developed on the Fish Creek Gypsum.

Younger Alluvium (Qya)

Active washes incise all of the other units in the mapped area. The active washes merge in the northern portion of the mapped area, becoming a single broad wash several hundred feet wide. The wash deposits are generally coarse sands with cobbles in the southern portion of the site, grading to silty fine sands in the northern portion of the site. Clasts are largely subangular to subrounded tonalite, but metamorphic and gypsum rock clasts are present. No soil development was observed and these materials are entirely unconsolidated.

No hydric soils are present.

Plaster City Plant

Approximately 98.5 percent of the soils at the Plaster City Plant and the vicinity are not mapped. The remaining 1.5 percent of the soils that are mapped consists of Indio-Vint complex and Rositas silt loam. These mapped soils are located within the eastern portion of the Plaster City Plant (Appendix B). The following descriptions of the soils located within the Plaster City Plant area and vicinity are summarized from the U.S. Department of Agriculture Soil Conservation Service Soil Survey of Imperial County, California, Imperial Valley Area (1981).

Indio-Vint Complex (119)

These soils are found on flood plains and alluvial basin floors at elevations of 200 feet above sea level to 230 feet below. This unit averages about 35 percent Indio loam and 30 percent Vint loamy fine sand. The remaining 35 percent is Rositas, Meloland, and Holtville soils; soils that are highly stratified with sand to silt loam textures; narrow areas with slopes of 2 to 5 percent; and areas that have hummocky or dune topography.

The Indio soil is very deep and well drained. It formed in alluvial and eolian sediments of mixed origin. Some areas are saline. Permeability of the Indio soil is moderate, and available water capacity is high to very high. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate. The effective rooting depth is 60 inches or more.

The Vint soil is very deep and well drained. It formed in alluvial and eolian sediments from diverse sources. Permeability of the Vint soil is moderately rapid, and available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is high. The effective rooting depth is 60 inches or more.

Rositas Silt Loam (137)

This very deep, somewhat excessively drained, nearly level soil is on flood plains, basins, and terracesat elevations of 35 to 300 feet. Included with this soil in mapping are areas of Vint and Meloland soils and scattered coppice dunes of Rositas fine sand. Permeability is rapid, and available water capacity is low. Surface runoff is slow, and the hazard of water erosion is slight. There is a moderate hazard of soil blowing and abrasion to young plants. The effective rooting depth is 60 inches or more.

4.0 METHODOLOGY

Prior to the site visit, project plans, topographic maps, and satellite imaging were examined to establish an accurate project location, project description, watershed, soils, and surrounding land uses. The project location was reviewed and studied for information that would aid in determining the potential for wetlands, perennial, intermittent, or episodic drainages, and associated riparian vegetation. Current and historic aerial imagery of the project area were reviewed for signs of stream activity. Changes in landscape, color, vegetation density, and drainage pattern were noted. Anthropogenic disturbances within the project area were also identified.

Potential watercourses and related landform boundaries, such as changes in landscape color, vegetation densities, and drainage patterns, were then outlined on aerial photography. Transects were then selected for field verification of stream presence indicators. Reference points along each transect were recorded on a hand-held Global Positioning System (GPS) for field reference.

Field surveys of the proposed project areas were conducted on April 19, 2016 through April 21, 2016. The jurisdictional delineation survey area included all of USG holdings at the Plaster City Quarry, a 150-foot wide alignment north of the Quarry tram railroad for the proposed waterline/powerline form the Quarry to Quarry Well No. 3, and the alignment between the existing Evan Hewes Highway and old Evan Hewes Highway where replacement of the waterline from Ocotillo to the Plaster City Plant is proposed.

During the field survey, the selected transects were walked a minimum of 100 feet upstream and downstream, noting the presence or absence of fluvial activity, boundaries of geomorphic units, changes in plant species composition between different geomorphic units, photographing points of transition, and mapping the watercourse and watercourse boundaries. The guidelines followed are those established in the 2014 *Mapping Episodic Stream Activity (MESA) Field Guide*. Areas measured were also recorded using a hand-held GPS for accurate location reference.

Furthermore, the presence of an ordinary high water mark was recorded. Where the presence of an OHWM was evident, a second measurement was taken for the width of the OHWM and recorded. The OHWM was determined based upon erosion, the deposition of vegetation or debris, and changes in vegetation, as described in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (August 2008).

Where changes in plant community composition were apparent, the area was examined for the possibility of wetlands. Whether or not adjacent to WUS, the potential wetland area is evaluated for the presence of the three wetland indicators: hydrology, hydric soils and hydrophytic vegetation. The guidelines followed are those established in the 1987 *Army Corps of Engineers Manual*.

Jurisdictional drainages and wetlands were evaluated for impacts associated with all aspects of the proposed project. The mine development plan and mine development information obtained from the USG administrative staff was referenced to delineate and quantify the area to be impacted by the proposed Plaster City Quarry. The expansion footprint, vegetation, wildlife, hydrology, and water quality impacts were all calculated and recorded. The jurisdictional drainages and wetlands were also evaluated for their connectivity to "navigable waters" as described in "The Clean Water Act". The field assessments for the waterline/powerline north of the quarry and the waterline at the Plaster City Plant followed similar procedures.

5.0 RESULTS

5.1 RESULTS OF THE JURISDICTIONAL DELINEATION

A total of 327.55 acres of jurisdictional drainages were identified to occur within the proposed Plaster City Quarry Expansion/Modernization Project boundaries (Figures 6 and 7, 1 through 8). No significant amount of riparian vegetation was observed to occur on the drainages; therefore, the same jurisdictional areas were identified for the CDFW, USACE, and RWQCB.

5.2 EXISTING RESOURCES ASSOCIATED WITH DRAINAGES

Jurisdictional drainages that are unnamed drainages are identified on the figures and discussed below as they occur within each of the proposed project areas: Plaster City Quarry, the Plaster

City Quarry proposed water/power supply alignment, and the Plaster City Plant water supply line replacement area.

5.2.1 Plaster City Quarry

A total of 325.79 acres of unnamed streambeds occur in the Plaster City Quarry area (Figure 6). The drainages exhibit a bed, bank and channel, and appear to convey water only during intense storm events. The streambeds are all characterized as ephemeral with little or no vegetation. Sparse vegetation found in these drainages include: smoke tree *(Psorothamnus spinosus),* white bursage *(Ambrosia dumosa),* catclaw acacia, *(Acacia greggii)* brittlebush *(Encelia farinose),* ocotillo *(Foquieria splendens),* and Schott's indigo bush (*Psorothamnus schotti)*.

No wetland habitat was identified to occur in the Plaster City Quarry area.

5.2.2 Plaster City Quarry Water Supply

A total of 0.21 acre of unnamed streambeds were identified in the portion of the survey area corresponding the alignment for a proposed waterline/powerline extending from the Quarry to Quarry Well No. 3 (APN 033-020-09). The streambeds in this survey area exhibit a bed, bank and channel, and appear to convey water only during intense storm events. The streambeds are all characterized as ephemeral with little or no vegetation. Sparse vegetation found in the drainages include: **s**moke tree *(Psorothamnus spinosus),* white bursage *(Ambrosia dumosa),* catclaw acacia, *(Acacia greggii)* brittlebush *(Encelia farinose),* ocotillo *(Foquieria splendens),* and Schott's indigo bush (*Psorothamnus schotti)*.

No wetland habitat was identified to occur in the waterline/powerline survey area.

5.2.3 Plaster City Plant Water Supply

A total of 1.55 acres of unnamed streambeds were identified in the survey area corresponding to the Plaster City Plant waterline replacement (Figures 7, 1 through 8). The streambeds in this survey area exhibit a bed, bank and channel, and appear to convey water only during intense storm events. The streambeds are all characterized as ephemeral with little or no vegetation. Sparse vegetation found in the drainages include: **s**moke tree *(Psorothamnus spinosus),* white bursage *(Ambrosia dumosa),* catclaw acacia, *(Acacia greggii)* brittlebush *(Encelia farinose),* ocotillo *(Foquieria splendens),* and Schott's indigo bush (*Psorothamnus schotti)*.

No wetland habitat was identified to occur in the water supply line replacement survey area.

5.3 AGENCY JURISDICTION

5.3.1 California Department of Fish and Wildlife

Under the Lake and Streambed Alteration Program, the California Department of Fish and Wildlife has jurisdiction over portions of the site identified as stream or lake as defined by the presence of a bed, bank or channel and where riparian vegetation was present on a bank to the outside drip-line of the vegetation. The California Department of Fish and Wildlife would assert jurisdiction over all 327.55 acres of onsite streambeds located within the proposed Plaster City Quarry Expansion/Modernization Project boundaries. These streambeds would fall under the jurisdiction of California Fish and Game Code Section 1602. Any impacts to these drainages would require notification to the Department of Fish and Wildlife for review under the Streambed Alteration Agreement Program.

5.3.2 Regional Water Quality Control Board

Section 401 of the CWA specifies that certification from the State is required for any project requesting a federal license or permit to conduct any activities including, but not limited to, the construction or operation of facilities that may result in any discharge into navigable waters. Impacts to any of the 327.55 acres of streams located within the proposed Plaster City Expansion/Modernization Project boundaries will require a 404 permit from the USACE; therefore, a 401 Certification from the Colorado River RWQCB will be needed upon issuance of a 404 permit.

5.3.3 Army Corps of Engineers

The USACE regulates discharge of dredged or fill material into wetlands and "waters of the United States", which includes "tidal waters", "interstate waters", and "all other waters, interstate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce or which are tributaries to waters subject to the ebb and flow of the tide" pursuant to provisions of Section 404 of the Clean Water Act.

The 327.55 acres of streams located within the proposed Plaster City Expansion/Modernization Project boundaries consist of a series of unnamed desert ephemeral streambeds that flow only during severe rain events. These streambeds have a definable "ordinary high water mark" distinguishable by erosional and sedimentary characteristics. These drainages ultimately flow into the Salton Sea. The Salton Sea is a traditional navigable water as defined by the Clean Water Act. Therefore, drainages located within the proposed Plaster City Expansion/Modernization Project boundaries have a significant nexus to "traditional navigable water" and a 404 Clean Water Act permit from the USACE would be required for any fill associated with the within the proposed Plaster City Expansion/Modernization Project.

5.4 PROJECT IMPACTS TO JURISDICTIONAL AREAS

5.4.1 Impacts to Jurisdictional Drainages

Plaster City Quarry

The proposed Project will permanently impact portions of jurisdictional streambeds located within the Quarry area of development as shown in the Mine Plan. Impacts to these drainages are considered permanent because restoration activities are not anticipated to occur until reclamation of the Quarry is undertaken. Furthermore, the reclamation plan does not specifically address restoration of streams.

Ephemeral streambeds and washes located within the Quarry will be excavated and filled as the Quarry expands to access new deposits of gypsum. Proposed operations within this area will utilize heavy machinery and explosives to excavate the new phases of the Quarry as outlined in Table 1 above and described in the Mine Reclamation Plan (Lilburn 2003). Alluvial wash quarrying will involve the construction of a berm beginning at the southernmost limit of the disturbance area. The expansion of quarrying activities within the Quarry is anticipated to result in approximately 134.08 acres (107,458 linear feet) of permanent impacts to CDFW, USACE, and RWQCB jurisdictional drainages (Appendix A).

Plaster City Quarry Water Supply

Installation of new well and approximate 20,719 lineal feet of water supply pipeline and power supply lines will result in the filling of all ephemeral streambeds and washes within the waterline/powerline area. Ephemeral streambeds and washes located within the waterline/powerline area will be excavated and filled as a result of the proposed waterline/powerline installation activities. The proposed waterline/powerline installation activities are anticipated to result in approximately 0.21 acres of impacts to CDFW, USACE, and RWQCB jurisdictional drainages (Figures 7, 1 through 8).

Plaster City Plant Water Supply

As described in the BLM application CACA-044014 the proposed replacement waterline would be installed within a 75-foot wide right-of-way south of the Evan Hewes Highway centerline. The replacement pipeline would be installed approximately 50 feet south of the Evan Hewes Highway centerline. The existing pipeline would be abandoned in place.

USG would require access for equipment along the entire length of the pipeline, approximately 8.77 miles from the USG groundwater storage tank in the community of Ocotillo east to the Plaster City Plant. Construction equipment would include but not be limited to service trucks, tractors, backhoes, graders for excavation of a trench and installation of the replacement pipeline. Installation of the pipeline would include excavation of a trench, placement of the new pipeline, and fill/compaction, or material to pre-project conditions. The proposed final depth of the pipeline ranges from two (2) to six (6) feet below ground surface.

The proposed water pipeline replacement activities will result in the filling of all ephemeral streambeds and washes within the water supply line replacement area. Ephemeral streambeds and washes located within the water supply line replacement area will be excavated and filled as a result of the proposed water supply pipeline replacement activities. The proposed water supply pipeline replacement activities are anticipated to result in approximately 1.55 acres of temporary impacts to CDFW, USACE, and RWQCB jurisdictional drainages (Figures 7, 1 through 8). All waterline construction areas will be restored to pre-project conditions following the completion of construction activities.

Overall Project Impacts

Implementation of the proposed project would impact a total of 135.84 acres of CDFW, USACE, and RWQCB jurisdictional streambeds. Full build-out of the Quarry would result in permanent impacts to approximately 134.29 acres of jurisdictional drainages. Activities associated with the Plant water supply would result in temporary impacts to approximately 1.55 acres of jurisdictional drainages associated with replacement of an existing water pipeline. The impacts to jurisdictional drainages for each project area is outlined in Tables 2 and 3 below.

Table 2.

PLASTER CITY QUARRY JURISDICTIONAL WATERS IMPACT CALCULATIONS

Item	Status	50' Wide Quarry Wash Diversion Berm Jurisdictional Water Impacts		Jurisdictional Water Impacts		TOTALS IMPACTS	
		A	B	C	D	E	F
		Linear Feet	Acres	Linear Feet	Acres	Linear Feet (A+C)	Acres (B+D)
Phase 1A Quarry	Existing	0	0.000	0	0.000	0	0.00
Phase 1B Quarry	Existing	0	0.000	180	0.030	180	0.03
Processing Area	Existing	0	0.000	0	0.000	0	0.00
Phase 2	Proposed	1520	1.596	10685	25.773	12205	27.37
Phase 2P	Proposed	0	0.000	450	2.100	450	2.10
Phase 3	Proposed	2500	2.869	1000	3.962	3500	6.83
Phase 3P (a)	Proposed	0	0.000	310	1.223	310	1.22
Phase 3P (b)	Proposed	0	0.000	1200	2.097	1200	2.10
Phase 4	Proposed	1450	1.488	2715	20.106	4165	21.59
Phase 5	Proposed	2000	2.202	3000	12.276	5000	14.48
Phase 6	Proposed	350	0.224	20737	7.584	21087	7.81
Phase 6Bp	Proposed	0	0.000	6168	0.935	6168	0.94
Phase 7	Proposed	415	0.265	15766	13.642	16181	13.91
Phase 7Bp	Proposed	0	0.000	0	0.000	0	0.00
Phase 8	Proposed	585	0.447	16280	13.312	16865	13.76
Phase 9	Proposed	795	0.320	8220	2.519	9015	2.84
Phase 10	Proposed	180	0.096	900	1.572	1080	1.67
Phase 10P	Proposed	2840	2.901	5850	13.839	8690	16.74
Phase S1	Existing	0	0.000	145	0.221	145	0.22
Phase S2	Existing	0	0.000	60	0.023	60	0.02
Phase S3	Existing	0	0.000	250	0.056	250	0.06
Haul Road to Phase 6Bp	Proposed	0	0.000	100	0.033	100	0.03
Haul Road to Phase 7Bp	Proposed	0	0.000	735	0.364	735	0.36
Tramroad Easement	Existing	0	0.000	0	0.000	0	0.00
Water Pipeline and Powerline	Proposed	0	0.000	0	0.000	0	0.00
Well Site #3	Existing	0	0.000	72	0.214	72	0.21
	TOTALS	**12,635.00**	**12.408**	**94,823.00**	**121.881**	**107,458.00**	**134.29**

Table 3.

PLASTER CITY PLANT JURISDICTIONAL WATERS IMPACT CALCULATIONS

Item	Status	Jurisdictional Water Impacts	
		Permanent (Acres)	Temporary (Acres)
Water Supply	Proposed	0.000	1.550

5.4.2 Project Impacts to Wetlands

No wetlands were identified or recorded within the project survey area. The project will not impact wetlands.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 PERMITS

6.1.1 Streambed Alteration Agreement Notification

The proposed project will result in approximately 134.29 acres of permanent impacts and streambeds within the jurisdiction of the CDFW. In addition, the activities associated with the Plaster City Plant water supply would result in temporary impacts to approximately 1.55 acres of jurisdictional drainages associated with replacement of an existing water pipeline. USG will be required to submit a notification for a 1602 Streambed Alteration Agreement to the California Department of Fish and Wildlife for impacts to jurisdictional streambeds prior to commencing activities associated with the proposed project.

6.1.2 Regional Water Quality Control Board

In 2014 the Colorado River Basin Regional Water Quality Control Board issued an Order for a Technically-Conditioned Clean Water Act Section 401 Water Quality Certification. This 401 Certification covers an approximately 111-acre area consisting of Quarry Phases 2 and 2P and an approximately 25-acre area at the Shoveler Quarry.

The proposed project will result in permanent impacts to approximately 134.29 acres of streambeds within the jurisdiction of the Colorado River Water Quality Control Board. In addition, the activities associated with the Plaster City Plant water supply would result in temporary impacts to approximately 1.55 acres of jurisdictional drainages associated with replacement of an existing water pipeline. USG will be required to obtain a 401 Certification for impacts to Waters of the U.S. from the Colorado River RWQCB for project activities not covered under the existing 401 Water Quality Certification prior to commencing the proposed Plaster City Expansion/Modernization Project activities.

6.1.3 United States Army Corps of Engineers

The proposed Plaster City Expansion/Modernization Project will result in permanent impacts to approximately 134.29 acres of streambeds within the jurisdiction of the USACE. In addition, the activities associated with the Plaster City Plant water supply would result in temporary impacts to approximately 1.55 acres of jurisdictional drainages associated with replacement of an existing water pipeline. USG will be required to obtain a 404 Permit from the USACE for impacts to Waters of the U.S. prior to commencing the proposed Plaster City Expansion/Modernization Project activities.

6.2 AVOIDANCE AND MINIMIZATION RECOMMENDATIONS

To minimize impacts associated with the proposed Plaster City Expansion/Modernization Project on resources associated with the drainages, the following avoidance and minimization measures are recommended:

Wildlife

- USG shall instruct employees and other visitors at the mine to avoid Peninsular Bighorn Sheep. Access to undisturbed lands by humans on foot shall be restricted, and usually would include only biologists and mining personnel. The project proponent has established a training program, including new-employee orientation and annual refreshers, to educate employees/visitors regarding bighorn sheep and the importance of avoidance. A Section 7 consultation was initiated by BLM with USFWS in 2008 to determine potential impacts to Peninsular Bighorn Sheep and determine recommended methods of avoidance. To date USFWS has not rendered an opinion.
- The project proponent shall not allow domestic animals (cattle, sheep, donkeys, dogs, etc.) onto the mine site or any lands under USG control. Training for mine employees shall include instructions to report observations of domestic animals to the mine manager. Upon receiving any such reports, the mine manager shall contact the appropriate authorities for removal of domestic animals.
- In project areas where nesting birds may occur, the applicant: 1) shall avoid removing potential nesting riparian vegetation from March 15 through September 15, or 2) shall survey all potential nesting riparian vegetation within the project site for active bird nests. If an active bird nest is located, the nest site shall be flagged or staked a minimum of 5 yards in all directions, the flagged zone shall not be disturbed until the nest becomes inactive.

Habitat/Vegetation

- When appropriate, mitigation for the removal of vegetation associated with the drainage shall include re-vegetation of suitable areas with desirable vegetation native to the area.
- Work areas within jurisdictional drainages shall be delineated with flagging or other means of marking prior to ground disturbance to assure work activities and impacts do not exceed permitted limits.
- All areas of disturbed soils with slopes towards a wash shall be stabilized to reduce erosion potential. Where possible, stabilization shall include the re-vegetation of stripped or exposed areas with vegetation native to the area. Where suitable vegetation cannot reasonably be expected to become established, non-erodible materials may be used for such stabilization.

Best Management Practices

- Structures and associated materials, including debris, not designed to withstand high seasonal flows shall be relocated to areas above the high water mark before such flows occur.
- All debris, bark, slash, sawdust, rubbish, silt, cement or concrete or washings thereof, asphalt, paint or other coating materials, oil or other petroleum products, or any other substance resulting from project-related activities which would be hazardous to aquatic life or jurisdictional waters, shall be prevented from contaminating the soil and/or

entering the waters of the state. None of these materials shall be allowed to enter into or be placed within or where they may be washed by rainfall or runoff into jurisdictional waters. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any stream.

- Any project-disturbed portions of drainages not permanently impacted by this project will be restored to as near pre-project conditions as possible.
- Precautions to minimize turbidity/siltation shall be taken into account during project planning and implementation. This will include the work site to be isolated and/or the construction of silt catchment basins, so the silt or other deleterious materials are not allowed to pass to the downstream reaches.
- Spoil sites shall not be located within a wash, where spoil can be washed back into a stream, or where it will cover aquatic or riparian vegetation. The applicant will remove all human-generated debris.

7.0 REFERENCES CITED

CDFG (California Department of Fish and Game) and California State University, Fresno, 2014. The MESA Field Guide: Mapping Episodic Stream Activity. Sacramento, California.

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FIGURES

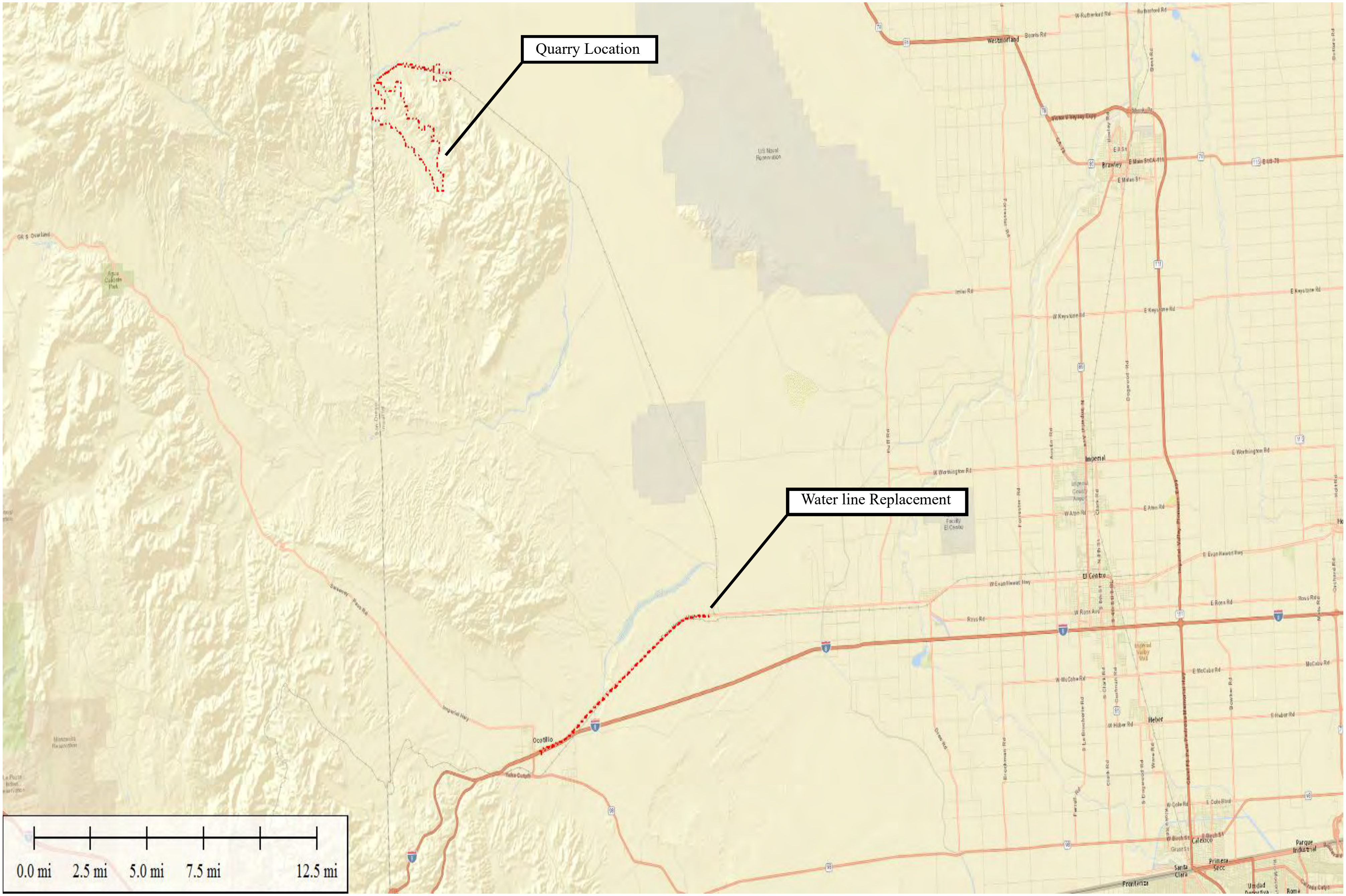

Figure 1

Vicinity Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Project Locations

N

Hernandez
Environmental
Services

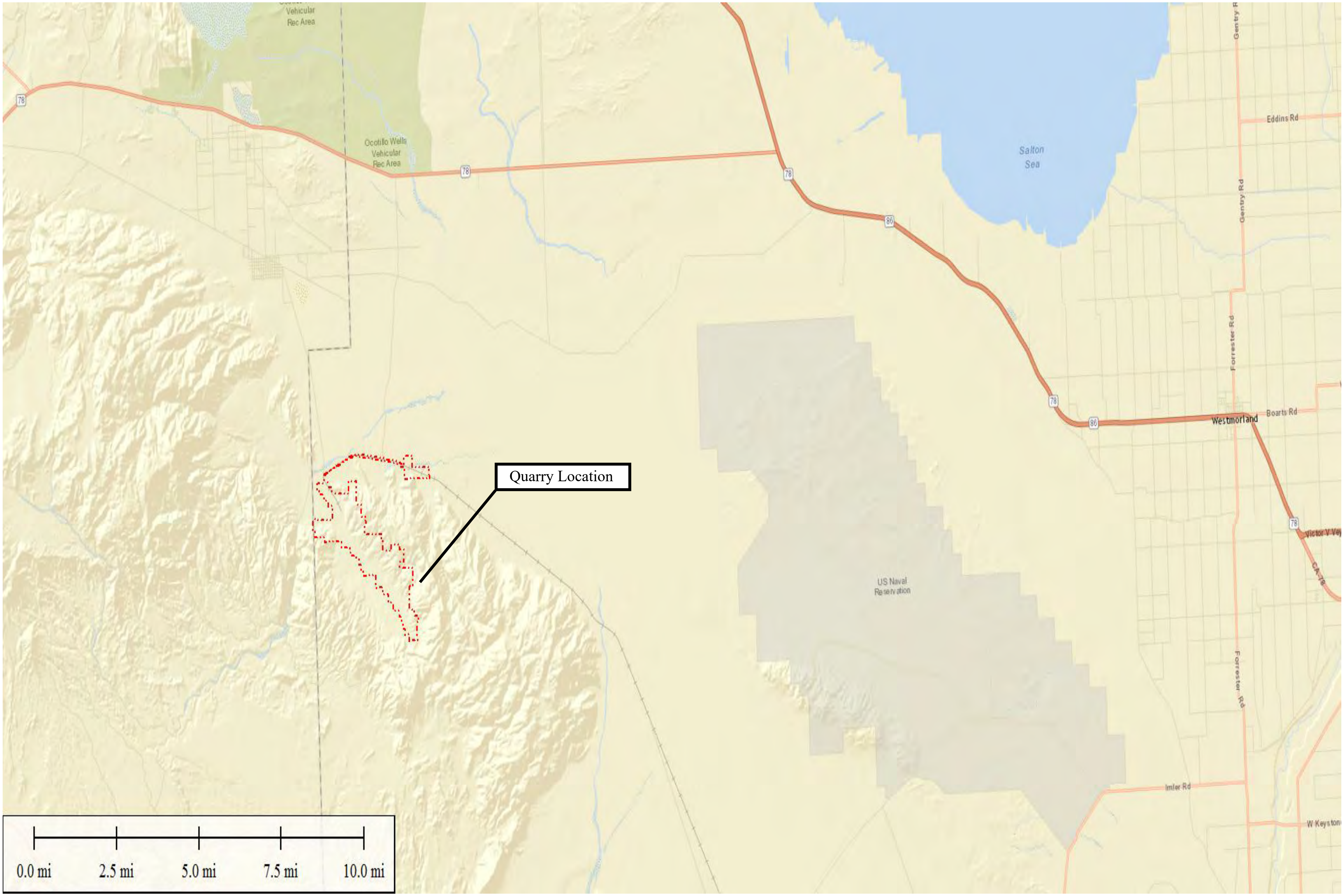

Figure 2
Quarry Location Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Plaster City Quarry Location

N

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Environmental
Services

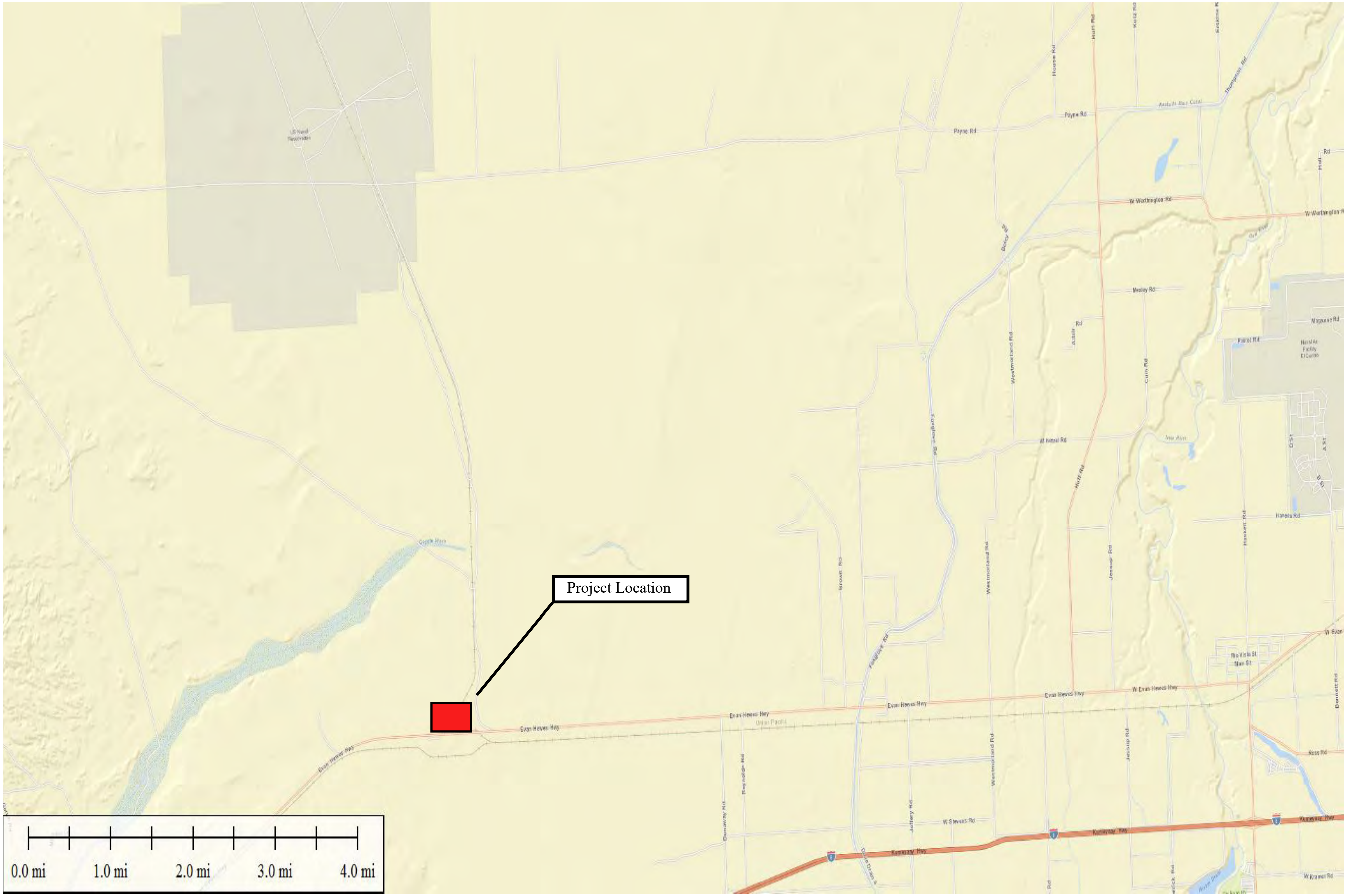


Figure 3

Plaster City Location Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Plaster City Plant Location

N

Hernandez Environmental Services

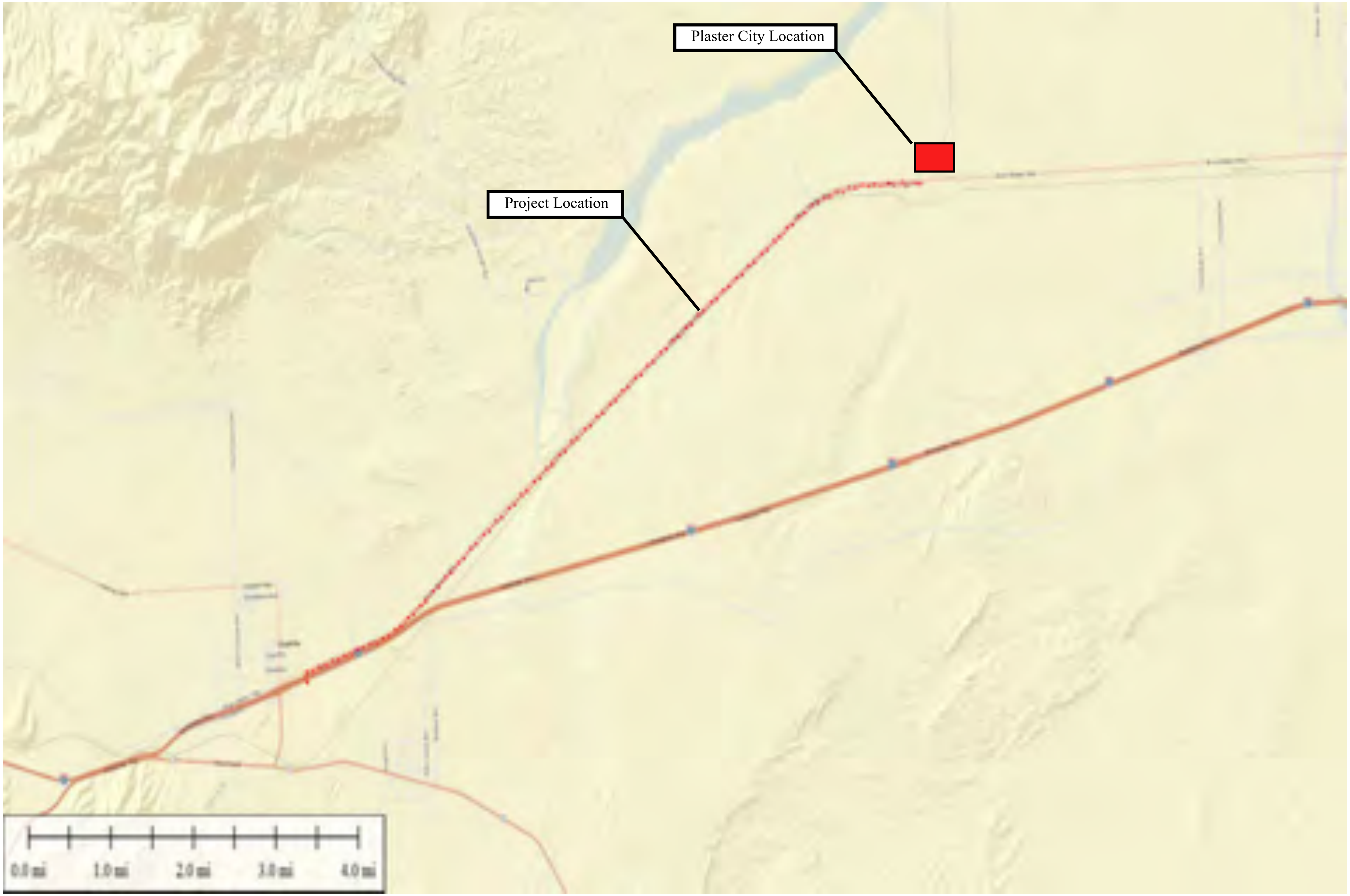


Figure 4

Water Line Replacement Location Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Plaster City Plant Location

Water Line Replacement Location

N

Hernandez Environmental Services

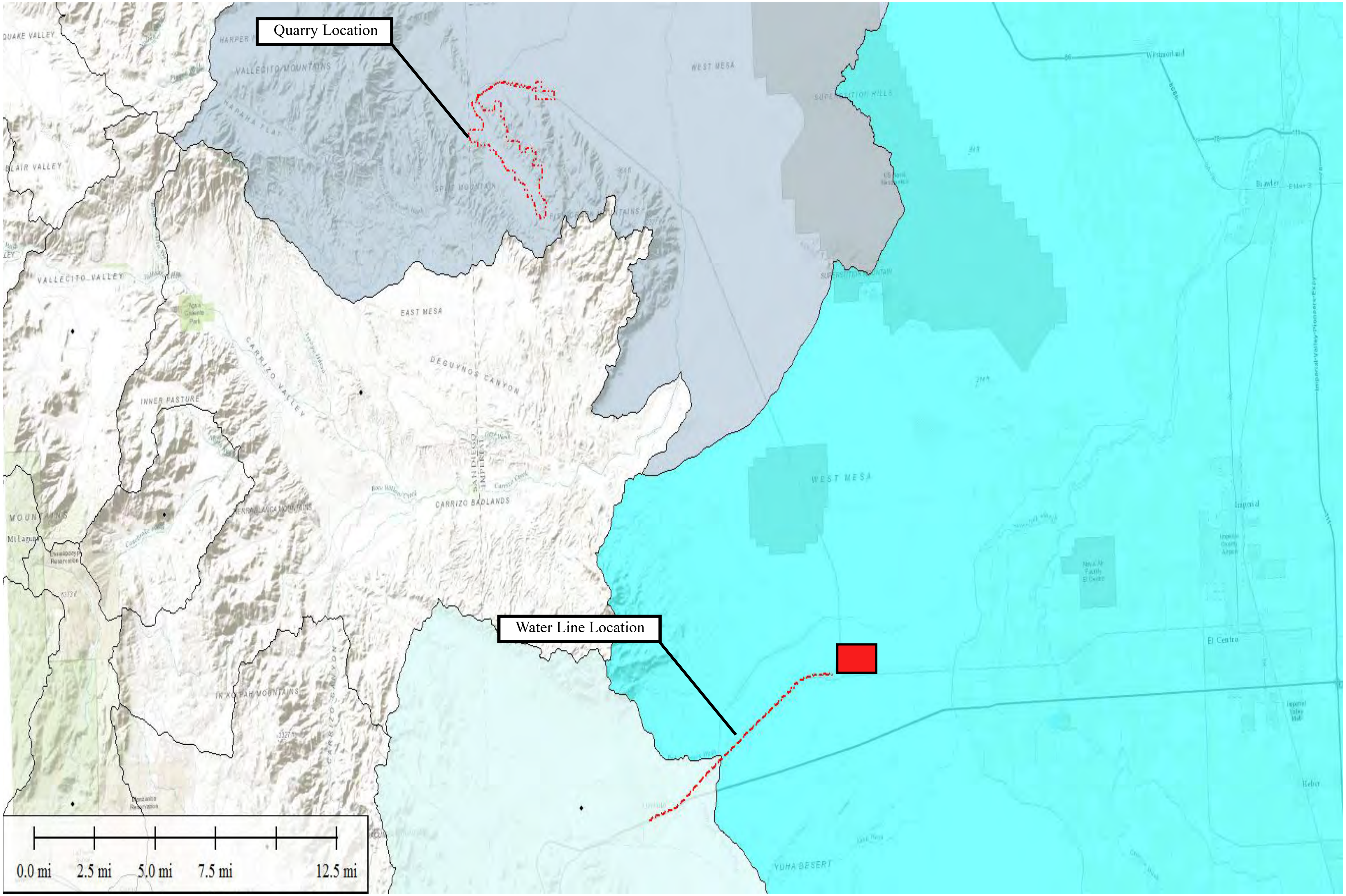


Figure 5

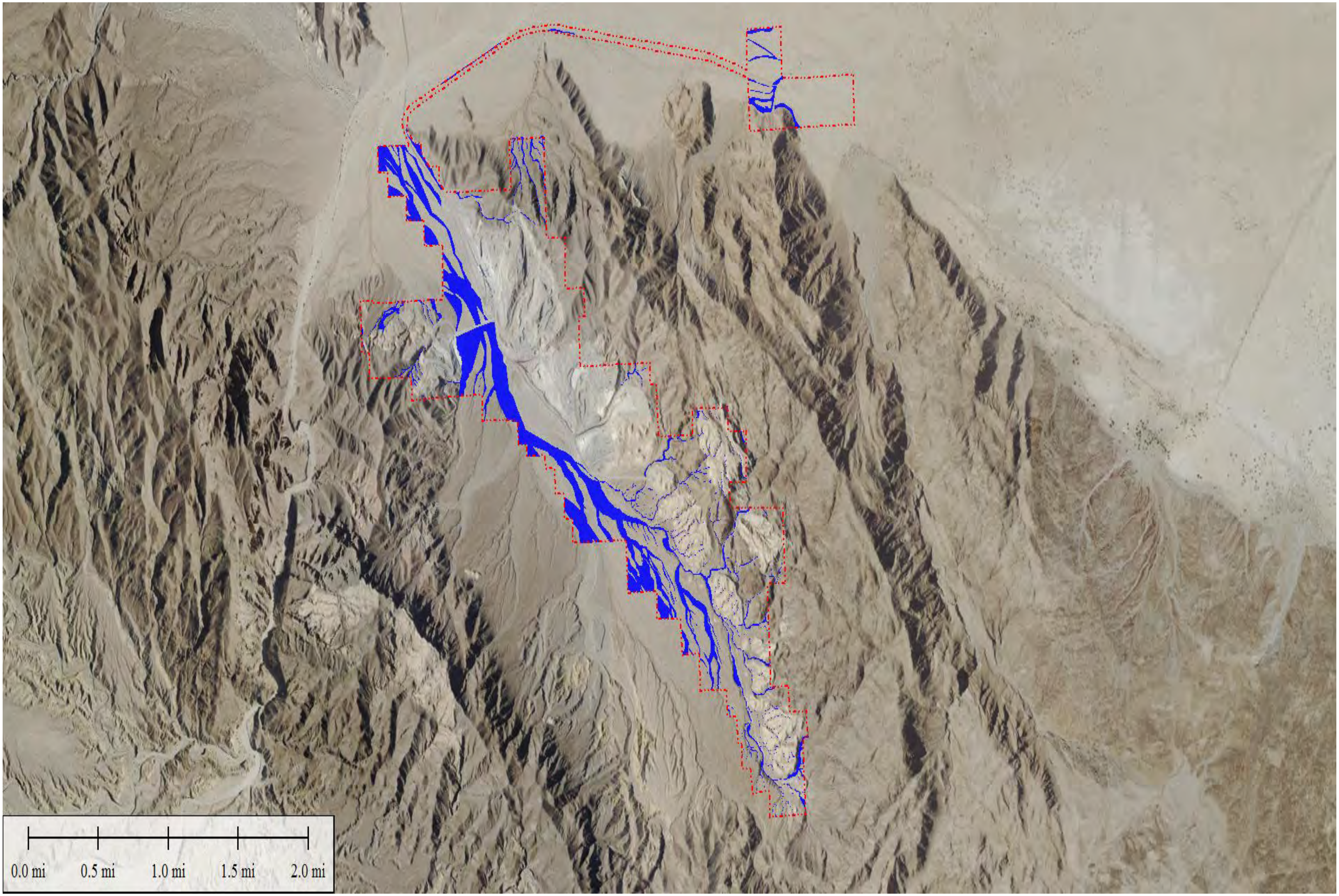
Hydrologic Unit Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

- Plaster City Plant Location
- Plaster City QuarryLocation
- Water Line Replacement Location
- Imperial Hydrologic Unit Coyote Wells
- Imperial Hydrologic Unit Brawley
- Anza Borrego Hydrologic Unit

N

Hernandez Environmental Services



Legend

Plaster City Quarry Location

326 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

Figure 6

Plaster City Mine Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Figure 7 (1 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

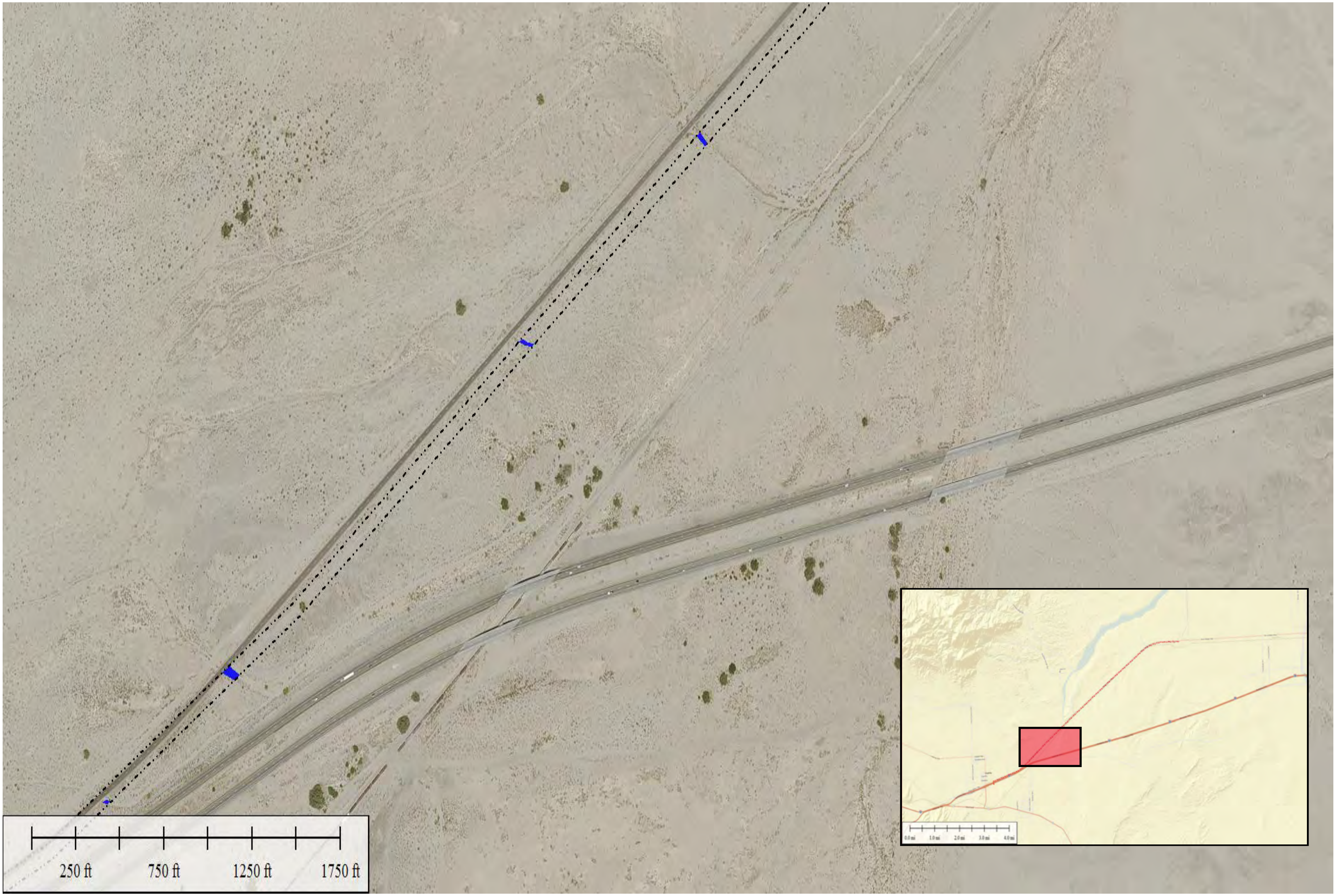


Figure 7 (2 of 8)
Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

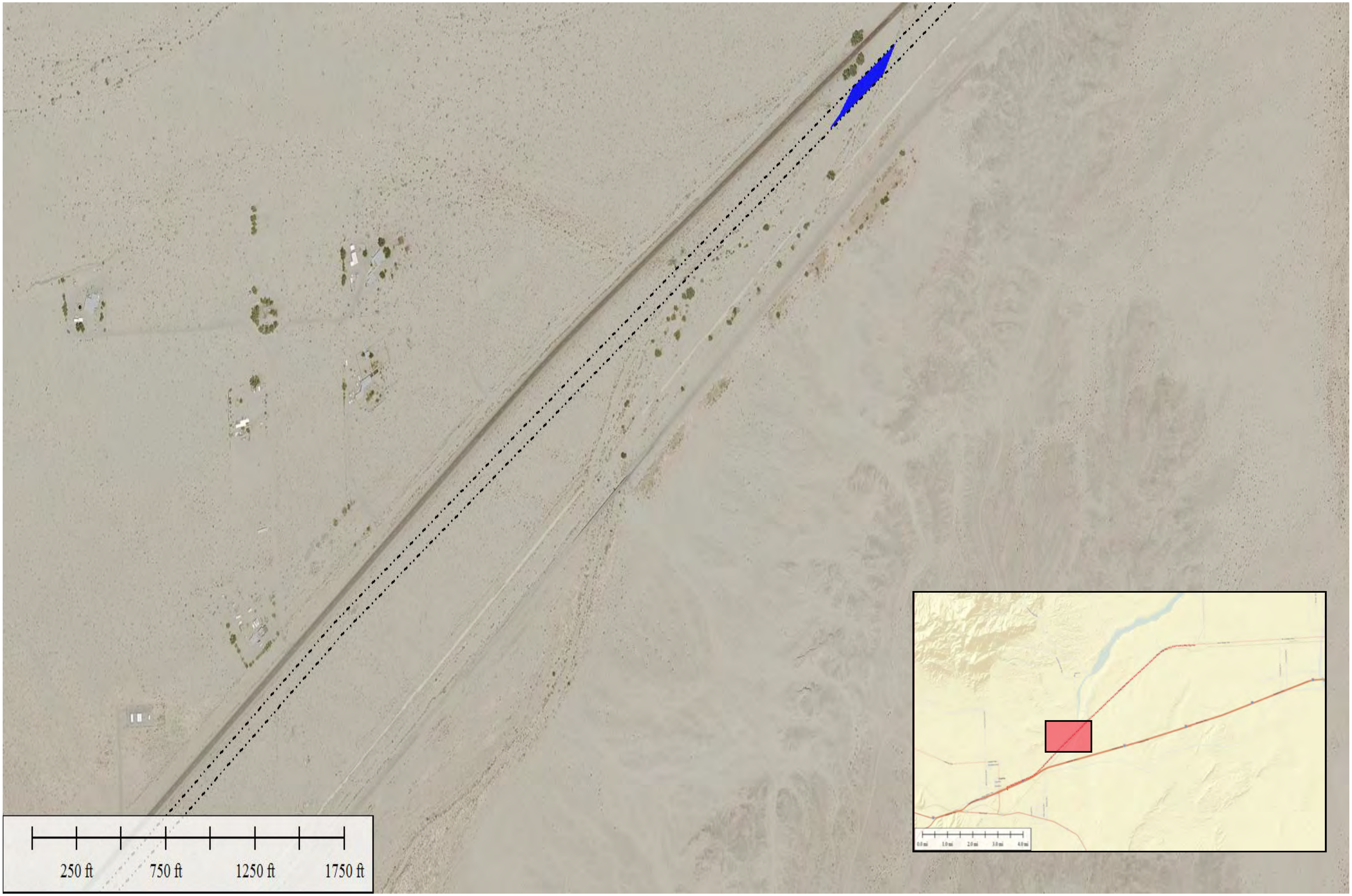


Figure 7 (3 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

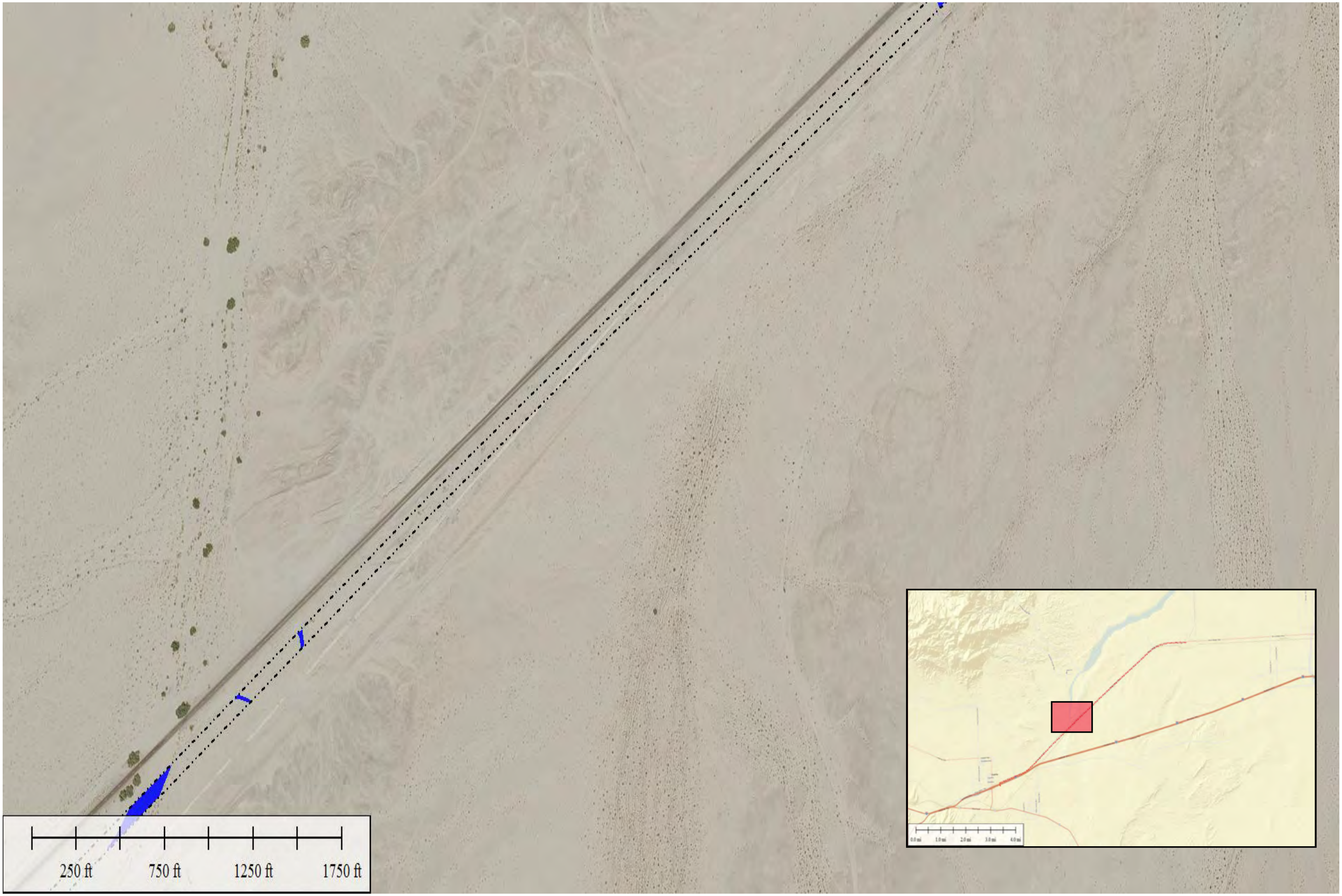


Figure 7 (4 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

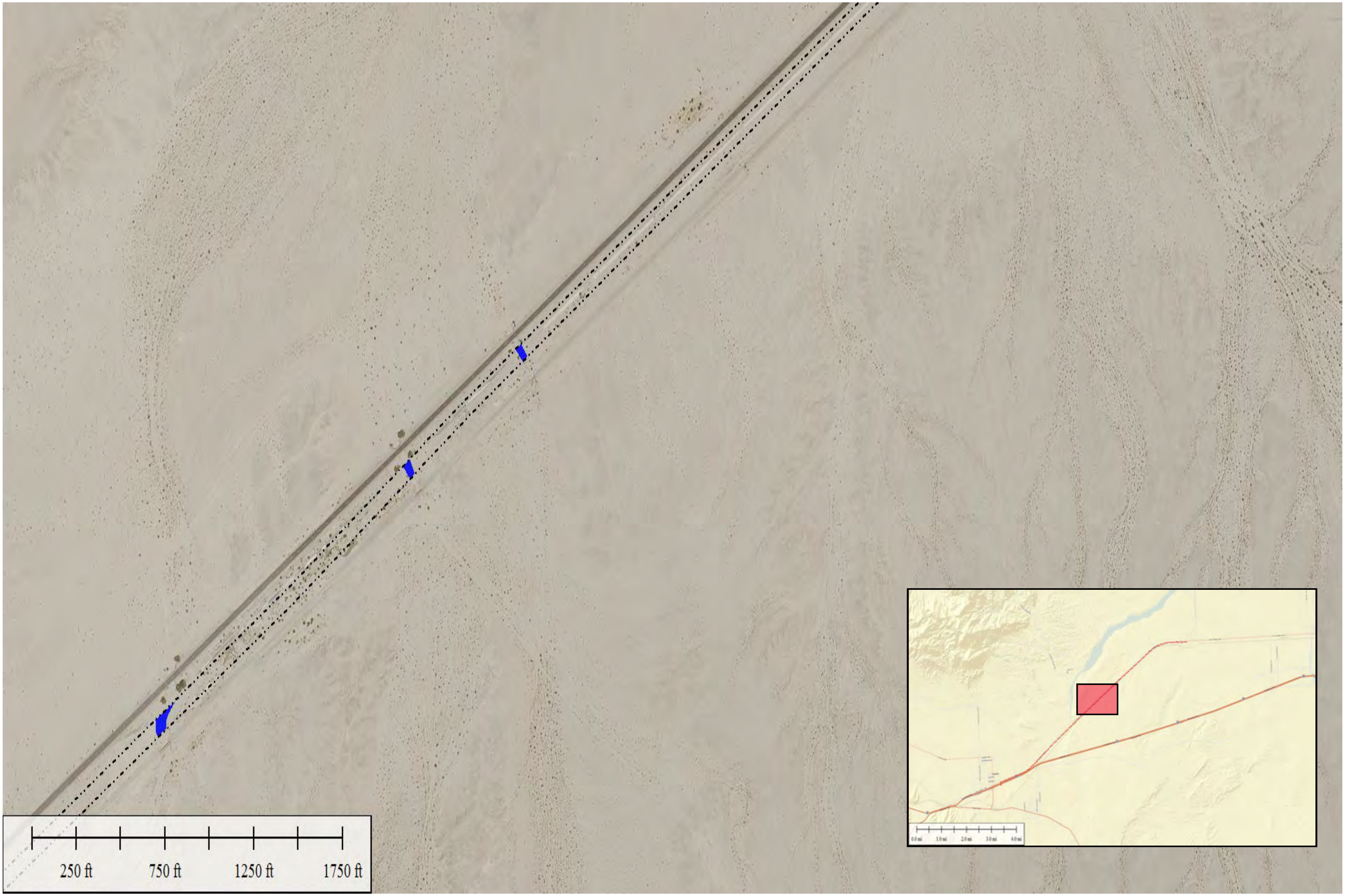


Figure 7 (5 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project

Imperial County, CA

Legend

Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

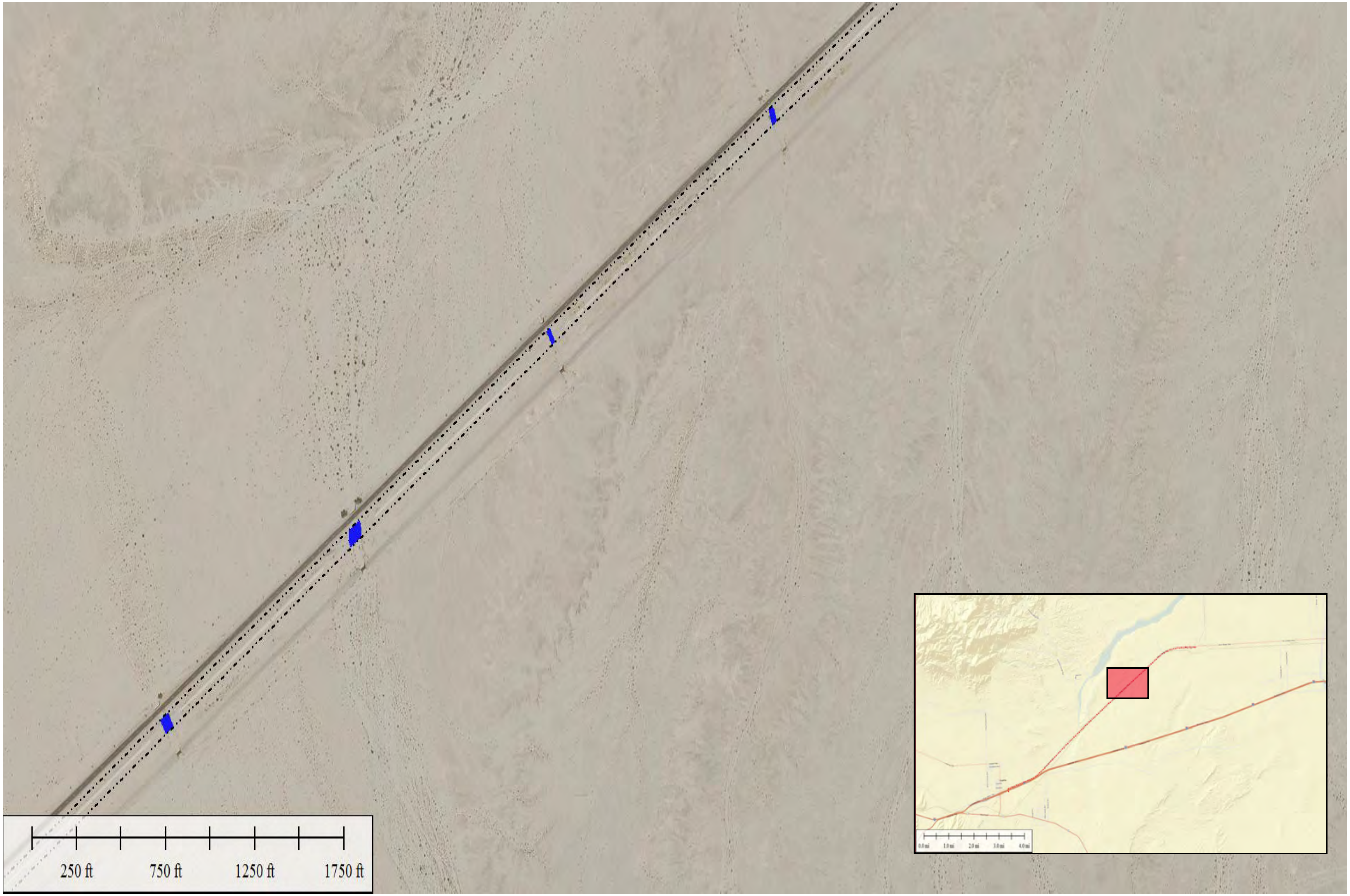


Figure 7 (6 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

Figure 7 (7 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

(dashed outline)	Waterline Alignment Survey Area
(blue fill)	1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

Figure 7 (8 of 8)

Water Line Replacement Jurisdictional Waters Map
USG Plaster City Mine Quarry
Expansion/Modernization Project
Imperial County, CA

Legend

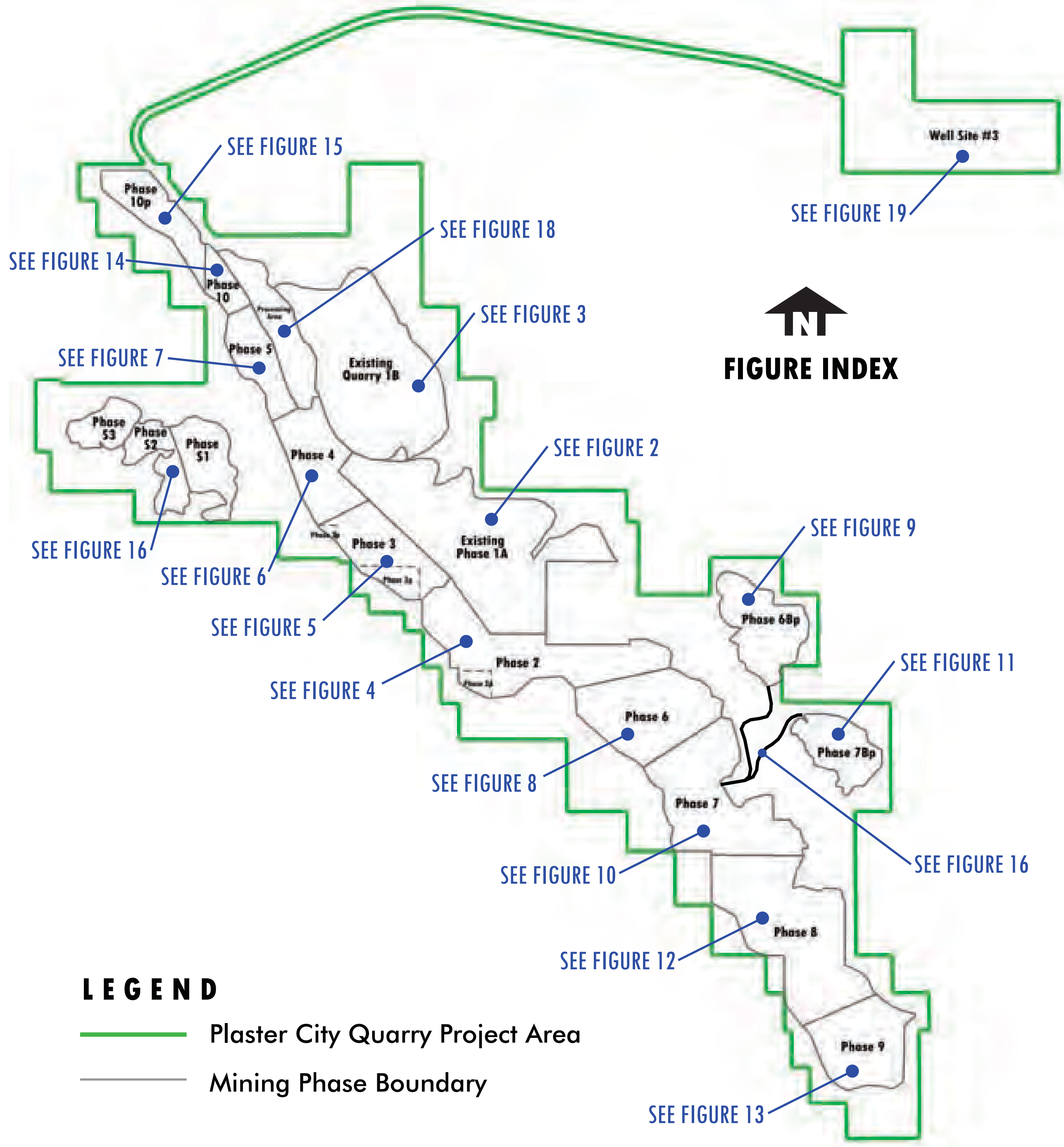
Waterline Alignment Survey Area

1.55 Acres State and Federal Jurisdictional Streams

N

Hernandez Environmental Services

APPENDIX A



PLASTER CITY QUARRY JURISDICTIONAL WATERS IMPACT CALCULATIONS

		50' Wide Quarry Wash Diversion Berm Jurisdictional Water Impacts		Jurisdictional Water Impacts		TOTALS IMPACTS	
		A	B	C	D	E	F
Item	Status	Linear Feet	Acres	Linear Feet	Acres	Linear Feet (A+C)	Acres (B+D)
Phase 1A Quarry	Existing	0	0.000	0	0.000	0	0.00
Phase 1B Quarry	Existing	0	0.000	180	0.030	180	0.03
Processing Area	Existing	0	0.000	0	0.000	0	0.00
Phase 2	Proposed	1520	1.596	10685	25.773	12205	27.37
Phase 2P	Proposed	0	0.000	450	2.100	450	2.10
Phase 3	Proposed	2500	2.869	1000	3.962	3500	6.83
Phase 3P (a)	Proposed	0	0.000	310	1.223	310	1.22
Phase 3P (b)	Proposed	0	0.000	1200	2.097	1200	2.10
Phase 4	Proposed	1450	1.488	2715	20.106	4165	21.59
Phase 5	Proposed	2000	2.202	3000	12.276	5000	14.48
Phase 6	Proposed	350	0.224	20737	7.584	21087	7.81
Phase 6Bp	Proposed	0	0.000	6168	0.935	6168	0.94
Phase 7	Proposed	415	0.265	15766	13.642	16181	13.91
Phase 7Bp	Proposed	0	0.000	0	0.000	0	0.00
Phase 8	Proposed	585	0.447	16280	13.312	16865	13.76
Phase 9	Proposed	795	0.320	8220	2.519	9015	2.84
Phase 10	Proposed	180	0.096	900	1.572	1080	1.67
Phase 10P	Proposed	2840	2.901	5850	13.839	8690	16.74
Phase S1	Existing	0	0.000	145	0.221	145	0.22
Phase S2	Existing	0	0.000	60	0.023	60	0.02
Phase S3	Existing	0	0.000	250	0.056	250	0.06
Haul Road to Phase 6Bp	Proposed	0	0.000	100	0.033	100	0.03
Haul Road to Phase 7Bp	Proposed	0	0.000	735	0.364	735	0.36
Tramroad Easement	Existing	0	0.000	0	0.000	0	0.00
Water Pipeline and Powerline	Proposed	0	0.000	0	0.000	0	0.00
Well Site #3	Existing	0	0.000	72	0.214	72	0.21
	TOTALS	12,635.00	12.408	94,823.00	121.881	107,458.00	134.29

JURISDICTIONAL WATERS IMPACT CALCULATIONS - SUMMARY

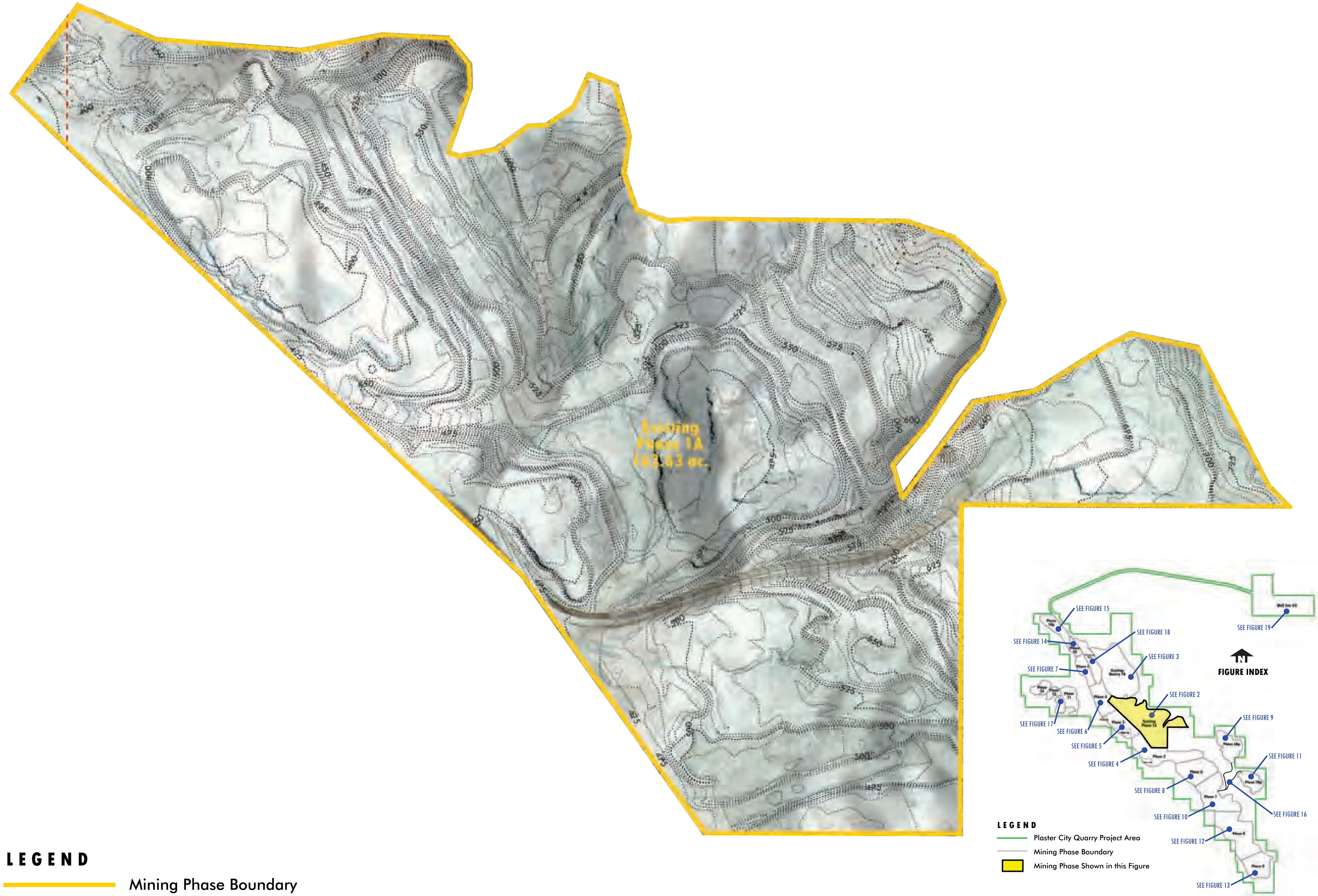
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Prepared By (TAG 11/02/16)
LILBURN CORPORATION

Figure 1

Jurisdictional Waters Impact Areas

No Impacts



LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50′ Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

N
0 400
FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 1A

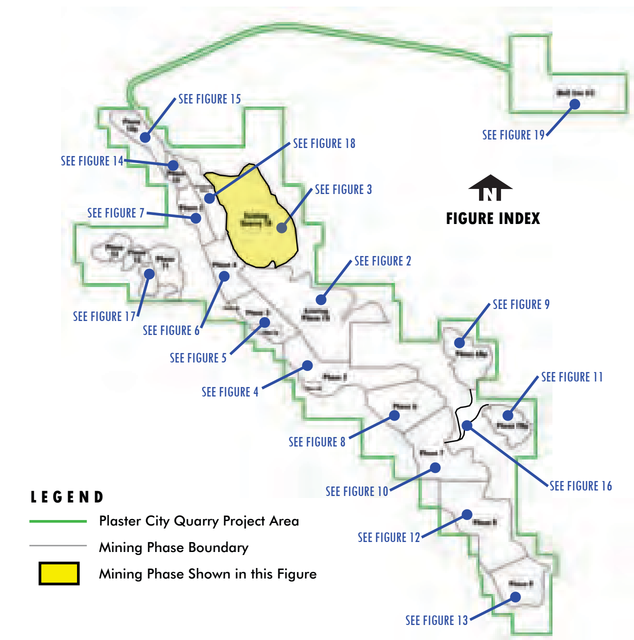
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 2

Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	180	0.03

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



LEGEND

Mining Phase Boundary

Color Coded Jurisdictional Water Impact Areas

A A3 A3a A3a1 Jurisdictional Waters Segment Designation System

Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

N
0 400
FEET

Prepared By (TAG 11/02/16)
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 1B

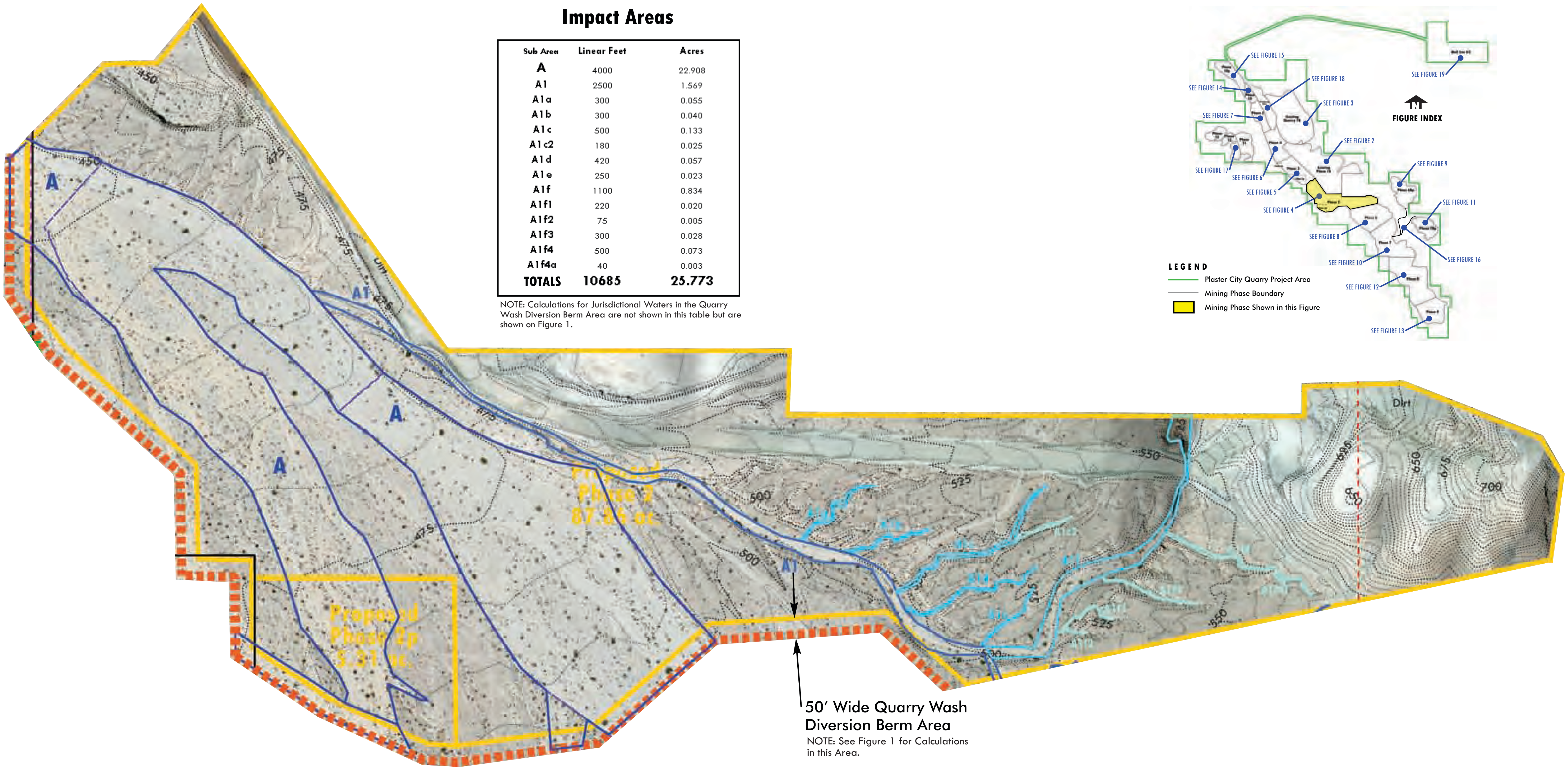
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 3

Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	4000	22.908
A1	2500	1.569
A1a	300	0.055
A1b	300	0.040
A1c	500	0.133
A1c2	180	0.025
A1d	420	0.057
A1e	250	0.023
A1f	1100	0.834
A1f1	220	0.020
A1f2	75	0.005
A1f3	300	0.028
A1f4	500	0.073
A1f4a	40	0.003
TOTALS	**10685**	**25.773**

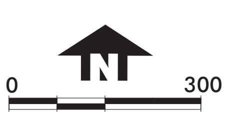
NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.



Prepared By (TAG 11/02/16):

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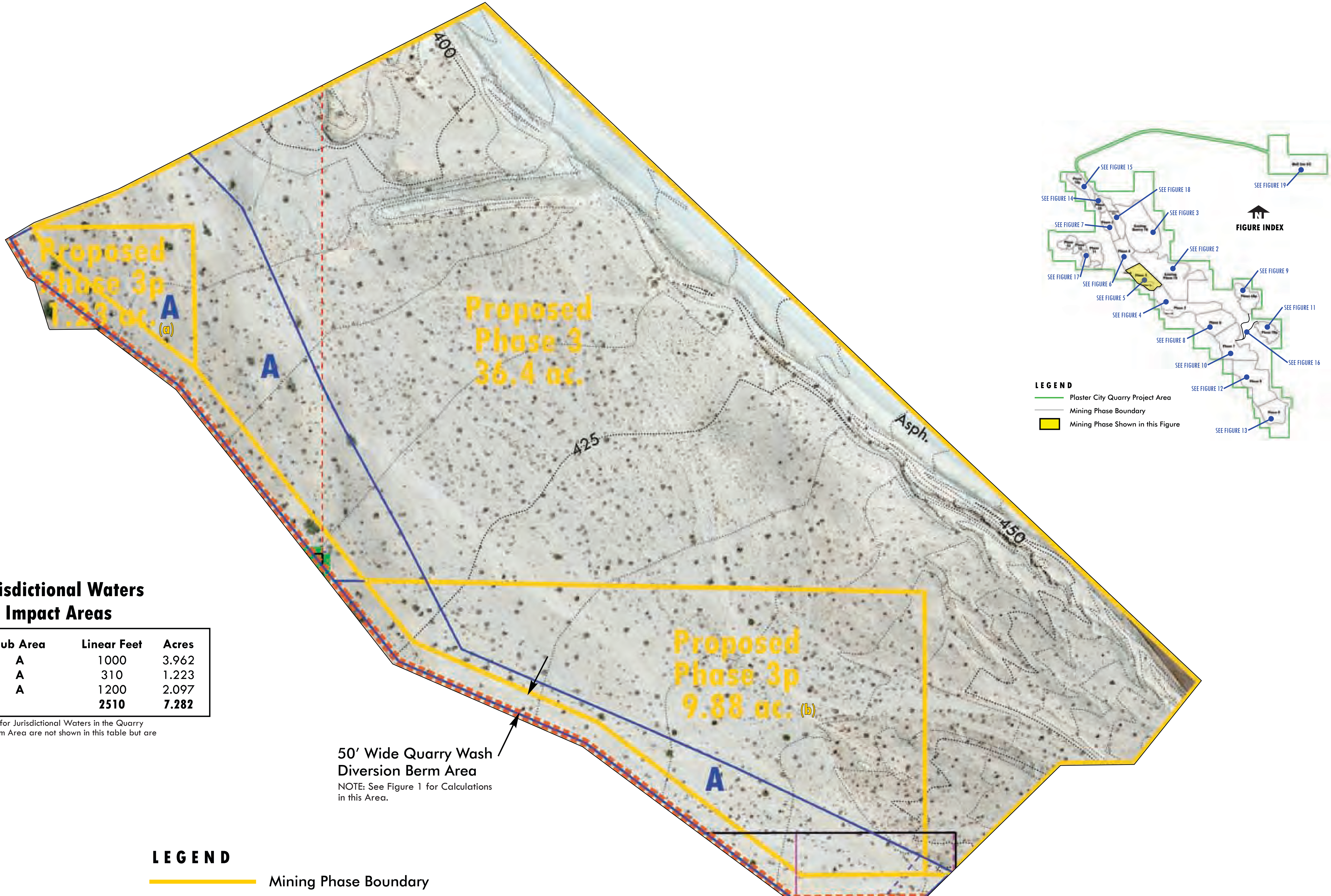
JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 2

SEIS - United States Gypsum Company - Plaster City Quarry

County of Imperial, California

Figure 4



50' Wide Quarry Wash Diversion Berm Area

NOTE: See Figure 1 for Calculations in this Area.

Jurisdictional Waters Impact Areas

Phase	Sub Area	Linear Feet	Acres
3	A	1000	3.962
3p (a)	A	310	1.223
3p (b)	A	1200	2.097
TOTALS		**2510**	**7.282**

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.

LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

N

0 200

FEET

Prepared By (TAG 11/02/16)

LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASES 3 and 3p

SEIS - United States Gypsum Company - Plaster City Quarry

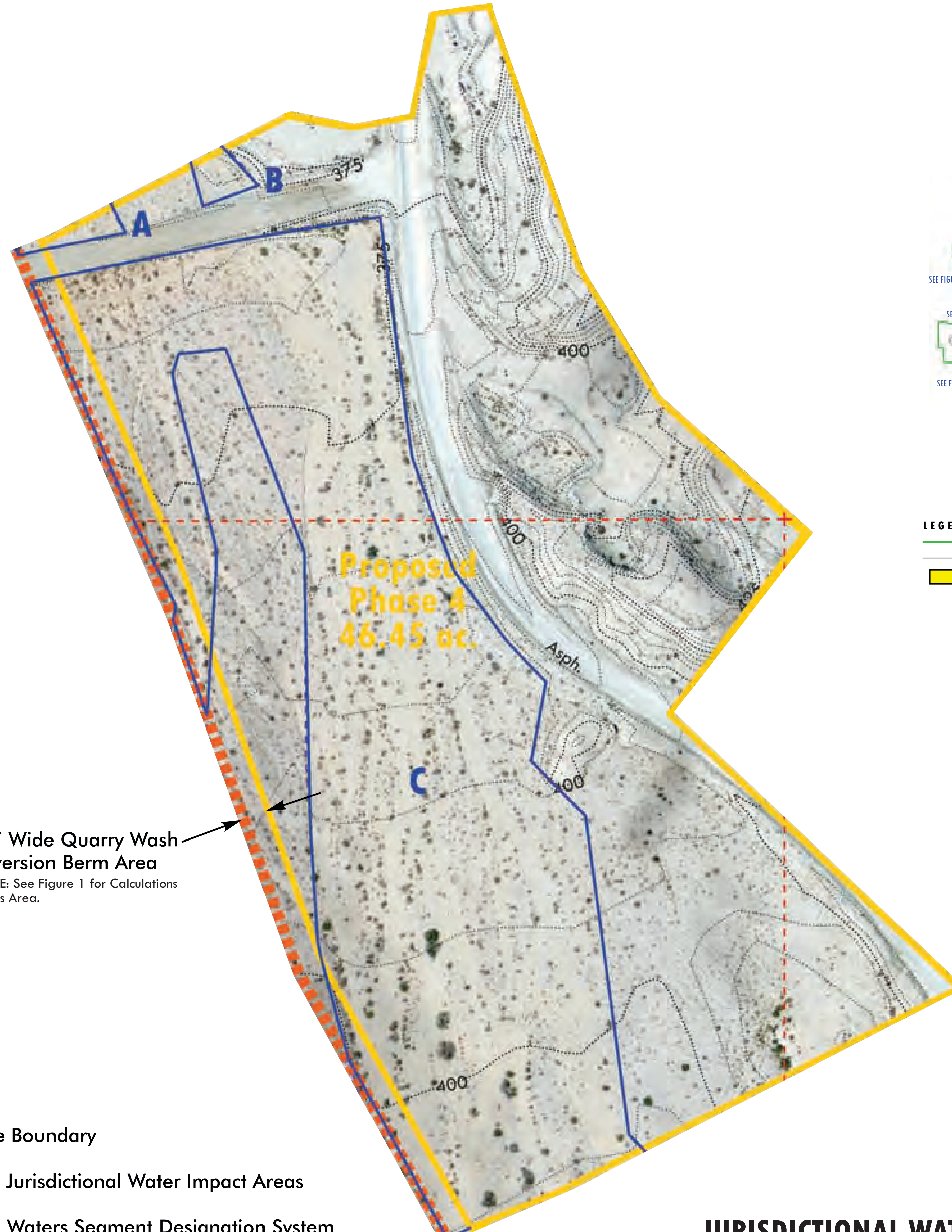
County of Imperial, California

Figure 5

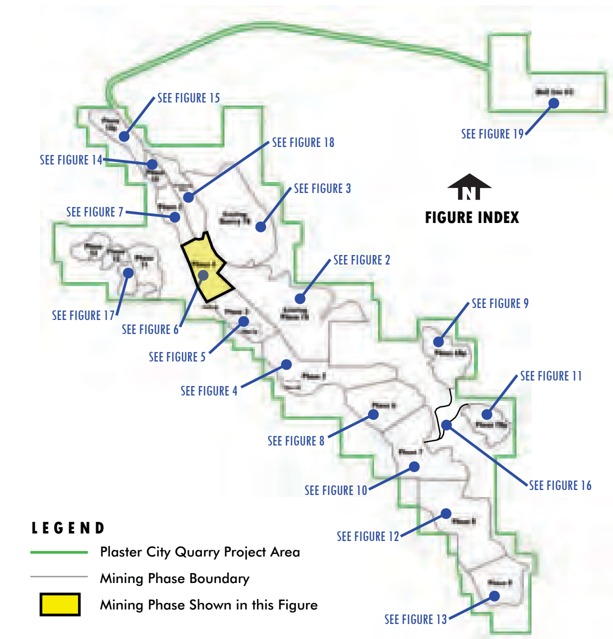
Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	30	0.121
B	85	0.182
C	2600	19.803
TOTALS	**2715**	**20.106**

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



50' Wide Quarry Wash Diversion Berm Area
NOTE: See Figure 1 for Calculations in this Area.



LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

0 250
FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 4

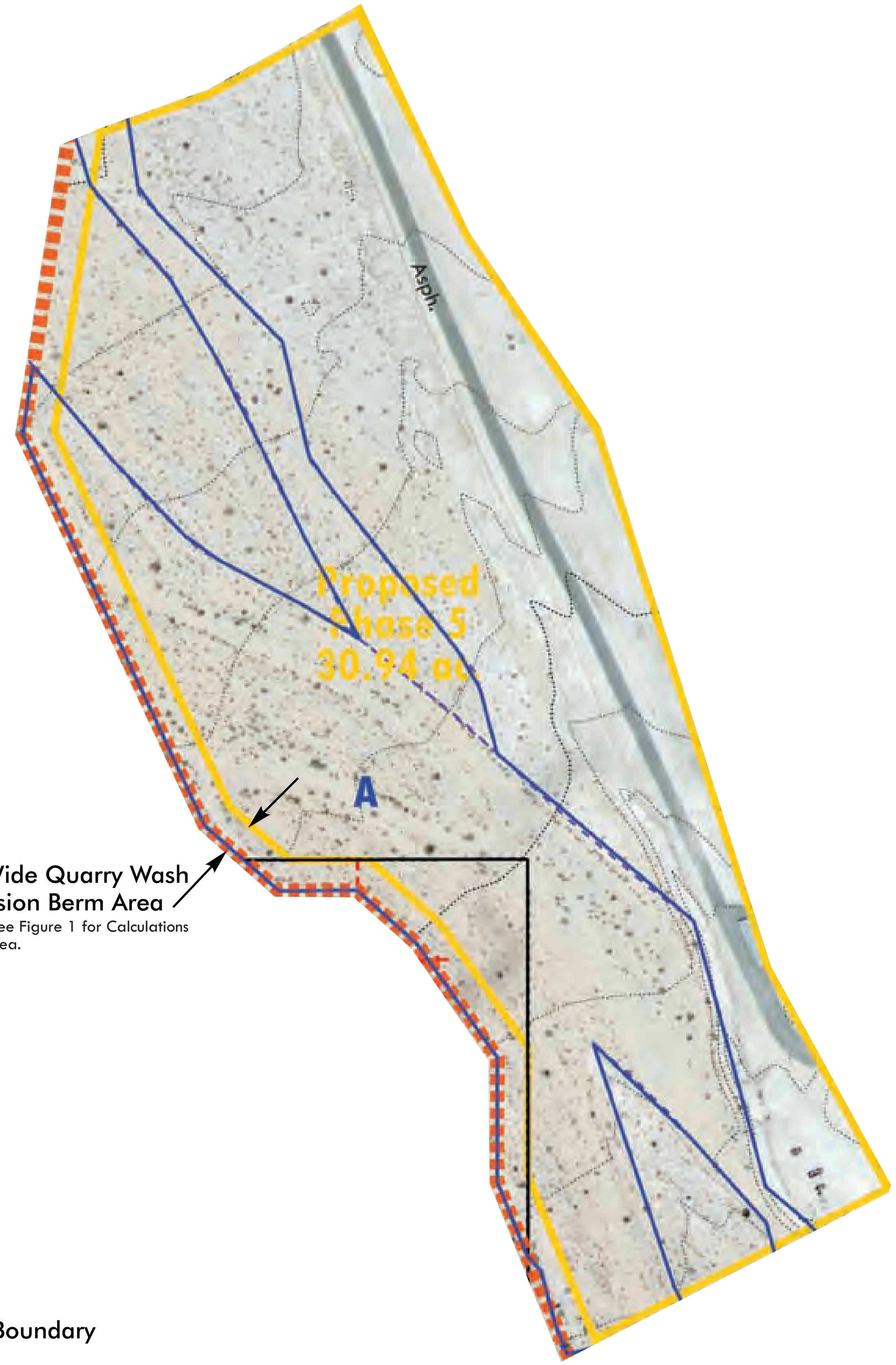
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 6

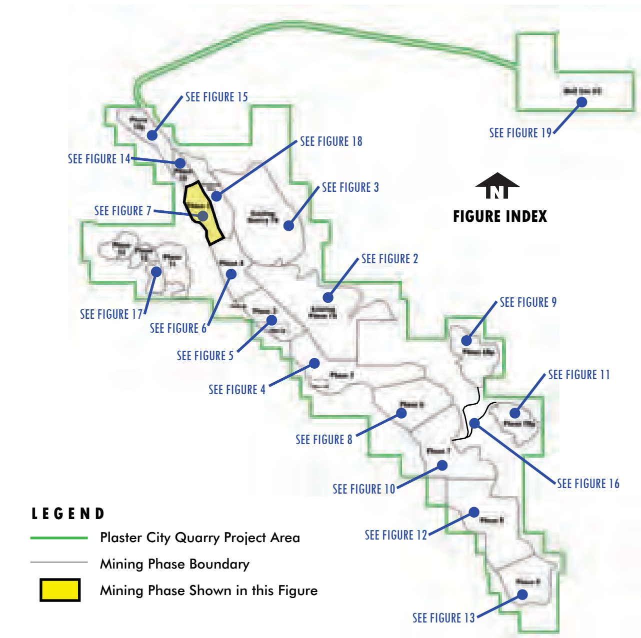
Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	3000	12.276

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



50' Wide Quarry Wash Diversion Berm Area
NOTE: See Figure 1 for Calculations in this Area.



LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

0 250
FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 5

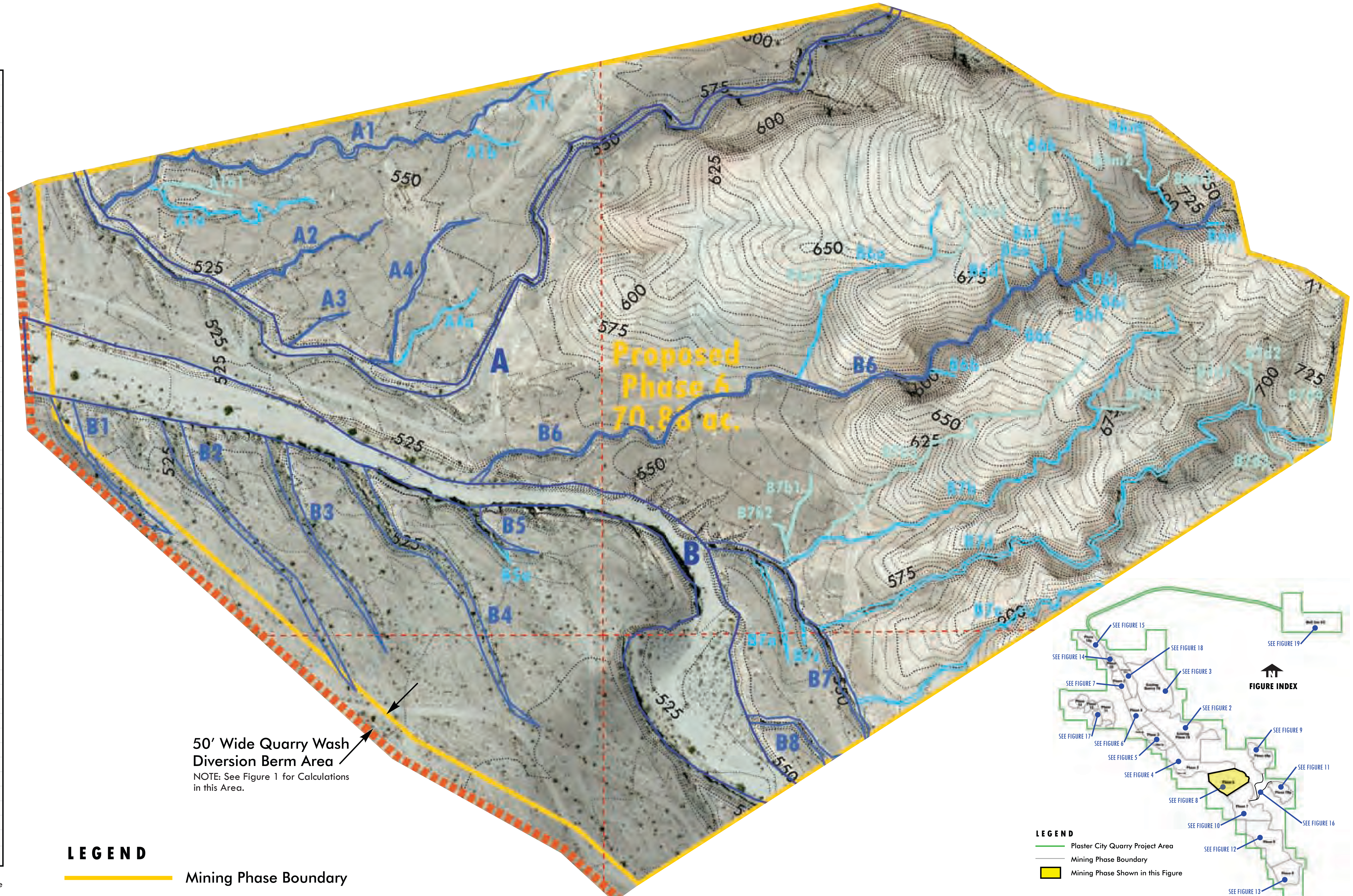
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 7

Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	2450	0.968
A1	1165	0.117
A1a	475	0.041
A1a1	161	0.013
A1b	111	0.009
A1c	50	0.003
A2	390	0.035
A3	150	0.012
A4	440	0.042
A4a	265	0.021
B	2200	4.205
B1	130	0.064
B2	700	0.27
B3	530	0.189
B4	750	0.34
B5	825	0.05
B5a	63	0.006
B6	2044	0.242
B6a	575	0.043
B6a1	38	0.002
B6a2	165	0.010
B6b	60	0.005
B6c	65	0.004
B6d	72	0.003
B6e	35	0.003
B6f	50	0.001
B6g	95	0.007
B6h	60	0.004
B6i	50	0.004
B6j	20	0.001
B6k	222	0.018
B6l	130	0.009
B6m	233	0.015
B6m1	50	0.002
B6m2	45	0.002
B6n	44	0.003
B7	552	0.175
B7a	222	0.039
B7b	1222	0.094
B7b1	203	0.018
B7b2	57	0.004
B7bs	750	0.060
B7c	52	0.004
B7d	1500	0.232
B7d1	121	0.014
B7d2	25	0.001
B7b3	100	0.013
B7b4	105	0.012
B7e	684	0.091
B8	237	0.064
TOTALS	**20737**	**7.584**

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



0 200
FEET

Prepared By (TAG 11/02/16)
LILBURN CORPORATION

LEGEND

Mining Phase Boundary

Color Coded Jurisdictional Water Impact Areas

A A3 A3a A3a1 Jurisdictional Waters Segment Designation System

Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

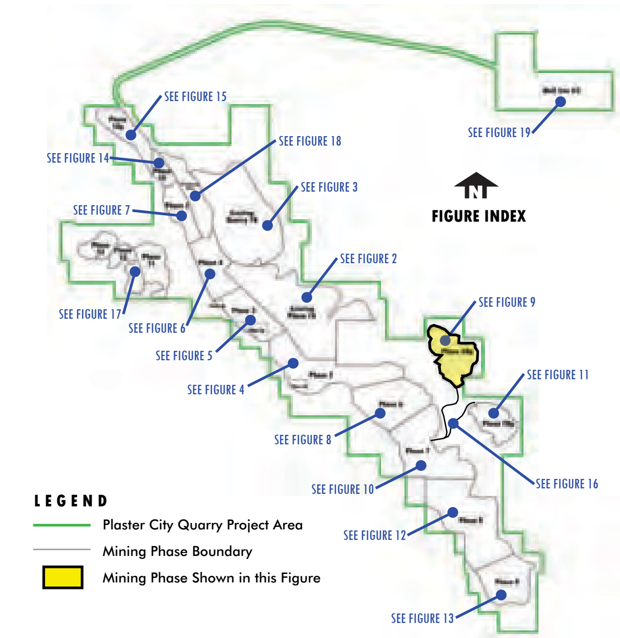
JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 6

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 8

Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	250	0.050
A1	100	0.017
A2	65	0.011
B	850	0.156
B1	280	0.033
B1a	110	0.008
B2	320	0.047
B2a	160	0.019
B3	60	0.002
B4	60	0.007
C	220	0.041
D	25	0.001
E	125	0.016
F	50	0.003
G	650	0.116
G1	250	0.027
G2	280	0.059
G2a	65	0.009
H	850	0.091
H1	190	0.015
I	150	0.012
J	70	0.009
K	900	0.170
K1	88	0.017
TOTALS	**6168**	**0.935**



LEGEND

Mining Phase Boundary

Color Coded Jurisdictional Water Impact Areas

A A3 A3a A3a1 Jurisdictional Waters Segment Designation System

Outer Limits of 50′ Wide Quarry Wash Diversion Berm

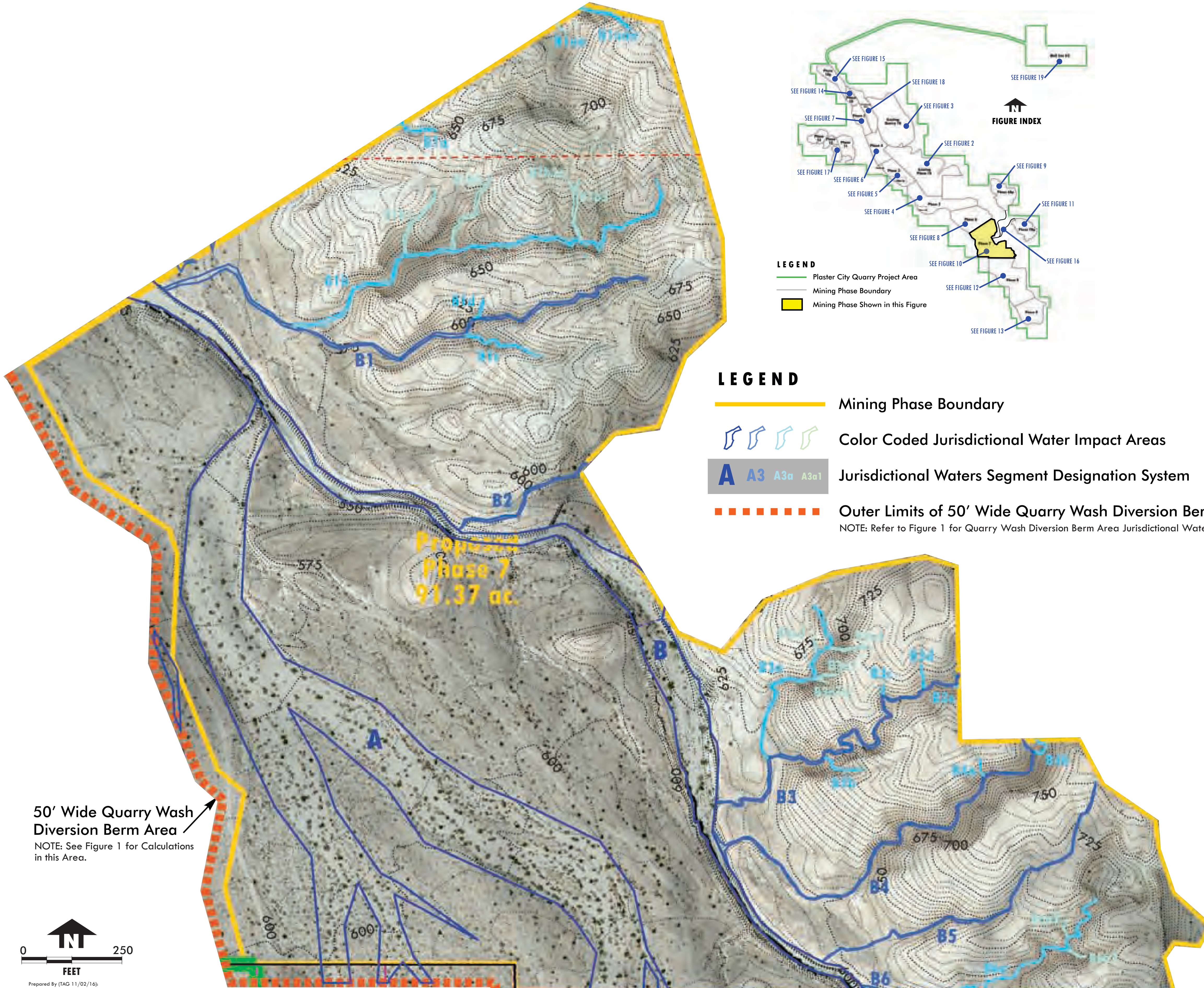
0 250
FEET

Prepared By (TAG 11/02/16)
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 6Bp

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 9



LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	3200	9.670
B	3000	2.941
B1	1500	0.229
B1a	100	0.009
B1aa	35	0.001
B1aaa	150	0.017
B1b	1230	0.168
B1c	230	0.023
B1d	65	0.006
B1b1	200	0.020
Bib2	250	0.033
B1b3	175	0.023
B1b3a	35	0.001
B2	410	0.043
B3	1050	0.114
B3a	550	0.062
B3a2	40	0.002
B3a1	75	0.005
B3a1a	30	0.001
B3a3	110	0.009
B3b	120	0.007
B3c	31	0.002
B3d	70	0.004
B3e	10	0.001
B4	1250	0.119
B4a	50	0.002
B4b	75	0.004
B5	1000	0.071
B6	85	0.015
B6a	550	0.035
B6a2	50	0.002
B6a1	40	0.003
TOTALS	**15766**	**13.642**

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.

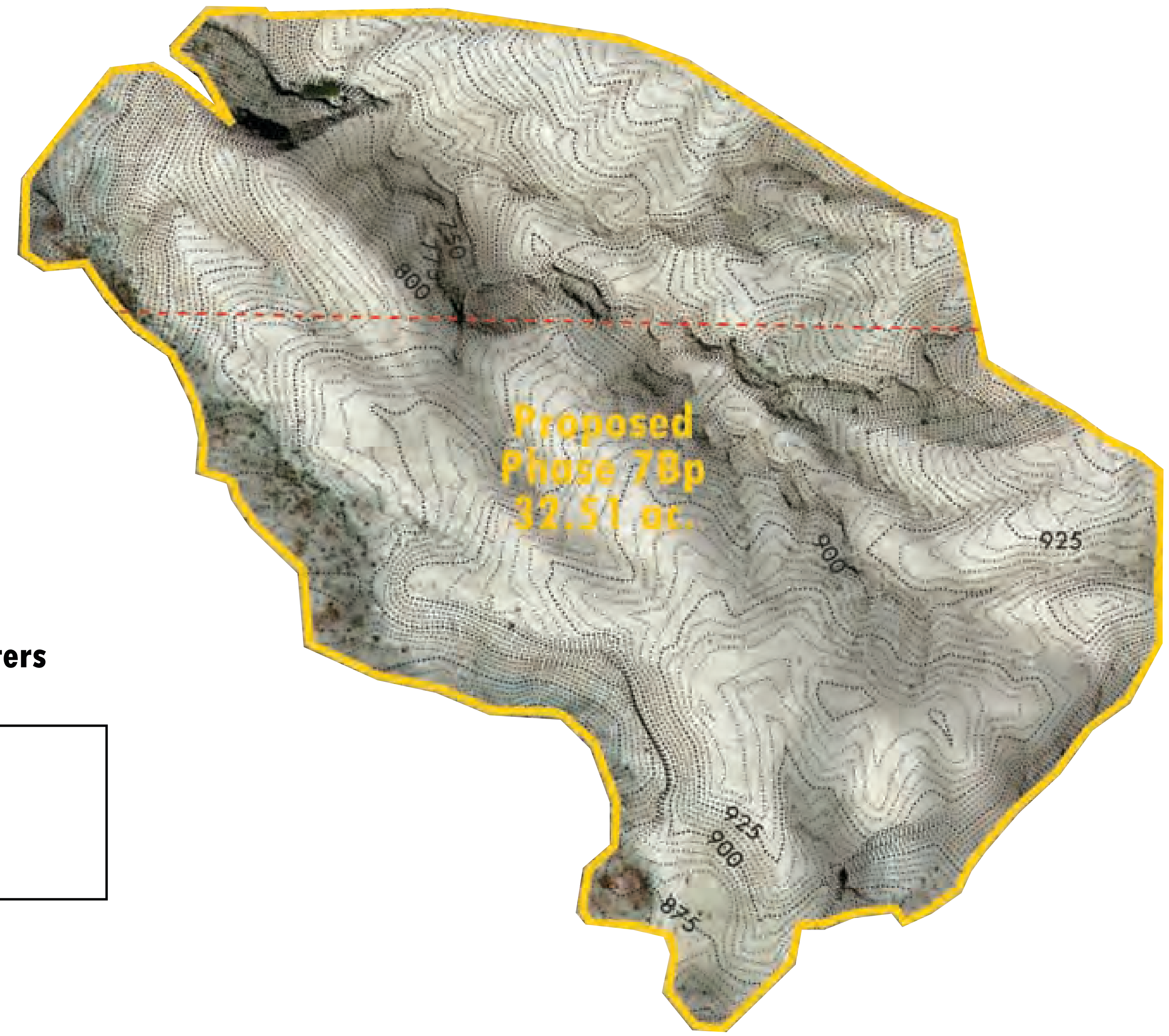
0 250
FEET

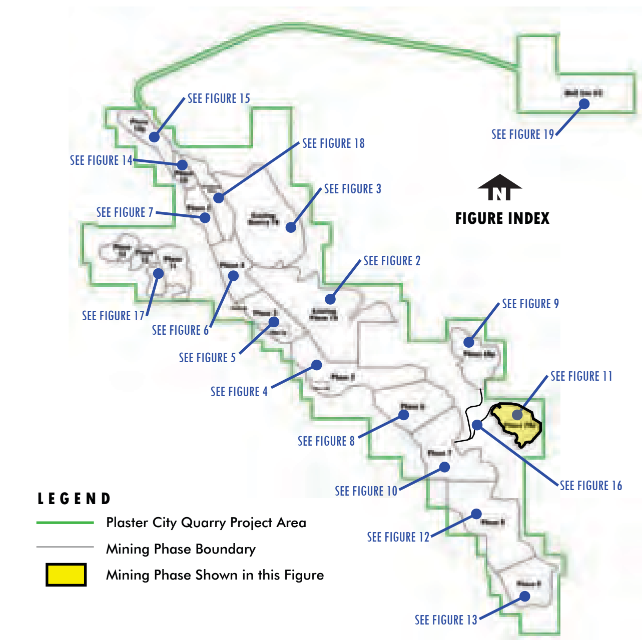
Prepared By (TAG 11/02/16):
LILBURN
CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 7

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 10





Jurisdictional Waters Impact Areas

No Impacts

LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

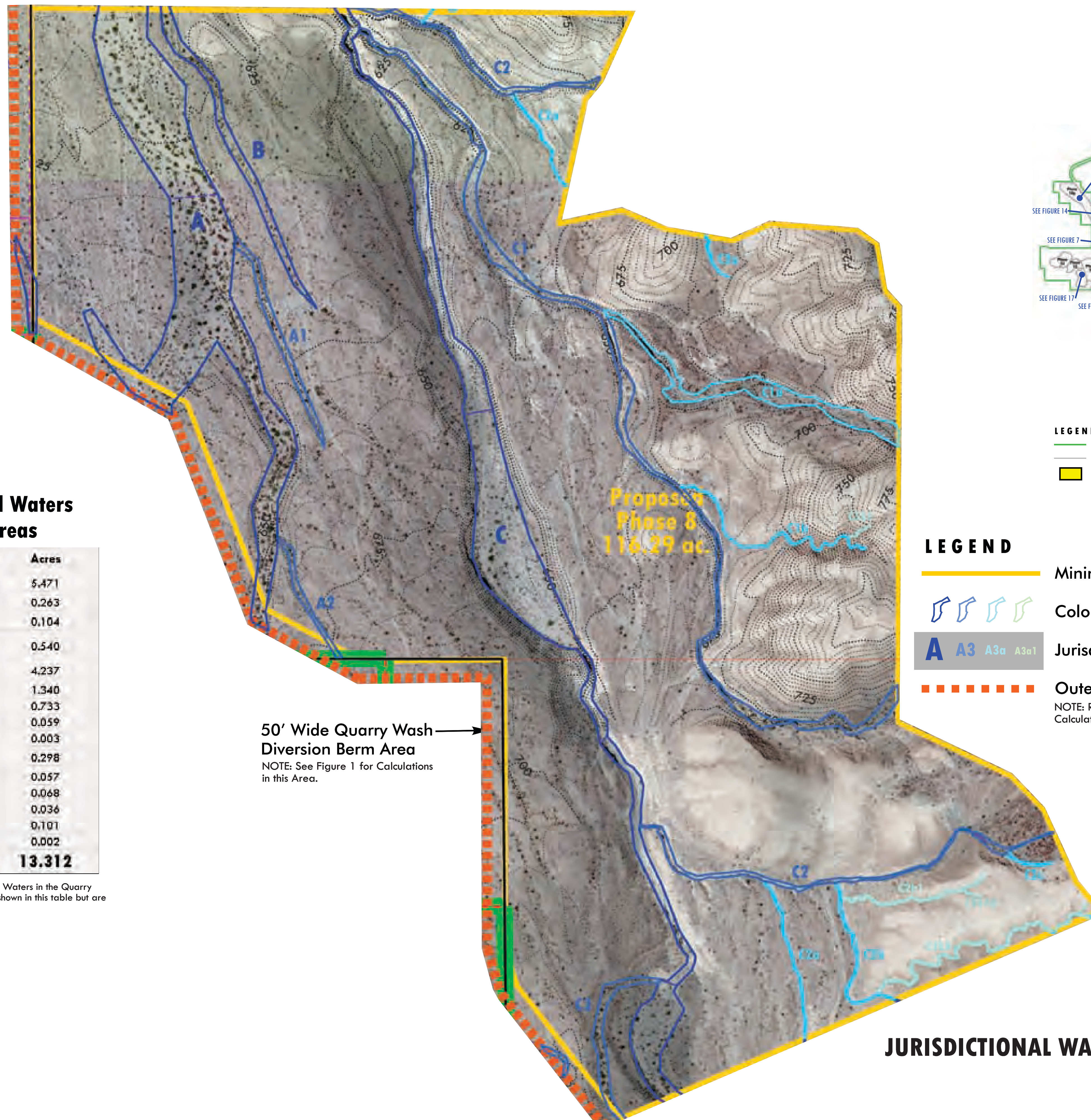
0 250
FEET

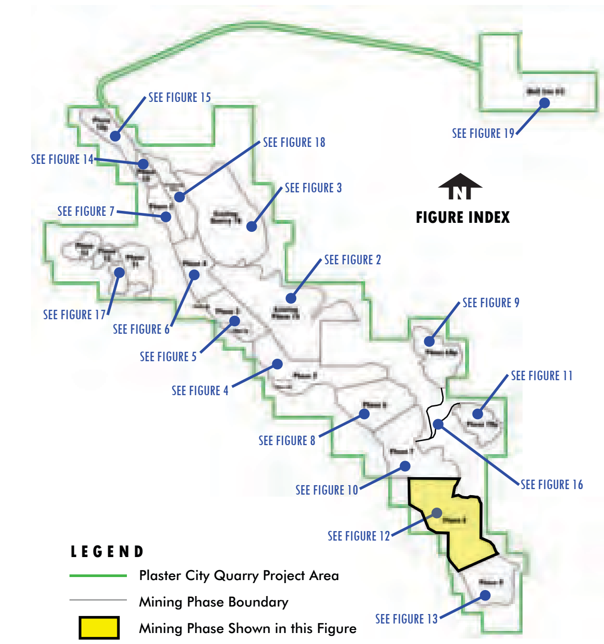
Prepared By (TAG 11/02/16):
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 7Bp

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 11





Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	2300	5.471
A1	600	0.263
A2	350	0.104
B	1000	0.540
C	3500	4.237
C1	3000	1.340
C1a	1000	0.733
C1b	750	0.059
C1b1	80	0.003
C2	1300	0.298
C2a	500	0.057
C2b	500	0.068
C2b1	450	0.036
C2b2	900	0.101
C2b1a	50	0.002
TOTALS	**16280**	**13.312**

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.

LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50′ Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

0 300 FEET

Prepared By (TAG 11/02/16):

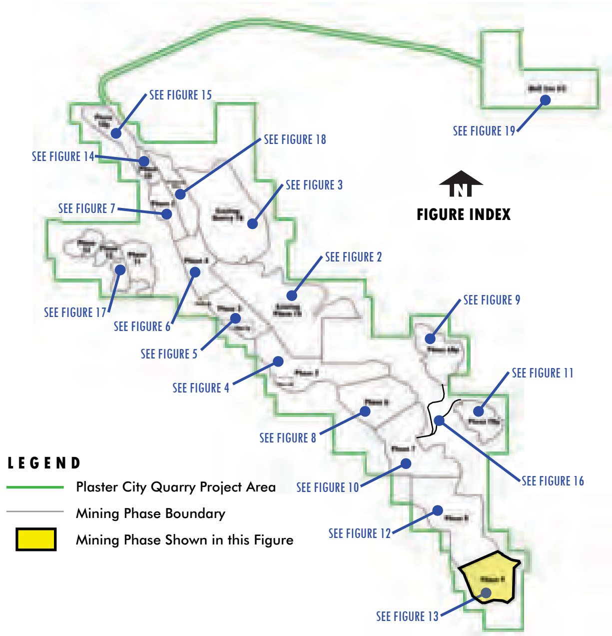
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 8

SEIS - United States Gypsum Company - Plaster City Quarry

County of Imperial, California

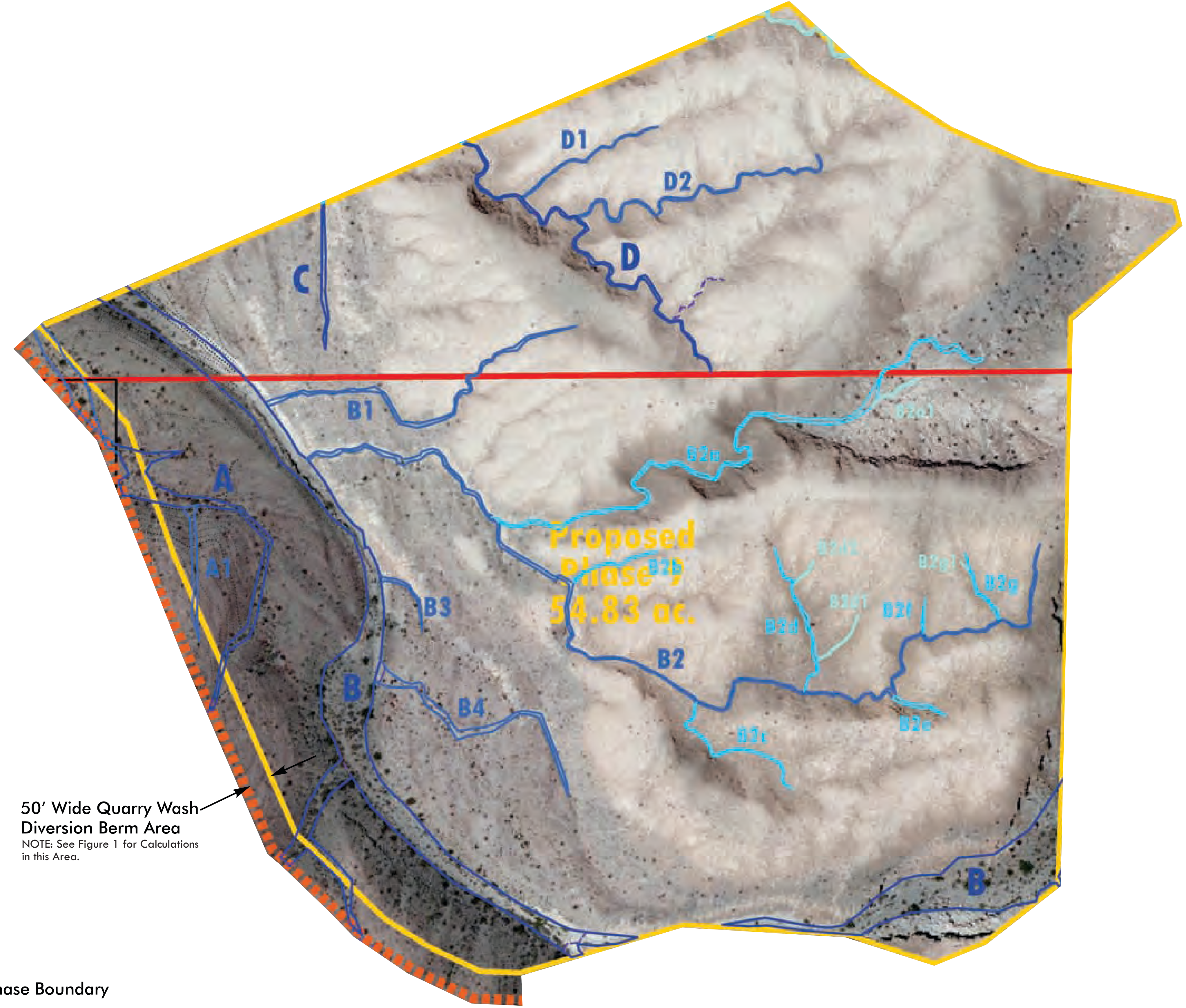
Figure 12



Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	600	0.176
A1	200	0.040
B	2000	1.657
B1	700	0.077
B2	2000	0.190
B2a	1200	0.156
B2a1	100	0.007
B2b	150	0.010
B2c	300	0.021
B2d	300	0.022
B2d1	125	0.005
B2d2	60	0.003
B2e	100	0.013
B2f	70	0.003
B2g	140	0.012
B2g1	25	0.001
B3	150	0.012
B4	500	0.114
TOTALS	8220	2.519

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



LEGEND

Mining Phase Boundary

Color Coded Jurisdictional Water Impact Areas

A A3 A3a A3a1 Jurisdictional Waters Segment Designation System

Outer Limits of 50′ Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

N
0 200
FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 9

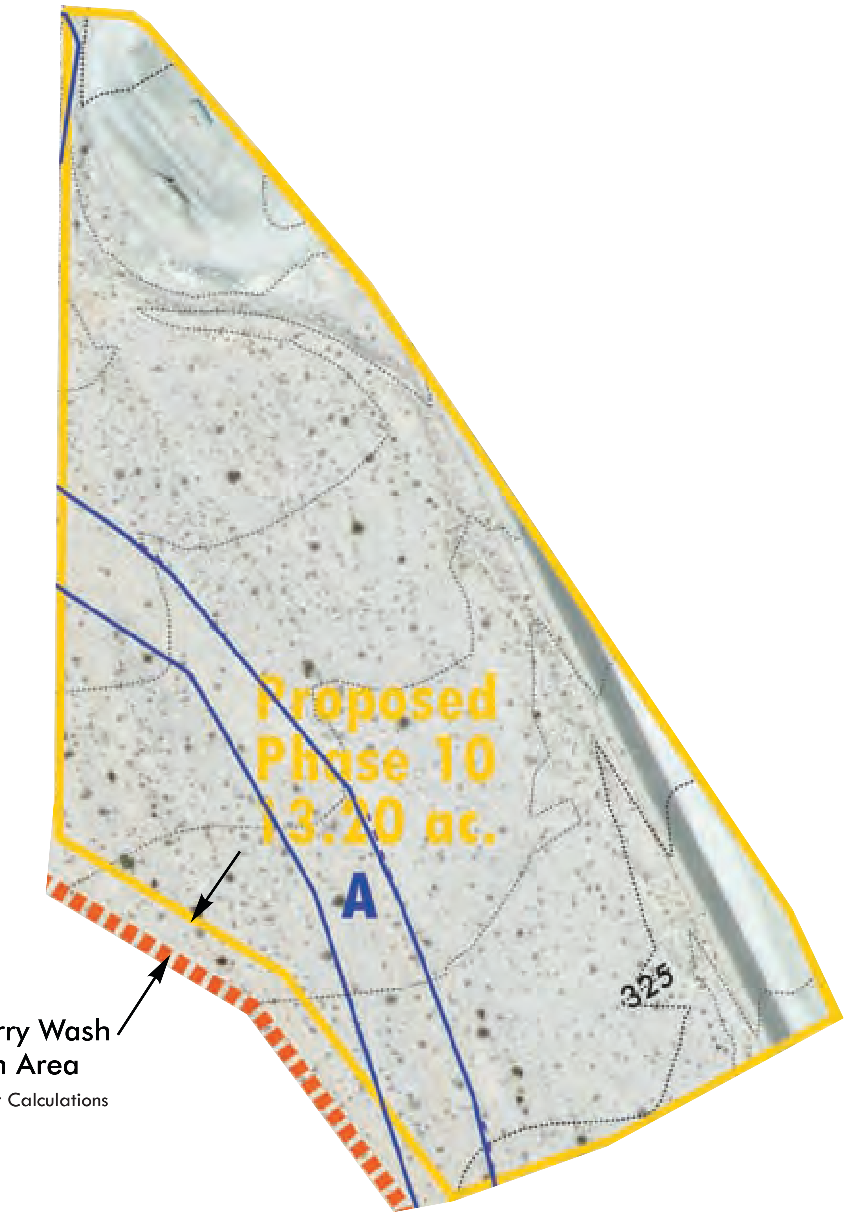
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 13

Jurisdictional Waters Impact Areas

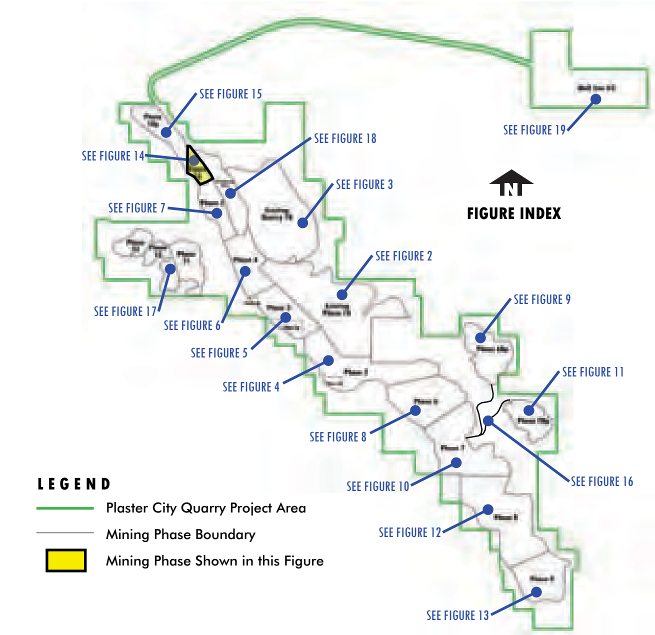
Sub Area	Linear Feet	Acres
A	900	1.572

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.



50' Wide Quarry Wash Diversion Berm Area

NOTE: See Figure 1 for Calculations in this Area.



LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

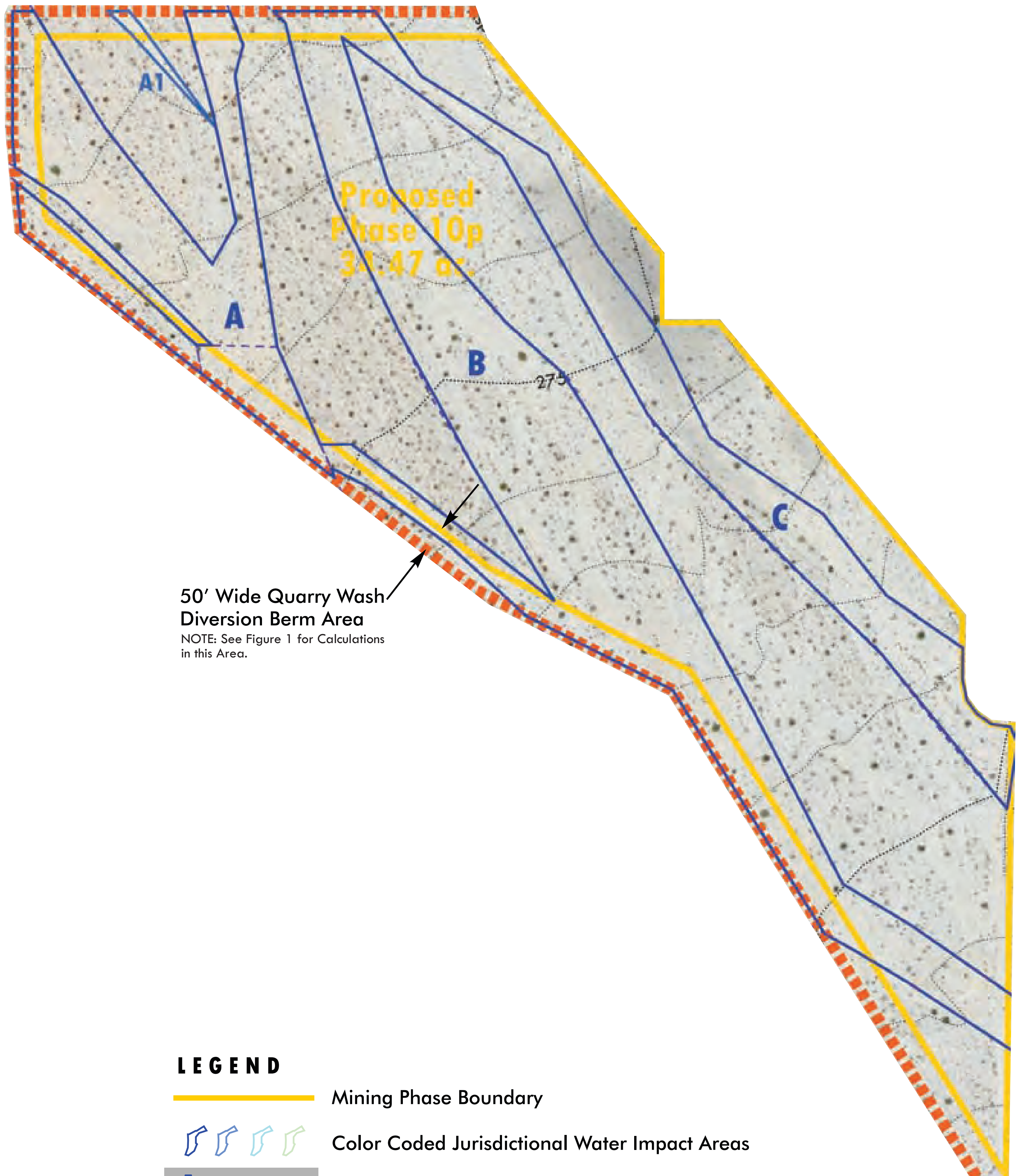
0 200
FEET

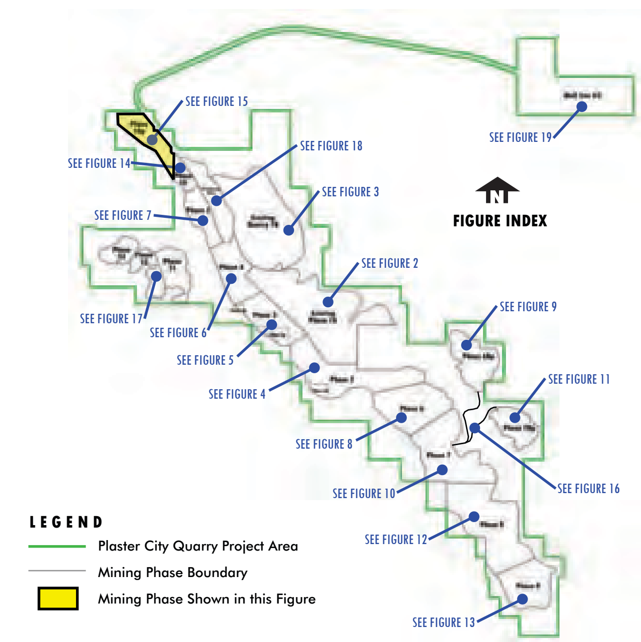
Prepared By (TAG 11/02/16)
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 10

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 14





Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	1400	3.007
B	2450	7.194
C	2000	3.638
TOTALS	**5850**	**13.839**

NOTE: Calculations for Jurisdictional Waters in the Quarry Wash Diversion Berm Area are not shown in this table but are shown on Figure 1.

LEGEND

Mining Phase Boundary

Color Coded Jurisdictional Water Impact Areas

A A3 A3a A3a1 Jurisdictional Waters Segment Designation System

Outer Limits of 50' Wide Quarry Wash Diversion Berm

NOTE: Refer to Figure 1 for Quarry Wash Diversion Berm Area Jurisdictional Waters Calculations.

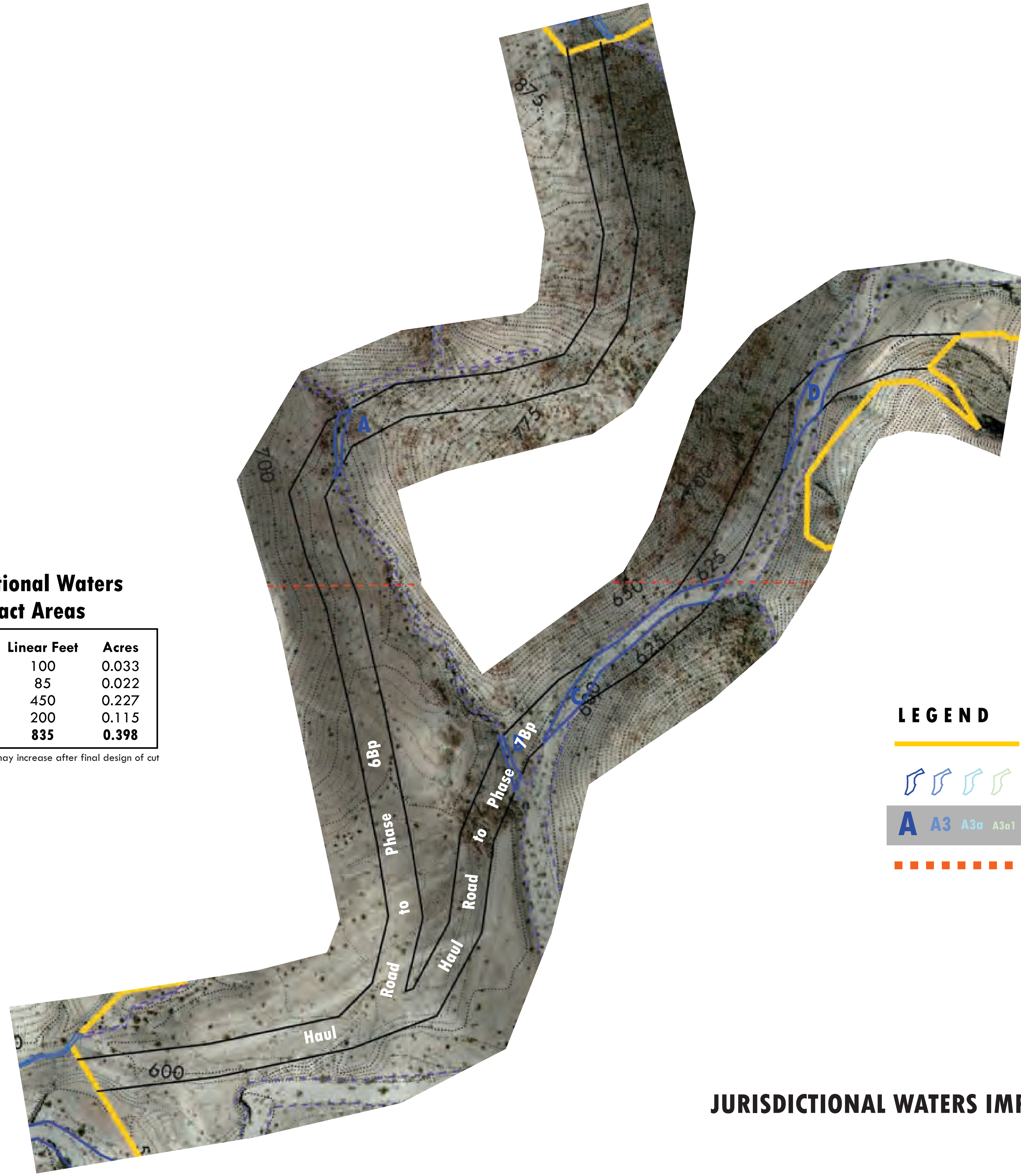
0 250
FEET

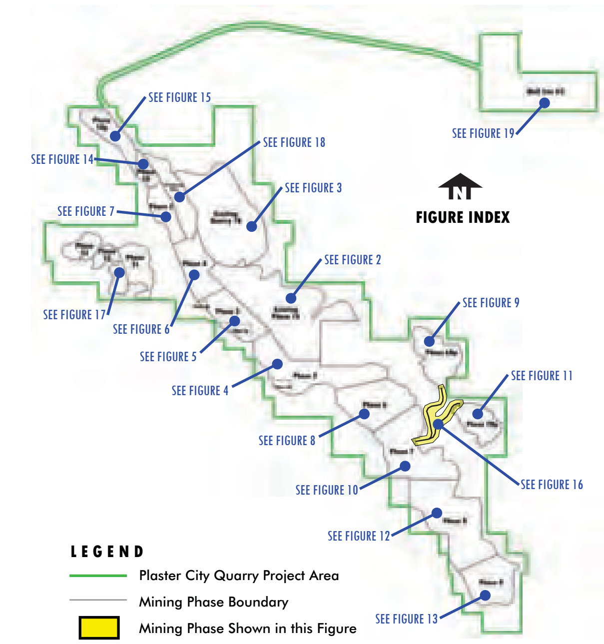
Prepared By (TAG 11/02/16)
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASE 10p

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 15





Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	100	0.033
B	85	0.022
C	450	0.227
D	200	0.115
TOTALS	**835**	**0.398**

NOTE: Haul Road Impacts may increase after final design of cut and fill slopes.

LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 — Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

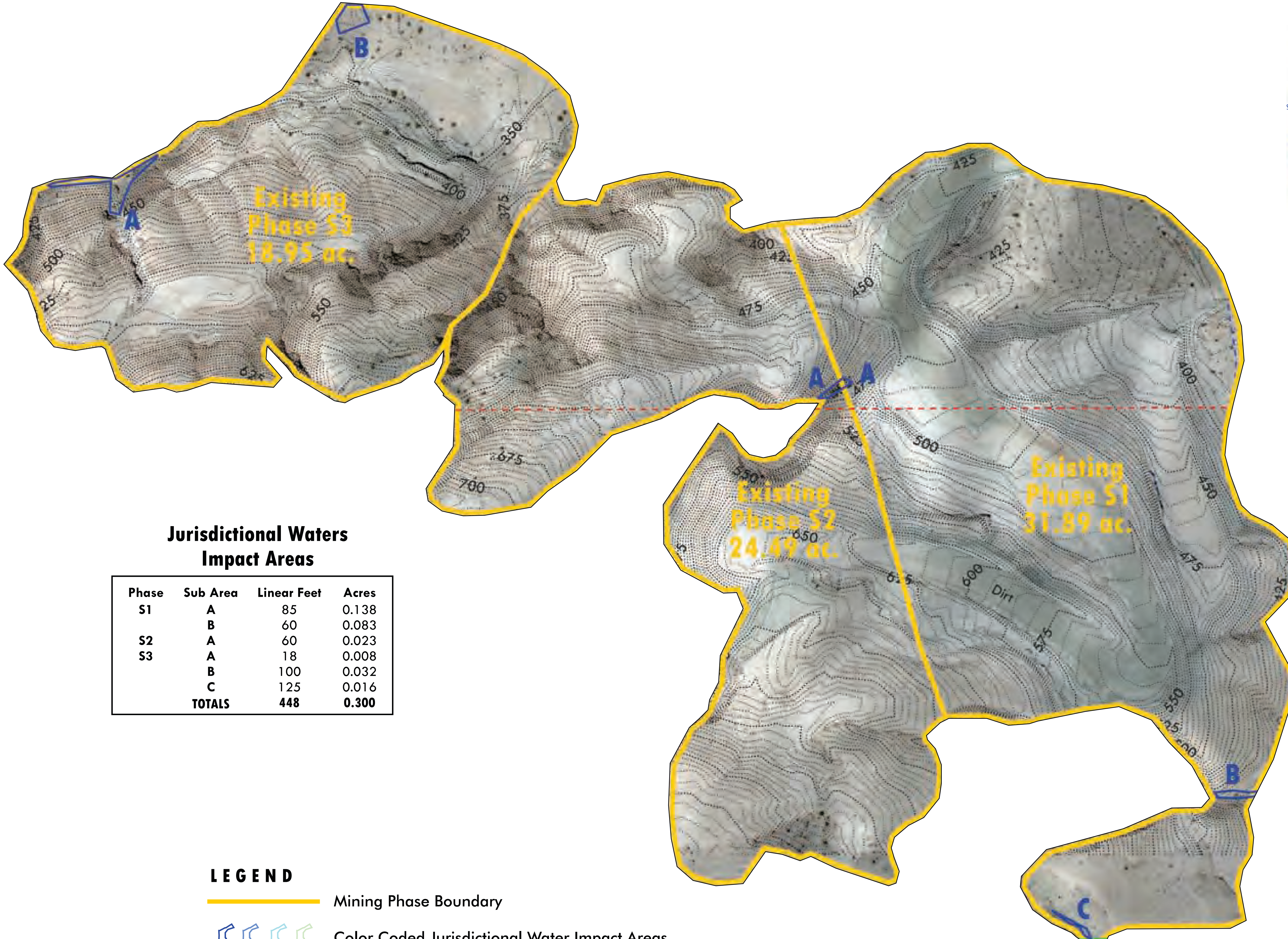
0 200
FEET

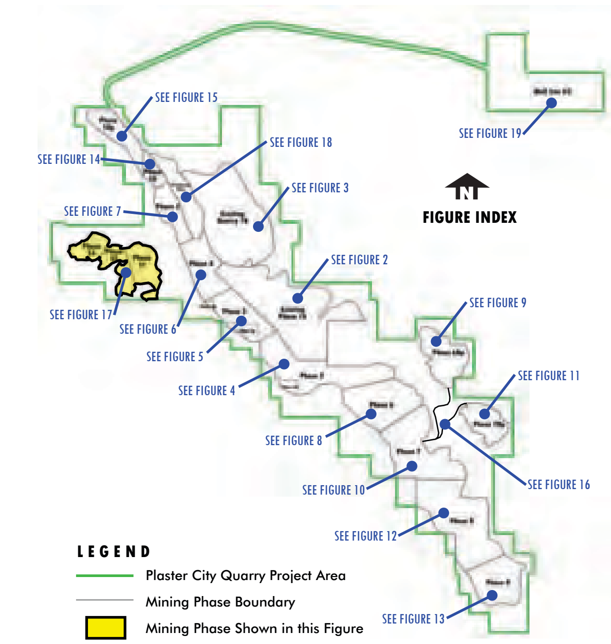
Prepared By (TAG 11/02/16):
LILBURN CORPORATION

JURISDICTIONAL WATERS IMPACT CALCULATIONS - HAUL ROADS NORTH and SOUTH

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 16





Jurisdictional Waters Impact Areas

Phase	Sub Area	Linear Feet	Acres
S1	A	85	0.138
	B	60	0.083
S2	A	60	0.023
S3	A	18	0.008
	B	100	0.032
	C	125	0.016
	TOTALS	**448**	**0.300**

LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

0 250 FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

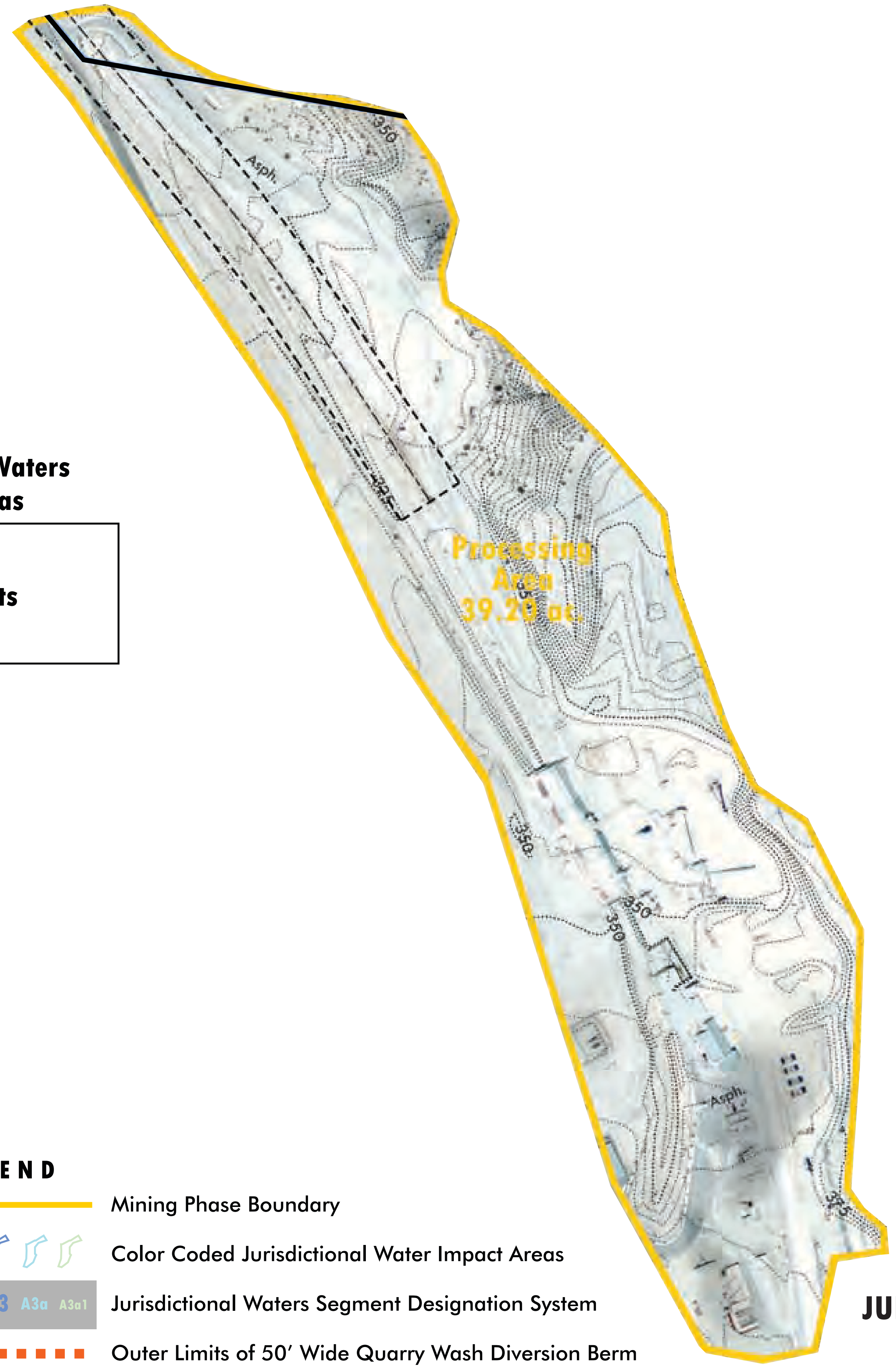
JURISDICTIONAL WATERS IMPACT CALCULATIONS - PHASES S1, S2 and S3

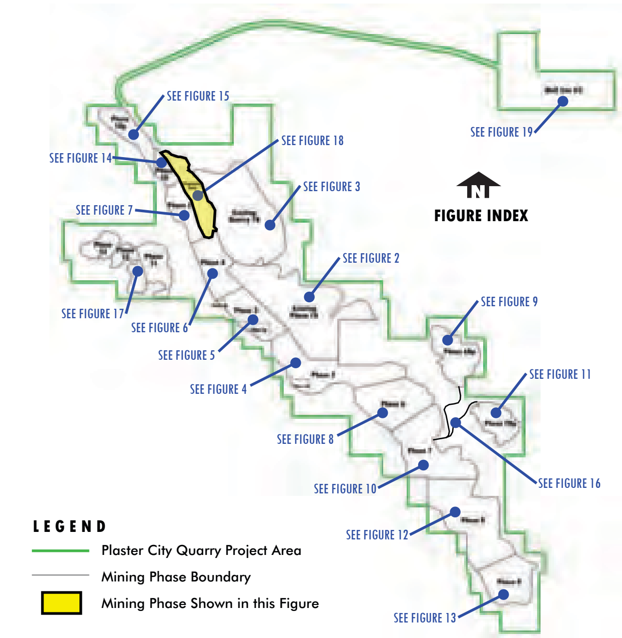
SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 17

Jurisdictional Waters Impact Areas

No Impacts





LEGEND

- Mining Phase Boundary
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 Jurisdictional Waters Segment Designation System
- Outer Limits of 50' Wide Quarry Wash Diversion Berm

N
0 300
FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

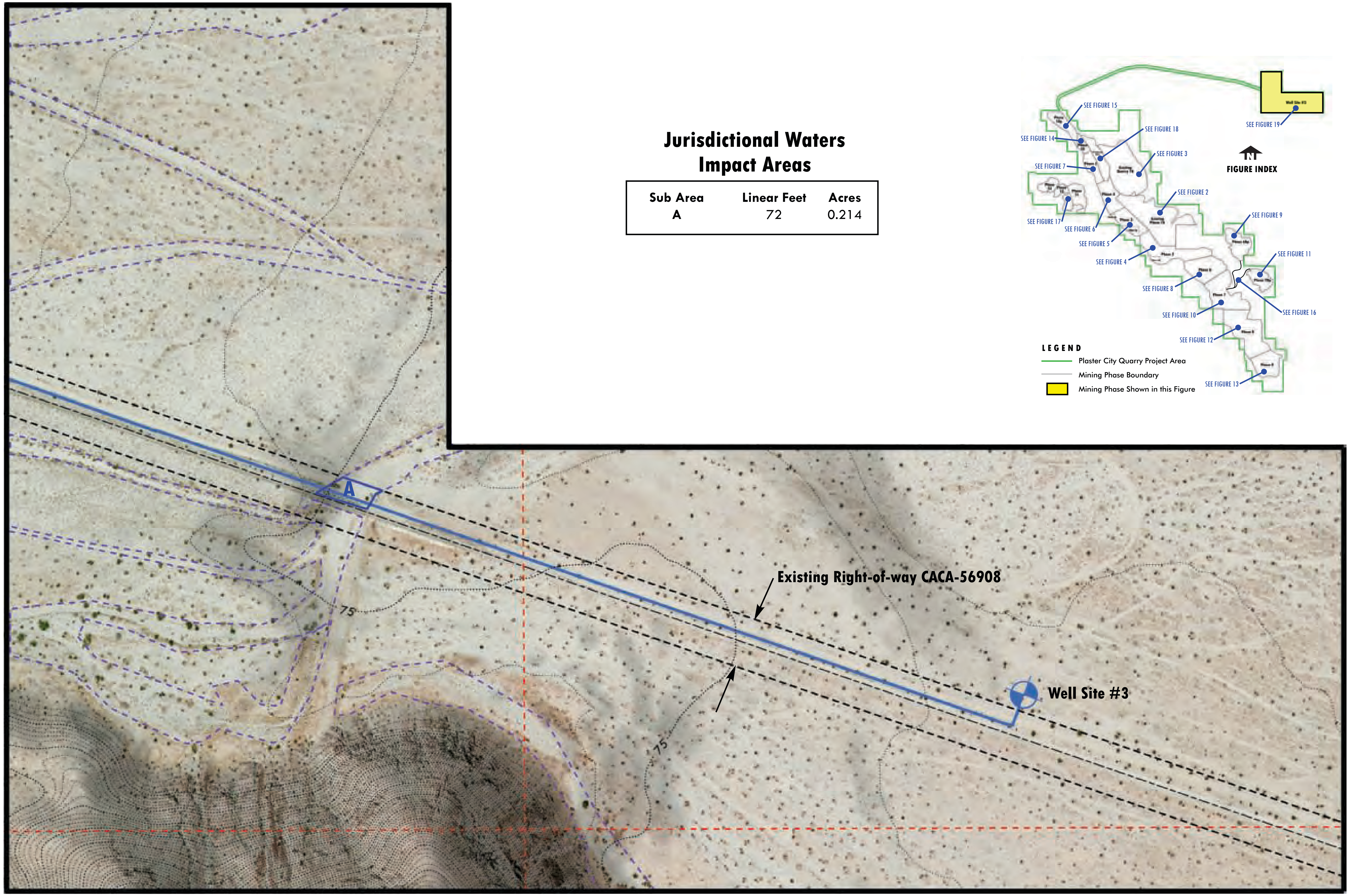
JURISDICTIONAL WATERS IMPACT CALCULATIONS - PROCESSING AREA

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 18

Jurisdictional Waters Impact Areas

Sub Area	Linear Feet	Acres
A	72	0.214



LEGEND

- USG Patented Land
- Color Coded Jurisdictional Water Impact Areas
- A A3 A3a A3a1 Jurisdictional Waters Segment Designation System
- Proposed Waterline/Powerline

N
0 300
FEET

Prepared By (TAG 11/02/16):
LILBURN CORPORATION

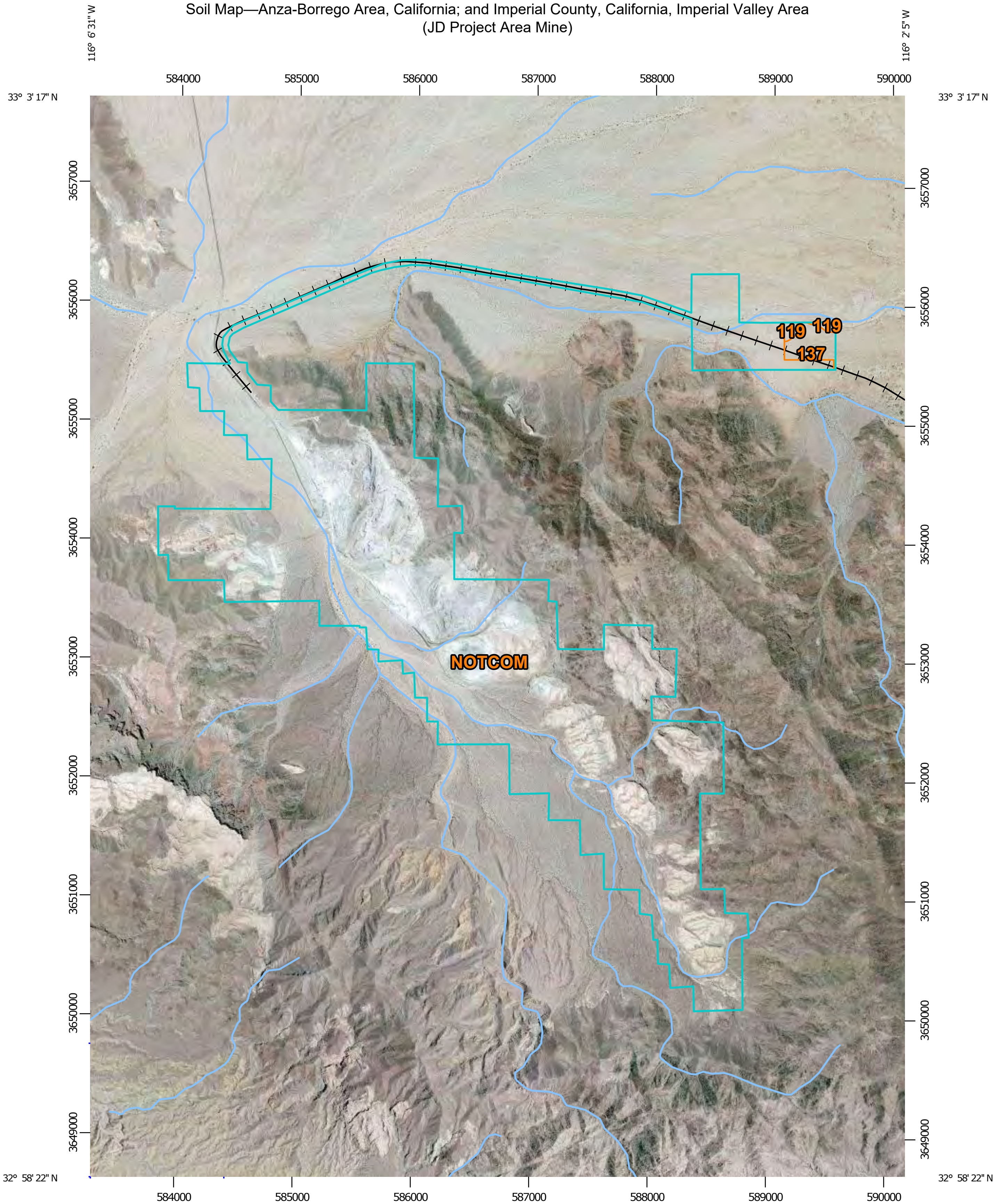
JURISDICTIONAL WATERS IMPACT CALCULATIONS - WELL SITE #3

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Figure 19

APPENDIX B

Soil Map—Anza-Borrego Area, California; and Imperial County, California, Imperial Valley Area
(JD Project Area Mine)



Map Scale: 1:44,400 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Anza-Borrego Area, California
Survey Area Data: Version 1, Dec 13, 2013

Soil Survey Area: Imperial County, California, Imperial Valley Area
Survey Area Data: Version 8, Sep 12, 2016

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

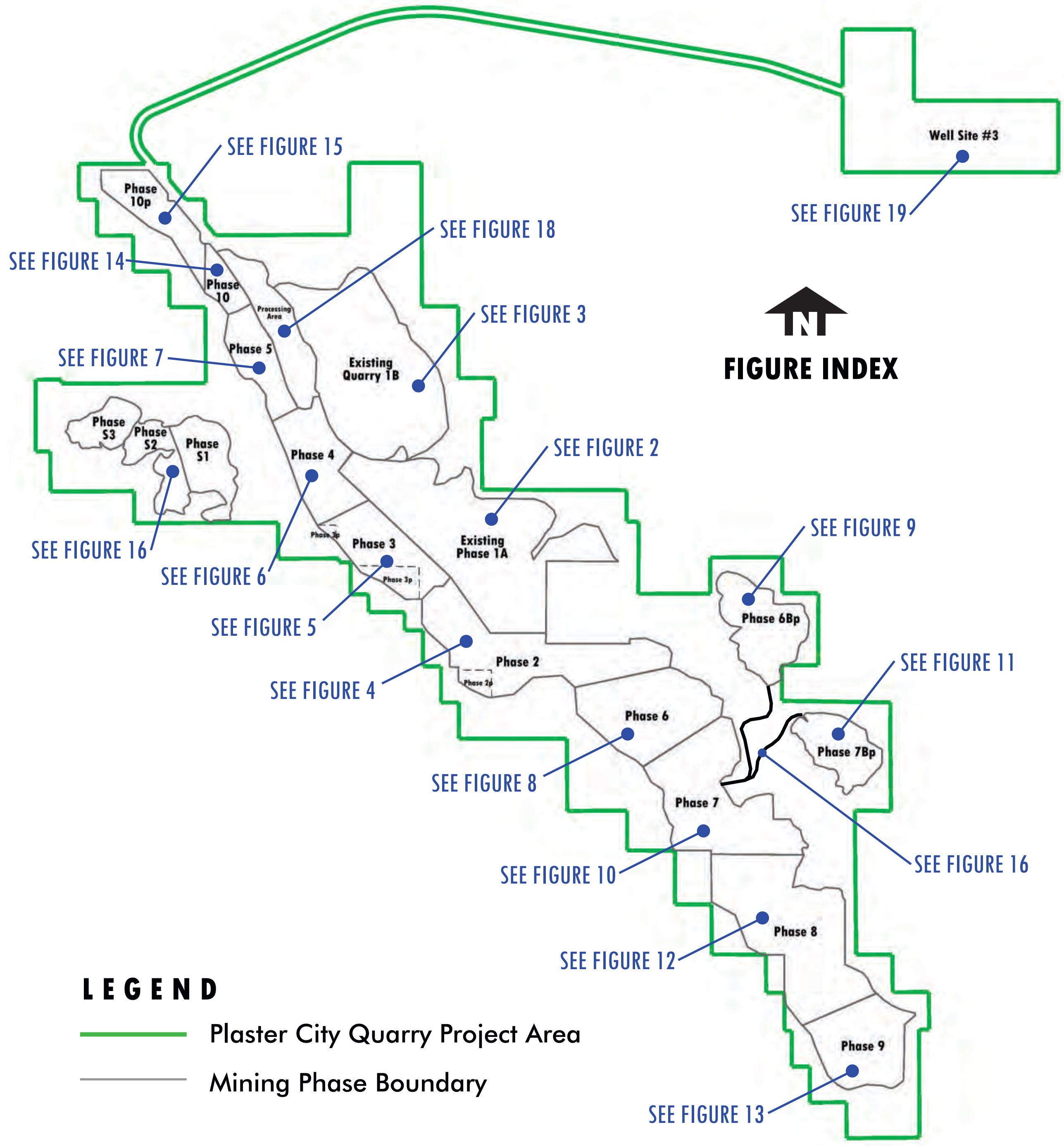
Date(s) aerial images were photographed: May 2, 2010—Jun 3, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Anza-Borrego Area, California (CA804)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
NOTCOM	No Digital Data Available	2,271.7	98.5%
Subtotals for Soil Survey Area		**2,271.7**	**98.5%**
Totals for Area of Interest		**2,305.7**	**100.0%**

Imperial County, California, Imperial Valley Area (CA683)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
119	Indio-Vint complex	6.5	0.3%
137	Rositas silt loam, 0 to 2 percent slopes	27.5	1.2%
Subtotals for Soil Survey Area		**34.0**	**1.5%**
Totals for Area of Interest		**2,305.7**	**100.0%**



PLASTER CITY QUARRY JURISDICTIONAL WATERS IMPACT CALCULATIONS

		50' Wide Quarry Wash Diversion Berm Jurisdictional Water Impacts		Jurisdictional Water Impacts		TOTALS IMPACTS	
		A	B	C	D	E	F
Item	Status	Linear Feet	Acres	Linear Feet	Acres	Linear Feet (A+C)	Acres (B+D)
Phase 1A Quarry	Existing	0	0.000	0	0.000	0	0.00
Phase 1B Quarry	Existing	0	0.000	180	0.030	180	0.03
Processing Area	Existing	0	0.000	0	0.000	0	0.00
Phase 2	Proposed	1520	1.596	10685	25.773	12205	27.37
Phase 2P	Proposed	0	0.000	450	2.100	450	2.10
Phase 3	Proposed	2500	2.869	1000	3.962	3500	6.83
Phase 3P (a)	Proposed	0	0.000	310	1.223	310	1.22
Phase 3P (b)	Proposed	0	0.000	1200	2.097	1200	2.10
Phase 4	Proposed	1450	1.488	2715	20.106	4165	21.59
Phase 5	Proposed	2000	2.202	3000	12.276	5000	14.48
Phase 6	Proposed	350	0.224	20737	7.584	21087	7.81
Phase 6Bp	Proposed	0	0.000	6168	0.935	6168	0.94
Phase 7	Proposed	415	0.265	15766	13.642	16181	13.91
Phase 7Bp	Proposed	0	0.000	0	0.000	0	0.00
Phase 8	Proposed	585	0.447	16280	13.312	16865	13.76
Phase 9	Proposed	795	0.320	8220	2.519	9015	2.84
Phase 10	Proposed	180	0.096	900	1.572	1080	1.67
Phase 10P	Proposed	2840	2.901	5850	13.839	8690	16.74
Phase S1	Existing	0	0.000	145	0.221	145	0.22
Phase S2	Existing	0	0.000	60	0.023	60	0.02
Phase S3	Existing	0	0.000	250	0.056	250	0.06
Haul Road to Phase 6Bp	Proposed	0	0.000	100	0.033	100	0.03
Haul Road to Phase 7Bp	Proposed	0	0.000	735	0.364	735	0.36
Tramroad Easement	Existing	0	0.000	0	0.000	0	0.00
Water Pipeline and Powerline	Proposed	0	0.000	0	0.000	0	0.00
Well Site #3	Existing	0	0.000	72	0.214	72	0.21
	TOTALS	**12,635.00**	**12.408**	**94,823.00**	**121.881**	**107,458.00**	**134.29**

JURISDICTIONAL WATERS IMPACT CALCULATIONS - SUMMARY

SEIS - United States Gypsum Company - Plaster City Quarry
County of Imperial, California

Prepared By (TAG 11/02/16)
LILBURN CORPORATION

Figure 1

APPENDIX B

NOAA ATLAS 14 PRECIPITATION DATA

NOAA Atlas 14, Volume 6, Version 2
Location name: Borrego Springs, California, US*
Latitude: 33.0031°, Longitude: -116.0718°
Elevation: 536 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.097 (0.081–0.115)	0.137 (0.116–0.164)	0.198 (0.166–0.238)	0.253 (0.211–0.307)	0.339 (0.272–0.425)	0.413 (0.325–0.531)	0.499 (0.382–0.657)	0.596 (0.443–0.810)	0.748 (0.532–1.06)	0.882 (0.604–1.30)
10-min	0.138 (0.117–0.166)	0.197 (0.166–0.235)	0.283 (0.238–0.341)	0.363 (0.302–0.440)	0.485 (0.390–0.610)	0.593 (0.466–0.761)	0.715 (0.547–0.942)	0.855 (0.635–1.16)	1.07 (0.762–1.52)	1.26 (0.866–1.86)
15-min	0.167 (0.141–0.200)	0.238 (0.200–0.285)	0.343 (0.288–0.412)	0.438 (0.365–0.532)	0.587 (0.472–0.737)	0.717 (0.563–0.921)	0.864 (0.662–1.14)	1.03 (0.768–1.41)	1.30 (0.922–1.84)	1.53 (1.05–2.25)
30-min	0.233 (0.197–0.279)	0.331 (0.279–0.397)	0.477 (0.401–0.574)	0.611 (0.509–0.740)	0.817 (0.657–1.03)	0.998 (0.785–1.28)	1.20 (0.922–1.59)	1.44 (1.07–1.96)	1.81 (1.28–2.56)	2.13 (1.46–3.14)
60-min	0.326 (0.275–0.389)	0.462 (0.390–0.554)	0.667 (0.560–0.801)	0.853 (0.711–1.03)	1.14 (0.918–1.43)	1.39 (1.10–1.79)	1.68 (1.29–2.22)	2.01 (1.50–2.73)	2.52 (1.79–3.58)	2.97 (2.04–4.38)
2-hr	0.436 (0.368–0.522)	0.606 (0.511–0.726)	0.862 (0.724–1.04)	1.10 (0.913–1.33)	1.46 (1.18–1.84)	1.78 (1.40–2.29)	2.15 (1.65–2.84)	2.57 (1.91–3.50)	3.23 (2.30–4.59)	3.81 (2.61–5.61)
3-hr	0.503 (0.425–0.602)	0.694 (0.585–0.832)	0.981 (0.824–1.18)	1.25 (1.04–1.51)	1.66 (1.33–2.08)	2.02 (1.59–2.59)	2.43 (1.86–3.21)	2.91 (2.16–3.95)	3.65 (2.59–5.18)	4.30 (2.95–6.33)
6-hr	0.623 (0.526–0.745)	0.853 (0.719–1.02)	1.20 (1.01–1.44)	1.51 (1.26–1.84)	2.01 (1.61–2.52)	2.44 (1.92–3.13)	2.92 (2.24–3.86)	3.48 (2.59–4.73)	4.35 (3.09–6.18)	5.11 (3.50–7.53)
12-hr	0.750 (0.633–0.897)	1.04 (0.879–1.25)	1.48 (1.24–1.78)	1.87 (1.56–2.27)	2.47 (1.99–3.11)	2.99 (2.35–3.84)	3.57 (2.74–4.71)	4.23 (3.14–5.74)	5.22 (3.71–7.42)	6.09 (4.17–8.96)
24-hr	0.923 (0.815–1.07)	1.31 (1.16–1.52)	1.88 (1.66–2.19)	2.39 (2.09–2.80)	3.16 (2.68–3.81)	3.81 (3.17–4.68)	4.53 (3.68–5.70)	5.34 (4.23–6.89)	6.56 (4.99–8.80)	7.60 (5.60–10.5)
2-day	1.06 (0.935–1.22)	1.52 (1.34–1.75)	2.19 (1.92–2.54)	2.78 (2.43–3.25)	3.67 (3.11–4.42)	4.43 (3.68–5.44)	5.27 (4.27–6.62)	6.20 (4.91–8.00)	7.61 (5.79–10.2)	8.80 (6.49–12.2)
3-day	1.12 (0.992–1.30)	1.61 (1.42–1.87)	2.34 (2.06–2.71)	2.98 (2.60–3.48)	3.93 (3.33–4.74)	4.74 (3.94–5.82)	5.63 (4.57–7.08)	6.64 (5.25–8.56)	8.14 (6.19–10.9)	9.43 (6.95–13.1)
4-day	1.18 (1.04–1.36)	1.70 (1.50–1.96)	2.46 (2.17–2.86)	3.14 (2.74–3.67)	4.15 (3.52–5.01)	5.01 (4.16–6.15)	5.95 (4.83–7.48)	7.01 (5.54–9.04)	8.59 (6.53–11.5)	9.94 (7.32–13.8)
7-day	1.25 (1.10–1.44)	1.81 (1.60–2.09)	2.65 (2.33–3.07)	3.39 (2.96–3.97)	4.50 (3.81–5.42)	5.43 (4.51–6.67)	6.44 (5.23–8.10)	7.57 (5.98–9.76)	9.23 (7.02–12.4)	10.6 (7.83–14.7)
10-day	1.29 (1.14–1.48)	1.88 (1.66–2.18)	2.78 (2.44–3.22)	3.57 (3.12–4.17)	4.76 (4.03–5.73)	5.74 (4.77–7.06)	6.82 (5.54–8.57)	8.01 (6.33–10.3)	9.77 (7.43–13.1)	11.2 (8.28–15.6)
20-day	1.39 (1.22–1.60)	2.07 (1.83–2.40)	3.12 (2.74–3.61)	4.05 (3.54–4.73)	5.46 (4.62–6.58)	6.64 (5.52–8.16)	7.92 (6.43–9.96)	9.33 (7.38–12.0)	11.4 (8.64–15.2)	13.0 (9.60–18.0)
30-day	1.50 (1.32–1.73)	2.27 (2.00–2.62)	3.45 (3.04–4.00)	4.52 (3.95–5.28)	6.16 (5.21–7.42)	7.52 (6.24–9.24)	8.98 (7.29–11.3)	10.6 (8.36–13.6)	12.9 (9.78–17.2)	14.7 (10.8–20.4)
45-day	1.65 (1.46–1.90)	2.53 (2.23–2.93)	3.89 (3.42–4.51)	5.13 (4.48–5.99)	7.04 (5.96–8.48)	8.64 (7.18–10.6)	10.4 (8.41–13.0)	12.2 (9.64–15.7)	14.8 (11.3–19.8)	16.9 (12.4–23.4)
60-day	1.78 (1.57–2.05)	2.76 (2.43–3.19)	4.28 (3.77–4.97)	5.68 (4.96–6.64)	7.80 (6.60–9.40)	9.59 (7.97–11.8)	11.5 (9.35–14.5)	13.5 (10.7–17.4)	16.4 (12.4–21.9)	18.6 (13.7–25.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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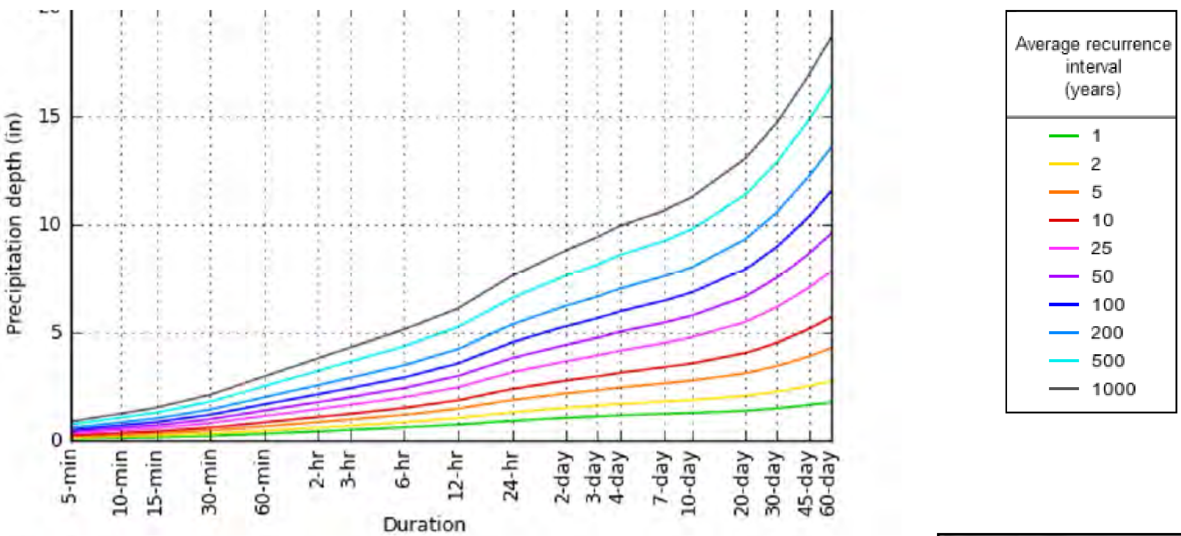
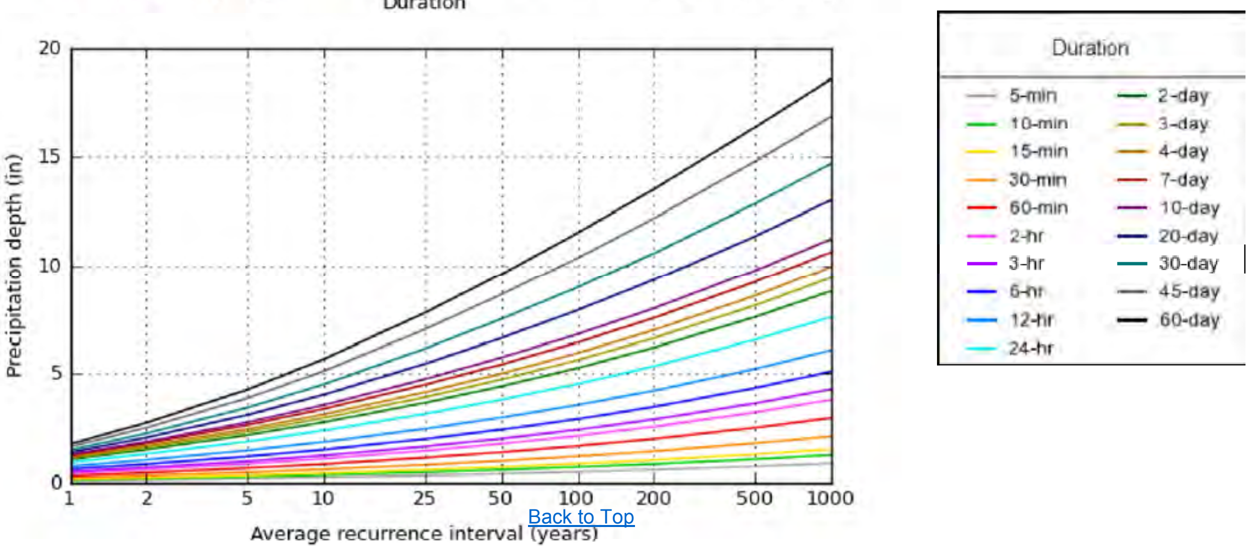
PF graphical





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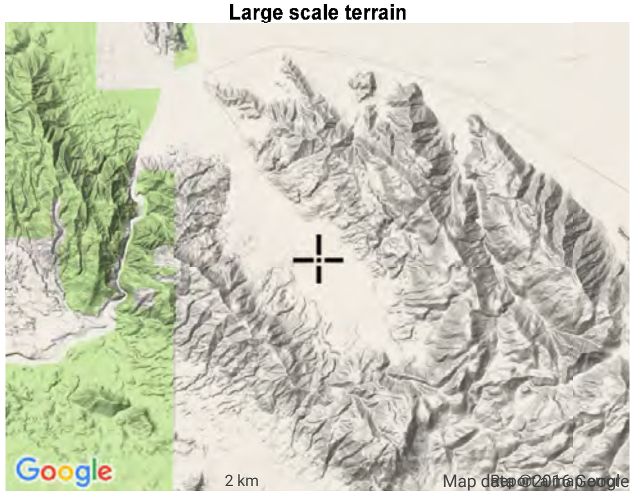
NOAA Atlas 14, Volume 6, Version 2 Created (GMT): Thu Sep 8 22:27:13 2016

Maps & aerials

Small scale terrain

Large scale terrain



Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910

APPENDIX C

AES HYDROLOGY CALCULATIONS

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             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2014 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 21.0)
                 Release Date: 06/01/2014  License ID 1419

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 10YR - 6HR                                                               *
* US GYPSUM - EXISTING CONDITION                                           *
* JN: 9369 - 10/14/16 - JO                                                 *
 **************************************************************************

  FILE NAME: TOTAL100.DAT
  TIME/DATE OF STUDY: 17:57 10/14/2016


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   31605.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   16095.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1915.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    7000.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.484 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  1.50 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9811


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  17.230


============================================================================
                     UNIT HYDROGRAPH DETERMINATION
----------------------------------------------------------------------------
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.923	1566.112
2	7.086	4205.552
3	15.644	6970.772
4	28.833	10742.733
5	40.219	9274.123
6	47.927	6277.550
7	53.574	4600.054
8	57.616	3291.915
9	61.075	2817.780
10	64.073	2441.423
11	66.690	2132.115
12	69.018	1896.216
13	71.169	1751.996
14	73.061	1540.612
15	74.712	1345.286
16	76.249	1251.525
17	77.683	1168.242
18	78.966	1045.081
19	80.179	987.923
20	81.332	939.452
21	82.389	860.879
22	83.322	759.226
23	84.204	718.510
24	84.974	627.192
25	85.738	622.854
26	86.446	576.229
27	87.122	550.377
28	87.796	549.172
29	88.423	511.047
30	89.028	492.299
31	89.632	492.485
32	90.209	469.586

33	90.743	435.426
34	91.278	435.240
35	91.811	434.320
36	92.288	388.707
37	92.733	362.117
38	93.177	362.117
39	93.622	362.297
40	94.045	344.207
41	94.392	283.264
42	94.733	277.727
43	95.075	277.914
44	95.416	278.094
45	95.757	277.727
46	96.069	254.275
47	96.319	203.678
48	96.567	201.833
49	96.815	202.019
50	97.063	202.013
51	97.311	201.833
52	97.559	202.019
53	97.807	201.646
54	98.008	163.982
55	98.083	60.937
56	98.150	55.027
57	98.218	55.027
58	98.285	55.027
59	98.353	55.400
60	98.420	54.661
61	98.488	55.394
62	98.556	55.400
63	98.624	54.661
64	98.692	55.394
65	98.759	54.661
66	98.827	55.400
67	98.895	55.394
68	98.962	54.661
69	99.030	55.400
70	99.097	54.661
71	99.164	54.661
72	99.231	54.661
73	99.298	54.661
74	99.365	54.661
75	99.433	54.661
76	99.500	54.661
77	99.567	54.661
78	99.634	54.661
79	99.701	54.661
80	99.768	54.661
81	99.835	54.661
82	99.902	54.661
83	99.969	54.661
84	100.000	24.944

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0074	0.0066	0.0007
2	0.0088	0.0079	0.0009
3	0.0088	0.0079	0.0009
4	0.0088	0.0079	0.0009
5	0.0088	0.0079	0.0009
6	0.0103	0.0093	0.0010
7	0.0103	0.0093	0.0010
8	0.0103	0.0093	0.0010
9	0.0103	0.0093	0.0010
10	0.0103	0.0093	0.0010
11	0.0103	0.0093	0.0010
12	0.0118	0.0106	0.0012
13	0.0118	0.0106	0.0012
14	0.0118	0.0106	0.0012
15	0.0118	0.0106	0.0012
16	0.0118	0.0106	0.0012
17	0.0118	0.0106	0.0012
18	0.0118	0.0106	0.0012
19	0.0118	0.0106	0.0012
20	0.0118	0.0106	0.0012
21	0.0118	0.0106	0.0012
22	0.0118	0.0106	0.0012
23	0.0118	0.0106	0.0012
24	0.0132	0.0119	0.0013
25	0.0118	0.0106	0.0012
26	0.0132	0.0119	0.0013
27	0.0132	0.0119	0.0013
28	0.0132	0.0119	0.0013
29	0.0132	0.0119	0.0013
30	0.0132	0.0119	0.0013
31	0.0132	0.0119	0.0013
32	0.0132	0.0119	0.0013
33	0.0147	0.0132	0.0015
34	0.0147	0.0132	0.0015
35	0.0147	0.0132	0.0015
36	0.0147	0.0132	0.0015
37	0.0147	0.0132	0.0015
38	0.0162	0.0146	0.0016
39	0.0162	0.0146	0.0016

40	0.0162	0.0146	0.0016
41	0.0177	0.0159	0.0018
42	0.0191	0.0172	0.0019
43	0.0206	0.0185	0.0021
44	0.0206	0.0185	0.0021
45	0.0221	0.0196	0.0024
46	0.0221	0.0196	0.0024
47	0.0235	0.0196	0.0039
48	0.0235	0.0196	0.0039
49	0.0250	0.0196	0.0054
50	0.0265	0.0196	0.0069
51	0.0280	0.0196	0.0083
52	0.0294	0.0196	0.0098
53	0.0309	0.0196	0.0113
54	0.0309	0.0196	0.0113
55	0.0324	0.0196	0.0127
56	0.0338	0.0196	0.0142
57	0.0353	0.0196	0.0157
58	0.0353	0.0196	0.0157
59	0.0368	0.0196	0.0172
60	0.0383	0.0196	0.0186
61	0.0456	0.0196	0.0260
62	0.0530	0.0196	0.0333
63	0.0574	0.0196	0.0378
64	0.0618	0.0196	0.0422
65	0.0692	0.0196	0.0495
66	0.0824	0.0196	0.0628
67	0.0280	0.0196	0.0083
68	0.0132	0.0119	0.0013
69	0.0088	0.0079	0.0009
70	0.0074	0.0066	0.0007
71	0.0044	0.0040	0.0004
72	0.0029	0.0026	0.0003

TOTAL STORM RAINFALL(INCHES) = 1.47
TOTAL SOIL-LOSS(INCHES) = 0.99
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.48

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 556.7228
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 269.0665

---

6 - H O U R   S T O R M
R U N O F F   H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	550.0	1100.0	1650.0	2200.0
0.083	0.0079	1.15	Q	.	.	.	.
0.167	0.0388	4.48	Q	.	.	.	.
0.250	0.1092	10.23	Q	.	.	.	.
0.333	0.2411	19.16	Q	.	.	.	.
0.417	0.4309	27.56	Q	.	.	.	.
0.500	0.6635	33.77	Q	.	.	.	.
0.583	0.9301	38.70	Q	.	.	.	.
0.667	1.2250	42.83	Q	.	.	.	.
0.750	1.5485	46.97	Q	.	.	.	.
0.833	1.8966	50.54	Q	.	.	.	.
0.917	2.2643	53.39	Q	.	.	.	.
1.000	2.6500	56.01	VQ	.	.	.	.
1.083	3.0541	58.68	VQ	.	.	.	.
1.167	3.4778	61.51	VQ	.	.	.	.
1.250	3.9232	64.67	VQ	.	.	.	.
1.333	4.3878	67.47	VQ	.	.	.	.
1.417	4.8679	69.71	VQ	.	.	.	.
1.500	5.3610	71.59	VQ	.	.	.	.
1.583	5.8650	73.18	VQ	.	.	.	.
1.667	6.3790	74.63	VQ	.	.	.	.
1.750	6.9020	75.95	.Q	.	.	.	.
1.833	7.4331	77.12	.Q	.	.	.	.
1.917	7.9716	78.19	.Q	.	.	.	.
2.000	8.5184	79.39	.Q	.	.	.	.
2.083	9.0741	80.69	.Q	.	.	.	.
2.167	9.6400	82.17	.Q	.	.	.	.
2.250	10.2194	84.13	.Q	.	.	.	.
2.333	10.8097	85.70	.Q	.	.	.	.
2.417	11.4126	87.55	.Q	.	.	.	.
2.500	12.0279	89.34	.Q	.	.	.	.
2.583	12.6528	90.73	.Q	.	.	.	.
2.667	13.2861	91.96	.Q	.	.	.	.
2.750	13.9280	93.20	.QV	.	.	.	.
2.833	14.5806	94.76	.QV	.	.	.	.
2.917	15.2463	96.65	.QV	.	.	.	.
3.000	15.9284	99.04	.QV	.	.	.	.
3.083	16.6249	101.13	.QV	.	.	.	.
3.167	17.3341	102.98	.QV	.	.	.	.
3.250	18.0569	104.95	.QV	.	.	.	.
3.333	18.7945	107.10	.QV	.	.	.	.
3.417	19.5512	109.88	.QV	.	.	.	.
3.500	20.3294	112.99	. QV	.	.	.	.
3.583	21.1325	116.61	. QV	.	.	.	.
3.667	21.9678	121.29	. QV	.	.	.	.
3.750	22.8430	127.08	. QV	.	.	.	.

```
   3.833     23.7635    133.65  . QV      .         .         .         .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)    Q(CFS) 0.     550.0    1100.0    1650.0    2200.0
----------------------------------------------------------------------------
   3.917     24.7450    142.51  . QV      .         .         .         .
   4.000     25.8176    155.74  . QV      .         .         .         .
   4.083     27.0174    174.22  .  QV     .         .         .         .
   4.167     28.4151    202.94  .  QV     .         .         .         .
   4.250     30.0604    238.90  .   Q     .         .         .         .
   4.333     32.0270    285.56  .   VQ    .         .         .         .
   4.417     34.3900    343.10  .    VQ   .         .         .         .
   4.500     37.1817    405.36  .    V Q  .         .         .         .
   4.583     40.4151    469.49  .     V Q .         .         .         .
   4.667     44.0903    533.64  .     V  Q.         .         .         .
   4.750     48.1936    595.81  .      V  Q         .         .         .
   4.833     52.7455    660.93  .      V  . Q       .         .         .
   4.917     57.7685    729.35  .       V .  Q      .         .         .
   5.000     63.2683    798.56  .        V.   Q     .         .         .
   5.083     69.2985    875.58  .         V    Q    .         .         .
   5.167     76.0633    982.25  .         .V     Q  .         .         .
   5.250     83.8602   1132.10  .         . V       Q         .         .
   5.333     93.0704   1337.33  .         .  V      .   Q     .         .
   5.417    103.9871   1585.10  .         .    V    .       Q .         .
   5.500    116.8113   1862.08  .         .      V  .         .  Q      .
   5.583    131.1382   2080.27  .         .        V.         .      Q  .
   5.667    146.0387   2163.56  .         .         .V        .        Q.
   5.750    160.3640   2080.03  .         .         .  V      .      Q  .
   5.833    172.1211   1707.12  .         .         .    V    .Q        .
   5.917    181.2061   1319.14  .         .         .  Q  V   .         .
   6.000    188.5087   1060.34  .         .        Q.       V .         .
   6.083    194.5977    884.11  .         .     Q   .       V .         .
   6.167    199.9340    774.83  .         .   Q     .        V.         .
   6.250    204.6719    687.94  .         . Q       .         V         .
   6.333    208.9089    615.21  .         .Q        .         .V        .
   6.417    212.7357    555.66  .         Q         .         .V        .
   6.500    216.2195    505.84  .        Q.         .         . V       .
   6.583    219.3849    459.63  .       Q .         .         . V       .
   6.667    222.2849    421.07  .      Q  .         .         .  V      .
   6.750    224.9770    390.90  .      Q  .         .         .  V      .
   6.833    227.4788    363.25  .     Q   .         .         .  V      .
   6.917    229.8000    337.05  .     Q   .         .         .   V     .
   7.000    231.9703    315.13  .    Q    .         .         .   V     .
   7.083    233.9980    294.41  .    Q    .         .         .   V     .
   7.167    235.8845    273.93  .   Q     .         .         .    V    .
   7.250    237.6423    255.23  .   Q     .         .         .    V    .
   7.333    239.3005    240.77  .   Q     .         .         .    V    .
   7.417    240.8656    227.24  .   Q     .         .         .    V    .
   7.500    242.3663    217.91  .  Q      .         .         .     V   .
   7.583    243.7994    208.08  .  Q      .         .         .     V   .
   7.667    245.1755    199.81  .  Q      .         .         .     V   .
   7.750    246.5001    192.34  .  Q      .         .         .     V   .
   7.833    247.7677    184.05  .  Q      .         .         .     V   .
   7.917    248.9868    177.03  .  Q      .         .         .      V  .
   8.000    250.1602    170.38  .  Q      .         .         .      V  .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)    Q(CFS) 0.     550.0    1100.0    1650.0    2200.0
----------------------------------------------------------------------------
   8.083    251.2798    162.56  . Q       .         .         .      V  .
   8.167    252.3474    155.02  . Q       .         .         .      V  .
   8.250    253.3732    148.95  . Q       .         .         .      V  .
   8.333    254.3537    142.36  . Q       .         .         .      V  .
   8.417    255.2780    134.21  . Q       .         .         .      V  .
   8.500    256.1559    127.47  . Q       .         .         .       V .
   8.583    256.9950    121.84  . Q       .         .         .       V .
   8.667    257.7921    115.75  . Q       .         .         .       V .
   8.750    258.5403    108.64  .Q        .         .         .       V .
   8.833    259.2374    101.22  .Q        .         .         .       V .
   8.917    259.9018     96.47  .Q        .         .         .       V .
   9.000    260.5349     91.93  .Q        .         .         .       V .
   9.083    261.1334     86.90  .Q        .         .         .       V .
   9.167    261.6930     81.26  .Q        .         .         .       V .
   9.250    262.2082     74.80  .Q        .         .         .       V .
   9.333    262.6826     68.89  .Q        .         .         .        V.
   9.417    263.1349     65.68  .Q        .         .         .        V.
   9.500    263.5654     62.50  .Q        .         .         .        V.
   9.583    263.9669     58.31  .Q        .         .         .        V.
   9.667    264.3330     53.15  Q         .         .         .        V.
   9.750    264.6591     47.36  Q         .         .         .        V.
   9.833    264.9402     40.81  Q         .         .         .        V.
   9.917    265.1675     33.00  Q         .         .         .        V.
  10.000    265.3455     25.85  Q         .         .         .        V.
  10.083    265.5141     24.48  Q         .         .         .        V.
  10.167    265.6806     24.18  Q         .         .         .        V.
  10.250    265.8456     23.96  Q         .         .         .        V.
  10.333    266.0093     23.77  Q         .         .         .        V.
  10.417    266.1717     23.58  Q         .         .         .        V.
  10.500    266.3333     23.46  Q         .         .         .        V.
  10.583    266.4940     23.33  Q         .         .         .        V.
  10.667    266.6536     23.18  Q         .         .         .        V.
  10.750    266.8124     23.06  Q         .         .         .        V.
  10.833    266.9698     22.85  Q         .         .         .        V.
  10.917    267.1258     22.65  Q         .         .         .        V.
  11.000    267.2798     22.37  Q         .         .         .        V.
  11.083    267.4313     21.99  Q         .         .         .        V.
  11.167    267.5799     21.57  Q         .         .         .        V.
  11.250    267.7247     21.04  Q         .         .         .        V.
  11.333    267.8656     20.45  Q         .         .         .        V.
```

```
  11.417    268.0022     19.83  Q          .          .          .         V.
  11.500    268.1342     19.17  Q          .          .          .         V.
  11.583    268.2612     18.43  Q          .          .          .         V.
  11.667    268.3825     17.61  Q          .          .          .         V.
  11.750    268.4979     16.75  Q          .          .          .         V.
  11.833    268.6071     15.85  Q          .          .          .         V.
  11.917    268.7095     14.87  Q          .          .          .         V.
  12.000    268.8034     13.63  Q          .          .          .         V.
  12.083    268.8860     12.00  Q          .          .          .         V.
  12.167    268.9551     10.04  Q          .          .          .         V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       550.0    1100.0    1650.0    2200.0
----------------------------------------------------------------------------
  12.250    269.0092      7.85  Q          .          .          .         V.
  12.333    269.0458      5.32  Q          .          .          .         V.
  12.417    269.0611      2.22  Q          .          .          .         V.
  12.500    269.0639      0.41  Q          .          .          .         V.
  12.583    269.0650      0.16  Q          .          .          .         V.
  12.667    269.0657      0.10  Q          .          .          .         V.
  12.750    269.0661      0.06  Q          .          .          .         V.
  12.833    269.0663      0.03  Q          .          .          .         V.
  12.917    269.0664      0.01  Q          .          .          .         V.
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
             0%                             775.0
            10%                             200.0
            20%                             125.0
            30%                              90.0
            40%                              65.0
            50%                              45.0
            60%                              40.0
            70%                              30.0
            80%                              20.0
            90%                              15.0
============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
```

```
****************************************************************************
             F L O O D   R O U T I N G   A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2014 Advanced Engineering Software (aes)
                (Synthetic Unit Hydrograph Version 21.0)
                Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 5YR - 6HR                                                                *
* US GYPSUM - EXISTING CONDITION                                           *
* JN: 9369 - 10/14/16 - JO                                                 *
 **************************************************************************

  FILE NAME: TOTAL100.DAT
  TIME/DATE OF STUDY: 18:14 10/14/2016


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   31605.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   16095.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1915.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    7000.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.484 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  1.19 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9811


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  17.230


============================================================================
                     UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.923	1566.112
2	7.086	4205.552
3	15.644	6970.772
4	28.833	10742.733
5	40.219	9274.123
6	47.927	6277.550
7	53.574	4600.054
8	57.616	3291.915
9	61.075	2817.780
10	64.073	2441.423
11	66.690	2132.115
12	69.018	1896.216
13	71.169	1751.996
14	73.061	1540.612
15	74.712	1345.286
16	76.249	1251.525
17	77.683	1168.242
18	78.966	1045.081
19	80.179	987.923
20	81.332	939.452
21	82.389	860.879
22	83.322	759.226
23	84.204	718.510
24	84.974	627.192
25	85.738	622.854
26	86.446	576.229
27	87.122	550.377
28	87.796	549.172
29	88.423	511.047
30	89.028	492.299
31	89.632	492.485
32	90.209	469.586

33	90.743	435.426
34	91.278	435.240
35	91.811	434.320
36	92.288	388.707
37	92.733	362.117
38	93.177	362.117
39	93.622	362.297
40	94.045	344.207
41	94.392	283.264
42	94.733	277.727
43	95.075	277.914
44	95.416	278.094
45	95.757	277.727
46	96.069	254.275
47	96.319	203.678
48	96.567	201.833
49	96.815	202.019
50	97.063	202.013
51	97.311	201.833
52	97.559	202.019
53	97.807	201.646
54	98.008	163.982
55	98.083	60.937
56	98.150	55.027
57	98.218	55.027
58	98.285	55.027
59	98.353	55.400
60	98.420	54.661
61	98.488	55.394
62	98.556	55.400
63	98.624	54.661
64	98.692	55.394
65	98.759	54.661
66	98.827	55.400
67	98.895	55.394
68	98.962	54.661
69	99.030	55.400
70	99.097	54.661
71	99.164	54.661
72	99.231	54.661
73	99.298	54.661
74	99.365	54.661
75	99.433	54.661
76	99.500	54.661
77	99.567	54.661
78	99.634	54.661
79	99.701	54.661
80	99.768	54.661
81	99.835	54.661
82	99.902	54.661
83	99.969	54.661
84	100.000	24.944

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0058	0.0053	0.0006
2	0.0070	0.0063	0.0007
3	0.0070	0.0063	0.0007
4	0.0070	0.0063	0.0007
5	0.0070	0.0063	0.0007
6	0.0082	0.0074	0.0008
7	0.0082	0.0074	0.0008
8	0.0082	0.0074	0.0008
9	0.0082	0.0074	0.0008
10	0.0082	0.0074	0.0008
11	0.0082	0.0074	0.0008
12	0.0093	0.0084	0.0009
13	0.0093	0.0084	0.0009
14	0.0093	0.0084	0.0009
15	0.0093	0.0084	0.0009
16	0.0093	0.0084	0.0009
17	0.0093	0.0084	0.0009
18	0.0093	0.0084	0.0009
19	0.0093	0.0084	0.0009
20	0.0093	0.0084	0.0009
21	0.0093	0.0084	0.0009
22	0.0093	0.0084	0.0009
23	0.0093	0.0084	0.0009
24	0.0105	0.0095	0.0011
25	0.0093	0.0084	0.0009
26	0.0105	0.0095	0.0011
27	0.0105	0.0095	0.0011
28	0.0105	0.0095	0.0011
29	0.0105	0.0095	0.0011
30	0.0105	0.0095	0.0011
31	0.0105	0.0095	0.0011
32	0.0105	0.0095	0.0011
33	0.0117	0.0105	0.0012
34	0.0117	0.0105	0.0012
35	0.0117	0.0105	0.0012
36	0.0117	0.0105	0.0012
37	0.0117	0.0105	0.0012
38	0.0128	0.0116	0.0013
39	0.0128	0.0116	0.0013

40	0.0128	0.0116	0.0013
41	0.0140	0.0126	0.0014
42	0.0152	0.0137	0.0015
43	0.0163	0.0147	0.0016
44	0.0163	0.0147	0.0016
45	0.0175	0.0158	0.0018
46	0.0175	0.0158	0.0018
47	0.0187	0.0168	0.0019
48	0.0187	0.0168	0.0019
49	0.0198	0.0179	0.0020
50	0.0210	0.0189	0.0021
51	0.0222	0.0196	0.0025
52	0.0233	0.0196	0.0037
53	0.0245	0.0196	0.0049
54	0.0245	0.0196	0.0049
55	0.0257	0.0196	0.0061
56	0.0269	0.0196	0.0072
57	0.0280	0.0196	0.0084
58	0.0280	0.0196	0.0084
59	0.0292	0.0196	0.0096
60	0.0304	0.0196	0.0107
61	0.0362	0.0196	0.0166
62	0.0420	0.0196	0.0224
63	0.0455	0.0196	0.0259
64	0.0490	0.0196	0.0294
65	0.0549	0.0196	0.0352
66	0.0654	0.0196	0.0457
67	0.0222	0.0196	0.0025
68	0.0105	0.0095	0.0011
69	0.0070	0.0063	0.0007
70	0.0058	0.0053	0.0006
71	0.0035	0.0032	0.0004
72	0.0023	0.0021	0.0002

TOTAL STORM RAINFALL(INCHES) = 1.17
TOTAL SOIL-LOSS(INCHES) = 0.86
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.30

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 485.1316
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 170.0170

==

6 - H O U R   S T O R M
R U N O F F   H Y D R O G R A P H

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           HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
      (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      375.0     750.0    1125.0    1500.0
----------------------------------------------------------------------------
   0.083      0.0063      0.91  Q         .         .         .         .
   0.167      0.0308      3.55  Q         .         .         .         .
   0.250      0.0866      8.11  Q         .         .         .         .
   0.333      0.1913     15.20  Q         .         .         .         .
   0.417      0.3419     21.86  Q         .         .         .         .
   0.500      0.5264     26.79  Q         .         .         .         .
   0.583      0.7379     30.70  Q         .         .         .         .
   0.667      0.9718     33.98  Q         .         .         .         .
   0.750      1.2285     37.26  Q         .         .         .         .
   0.833      1.5046     40.10  VQ        .         .         .         .
   0.917      1.7963     42.36  VQ        .         .         .         .
   1.000      2.1023     44.43  VQ        .         .         .         .
   1.083      2.4230     46.55  VQ        .         .         .         .
   1.167      2.7590     48.80  VQ        .         .         .         .
   1.250      3.1124     51.30  VQ        .         .         .         .
   1.333      3.4810     53.52  VQ        .         .         .         .
   1.417      3.8619     55.31  VQ        .         .         .         .
   1.500      4.2530     56.79  .Q        .         .         .         .
   1.583      4.6529     58.06  .Q        .         .         .         .
   1.667      5.0606     59.21  .Q        .         .         .         .
   1.750      5.4756     60.25  .Q        .         .         .         .
   1.833      5.8969     61.18  .Q        .         .         .         .
   1.917      6.3241     62.03  .Q        .         .         .         .
   2.000      6.7579     62.98  .Q        .         .         .         .
   2.083      7.1988     64.02  .Q        .         .         .         .
   2.167      7.6478     65.19  .Q        .         .         .         .
   2.250      8.1074     66.74  .Q        .         .         .         .
   2.333      8.5757     67.99  .QV       .         .         .         .
   2.417      9.0540     69.45  .QV       .         .         .         .
   2.500      9.5422     70.88  .QV       .         .         .         .
   2.583     10.0379     71.98  .QV       .         .         .         .
   2.667     10.5403     72.96  .QV       .         .         .         .
   2.750     11.0496     73.94  .QV       .         .         .         .
   2.833     11.5673     75.17  . Q       .         .         .         .
   2.917     12.0954     76.68  . Q       .         .         .         .
   3.000     12.6365     78.57  . Q       .         .         .         .
   3.083     13.1891     80.23  . QV      .         .         .         .
   3.167     13.7517     81.70  . QV      .         .         .         .
   3.250     14.3252     83.26  . QV      .         .         .         .
   3.333     14.9103     84.96  . QV      .         .         .         .
   3.417     15.5106     87.17  . QV      .         .         .         .
   3.500     16.1280     89.64  . QV      .         .         .         .
   3.583     16.7651     92.51  . QV      .         .         .         .
   3.667     17.4278     96.22  . Q V     .         .         .         .
   3.750     18.1202    100.53  . Q V     .         .         .         .
```

```
    3.833     18.8430    104.96 . Q V     .         .         .         .

---------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.     375.0     750.0    1125.0    1500.0
---------------------------------------------------------------------------
    3.917     19.5941    109.06 . Q V     .         .         .         .
    4.000     20.3734    113.15 .  QV     .         .         .         .
    4.083     21.1800    117.12 .  QV     .         .         .         .
    4.167     22.0160    121.39 .  Q V    .         .         .         .
    4.250     22.8869    126.45 .  Q V    .         .         .         .
    4.333     23.8141    134.63 .  Q V    .         .         .         .
    4.417     24.8393    148.86 .  Q V    .         .         .         .
    4.500     26.0120    170.26 .   Q V   .         .         .         .
    4.583     27.3871    199.68 .    QV   .         .         .         .
    4.667     29.0045    234.84 .     Q   .         .         .         .
    4.750     30.8768    271.86 .      Q  .         .         .         .
    4.833     33.0349    313.35 .      VQ .         .         .         .
    4.917     35.5053    358.70 .       VQ.         .         .         .
    5.000     38.2999    405.77 .        VQ         .         .         .
    5.083     41.4670    459.87 .        V. Q       .         .         .
    5.167     45.1734    538.17 .         V   Q     .         .         .
    5.250     49.6593    651.34 .         .V     Q  .         .         .
    5.333     55.2312    809.05 .         . V       .Q        .         .
    5.417     62.1244   1000.90 .         .   V     .     Q   .         .
    5.500     70.5010   1216.28 .         .     V   .         . Q       .
    5.583     80.0421   1385.37 .         .       V .         .     Q   .
    5.667     90.0566   1454.10 .         .         .V        .       Q .
    5.750     99.7084   1401.43 .         .         .  V      .      Q  .
    5.833    107.4958   1130.73 .         .         .    V    Q         .
    5.917    113.4434    863.59 .         .         .  Q  V   .         .
    6.000    118.2177    693.23 .         .       Q .      V  .         .
    6.083    122.1874    576.40 .         .    Q    .       V .         .
    6.167    125.6722    505.99 .         .  Q      .        V.         .
    6.250    128.7586    448.15 .         .Q        .         V         .
    6.333    131.5114    399.71 .         Q         .         V         .
    6.417    133.9926    360.26 .        Q.         .         .V        .
    6.500    136.2471    327.36 .       Q .         .         . V       .
    6.583    138.2889    296.46 .      Q  .         .         . V       .
    6.667    140.1558    271.08 .      Q  .         .         . V       .
    6.750    141.8884    251.57 .     Q   .         .         .  V      .
    6.833    143.4956    233.37 .     Q   .         .         .  V      .
    6.917    144.9831    215.98 .    Q    .         .         .   V     .
    7.000    146.3723    201.71 .    Q    .         .         .   V     .
    7.083    147.6669    187.98 .    Q    .         .         .   V     .
    7.167    148.8672    174.28 .   Q     .         .         .    V    .
    7.250    149.9822    161.89 .   Q     .         .         .    V    .
    7.333    151.0329    152.57 .   Q     .         .         .    V    .
    7.417    152.0222    143.65 .  Q      .         .         .    V    .
    7.500    152.9725    137.99 .  Q      .         .         .    V    .
    7.583    153.8790    131.61 .  Q      .         .         .     V   .
    7.667    154.7501    126.49 .  Q      .         .         .     V   .
    7.750    155.5894    121.86 .  Q      .         .         .     V   .
    7.833    156.3919    116.51 .  Q      .         .         .     V   .
    7.917    157.1649    112.24 . Q       .         .         .     V   .
    8.000    157.9099    108.18 . Q       .         .         .      V  .

---------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.     375.0     750.0    1125.0    1500.0
---------------------------------------------------------------------------
    8.083    158.6204    103.16 . Q       .         .         .      V  .
    8.167    159.2978     98.36 . Q       .         .         .      V  .
    8.250    159.9497     94.66 . Q       .         .         .      V  .
    8.333    160.5726     90.44 . Q       .         .         .      V  .
    8.417    161.1587     85.10 . Q       .         .         .      V  .
    8.500    161.7159     80.92 . Q       .         .         .       V .
    8.583    162.2502     77.58 . Q       .         .         .       V .
    8.667    162.7592     73.91 .Q        .         .         .       V .
    8.750    163.2379     69.51 .Q        .         .         .       V .
    8.833    163.6847     64.87 .Q        .         .         .       V .
    8.917    164.1136     62.28 .Q        .         .         .       V .
    9.000    164.5240     59.60 .Q        .         .         .       V .
    9.083    164.9132     56.51 .Q        .         .         .       V .
    9.167    165.2778     52.94 .Q        .         .         .       V .
    9.250    165.6133     48.72 .Q        .         .         .       V .
    9.333    165.9228     44.93 .Q        .         .         .        V.
    9.417    166.2203     43.20 .Q        .         .         .        V.
    9.500    166.5046     41.28 .Q        .         .         .        V.
    9.583    166.7700     38.55 .Q        .         .         .        V.
    9.667    167.0115     35.05 Q         .         .         .        V.
    9.750    167.2253     31.05 Q         .         .         .        V.
    9.833    167.4075     26.45 Q         .         .         .        V.
    9.917    167.5512     20.86 Q         .         .         .        V.
   10.000    167.6598     15.78 Q         .         .         .        V.
   10.083    167.7641     15.14 Q         .         .         .        V.
   10.167    167.8669     14.92 Q         .         .         .        V.
   10.250    167.9684     14.75 Q         .         .         .        V.
   10.333    168.0690     14.60 Q         .         .         .        V.
   10.417    168.1686     14.45 Q         .         .         .        V.
   10.500    168.2675     14.36 Q         .         .         .        V.
   10.583    168.3657     14.26 Q         .         .         .        V.
   10.667    168.4631     14.14 Q         .         .         .        V.
   10.750    168.5599     14.06 Q         .         .         .        V.
   10.833    168.6559     13.94 Q         .         .         .        V.
   10.917    168.7514     13.85 Q         .         .         .        V.
   11.000    168.8459     13.73 Q         .         .         .        V.
   11.083    168.9395     13.59 Q         .         .         .        V.
   11.167    169.0322     13.46 Q         .         .         .        V.
   11.250    169.1235     13.26 Q         .         .         .        V.
   11.333    169.2131     13.02 Q         .         .         .        V.
```

```
 11.417    169.3009     12.75  Q         .         .         .        V.
 11.500    169.3867     12.45  Q         .         .         .        V.
 11.583    169.4699     12.08  Q         .         .         .        V.
 11.667    169.5501     11.65  Q         .         .         .        V.
 11.750    169.6272     11.19  Q         .         .         .        V.
 11.833    169.7009     10.70  Q         .         .         .        V.
 11.917    169.7708     10.14  Q         .         .         .        V.
 12.000    169.8354      9.39  Q         .         .         .        V.
 12.083    169.8926      8.31  Q         .         .         .        V.
 12.167    169.9407      6.98  Q         .         .         .        V.

-----------------------------------------------------------------------------
TIME(HRS) VOLUME(AF)   Q(CFS) 0.      375.0     750.0    1125.0    1500.0
-----------------------------------------------------------------------------
 12.250    169.9783      5.46  Q         .         .         .        V.
 12.333    170.0036      3.68  Q         .         .         .        V.
 12.417    170.0135      1.44  Q         .         .         .        V.
 12.500    170.0151      0.22  Q         .         .         .        V.
 12.583    170.0160      0.13  Q         .         .         .        V.
 12.667    170.0165      0.08  Q         .         .         .        V.
 12.750    170.0169      0.05  Q         .         .         .        V.
 12.833    170.0170      0.02  Q         .         .         .        V.
 12.917    170.0171      0.01  Q         .         .         .         V
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	775.0
10%	180.0
20%	110.0
30%	75.0
40%	50.0
50%	40.0
60%	30.0
70%	25.0
80%	20.0
90%	15.0

END OF FLOODSCx ROUTING ANALYSIS

```
****************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2014 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 21.0)
                 Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 2YR - 6 HR                                                               *
* US GYPSUM - EXISTING CONDITION                                           *
* JN: 9369 - 10/14/16 - JO                                                 *
 **************************************************************************

  FILE NAME: TOTAL100.DAT
  TIME/DATE OF STUDY: 18:24 10/14/2016


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   31605.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   16095.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1915.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    7000.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.484 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  0.85 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9811


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  17.230


============================================================================
                     UNIT HYDROGRAPH DETERMINATION
----------------------------------------------------------------------------
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.923	1566.112
2	7.086	4205.552
3	15.644	6970.772
4	28.833	10742.733
5	40.219	9274.123
6	47.927	6277.550
7	53.574	4600.054
8	57.616	3291.915
9	61.075	2817.780
10	64.073	2441.423
11	66.690	2132.115
12	69.018	1896.216
13	71.169	1751.996
14	73.061	1540.612
15	74.712	1345.286
16	76.249	1251.525
17	77.683	1168.242
18	78.966	1045.081
19	80.179	987.923
20	81.332	939.452
21	82.389	860.879
22	83.322	759.226
23	84.204	718.510
24	84.974	627.192
25	85.738	622.854
26	86.446	576.229
27	87.122	550.377
28	87.796	549.172
29	88.423	511.047
30	89.028	492.299
31	89.632	492.485
32	90.209	469.586

33	90.743	435.426
34	91.278	435.240
35	91.811	434.320
36	92.288	388.707
37	92.733	362.117
38	93.177	362.117
39	93.622	362.297
40	94.045	344.207
41	94.392	283.264
42	94.733	277.727
43	95.075	277.914
44	95.416	278.094
45	95.757	277.727
46	96.069	254.275
47	96.319	203.678
48	96.567	201.833
49	96.815	202.019
50	97.063	202.013
51	97.311	201.833
52	97.559	202.019
53	97.807	201.646
54	98.008	163.982
55	98.083	60.937
56	98.150	55.027
57	98.218	55.027
58	98.285	55.027
59	98.353	55.400
60	98.420	54.661
61	98.488	55.394
62	98.556	55.400
63	98.624	54.661
64	98.692	55.394
65	98.759	54.661
66	98.827	55.400
67	98.895	55.394
68	98.962	54.661
69	99.030	55.400
70	99.097	54.661
71	99.164	54.661
72	99.231	54.661
73	99.298	54.661
74	99.365	54.661
75	99.433	54.661
76	99.500	54.661
77	99.567	54.661
78	99.634	54.661
79	99.701	54.661
80	99.768	54.661
81	99.835	54.661
82	99.902	54.661
83	99.969	54.661
84	100.000	24.944

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0041	0.0037	0.0004
2	0.0050	0.0045	0.0005
3	0.0050	0.0045	0.0005
4	0.0050	0.0045	0.0005
5	0.0050	0.0045	0.0005
6	0.0058	0.0052	0.0006
7	0.0058	0.0052	0.0006
8	0.0058	0.0052	0.0006
9	0.0058	0.0052	0.0006
10	0.0058	0.0052	0.0006
11	0.0058	0.0052	0.0006
12	0.0066	0.0060	0.0007
13	0.0066	0.0060	0.0007
14	0.0066	0.0060	0.0007
15	0.0066	0.0060	0.0007
16	0.0066	0.0060	0.0007
17	0.0066	0.0060	0.0007
18	0.0066	0.0060	0.0007
19	0.0066	0.0060	0.0007
20	0.0066	0.0060	0.0007
21	0.0066	0.0060	0.0007
22	0.0066	0.0060	0.0007
23	0.0066	0.0060	0.0007
24	0.0075	0.0067	0.0007
25	0.0066	0.0060	0.0007
26	0.0075	0.0067	0.0007
27	0.0075	0.0067	0.0007
28	0.0075	0.0067	0.0007
29	0.0075	0.0067	0.0007
30	0.0075	0.0067	0.0007
31	0.0075	0.0067	0.0007
32	0.0075	0.0067	0.0007
33	0.0083	0.0075	0.0008
34	0.0083	0.0075	0.0008
35	0.0083	0.0075	0.0008
36	0.0083	0.0075	0.0008
37	0.0083	0.0075	0.0008
38	0.0091	0.0082	0.0009
39	0.0091	0.0082	0.0009

```
          40              0.0091           0.0082              0.0009
          41              0.0099           0.0090              0.0010
          42              0.0108           0.0097              0.0011
          43              0.0116           0.0104              0.0012
          44              0.0116           0.0104              0.0012
          45              0.0124           0.0112              0.0012
          46              0.0124           0.0112              0.0012
          47              0.0133           0.0119              0.0013
          48              0.0133           0.0119              0.0013
          49              0.0141           0.0127              0.0014
          50              0.0149           0.0134              0.0015
          51              0.0158           0.0142              0.0016
          52              0.0166           0.0149              0.0017
          53              0.0174           0.0157              0.0017
          54              0.0174           0.0157              0.0017
          55              0.0182           0.0164              0.0018
          56              0.0191           0.0172              0.0019
          57              0.0199           0.0179              0.0020
          58              0.0199           0.0179              0.0020
          59              0.0207           0.0187              0.0021
          60              0.0216           0.0194              0.0022
          61              0.0257           0.0196              0.0061
          62              0.0298           0.0196              0.0102
          63              0.0323           0.0196              0.0127
          64              0.0348           0.0196              0.0152
          65              0.0390           0.0196              0.0193
          66              0.0464           0.0196              0.0268
          67              0.0158           0.0142              0.0016
          68              0.0075           0.0067              0.0007
          69              0.0050           0.0045              0.0005
          70              0.0041           0.0037              0.0004
          71              0.0025           0.0022              0.0002
          72              0.0017           0.0015              0.0002

         TOTAL STORM RAINFALL(INCHES) =  0.83
         TOTAL SOIL-LOSS(INCHES) =  0.68
         TOTAL EFFECTIVE RAINFALL(INCHES) =  0.15

----------------------------------------------------------------------------
    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =     379.7557
    TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =      85.4730
----------------------------------------------------------------------------

============================================================================

                          6 - H O U R   S T O R M
                    R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      200.0     400.0     600.0     800.0
----------------------------------------------------------------------------
   0.083      0.0045      0.65  Q         .         .         .         .
   0.167      0.0218      2.52  Q         .         .         .         .
   0.250      0.0615      5.76  Q         .         .         .         .
   0.333      0.1358     10.79  Q         .         .         .         .
   0.417      0.2428     15.53  Q         .         .         .         .
   0.500      0.3738     19.03  Q         .         .         .         .
   0.583      0.5239     21.80  VQ        .         .         .         .
   0.667      0.6901     24.13  VQ        .         .         .         .
   0.750      0.8723     26.46  VQ        .         .         .         .
   0.833      1.0684     28.47  VQ        .         .         .         .
   0.917      1.2755     30.08  VQ        .         .         .         .
   1.000      1.4928     31.55  VQ        .         .         .         .
   1.083      1.7205     33.06  VQ        .         .         .         .
   1.167      1.9592     34.65  VQ        .         .         .         .
   1.250      2.2101     36.43  .Q        .         .         .         .
   1.333      2.4718     38.01  .Q        .         .         .         .
   1.417      2.7423     39.27  .Q        .         .         .         .
   1.500      3.0200     40.33  .VQ       .         .         .         .
   1.583      3.3039     41.23  .VQ       .         .         .         .
   1.667      3.5935     42.04  .VQ       .         .         .         .
   1.750      3.8881     42.78  .VQ       .         .         .         .
   1.833      4.1873     43.44  .VQ       .         .         .         .
   1.917      4.4907     44.05  . Q       .         .         .         .
   2.000      4.7987     44.72  . Q       .         .         .         .
   2.083      5.1117     45.46  . Q       .         .         .         .
   2.167      5.4305     46.29  . Q       .         .         .         .
   2.250      5.7570     47.39  . Q       .         .         .         .
   2.333      6.0895     48.28  . Q       .         .         .         .
   2.417      6.4291     49.32  . QV      .         .         .         .
   2.500      6.7757     50.33  . QV      .         .         .         .
   2.583      7.1277     51.11  . QV      .         .         .         .
   2.667      7.4845     51.80  . QV      .         .         .         .
   2.750      7.8461     52.50  . QV      .         .         .         .
   2.833      8.2137     53.38  . QV      .         .         .         .
   2.917      8.5887     54.45  . Q V     .         .         .         .
   3.000      8.9730     55.79  . Q V     .         .         .         .
   3.083      9.3653     56.97  . Q V     .         .         .         .
   3.167      9.7649     58.01  . Q V     .         .         .         .
   3.250     10.1721     59.12  . Q V     .         .         .         .
   3.333     10.5876     60.33  .  QV     .         .         .         .
   3.417     11.0139     61.90  .  Q V    .         .         .         .
   3.500     11.4522     63.65  .  Q V    .         .         .         .
   3.583     11.9046     65.69  .  Q V    .         .         .         .
   3.667     12.3752     68.33  .  Q V    .         .         .         .
   3.750     12.8668     71.38  .  Q  V   .         .         .         .
```

```
  3.833     13.3801     74.53  .  Q  V   .         .         .         .

---------------------------------------------------------------------------
TIME(HRS) VOLUME(AF)   Q(CFS) 0.      200.0     400.0     600.0     800.0
---------------------------------------------------------------------------
  3.917     13.9135     77.44  .  Q  V   .         .         .         .
  4.000     14.4668     80.35  .   Q V   .         .         .         .
  4.083     15.0396     83.17  .   Q  V  .         .         .         .
  4.167     15.6332     86.20  .   Q  V  .         .         .         .
  4.250     16.2491     89.43  .   Q  V  .         .         .         .
  4.333     16.8901     93.07  .   Q  V  .         .         .         .
  4.417     17.5598     97.24  .   Q   V .         .         .         .
  4.500     18.2594    101.58  .    Q  V .         .         .         .
  4.583     18.9888    105.91  .    Q  V .         .         .         .
  4.667     19.7475    110.16  .    Q   V.         .         .         .
  4.750     20.5345    114.27  .    Q   V.         .         .         .
  4.833     21.3505    118.48  .    Q   V.         .         .         .
  4.917     22.1965    122.84  .     Q   V         .         .         .
  5.000     23.0725    127.20  .     Q   V         .         .         .
  5.083     24.0192    137.45  .     Q   .V        .         .         .
  5.167     25.1515    164.42  .       Q .V        .         .         .
  5.250     26.6446    216.80  .         Q V       .         .         .
  5.333     28.7465    305.20  .         .  V Q    .         .         .
  5.417     31.6587    422.85  .         .   V     .Q        .         .
  5.500     35.5234    561.15  .         .     V   .       Q .         .
  5.583     40.1900    677.60  .         .       V .         .  Q      .
  5.667     45.2803    739.11  .         .         .V        .     Q   .
  5.750     50.3169    731.32  .         .         .  V      .     Q   .
  5.833     54.3869    590.96  .         .         .    V   Q.         .
  5.917     57.4635    446.73  .         .         . Q   V   .         .
  6.000     59.9097    355.19  .         .      Q  .       V .         .
  6.083     61.9240    292.47  .         .   Q     .       V .         .
  6.167     63.6854    255.75  .         . Q       .        V.         .
  6.250     65.2383    225.48  .         .Q        .         V         .
  6.333     66.6167    200.15  .         Q         .         .V        .
  6.417     67.8548    179.78  .       Q .         .         .V        .
  6.500     68.9777    163.05  .       Q .         .         . V       .
  6.583     69.9910    147.13  .      Q  .         .         . V       .
  6.667     70.9154    134.22  .     Q   .         .         .  V      .
  6.750     71.7735    124.60  .     Q   .         .         .  V      .
  6.833     72.5693    115.54  .    Q    .         .         .  V      .
  6.917     73.3044    106.74  .    Q    .         .         .   V     .
  7.000     73.9904     99.61  .   Q     .         .         .   V     .
  7.083     74.6284     92.64  .   Q     .         .         .   V     .
  7.167     75.2172     85.49  .   Q     .         .         .    V    .
  7.250     75.7610     78.95  .  Q      .         .         .    V    .
  7.333     76.2717     74.15  .  Q      .         .         .    V    .
  7.417     76.7501     69.47  .  Q      .         .         .    V    .
  7.500     77.2091     66.64  .  Q      .         .         .     V   .
  7.583     77.6456     63.39  .  Q      .         .         .     V   .
  7.667     78.0653     60.93  .  Q      .         .         .     V   .
  7.750     78.4697     58.73  . Q       .         .         .     V   .
  7.833     78.8559     56.07  . Q       .         .         .     V   .
  7.917     79.2283     54.07  . Q       .         .         .      V  .
  8.000     79.5878     52.21  . Q       .         .         .      V  .

---------------------------------------------------------------------------
TIME(HRS) VOLUME(AF)   Q(CFS) 0.      200.0     400.0     600.0     800.0
---------------------------------------------------------------------------
  8.083     79.9305     49.75  . Q       .         .         .      V  .
  8.167     80.2569     47.40  . Q       .         .         .      V  .
  8.250     80.5719     45.73  . Q       .         .         .      V  .
  8.333     80.8733     43.77  . Q       .         .         .      V  .
  8.417     81.1561     41.06  . Q       .         .         .      V  .
  8.500     81.4247     39.00  .Q        .         .         .       V .
  8.583     81.6823     37.41  .Q        .         .         .       V .
  8.667     81.9276     35.61  .Q        .         .         .       V .
  8.750     82.1576     33.40  .Q        .         .         .       V .
  8.833     82.3716     31.08  .Q        .         .         .       V .
  8.917     82.5780     29.96  .Q        .         .         .       V .
  9.000     82.7762     28.78  .Q        .         .         .       V .
  9.083     82.9649     27.41  .Q        .         .         .       V .
  9.167     83.1426     25.80  .Q        .         .         .       V .
  9.250     83.3066     23.81  .Q        .         .         .       V .
  9.333     83.4583     22.04  .Q        .         .         .        V.
  9.417     83.6067     21.54  .Q        .         .         .        V.
  9.500     83.7512     20.99  .Q        .         .         .        V.
  9.583     83.8881     19.88  Q         .         .         .        V.
  9.667     84.0137     18.24  Q         .         .         .        V.
  9.750     84.1255     16.23  Q         .         .         .        V.
  9.833     84.2205     13.80  Q         .         .         .        V.
  9.917     84.2940     10.66  Q         .         .         .        V.
 10.000     84.3469      7.68  Q         .         .         .        V.
 10.083     84.3971      7.29  Q         .         .         .        V.
 10.167     84.4462      7.13  Q         .         .         .        V.
 10.250     84.4945      7.01  Q         .         .         .        V.
 10.333     84.5421      6.91  Q         .         .         .        V.
 10.417     84.5889      6.81  Q         .         .         .        V.
 10.500     84.6353      6.74  Q         .         .         .        V.
 10.583     84.6813      6.67  Q         .         .         .        V.
 10.667     84.7267      6.59  Q         .         .         .        V.
 10.750     84.7717      6.53  Q         .         .         .        V.
 10.833     84.8161      6.45  Q         .         .         .        V.
 10.917     84.8601      6.39  Q         .         .         .        V.
 11.000     84.9035      6.30  Q         .         .         .        V.
 11.083     84.9463      6.21  Q         .         .         .        V.
 11.167     84.9885      6.13  Q         .         .         .        V.
 11.250     85.0299      6.02  Q         .         .         .        V.
 11.333     85.0707      5.93  Q         .         .         .        V.
```

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 11.417     85.1109      5.83  Q          .          .          .         V.
 11.500     85.1504      5.73  Q          .          .          .         V.
 11.583     85.1892      5.63  Q          .          .          .         V.
 11.667     85.2272      5.52  Q          .          .          .         V.
 11.750     85.2645      5.41  Q          .          .          .         V.
 11.833     85.3010      5.30  Q          .          .          .         V.
 11.917     85.3367      5.19  Q          .          .          .         V.
 12.000     85.3709      4.95  Q          .          .          .         V.
 12.083     85.4018      4.50  Q          .          .          .         V.
 12.167     85.4285      3.87  Q          .          .          .         V.

----------------------------------------------------------------------------
TIME(HRS) VOLUME(AF)   Q(CFS) 0.      200.0     400.0     600.0     800.0
----------------------------------------------------------------------------
 12.250     85.4498      3.10  Q          .          .          .         V.
 12.333     85.4646      2.15  Q          .          .          .         V.
 12.417     85.4706      0.87  Q          .          .          .         V.
 12.500     85.4716      0.15  Q          .          .          .         V.
 12.583     85.4723      0.09  Q          .          .          .         V.
 12.667     85.4727      0.06  Q          .          .          .         V.
 12.750     85.4729      0.03  Q          .          .          .         V.
 12.833     85.4730      0.02  Q          .          .          .          V
 12.917     85.4730      0.00  Q          .          .          .          V
-------------------------------------------------------------------------------
```

```
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                 Duration
       Peak Flow Rate                      (minutes)
   =======================                 =========
             0%                              775.0
            10%                              215.0
            20%                               85.0
            30%                               60.0
            40%                               45.0
            50%                               35.0
            60%                               30.0
            70%                               25.0
            80%                               15.0
            90%                               15.0
============================================================================
```

END OF FLOODSCx ROUTING ANALYSIS

****

F L O O D   R O U T I N G   A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
(RCFC&WCD) 1978 HYDROLOGY MANUAL

(Synthetic Unit Hydrograph Version 21.0)
Release Date: 06/01/2014 License ID 1419

Analysis prepared by:

************************** DESCRIPTION OF STUDY **************************
* 10 YR - 6 HR *
* US GYPSUM - PROPOSED CONDITION *
* 9369 - 1/17/17 - JO *
****

FILE NAME: TOTAL2.DAT
TIME/DATE OF STUDY: 09:17 01/17/2017

****
FLOW PROCESS FROM NODE   1.00 TO NODE   2.00 IS CODE =   1

>>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==

(UNIT-HYDROGRAPH ADDED TO STREAM #1)

WATERCOURSE LENGTH =   29227.000 FEET
LENGTH FROM CONCENTRATION POINT TO CENTROID =   14259.000 FEET
ELEVATION VARIATION ALONG WATERCOURSE =   1478.000 FEET
BASIN FACTOR = 0.020
WATERSHED AREA =   3881.000 ACRES
BASEFLOW =   0.000 CFS/SQUARE-MILE
WATERCOURSE "LAG" TIME =   0.464 HOURS
CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
MOUNTAIN S-GRAPH SELECTED
UNIFORM MEAN SOIL-LOSS(INCH/HOUR) = 0.236
LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
USER-ENTERED RAINFALL = 1.51 INCHES
RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9891

UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 17.958

==

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	2.015	945.769
2	7.502	2575.395
3	16.876	4399.666
4	30.805	6537.602
5	41.889	5202.379
6	49.415	3532.752
7	54.792	2523.725
8	58.725	1845.581
9	62.224	1642.708
10	65.149	1372.467
11	67.766	1228.707
12	70.065	1078.935
13	72.219	1010.701
14	74.021	846.150
15	75.666	772.082
16	77.196	718.096
17	78.594	655.874
18	79.870	598.855
19	81.082	569.094
20	82.218	533.335
21	83.197	459.371
22	84.129	437.316
23	84.936	378.919
24	85.733	374.020
25	86.470	345.842
26	87.174	330.576
27	87.874	328.589
28	88.521	303.626
29	89.151	295.866
30	89.781	295.254
31	90.364	273.711
32	90.921	261.361

33	91.478	261.461
34	92.019	254.313
35	92.492	221.849
36	92.955	217.459
37	93.419	217.459
38	93.879	216.134
39	94.265	181.216
40	94.621	166.921
41	94.977	166.925
42	95.332	166.821
43	95.688	167.025
44	96.025	158.141
45	96.290	124.451
46	96.548	121.186
47	96.807	121.390
48	97.065	121.186
49	97.324	121.390
50	97.582	121.286
51	97.840	121.082
52	98.026	87.188
53	98.097	33.489
54	98.168	33.281
55	98.238	33.077
56	98.309	33.081
57	98.379	33.077
58	98.450	33.077
59	98.521	33.285
60	98.591	32.873
61	98.662	33.281
62	98.732	32.876
63	98.803	33.281
64	98.873	33.081
65	98.944	33.077
66	99.014	33.077
67	99.085	33.077
68	99.155	33.077
69	99.226	33.077
70	99.296	33.077
71	99.366	33.077
72	99.437	33.077
73	99.507	33.077
74	99.578	33.077
75	99.648	33.077
76	99.719	33.077
77	99.789	33.077
78	99.860	33.077
79	99.930	33.077
80	100.000	32.726

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0075	0.0067	0.0007
2	0.0090	0.0081	0.0009
3	0.0090	0.0081	0.0009
4	0.0090	0.0081	0.0009
5	0.0090	0.0081	0.0009
6	0.0105	0.0094	0.0010
7	0.0105	0.0094	0.0010
8	0.0105	0.0094	0.0010
9	0.0105	0.0094	0.0010
10	0.0105	0.0094	0.0010
11	0.0105	0.0094	0.0010
12	0.0119	0.0108	0.0012
13	0.0119	0.0108	0.0012
14	0.0119	0.0108	0.0012
15	0.0119	0.0108	0.0012
16	0.0119	0.0108	0.0012
17	0.0119	0.0108	0.0012
18	0.0119	0.0108	0.0012
19	0.0119	0.0108	0.0012
20	0.0119	0.0108	0.0012
21	0.0119	0.0108	0.0012
22	0.0119	0.0108	0.0012
23	0.0119	0.0108	0.0012
24	0.0134	0.0121	0.0013
25	0.0119	0.0108	0.0012
26	0.0134	0.0121	0.0013
27	0.0134	0.0121	0.0013
28	0.0134	0.0121	0.0013
29	0.0134	0.0121	0.0013
30	0.0134	0.0121	0.0013
31	0.0134	0.0121	0.0013
32	0.0134	0.0121	0.0013
33	0.0149	0.0134	0.0015
34	0.0149	0.0134	0.0015
35	0.0149	0.0134	0.0015
36	0.0149	0.0134	0.0015
37	0.0149	0.0134	0.0015
38	0.0164	0.0148	0.0016
39	0.0164	0.0148	0.0016
40	0.0164	0.0148	0.0016
41	0.0179	0.0161	0.0018
42	0.0194	0.0175	0.0019
43	0.0209	0.0188	0.0021

44	0.0209	0.0188	0.0021
45	0.0224	0.0196	0.0028
46	0.0224	0.0196	0.0028
47	0.0239	0.0196	0.0043
48	0.0239	0.0196	0.0043
49	0.0254	0.0196	0.0058
50	0.0269	0.0196	0.0072
51	0.0284	0.0196	0.0087
52	0.0299	0.0196	0.0102
53	0.0314	0.0196	0.0117
54	0.0314	0.0196	0.0117
55	0.0329	0.0196	0.0132
56	0.0344	0.0196	0.0147
57	0.0358	0.0196	0.0162
58	0.0358	0.0196	0.0162
59	0.0373	0.0196	0.0177
60	0.0388	0.0196	0.0192
61	0.0463	0.0196	0.0267
62	0.0538	0.0196	0.0341
63	0.0582	0.0196	0.0386
64	0.0627	0.0196	0.0431
65	0.0702	0.0196	0.0506
66	0.0836	0.0196	0.0640
67	0.0284	0.0196	0.0087
68	0.0134	0.0121	0.0013
69	0.0090	0.0081	0.0009
70	0.0075	0.0067	0.0007
71	0.0045	0.0040	0.0004
72	0.0030	0.0027	0.0003

TOTAL STORM RAINFALL(INCHES) = 1.49
TOTAL SOIL-LOSS(INCHES) = 1.00
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.49

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 323.4124
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 159.5338

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6 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	350.0	700.0	1050.0	1400.0
0.083	0.0049	0.71	Q	.	.	.	.
0.167	0.0239	2.77	Q	.	.	.	.
0.250	0.0683	6.44	Q	.	.	.	.
0.333	0.1508	11.98	Q	.	.	.	.
0.417	0.2668	16.84	Q	.	.	.	.
0.500	0.4073	20.40	Q	.	.	.	.
0.583	0.5670	23.19	Q	.	.	.	.
0.667	0.7434	25.61	Q	.	.	.	.
0.750	0.9368	28.09	Q	.	.	.	.
0.833	1.1443	30.13	Q	.	.	.	.
0.917	1.3632	31.78	Q	.	.	.	.
1.000	1.5925	33.29	Q	.	.	.	.
1.083	1.8326	34.87	Q	.	.	.	.
1.167	2.0843	36.55	VQ	.	.	.	.
1.250	2.3491	38.44	VQ	.	.	.	.
1.333	2.6249	40.05	VQ	.	.	.	.
1.417	2.9095	41.33	VQ	.	.	.	.
1.500	3.2016	42.41	VQ	.	.	.	.
1.583	3.5000	43.32	VQ	.	.	.	.
1.667	3.8042	44.17	VQ	.	.	.	.
1.750	4.1134	44.90	.Q	.	.	.	.
1.833	4.4273	45.58	.Q	.	.	.	.
1.917	4.7453	46.18	.Q	.	.	.	.
2.000	5.0683	46.89	.Q	.	.	.	.
2.083	5.3965	47.65	.Q	.	.	.	.
2.167	5.7308	48.55	.Q	.	.	.	.
2.250	6.0733	49.72	.Q	.	.	.	.
2.333	6.4218	50.61	.Q	.	.	.	.
2.417	6.7782	51.75	.Q	.	.	.	.
2.500	7.1417	52.78	.Q	.	.	.	.
2.583	7.5107	53.58	.Q	.	.	.	.
2.667	7.8845	54.28	.Q	.	.	.	.
2.750	8.2633	55.00	.QV	.	.	.	.
2.833	8.6486	55.94	.QV	.	.	.	.
2.917	9.0417	57.08	.QV	.	.	.	.
3.000	9.4448	58.52	.QV	.	.	.	.
3.083	9.8560	59.72	.QV	.	.	.	.
3.167	10.2748	60.81	.QV	.	.	.	.
3.250	10.7014	61.94	.QV	.	.	.	.
3.333	11.1367	63.21	.QV	.	.	.	.
3.417	11.5837	64.90	.QV	.	.	.	.
3.500	12.0432	66.72	.Q V	.	.	.	.
3.583	12.5178	68.92	.Q V	.	.	.	.
3.667	13.0120	71.76	. QV	.	.	.	.
3.750	13.5319	75.49	. QV	.	.	.	.
3.833	14.0837	80.12	. QV	.	.	.	.

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	350.0	700.0	1050.0	1400.0

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---------------------------------------------------------------------------
   3.917     14.6812     86.75  . QV      .         .         .         .
   4.000     15.3473     96.72  . QV      .         .         .         .
   4.083     16.1022    109.61  .  QV     .         .         .         .
   4.167     16.9851    128.20  .  QV     .         .         .         .
   4.250     18.0220    150.56  .   Q     .         .         .         .
   4.333     19.2589    179.60  .   VQ    .         .         .         .
   4.417     20.7372    214.64  .    VQ   .         .         .         .
   4.500     22.4746    252.27  .    V Q  .         .         .         .
   4.583     24.4772    290.78  .     V Q .         .         .         .
   4.667     26.7413    328.75  .     V  Q.         .         .         .
   4.750     29.2597    365.68  .      V  Q         .         .         .
   4.833     32.0479    404.85  .       V .Q        .         .         .
   4.917     35.1178    445.74  .       V . Q       .         .         .
   5.000     38.4697    486.71  .        V.  Q      .         .         .
   5.083     42.1369    532.48  .         V    Q    .         .         .
   5.167     46.2488    597.05  .         .V     Q  .         .         .
   5.250     50.9939    688.98  .         . V      Q.         .         .
   5.333     56.6064    814.94  .         .   V     .  Q      .         .
   5.417     63.2439    963.76  .         .    V    .      Q  .         .
   5.500     71.0174   1128.72  .         .      V  .         . Q       .
   5.583     79.6821   1258.11  .         .        V.         .    Q    .
   5.667     88.6572   1303.18  .         .         . V       .      Q  .
   5.750     97.1529   1233.58  .         .         .   V     .    Q    .
   5.833    103.9623    988.73  .         .         .     V Q .         .
   5.917    109.2136    762.48  .         .         .Q     V  .         .
   6.000    113.4329    612.64  .         .      Q  .       V .         .
   6.083    116.9806    515.13  .         .   Q     .        V.         .
   6.167    120.1053    453.70  .         . Q       .         V         .
   6.250    122.8649    400.70  .         .Q        .         V         .
   6.333    125.3379    359.08  .         Q         .         .V        .
   6.417    127.5663    323.56  .        Q.         .         .V        .
   6.500    129.5941    294.45  .       Q .         .         . V       .
   6.583    131.4291    266.43  .      Q  .         .         . V       .
   6.667    133.1210    245.66  .      Q  .         .         .  V      .
   6.750    134.6889    227.66  .     Q   .         .         .  V      .
   6.833    136.1415    210.92  .     Q   .         .         .   V     .
   6.917    137.4902    195.84  .    Q    .         .         .   V     .
   7.000    138.7486    182.72  .    Q    .         .         .   V     .
   7.083    139.9189    169.93  .   Q     .         .         .    V    .
   7.167    141.0036    157.49  .   Q     .         .         .    V    .
   7.250    142.0245    148.24  .   Q     .         .         .    V    .
   7.333    142.9851    139.48  .  Q      .         .         .    V    .
   7.417    143.9037    133.39  .  Q      .         .         .     V   .
   7.500    144.7795    127.16  .  Q      .         .         .     V   .
   7.583    145.6188    121.86  .  Q      .         .         .     V   .
   7.667    146.4252    117.09  .  Q      .         .         .     V   .
   7.750    147.1952    111.81  .  Q      .         .         .     V   .
   7.833    147.9352    107.44  .  Q      .         .         .      V  .
   7.917    148.6447    103.03  . Q       .         .         .      V  .
   8.000    149.3192     97.93  . Q       .         .         .      V  .

---------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      350.0     700.0    1050.0    1400.0
---------------------------------------------------------------------------
   8.083    149.9633     93.52  . Q       .         .         .      V  .
   8.167    150.5804     89.60  . Q       .         .         .      V  .
   8.250    151.1657     84.99  . Q       .         .         .      V  .
   8.333    151.7155     79.83  . Q       .         .         .       V .
   8.417    152.2390     76.01  . Q       .         .         .       V .
   8.500    152.7369     72.30  . Q       .         .         .       V .
   8.583    153.2060     68.11  .Q        .         .         .       V .
   8.667    153.6411     63.18  .Q        .         .         .       V .
   8.750    154.0516     59.60  .Q        .         .         .       V .
   8.833    154.4422     56.72  .Q        .         .         .       V .
   8.917    154.8115     53.61  .Q        .         .         .       V .
   9.000    155.1570     50.17  .Q        .         .         .       V .
   9.083    155.4756     46.26  .Q        .         .         .       V .
   9.167    155.7671     42.33  .Q        .         .         .        V.
   9.250    156.0437     40.16  .Q        .         .         .        V.
   9.333    156.3060     38.09  .Q        .         .         .        V.
   9.417    156.5497     35.39  .Q        .         .         .        V.
   9.500    156.7711     32.15  Q         .         .         .        V.
   9.583    156.9676     28.52  Q         .         .         .        V.
   9.667    157.1357     24.40  Q         .         .         .        V.
   9.750    157.2696     19.45  Q         .         .         .        V.
   9.833    157.3774     15.64  Q         .         .         .        V.
   9.917    157.4810     15.05  Q         .         .         .        V.
  10.000    157.5835     14.88  Q         .         .         .        V.
  10.083    157.6851     14.75  Q         .         .         .        V.
  10.167    157.7858     14.63  Q         .         .         .        V.
  10.250    157.8859     14.53  Q         .         .         .        V.
  10.333    157.9854     14.44  Q         .         .         .        V.
  10.417    158.0841     14.34  Q         .         .         .        V.
  10.500    158.1823     14.26  Q         .         .         .        V.
  10.583    158.2794     14.11  Q         .         .         .        V.
  10.667    158.3757     13.98  Q         .         .         .        V.
  10.750    158.4706     13.78  Q         .         .         .        V.
  10.833    158.5638     13.53  Q         .         .         .        V.
  10.917    158.6550     13.24  Q         .         .         .        V.
  11.000    158.7439     12.91  Q         .         .         .        V.
  11.083    158.8301     12.52  Q         .         .         .        V.
  11.167    158.9136     12.13  Q         .         .         .        V.
  11.250    158.9942     11.69  Q         .         .         .        V.
  11.333    159.0713     11.20  Q         .         .         .        V.
  11.417    159.1448     10.67  Q         .         .         .        V.
  11.500    159.2146     10.13  Q         .         .         .        V.
  11.583    159.2803      9.54  Q         .         .         .        V.
  11.667    159.3416      8.91  Q         .         .         .        V.
```

```
 11.750    159.3969      8.02  Q          .         .         .        V.
 11.833    159.4443      6.89  Q          .         .         .        V.
 11.917    159.4830      5.61  Q          .         .         .        V.
 12.000    159.5118      4.18  Q          .         .         .        V.
 12.083    159.5291      2.51  Q          .         .         .        V.
 12.167    159.5319      0.41  Q          .         .         .        V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      350.0     700.0    1050.0    1400.0
----------------------------------------------------------------------------
 12.250    159.5328      0.12  Q          .         .         .        V.
 12.333    159.5333      0.08  Q          .         .         .        V.
 12.417    159.5336      0.05  Q          .         .         .        V.
 12.500    159.5338      0.02  Q          .         .         .        V.
 12.583    159.5339      0.01  Q          .         .         .         V
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                Duration
       Peak Flow Rate                     (minutes)
   =======================                =========
             0%                             755.0
            10%                             195.0
            20%                             125.0
            30%                              90.0
            40%                              60.0
            50%                              45.0
            60%                              35.0
            70%                              30.0
            80%                              20.0
            90%                              15.0
============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
```

```
****************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                     (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2014 Advanced Engineering Software (aes)
                (Synthetic Unit Hydrograph Version 21.0)
                 Release Date: 06/01/2014  License ID 1419

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 5 YR - 6 HR                                                              *
* US GYPSUM - PROPOSED CONDITION                                           *
* 9369 - 1/17/17 - JO                                                      *
 **************************************************************************

  FILE NAME: TOTAL2.DAT
  TIME/DATE OF STUDY: 09:11 01/17/2017


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   29227.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   14259.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1478.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    3881.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.464 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  1.20 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9891


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  17.958


============================================================================
                      UNIT HYDROGRAPH DETERMINATION
----------------------------------------------------------------------------
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	2.015	945.769
2	7.502	2575.395
3	16.876	4399.666
4	30.805	6537.602
5	41.889	5202.379
6	49.415	3532.752
7	54.792	2523.725
8	58.725	1845.581
9	62.224	1642.708
10	65.149	1372.467
11	67.766	1228.707
12	70.065	1078.935
13	72.219	1010.701
14	74.021	846.150
15	75.666	772.082
16	77.196	718.096
17	78.594	655.874
18	79.870	598.855
19	81.082	569.094
20	82.218	533.335
21	83.197	459.371
22	84.129	437.316
23	84.936	378.919
24	85.733	374.020
25	86.470	345.842
26	87.174	330.576
27	87.874	328.589
28	88.521	303.626
29	89.151	295.866
30	89.781	295.254
31	90.364	273.711
32	90.921	261.361

33	91.478	261.461
34	92.019	254.313
35	92.492	221.849
36	92.955	217.459
37	93.419	217.459
38	93.879	216.134
39	94.265	181.216
40	94.621	166.921
41	94.977	166.925
42	95.332	166.821
43	95.688	167.025
44	96.025	158.141
45	96.290	124.451
46	96.548	121.186
47	96.807	121.390
48	97.065	121.186
49	97.324	121.390
50	97.582	121.286
51	97.840	121.082
52	98.026	87.188
53	98.097	33.489
54	98.168	33.281
55	98.238	33.077
56	98.309	33.081
57	98.379	33.077
58	98.450	33.077
59	98.521	33.285
60	98.591	32.873
61	98.662	33.281
62	98.732	32.876
63	98.803	33.281
64	98.873	33.081
65	98.944	33.077
66	99.014	33.077
67	99.085	33.077
68	99.155	33.077
69	99.226	33.077
70	99.296	33.077
71	99.366	33.077
72	99.437	33.077
73	99.507	33.077
74	99.578	33.077
75	99.648	33.077
76	99.719	33.077
77	99.789	33.077
78	99.860	33.077
79	99.930	33.077
80	100.000	32.726

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0059	0.0053	0.0006
2	0.0071	0.0064	0.0007
3	0.0071	0.0064	0.0007
4	0.0071	0.0064	0.0007
5	0.0071	0.0064	0.0007
6	0.0083	0.0075	0.0008
7	0.0083	0.0075	0.0008
8	0.0083	0.0075	0.0008
9	0.0083	0.0075	0.0008
10	0.0083	0.0075	0.0008
11	0.0083	0.0075	0.0008
12	0.0095	0.0085	0.0009
13	0.0095	0.0085	0.0009
14	0.0095	0.0085	0.0009
15	0.0095	0.0085	0.0009
16	0.0095	0.0085	0.0009
17	0.0095	0.0085	0.0009
18	0.0095	0.0085	0.0009
19	0.0095	0.0085	0.0009
20	0.0095	0.0085	0.0009
21	0.0095	0.0085	0.0009
22	0.0095	0.0085	0.0009
23	0.0095	0.0085	0.0009
24	0.0107	0.0096	0.0011
25	0.0095	0.0085	0.0009
26	0.0107	0.0096	0.0011
27	0.0107	0.0096	0.0011
28	0.0107	0.0096	0.0011
29	0.0107	0.0096	0.0011
30	0.0107	0.0096	0.0011
31	0.0107	0.0096	0.0011
32	0.0107	0.0096	0.0011
33	0.0119	0.0107	0.0012
34	0.0119	0.0107	0.0012
35	0.0119	0.0107	0.0012
36	0.0119	0.0107	0.0012
37	0.0119	0.0107	0.0012
38	0.0131	0.0118	0.0013
39	0.0131	0.0118	0.0013
40	0.0131	0.0118	0.0013
41	0.0142	0.0128	0.0014
42	0.0154	0.0139	0.0015
43	0.0166	0.0150	0.0017

```
         44            0.0166           0.0150              0.0017
         45            0.0178           0.0160              0.0018
         46            0.0178           0.0160              0.0018
         47            0.0190           0.0171              0.0019
         48            0.0190           0.0171              0.0019
         49            0.0202           0.0182              0.0020
         50            0.0214           0.0192              0.0021
         51            0.0226           0.0196              0.0029
         52            0.0237           0.0196              0.0041
         53            0.0249           0.0196              0.0053
         54            0.0249           0.0196              0.0053
         55            0.0261           0.0196              0.0065
         56            0.0273           0.0196              0.0077
         57            0.0285           0.0196              0.0089
         58            0.0285           0.0196              0.0089
         59            0.0297           0.0196              0.0100
         60            0.0309           0.0196              0.0112
         61            0.0368           0.0196              0.0172
         62            0.0427           0.0196              0.0231
         63            0.0463           0.0196              0.0267
         64            0.0498           0.0196              0.0302
         65            0.0558           0.0196              0.0362
         66            0.0665           0.0196              0.0468
         67            0.0226           0.0196              0.0029
         68            0.0107           0.0096              0.0011
         69            0.0071           0.0064              0.0007
         70            0.0059           0.0053              0.0006
         71            0.0036           0.0032              0.0004
         72            0.0024           0.0021              0.0002

        TOTAL STORM RAINFALL(INCHES) =  1.19
        TOTAL SOIL-LOSS(INCHES) =  0.87
        TOTAL EFFECTIVE RAINFALL(INCHES) =  0.31

----------------------------------------------------------------------------
     TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =      282.4119
     TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =      101.3996
----------------------------------------------------------------------------

============================================================================

                          6 - H O U R   S T O R M
                    R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      225.0     450.0     675.0     900.0
----------------------------------------------------------------------------
   0.083     0.0039     0.56  Q         .         .         .         .
   0.167     0.0190     2.20  Q         .         .         .         .
   0.250     0.0543     5.12  Q         .         .         .         .
   0.333     0.1198     9.52  Q         .         .         .         .
   0.417     0.2120    13.38  Q         .         .         .         .
   0.500     0.3237    16.21  Q         .         .         .         .
   0.583     0.4506    18.43  Q         .         .         .         .
   0.667     0.5908    20.35  Q         .         .         .         .
   0.750     0.7445    22.32  Q         .         .         .         .
   0.833     0.9094    23.95  VQ        .         .         .         .
   0.917     1.0834    25.26  VQ        .         .         .         .
   1.000     1.2656    26.46  VQ        .         .         .         .
   1.083     1.4564    27.71  VQ        .         .         .         .
   1.167     1.6564    29.05  VQ        .         .         .         .
   1.250     1.8668    30.55  VQ        .         .         .         .
   1.333     2.0860    31.83  VQ        .         .         .         .
   1.417     2.3122    32.85  VQ        .         .         .         .
   1.500     2.5443    33.70  .Q        .         .         .         .
   1.583     2.7814    34.43  .Q        .         .         .         .
   1.667     3.0232    35.10  .Q        .         .         .         .
   1.750     3.2689    35.68  .Q        .         .         .         .
   1.833     3.5184    36.22  .Q        .         .         .         .
   1.917     3.7711    36.70  .Q        .         .         .         .
   2.000     4.0278    37.26  .Q        .         .         .         .
   2.083     4.2886    37.87  .Q        .         .         .         .
   2.167     4.5543    38.58  .Q        .         .         .         .
   2.250     4.8264    39.51  .Q        .         .         .         .
   2.333     5.1034    40.22  .QV       .         .         .         .
   2.417     5.3867    41.12  .QV       .         .         .         .
   2.500     5.6755    41.94  .QV       .         .         .         .
   2.583     5.9688    42.58  .QV       .         .         .         .
   2.667     6.2658    43.14  .QV       .         .         .         .
   2.750     6.5669    43.71  .QV       .         .         .         .
   2.833     6.8730    44.46  .QV       .         .         .         .
   2.917     7.1855    45.36  . Q       .         .         .         .
   3.000     7.5058    46.51  . Q       .         .         .         .
   3.083     7.8326    47.46  . QV      .         .         .         .
   3.167     8.1654    48.32  . QV      .         .         .         .
   3.250     8.5044    49.22  . QV      .         .         .         .
   3.333     8.8504    50.23  . QV      .         .         .         .
   3.417     9.2056    51.57  . QV      .         .         .         .
   3.500     9.5707    53.02  . QV      .         .         .         .
   3.583     9.9479    54.77  . QV      .         .         .         .
   3.667    10.3407    57.03  . Q V     .         .         .         .
   3.750    10.7511    59.60  . Q V     .         .         .         .
   3.833    11.1794    62.19  . Q V     .         .         .         .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      225.0     450.0     675.0     900.0
```

```
---------------------------------------------------------------------------
   3.917     11.6243     64.60  . Q V     .         .         .         .
   4.000     12.0859     67.02  . Q V     .         .         .         .
   4.083     12.5636     69.37  .  QV     .         .         .         .
   4.167     13.0589     71.91  .  Q V    .         .         .         .
   4.250     13.5770     75.23  .  Q V    .         .         .         .
   4.333     14.1350     81.03  .  Q V    .         .         .         .
   4.417     14.7629     91.17  .   QV    .         .         .         .
   4.500     15.4966    106.54  .   Q V   .         .         .         .
   4.583     16.3664    126.29  .    QV   .         .         .         .
   4.667     17.3887    148.44  .     Q   .         .         .         .
   4.750     18.5685    171.30  .      Q  .         .         .         .
   4.833     19.9249    196.96  .      VQ .         .         .         .
   4.917     21.4718    224.60  .       VQ.         .         .         .
   5.000     23.2138    252.93  .        V.Q       .         .         .
   5.083     25.1798    285.48  .        V. Q      .         .         .
   5.167     27.4756    333.35  .         V   Q     .         .         .
   5.250     30.2534    403.33  .         .V     Q  .         .         .
   5.333     33.7013    500.63  .         .  V      . Q       .         .
   5.417     37.9459    616.32  .         .   V     .      Q  .         .
   5.500     43.0769    745.03  .         .     V   .         .  Q      .
   5.583     48.9012    845.69  .         .        V.         .      Q  .
   5.667     54.9844    883.28  .         .         .V        .        Q.
   5.750     60.7454    836.50  .         .         .  V      .      Q  .
   5.833     65.2766    657.94  .         .         .    V   Q.         .
   5.917     68.7403    502.93  .         .         . Q    V  .         .
   6.000     71.5182    403.35  .         .      Q  .       V .         .
   6.083     73.8509    338.70  .         .    Q    .        V.         .
   6.167     75.9083    298.74  .         .  Q      .        V.         .
   6.250     77.7180    262.78  .         .Q        .         V         .
   6.333     79.3371    235.09  .         Q         .         .V        .
   6.417     80.7918    211.22  .        Q.         .         .V        .
   6.500     82.1133    191.89  .       Q .         .         . V       .
   6.583     83.3040    172.88  .      Q  .         .         . V       .
   6.667     84.4017    159.39  .      Q  .         .         .  V      .
   6.750     85.4175    147.50  .     Q   .         .         .  V      .
   6.833     86.3564    136.32  .     Q   .         .         .   V     .
   6.917     87.2263    126.31  .    Q    .         .         .   V     .
   7.000     88.0366    117.66  .    Q    .         .         .   V     .
   7.083     88.7879    109.09  .   Q     .         .         .    V    .
   7.167     89.4814    100.69  .   Q     .         .         .    V    .
   7.250     90.1338     94.73  .   Q     .         .         .    V    .
   7.333     90.7462     88.92  .  Q      .         .         .    V    .
   7.417     91.3328     85.18  .  Q      .         .         .     V   .
   7.500     91.8915     81.11  .  Q      .         .         .     V   .
   7.583     92.4273     77.80  .  Q      .         .         .     V   .
   7.667     92.9425     74.81  .  Q      .         .         .     V   .
   7.750     93.4342     71.40  .  Q      .         .         .     V   .
   7.833     93.9076     68.74  .  Q      .         .         .      V  .
   7.917     94.3619     65.97  . Q       .         .         .      V  .
   8.000     94.7933     62.63  . Q       .         .         .      V  .

---------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      225.0     450.0     675.0     900.0
---------------------------------------------------------------------------
   8.083     95.2056     59.87  . Q       .         .         .      V  .
   8.167     95.6012     57.44  . Q       .         .         .      V  .
   8.250     95.9763     54.47  . Q       .         .         .      V  .
   8.333     96.3283     51.10  . Q       .         .         .      V  .
   8.417     96.6648     48.86  . Q       .         .         .       V .
   8.500     96.9861     46.66  . Q       .         .         .       V .
   8.583     97.2897     44.07  .Q        .         .         .       V .
   8.667     97.5713     40.89  .Q        .         .         .       V .
   8.750     97.8384     38.79  .Q        .         .         .       V .
   8.833     98.0939     37.09  .Q        .         .         .       V .
   8.917     98.3361     35.17  .Q        .         .         .       V .
   9.000     98.5631     32.97  .Q        .         .         .       V .
   9.083     98.7725     30.40  .Q        .         .         .       V .
   9.167     98.9641     27.81  .Q        .         .         .        V.
   9.250     99.1472     26.59  .Q        .         .         .        V.
   9.333     99.3216     25.32  .Q        .         .         .        V.
   9.417     99.4836     23.53  .Q        .         .         .        V.
   9.500     99.6304     21.31  Q         .         .         .        V.
   9.583     99.7598     18.78  Q         .         .         .        V.
   9.667     99.8690     15.87  Q         .         .         .        V.
   9.750     99.9536     12.29  Q         .         .         .        V.
   9.833    100.0198      9.61  Q         .         .         .        V.
   9.917    100.0843      9.36  Q         .         .         .        V.
  10.000    100.1479      9.23  Q         .         .         .        V.
  10.083    100.2107      9.12  Q         .         .         .        V.
  10.167    100.2729      9.03  Q         .         .         .        V.
  10.250    100.3345      8.95  Q         .         .         .        V.
  10.333    100.3956      8.88  Q         .         .         .        V.
  10.417    100.4563      8.81  Q         .         .         .        V.
  10.500    100.5166      8.76  Q         .         .         .        V.
  10.583    100.5765      8.69  Q         .         .         .        V.
  10.667    100.6360      8.64  Q         .         .         .        V.
  10.750    100.6949      8.56  Q         .         .         .        V.
  10.833    100.7534      8.49  Q         .         .         .        V.
  10.917    100.8112      8.39  Q         .         .         .        V.
  11.000    100.8681      8.26  Q         .         .         .        V.
  11.083    100.9238      8.08  Q         .         .         .        V.
  11.167    100.9782      7.91  Q         .         .         .        V.
  11.250    101.0312      7.69  Q         .         .         .        V.
  11.333    101.0824      7.44  Q         .         .         .        V.
  11.417    101.1316      7.15  Q         .         .         .        V.
  11.500    101.1788      6.85  Q         .         .         .        V.
  11.583    101.2237      6.52  Q         .         .         .        V.
  11.667    101.2660      6.15  Q         .         .         .        V.
```

```
  11.750    101.3044      5.58  Q          .          .          .         V.
  11.833    101.3376      4.81  Q          .          .          .         V.
  11.917    101.3646      3.93  Q          .          .          .         V.
  12.000    101.3848      2.93  Q          .          .          .         V.
  12.083    101.3967      1.73  Q          .          .          .         V.
  12.167    101.3980      0.19  Q          .          .          .         V.

 -----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      225.0      450.0      675.0      900.0
 -----------------------------------------------------------------------------
  12.250    101.3987      0.10  Q          .          .          .         V.
  12.333    101.3991      0.06  Q          .          .          .         V.
  12.417    101.3994      0.04  Q          .          .          .         V.
  12.500    101.3995      0.02  Q          .          .          .         V.
  12.583    101.3996      0.01  Q          .          .          .         V.
--------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	755.0
10%	180.0
20%	105.0
30%	70.0
40%	50.0
50%	40.0
60%	30.0
70%	25.0
80%	20.0
90%	15.0

END OF FLOODSCx ROUTING ANALYSIS

```
****************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2014 Advanced Engineering Software (aes)
                (Synthetic Unit Hydrograph Version 21.0)
                 Release Date: 06/01/2014  License ID 1419

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 2 YR - 6 HR                                                              *
* US GYPSUM - PROPOSED CONDITION                                           *
* 9369 - 1/17/17 - JO                                                      *
 **************************************************************************

  FILE NAME: TOTAL2.DAT
  TIME/DATE OF STUDY: 09:04 01/17/2017


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   29227.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   14259.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1478.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    3881.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.464 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  0.85 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9891


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  17.958


============================================================================
                      UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	2.015	945.769
2	7.502	2575.395
3	16.876	4399.666
4	30.805	6537.602
5	41.889	5202.379
6	49.415	3532.752
7	54.792	2523.725
8	58.725	1845.581
9	62.224	1642.708
10	65.149	1372.467
11	67.766	1228.707
12	70.065	1078.935
13	72.219	1010.701
14	74.021	846.150
15	75.666	772.082
16	77.196	718.096
17	78.594	655.874
18	79.870	598.855
19	81.082	569.094
20	82.218	533.335
21	83.197	459.371
22	84.129	437.316
23	84.936	378.919
24	85.733	374.020
25	86.470	345.842
26	87.174	330.576
27	87.874	328.589
28	88.521	303.626
29	89.151	295.866
30	89.781	295.254
31	90.364	273.711
32	90.921	261.361

33	91.478	261.461
34	92.019	254.313
35	92.492	221.849
36	92.955	217.459
37	93.419	217.459
38	93.879	216.134
39	94.265	181.216
40	94.621	166.921
41	94.977	166.925
42	95.332	166.821
43	95.688	167.025
44	96.025	158.141
45	96.290	124.451
46	96.548	121.186
47	96.807	121.390
48	97.065	121.186
49	97.324	121.390
50	97.582	121.286
51	97.840	121.082
52	98.026	87.188
53	98.097	33.489
54	98.168	33.281
55	98.238	33.077
56	98.309	33.081
57	98.379	33.077
58	98.450	33.077
59	98.521	33.285
60	98.591	32.873
61	98.662	33.281
62	98.732	32.876
63	98.803	33.281
64	98.873	33.081
65	98.944	33.077
66	99.014	33.077
67	99.085	33.077
68	99.155	33.077
69	99.226	33.077
70	99.296	33.077
71	99.366	33.077
72	99.437	33.077
73	99.507	33.077
74	99.578	33.077
75	99.648	33.077
76	99.719	33.077
77	99.789	33.077
78	99.860	33.077
79	99.930	33.077
80	100.000	32.726

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0042	0.0038	0.0004
2	0.0051	0.0046	0.0005
3	0.0051	0.0046	0.0005
4	0.0051	0.0046	0.0005
5	0.0051	0.0046	0.0005
6	0.0059	0.0053	0.0006
7	0.0059	0.0053	0.0006
8	0.0059	0.0053	0.0006
9	0.0059	0.0053	0.0006
10	0.0059	0.0053	0.0006
11	0.0059	0.0053	0.0006
12	0.0067	0.0061	0.0007
13	0.0067	0.0061	0.0007
14	0.0067	0.0061	0.0007
15	0.0067	0.0061	0.0007
16	0.0067	0.0061	0.0007
17	0.0067	0.0061	0.0007
18	0.0067	0.0061	0.0007
19	0.0067	0.0061	0.0007
20	0.0067	0.0061	0.0007
21	0.0067	0.0061	0.0007
22	0.0067	0.0061	0.0007
23	0.0067	0.0061	0.0007
24	0.0076	0.0068	0.0008
25	0.0067	0.0061	0.0007
26	0.0076	0.0068	0.0008
27	0.0076	0.0068	0.0008
28	0.0076	0.0068	0.0008
29	0.0076	0.0068	0.0008
30	0.0076	0.0068	0.0008
31	0.0076	0.0068	0.0008
32	0.0076	0.0068	0.0008
33	0.0084	0.0076	0.0008
34	0.0084	0.0076	0.0008
35	0.0084	0.0076	0.0008
36	0.0084	0.0076	0.0008
37	0.0084	0.0076	0.0008
38	0.0093	0.0084	0.0009
39	0.0093	0.0084	0.0009
40	0.0093	0.0084	0.0009
41	0.0101	0.0091	0.0010
42	0.0110	0.0099	0.0011
43	0.0118	0.0106	0.0012

44	0.0118	0.0106	0.0012
45	0.0127	0.0114	0.0013
46	0.0127	0.0114	0.0013
47	0.0135	0.0121	0.0013
48	0.0135	0.0121	0.0013
49	0.0143	0.0129	0.0014
50	0.0152	0.0137	0.0015
51	0.0160	0.0144	0.0016
52	0.0169	0.0152	0.0017
53	0.0177	0.0159	0.0018
54	0.0177	0.0159	0.0018
55	0.0186	0.0167	0.0019
56	0.0194	0.0175	0.0019
57	0.0202	0.0182	0.0020
58	0.0202	0.0182	0.0020
59	0.0211	0.0190	0.0021
60	0.0219	0.0196	0.0023
61	0.0262	0.0196	0.0065
62	0.0304	0.0196	0.0107
63	0.0329	0.0196	0.0133
64	0.0354	0.0196	0.0158
65	0.0397	0.0196	0.0200
66	0.0472	0.0196	0.0276
67	0.0160	0.0144	0.0016
68	0.0076	0.0068	0.0008
69	0.0051	0.0046	0.0005
70	0.0042	0.0038	0.0004
71	0.0025	0.0023	0.0003
72	0.0017	0.0015	0.0002

```
         TOTAL STORM RAINFALL(INCHES) =  0.84
         TOTAL SOIL-LOSS(INCHES) =  0.69
         TOTAL EFFECTIVE RAINFALL(INCHES) =  0.16

----------------------------------------------------------------------------
    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =     222.0003
    TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =      50.8366
----------------------------------------------------------------------------

============================================================================

                        6 - H O U R   S T O R M
                  R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      125.0     250.0     375.0     500.0
----------------------------------------------------------------------------
   0.083      0.0027      0.40  Q         .         .         .         .
   0.167      0.0135      1.57  Q         .         .         .         .
   0.250      0.0386      3.64  Q         .         .         .         .
   0.333      0.0852      6.77  Q         .         .         .         .
   0.417      0.1507      9.51  Q         .         .         .         .
   0.500      0.2301     11.52  Q         .         .         .         .
   0.583      0.3203     13.10  VQ        .         .         .         .
   0.667      0.4199     14.47  VQ        .         .         .         .
   0.750      0.5292     15.87  VQ        .         .         .         .
   0.833      0.6464     17.02  VQ        .         .         .         .
   0.917      0.7701     17.95  VQ        .         .         .         .
   1.000      0.8996     18.81  VQ        .         .         .         .
   1.083      1.0352     19.70  VQ        .         .         .         .
   1.167      1.1774     20.65  VQ        .         .         .         .
   1.250      1.3270     21.71  .Q        .         .         .         .
   1.333      1.4828     22.62  .Q        .         .         .         .
   1.417      1.6436     23.35  .Q        .         .         .         .
   1.500      1.8086     23.96  .Q        .         .         .         .
   1.583      1.9771     24.47  .Q        .         .         .         .
   1.667      2.1490     24.95  .Q        .         .         .         .
   1.750      2.3237     25.37  .VQ       .         .         .         .
   1.833      2.5010     25.75  .VQ       .         .         .         .
   1.917      2.6806     26.09  . Q       .         .         .         .
   2.000      2.8631     26.49  . Q       .         .         .         .
   2.083      3.0485     26.92  . Q       .         .         .         .
   2.167      3.2374     27.43  . Q       .         .         .         .
   2.250      3.4308     28.09  . Q       .         .         .         .
   2.333      3.6277     28.59  . Q       .         .         .         .
   2.417      3.8290     29.23  . QV      .         .         .         .
   2.500      4.0343     29.81  . QV      .         .         .         .
   2.583      4.2428     30.27  . QV      .         .         .         .
   2.667      4.4540     30.66  . QV      .         .         .         .
   2.750      4.6680     31.07  . QV      .         .         .         .
   2.833      4.8856     31.60  . QV      .         .         .         .
   2.917      5.1077     32.25  . Q V     .         .         .         .
   3.000      5.3353     33.06  . Q V     .         .         .         .
   3.083      5.5677     33.73  . Q V     .         .         .         .
   3.167      5.8043     34.35  . Q V     .         .         .         .
   3.250      6.0452     34.99  . Q V     .         .         .         .
   3.333      6.2911     35.71  . Q V     .         .         .         .
   3.417      6.5436     36.66  . Q  V    .         .         .         .
   3.500      6.8032     37.69  .  Q V    .         .         .         .
   3.583      7.0713     38.93  .  Q V    .         .         .         .
   3.667      7.3505     40.54  .  Q V    .         .         .         .
   3.750      7.6422     42.36  .  Q  V   .         .         .         .
   3.833      7.9467     44.21  .  Q  V   .         .         .         .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      125.0     250.0     375.0     500.0
```

```
---------------------------------------------------------------------------
    3.917      8.2629     45.92 .  Q  V   .         .         .         .
    4.000      8.5911     47.64 .  Q  V   .         .         .         .
    4.083      8.9307     49.31 .  Q   V  .         .         .         .
    4.167      9.2827     51.12 .   Q  V  .         .         .         .
    4.250      9.6479     53.03 .   Q  V  .         .         .         .
    4.333     10.0282     55.22 .   Q  V  .         .         .         .
    4.417     10.4255     57.68 .   Q   V .         .         .         .
    4.500     10.8403     60.23 .   Q   V .         .         .         .
    4.583     11.2728     62.80 .    Q  V .         .         .         .
    4.667     11.7225     65.29 .    Q   V.         .         .         .
    4.750     12.1888     67.71 .    Q   V.         .         .         .
    4.833     12.6723     70.21 .    Q   V.         .         .         .
    4.917     13.1737     72.80 .    Q    V         .         .         .
    5.000     13.6935     75.48 .     Q   V         .         .         .
    5.083     14.2595     82.18 .     Q    .V        .         .         .
    5.167     14.9475     99.90 .      Q   .V        .         .         .
    5.250     15.8748    134.65 .         Q V       .         .         .
    5.333     17.1976    192.07 .         .  V Q    .         .         .
    5.417     19.0233    265.09 .         .   V     .Q        .         .
    5.500     21.4281    349.18 .         .     V   .      Q  .         .
    5.583     24.3155    419.25 .         .        V.         .  Q      .
    5.667     27.4433    454.16 .         .         .V        .     Q   .
    5.750     30.4735    439.98 .         .         .  V      .    Q    .
    5.833     32.8470    344.63 .         .         .    V Q  .         .
    5.917     34.6408    260.46 .         .         Q      V  .         .
    6.000     36.0648    206.76 .         .     Q   .       V .         .
    6.083     37.2509    172.23 .         .  Q      .        V.         .
    6.167     38.2942    151.48 .         . Q       .         V         .
    6.250     39.2065    132.46 .         Q         .         V         .
    6.333     40.0193    118.02 .        Q.         .         .V        .
    6.417     40.7469    105.64 .       Q .         .         . V       .
    6.500     41.4065     95.78 .      Q  .         .         . V       .
    6.583     41.9980     85.89 .     Q   .         .         .  V      .
    6.667     42.5432     79.16 .     Q   .         .         .  V      .
    6.750     43.0474     73.21 .    Q    .         .         .  V      .
    6.833     43.5126     67.55 .    Q    .         .         .   V     .
    6.917     43.9427     62.45 .   Q     .         .         .   V     .
    7.000     44.3424     58.05 .   Q     .         .         .   V     .
    7.083     44.7115     53.58 .   Q     .         .         .    V    .
    7.167     45.0498     49.12 .  Q      .         .         .    V    .
    7.250     45.3671     46.07 .  Q      .         .         .    V    .
    7.333     45.6631     42.99 .  Q      .         .         .    V    .
    7.417     45.9464     41.13 .  Q      .         .         .     V   .
    7.500     46.2156     39.09 .  Q      .         .         .     V   .
    7.583     46.4739     37.50 .  Q      .         .         .     V   .
    7.667     46.7223     36.06 . Q       .         .         .     V   .
    7.750     46.9590     34.38 . Q       .         .         .     V   .
    7.833     47.1873     33.15 . Q       .         .         .      V  .
    7.917     47.4068     31.87 . Q       .         .         .      V  .
    8.000     47.6149     30.21 . Q       .         .         .      V  .

---------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      125.0     250.0     375.0     500.0
---------------------------------------------------------------------------
    8.083     47.8140     28.91 . Q       .         .         .      V  .
    8.167     48.0056     27.82 . Q       .         .         .      V  .
    8.250     48.1872     26.37 . Q       .         .         .      V  .
    8.333     48.3569     24.64 .Q        .         .         .       V .
    8.417     48.5192     23.57 .Q        .         .         .       V .
    8.500     48.6742     22.51 .Q        .         .         .       V .
    8.583     48.8206     21.26 .Q        .         .         .       V .
    8.667     48.9560     19.67 .Q        .         .         .       V .
    8.750     49.0849     18.70 .Q        .         .         .       V .
    8.833     49.2086     17.96 .Q        .         .         .       V .
    8.917     49.3265     17.12 .Q        .         .         .       V .
    9.000     49.4378     16.15 .Q        .         .         .       V .
    9.083     49.5408     14.97 .Q        .         .         .       V .
    9.167     49.6355     13.74 .Q        .         .         .        V.
    9.250     49.7276     13.37 .Q        .         .         .        V.
    9.333     49.8169     12.97 .Q        .         .         .        V.
    9.417     49.9009     12.20 Q         .         .         .        V.
    9.500     49.9775     11.12 Q         .         .         .        V.
    9.583     50.0451      9.82 Q         .         .         .        V.
    9.667     50.1019      8.25 Q         .         .         .        V.
    9.750     50.1447      6.21 Q         .         .         .        V.
    9.833     50.1766      4.63 Q         .         .         .        V.
    9.917     50.2074      4.48 Q         .         .         .        V.
   10.000     50.2376      4.38 Q         .         .         .        V.
   10.083     50.2673      4.31 Q         .         .         .        V.
   10.167     50.2965      4.24 Q         .         .         .        V.
   10.250     50.3253      4.18 Q         .         .         .        V.
   10.333     50.3538      4.14 Q         .         .         .        V.
   10.417     50.3820      4.09 Q         .         .         .        V.
   10.500     50.4099      4.05 Q         .         .         .        V.
   10.583     50.4375      4.00 Q         .         .         .        V.
   10.667     50.4648      3.97 Q         .         .         .        V.
   10.750     50.4917      3.91 Q         .         .         .        V.
   10.833     50.5183      3.86 Q         .         .         .        V.
   10.917     50.5445      3.81 Q         .         .         .        V.
   11.000     50.5704      3.75 Q         .         .         .        V.
   11.083     50.5958      3.69 Q         .         .         .        V.
   11.167     50.6209      3.64 Q         .         .         .        V.
   11.250     50.6455      3.57 Q         .         .         .        V.
   11.333     50.6697      3.51 Q         .         .         .        V.
   11.417     50.6934      3.44 Q         .         .         .        V.
   11.500     50.7166      3.38 Q         .         .         .        V.
   11.583     50.7394      3.31 Q         .         .         .        V.
   11.667     50.7616      3.23 Q         .         .         .        V.
```

```
 11.750     50.7824      3.01  Q          .         .         .        V.
 11.833     50.8007      2.66  Q          .         .         .        V.
 11.917     50.8159      2.22  Q          .         .         .        V.
 12.000     50.8276      1.69  Q          .         .         .        V.
 12.083     50.8346      1.03  Q          .         .         .        V.
 12.167     50.8355      0.12  Q          .         .         .        V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       125.0     250.0     375.0     500.0
----------------------------------------------------------------------------
 12.250     50.8360      0.07  Q          .         .         .        V.
 12.333     50.8363      0.04  Q          .         .         .        V.
 12.417     50.8365      0.03  Q          .         .         .        V.
 12.500     50.8366      0.01  Q          .         .         .        V.
 12.583     50.8366      0.01  Q          .         .         .        V.
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                    Duration
       Peak Flow Rate                         (minutes)
   =======================                    =========
             0%                                 755.0
            10%                                 205.0
            20%                                  85.0
            30%                                  55.0
            40%                                  45.0
            50%                                  35.0
            60%                                  25.0
            70%                                  25.0
            80%                                  15.0
            90%                                  15.0
============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
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            F L O O D   R O U T I N G   A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                  (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2017 Advanced Engineering Software (aes)
                (Synthetic Unit Hydrograph Version 21.1)
                 Release Date: 01/17/2017  License ID 1419

                          Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 10 YR - 6 HR                                                             *
* US GYPSUM - PROPOSED CONDITION                                           *
* 9571 - 1/17/17 - JO                                                      *
 **************************************************************************

  FILE NAME: TOTAL2.DAT
  TIME/DATE OF STUDY: 11:09 01/24/2017


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   32377.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   16956.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1883.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    3121.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.502 HOURS
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  1.51 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9912


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  16.608


============================================================================
                     UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.846	696.788
2	6.732	1844.299
3	14.631	2981.381
4	27.118	4713.090
5	38.690	4367.786
6	46.572	2974.965
7	52.450	2218.843
8	56.615	1571.769
9	60.034	1290.663
10	63.123	1165.772
11	65.720	980.377
12	68.096	896.685
13	70.200	794.404
14	72.193	752.191
15	73.868	632.191
16	75.402	578.923
17	76.836	541.441
18	78.177	506.194
19	79.375	452.067
20	80.524	433.620
21	81.628	416.846
22	82.599	366.284
23	83.497	338.855
24	84.324	312.310
25	85.062	278.667
26	85.798	277.777
27	86.475	255.583
28	87.127	245.772
29	87.777	245.554
30	88.384	229.085
31	88.967	219.939
32	89.549	219.852
33	90.114	213.327
34	90.632	195.217
35	91.147	194.416

36	91.662	194.419
37	92.146	182.699
38	92.575	162.192
39	93.004	161.835
40	93.433	161.749
41	93.860	161.127
42	94.223	136.981
43	94.551	124.106
44	94.880	124.109
45	95.209	124.109
46	95.538	124.195
47	95.866	123.841
48	96.142	104.224
49	96.381	90.105
50	96.620	90.284
51	96.859	90.195
52	97.098	90.108
53	97.337	90.373
54	97.576	90.019
55	97.815	90.195
56	98.008	72.974
57	98.080	26.986
58	98.145	24.682
59	98.210	24.500
60	98.276	24.857
61	98.341	24.503
62	98.406	24.500
63	98.471	24.857
64	98.537	24.679
65	98.602	24.503
66	98.667	24.679
67	98.732	24.500
68	98.797	24.682
69	98.863	24.679
70	98.928	24.679
71	98.993	24.503
72	99.059	24.679
73	99.123	24.503
74	99.188	24.503
75	99.253	24.503
76	99.318	24.503
77	99.383	24.503
78	99.448	24.503
79	99.513	24.503
80	99.578	24.503
81	99.643	24.503
82	99.708	24.503
83	99.773	24.503
84	99.838	24.503
85	99.902	24.503
86	99.967	24.503
87	100.000	12.308

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0075	0.0067	0.0007
2	0.0090	0.0081	0.0009
3	0.0090	0.0081	0.0009
4	0.0090	0.0081	0.0009
5	0.0090	0.0081	0.0009
6	0.0105	0.0094	0.0010
7	0.0105	0.0094	0.0010
8	0.0105	0.0094	0.0010
9	0.0105	0.0094	0.0010
10	0.0105	0.0094	0.0010
11	0.0105	0.0094	0.0010
12	0.0120	0.0108	0.0012
13	0.0120	0.0108	0.0012
14	0.0120	0.0108	0.0012
15	0.0120	0.0108	0.0012
16	0.0120	0.0108	0.0012
17	0.0120	0.0108	0.0012
18	0.0120	0.0108	0.0012
19	0.0120	0.0108	0.0012
20	0.0120	0.0108	0.0012
21	0.0120	0.0108	0.0012
22	0.0120	0.0108	0.0012
23	0.0120	0.0108	0.0012
24	0.0135	0.0121	0.0013
25	0.0120	0.0108	0.0012
26	0.0135	0.0121	0.0013
27	0.0135	0.0121	0.0013
28	0.0135	0.0121	0.0013
29	0.0135	0.0121	0.0013
30	0.0135	0.0121	0.0013
31	0.0135	0.0121	0.0013
32	0.0135	0.0121	0.0013
33	0.0150	0.0135	0.0015
34	0.0150	0.0135	0.0015
35	0.0150	0.0135	0.0015
36	0.0150	0.0135	0.0015
37	0.0150	0.0135	0.0015
38	0.0165	0.0148	0.0016
39	0.0165	0.0148	0.0016

40	0.0165	0.0148	0.0016
41	0.0180	0.0162	0.0018
42	0.0195	0.0175	0.0019
43	0.0210	0.0189	0.0021
44	0.0210	0.0189	0.0021
45	0.0225	0.0196	0.0028
46	0.0225	0.0196	0.0028
47	0.0239	0.0196	0.0043
48	0.0239	0.0196	0.0043
49	0.0254	0.0196	0.0058
50	0.0269	0.0196	0.0073
51	0.0284	0.0196	0.0088
52	0.0299	0.0196	0.0103
53	0.0314	0.0196	0.0118
54	0.0314	0.0196	0.0118
55	0.0329	0.0196	0.0133
56	0.0344	0.0196	0.0148
57	0.0359	0.0196	0.0163
58	0.0359	0.0196	0.0163
59	0.0374	0.0196	0.0178
60	0.0389	0.0196	0.0193
61	0.0464	0.0196	0.0268
62	0.0539	0.0196	0.0342
63	0.0584	0.0196	0.0387
64	0.0629	0.0196	0.0432
65	0.0703	0.0196	0.0507
66	0.0838	0.0196	0.0642
67	0.0284	0.0196	0.0088
68	0.0135	0.0121	0.0013
69	0.0090	0.0081	0.0009
70	0.0075	0.0067	0.0007
71	0.0045	0.0040	0.0004
72	0.0030	0.0027	0.0003

```
        TOTAL STORM RAINFALL(INCHES) =  1.50
        TOTAL SOIL-LOSS(INCHES) =  1.00
        TOTAL EFFECTIVE RAINFALL(INCHES) =  0.50

----------------------------------------------------------------------------
    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =     260.3882
    TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =     128.8239
----------------------------------------------------------------------------

============================================================================

                        6 - H O U R   S T O R M
                  R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
       (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       275.0     550.0     825.0    1100.0
----------------------------------------------------------------------------
   0.083      0.0036      0.52  Q         .         .         .         .
   0.167      0.0174      2.01  Q         .         .         .         .
   0.250      0.0485      4.51  Q         .         .         .         .
   0.333      0.1069      8.49  Q         .         .         .         .
   0.417      0.1928     12.46  Q         .         .         .         .
   0.500      0.2991     15.45  Q         .         .         .         .
   0.583      0.4219     17.83  Q         .         .         .         .
   0.667      0.5581     19.78  Q         .         .         .         .
   0.750      0.7075     21.69  Q         .         .         .         .
   0.833      0.8687     23.41  Q         .         .         .         .
   0.917      1.0392     24.76  Q         .         .         .         .
   1.000      1.2184     26.02  Q         .         .         .         .
   1.083      1.4061     27.26  Q         .         .         .         .
   1.167      1.6029     28.58  VQ        .         .         .         .
   1.250      1.8098     30.04  VQ        .         .         .         .
   1.333      2.0259     31.37  VQ        .         .         .         .
   1.417      2.2493     32.44  VQ        .         .         .         .
   1.500      2.4790     33.35  VQ        .         .         .         .
   1.583      2.7140     34.11  VQ        .         .         .         .
   1.667      2.9536     34.79  VQ        .         .         .         .
   1.750      3.1976     35.43  VQ        .         .         .         .
   1.833      3.4455     36.00  .Q        .         .         .         .
   1.917      3.6970     36.52  .Q        .         .         .         .
   2.000      3.9525     37.09  .Q        .         .         .         .
   2.083      4.2121     37.70  .Q        .         .         .         .
   2.167      4.4764     38.38  .Q        .         .         .         .
   2.250      4.7469     39.29  .Q        .         .         .         .
   2.333      5.0226     40.03  .Q        .         .         .         .
   2.417      5.3041     40.87  .Q        .         .         .         .
   2.500      5.5916     41.73  .Q        .         .         .         .
   2.583      5.8835     42.39  .Q        .         .         .         .
   2.667      6.1794     42.97  .Q        .         .         .         .
   2.750      6.4796     43.58  .QV       .         .         .         .
   2.833      6.7846     44.29  .QV       .         .         .         .
   2.917      7.0955     45.15  .QV       .         .         .         .
   3.000      7.4140     46.24  .QV       .         .         .         .
   3.083      7.7394     47.26  .QV       .         .         .         .
   3.167      8.0709     48.13  .QV       .         .         .         .
   3.250      8.4087     49.05  .QV       .         .         .         .
   3.333      8.7533     50.03  .QV       .         .         .         .
   3.417      9.1068     51.33  .QV       .         .         .         .
   3.500      9.4704     52.79  .QV       .         .         .         .
   3.583      9.8454     54.46  .Q V      .         .         .         .
   3.667     10.2351     56.58  . QV      .         .         .         .
   3.750     10.6447     59.47  . QV      .         .         .         .
```

```
  3.833     11.0795     63.13  . QV      .         .         .         .

---------------------------------------------------------------------------
TIME(HRS) VOLUME(AF)   Q(CFS) 0.      275.0     550.0     825.0    1100.0
---------------------------------------------------------------------------
  3.917     11.5495     68.24  . QV      .         .         .         .
  4.000     12.0718     75.84  . QV      .         .         .         .
  4.083     12.6617     85.65  .  Q      .         .         .         .
  4.167     13.3477     99.62  .  QV     .         .         .         .
  4.250     14.1527    116.88  .   Q     .         .         .         .
  4.333     15.1070    138.57  .   VQ    .         .         .         .
  4.417     16.2460    165.38  .    VQ   .         .         .         .
  4.500     17.5855    194.49  .    V Q  .         .         .         .
  4.583     19.1323    224.60  .    V  Q .         .         .         .
  4.667     20.8889    255.06  .     V  Q.         .         .         .
  4.750     22.8477    284.42  .      V  Q         .         .         .
  4.833     25.0159    314.82  .      V  .Q        .         .         .
  4.917     27.4042    346.78  .       V . Q       .         .         .
  5.000     30.0170    379.38  .        V.  Q      .         .         .
  5.083     32.8785    415.49  .         V    Q    .         .         .
  5.167     36.0781    464.58  .         .V    Q   .         .         .
  5.250     39.7457    532.53  .         . V      Q.         .         .
  5.333     44.0527    625.37  .         .  V      . Q       .         .
  5.417     49.1444    739.32  .         .    V    .     Q   .         .
  5.500     55.1217    867.91  .         .      V  .         .Q        .
  5.583     61.7993    969.58  .         .        V.         .    Q    .
  5.667     68.7628   1011.11  .         .         .V        .     Q   .
  5.750     75.5381    983.77  .         .         .  V      .    Q    .
  5.833     81.2267    825.99  .         .         .    V    Q         .
  5.917     85.6460    641.68  .         .         .  Q  V   .         .
  6.000     89.2012    516.21  .         .       Q .      V  .         .
  6.083     92.1479    427.86  .         .    Q    .       V .         .
  6.167     94.7164    372.95  .         .  Q      .        V.         .
  6.250     97.0092    332.92  .         . Q       .         V         .
  6.333     99.0532    296.78  .         Q         .         V         .
  6.417    100.9051    268.91  .        Q.         .         .V        .
  6.500    102.5890    244.50  .       Q .         .         .V        .
  6.583    104.1320    224.05  .       Q .         .         . V       .
  6.667    105.5361    203.87  .      Q  .         .         . V       .
  6.750    106.8374    188.95  .     Q   .         .         .  V      .
  6.833    108.0507    176.17  .     Q   .         .         .  V      .
  6.917    109.1815    164.19  .    Q    .         .         .  V      .
  7.000    110.2338    152.79  .    Q    .         .         .   V     .
  7.083    111.2217    143.44  .    Q    .         .         .   V     .
  7.167    112.1466    134.30  .   Q     .         .         .   V     .
  7.250    113.0065    124.87  .   Q     .         .         .    V    .
  7.333    113.8143    117.29  .   Q     .         .         .    V    .
  7.417    114.5767    110.70  .   Q     .         .         .    V    .
  7.500    115.2997    104.99  .  Q      .         .         .    V    .
  7.583    115.9944    100.88  .  Q      .         .         .     V   .
  7.667    116.6586     96.43  .  Q      .         .         .     V   .
  7.750    117.2978     92.82  .  Q      .         .         .     V   .
  7.833    117.9140     89.47  .  Q      .         .         .     V   .
  7.917    118.5044     85.72  .  Q      .         .         .     V   .
  8.000    119.0728     82.54  .  Q      .         .         .     V   .

---------------------------------------------------------------------------
TIME(HRS) VOLUME(AF)   Q(CFS) 0.      275.0     550.0     825.0    1100.0
---------------------------------------------------------------------------
  8.083    119.6213     79.64  . Q       .         .         .      V  .
  8.167    120.1464     76.24  . Q       .         .         .      V  .
  8.250    120.6470     72.68  . Q       .         .         .      V  .
  8.333    121.1286     69.92  . Q       .         .         .      V  .
  8.417    121.5904     67.06  . Q       .         .         .      V  .
  8.500    122.0286     63.63  . Q       .         .         .      V  .
  8.583    122.4432     60.19  . Q       .         .         .       V .
  8.667    122.8404     57.68  . Q       .         .         .       V .
  8.750    123.2197     55.07  . Q       .         .         .       V .
  8.833    123.5786     52.11  .Q        .         .         .       V .
  8.917    123.9134     48.62  .Q        .         .         .       V .
  9.000    124.2304     46.03  .Q        .         .         .       V .
  9.083    124.5336     44.02  .Q        .         .         .       V .
  9.167    124.8221     41.90  .Q        .         .         .       V .
  9.250    125.0945     39.54  .Q        .         .         .       V .
  9.333    125.3484     36.87  .Q        .         .         .       V .
  9.417    125.5811     33.79  .Q        .         .         .       V .
  9.500    125.7986     31.58  .Q        .         .         .        V.
  9.583    126.0067     30.22  .Q        .         .         .        V.
  9.667    126.2047     28.75  .Q        .         .         .        V.
  9.750    126.3895     26.82  Q         .         .         .        V.
  9.833    126.5580     24.47  Q         .         .         .        V.
  9.917    126.7082     21.81  Q         .         .         .        V.
 10.000    126.8378     18.82  Q         .         .         .        V.
 10.083    126.9428     15.25  Q         .         .         .        V.
 10.167    127.0253     11.98  Q         .         .         .        V.
 10.250    127.1036     11.37  Q         .         .         .        V.
 10.333    127.1809     11.23  Q         .         .         .        V.
 10.417    127.2577     11.14  Q         .         .         .        V.
 10.500    127.3337     11.04  Q         .         .         .        V.
 10.583    127.4092     10.97  Q         .         .         .        V.
 10.667    127.4844     10.92  Q         .         .         .        V.
 10.750    127.5592     10.85  Q         .         .         .        V.
 10.833    127.6335     10.80  Q         .         .         .        V.
 10.917    127.7075     10.74  Q         .         .         .        V.
 11.000    127.7810     10.67  Q         .         .         .        V.
 11.083    127.8538     10.58  Q         .         .         .        V.
 11.167    127.9259     10.47  Q         .         .         .        V.
 11.250    127.9972     10.34  Q         .         .         .        V.
 11.333    128.0672     10.17  Q         .         .         .        V.
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```
  11.417    128.1359      9.97  Q          .          .          .         V.
  11.500    128.2029      9.73  Q          .          .          .         V.
  11.583    128.2680      9.46  Q          .          .          .         V.
  11.667    128.3311      9.17  Q          .          .          .         V.
  11.750    128.3921      8.86  Q          .          .          .         V.
  11.833    128.4508      8.52  Q          .          .          .         V.
  11.917    128.5068      8.13  Q          .          .          .         V.
  12.000    128.5601      7.74  Q          .          .          .         V.
  12.083    128.6105      7.32  Q          .          .          .         V.
  12.167    128.6577      6.86  Q          .          .          .         V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       275.0      550.0      825.0    1100.0
----------------------------------------------------------------------------
  12.250    128.7011      6.30  Q          .          .          .         V.
  12.333    128.7393      5.55  Q          .          .          .         V.
  12.417    128.7714      4.66  Q          .          .          .         V.
  12.500    128.7966      3.65  Q          .          .          .         V.
  12.583    128.8139      2.50  Q          .          .          .         V.
  12.667    128.8214      1.10  Q          .          .          .         V.
  12.750    128.8228      0.20  Q          .          .          .         V.
  12.833    128.8233      0.08  Q          .          .          .         V.
  12.917    128.8236      0.05  Q          .          .          .         V.
  13.000    128.8238      0.03  Q          .          .          .         V.
  13.083    128.8239      0.01  Q          .          .          .         V.
  13.167    128.8239      0.00  Q          .          .          .         V.
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                              790.0
             10%                              200.0
             20%                              130.0
             30%                               90.0
             40%                               65.0
             50%                               50.0
             60%                               40.0
             70%                               30.0
             80%                               25.0
             90%                               15.0
=============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
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             F L O O D   R O U T I N G   A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                  (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2017 Advanced Engineering Software (aes)
                (Synthetic Unit Hydrograph Version 21.1)
                Release Date: 01/17/2017  License ID 1419

                          Analysis prepared by:



 ************************** DESCRIPTION OF STUDY **************************
* 5 YR - 6 HR                                                              *
* US GYPSUM - PROPOSED CONDITION                                           *
* 9571 - 1/17/17 - JO                                                      *
 **************************************************************************

  FILE NAME: TOTAL2.DAT
  TIME/DATE OF STUDY: 11:10 01/24/2017


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   32377.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   16956.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1883.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    3121.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.502 HOURS
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  1.20 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9912


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  16.608


============================================================================
                      UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
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INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.846	696.788
2	6.732	1844.299
3	14.631	2981.381
4	27.118	4713.090
5	38.690	4367.786
6	46.572	2974.965
7	52.450	2218.843
8	56.615	1571.769
9	60.034	1290.663
10	63.123	1165.772
11	65.720	980.377
12	68.096	896.685
13	70.200	794.404
14	72.193	752.191
15	73.868	632.191
16	75.402	578.923
17	76.836	541.441
18	78.177	506.194
19	79.375	452.067
20	80.524	433.620
21	81.628	416.846
22	82.599	366.284
23	83.497	338.855
24	84.324	312.310
25	85.062	278.667
26	85.798	277.777
27	86.475	255.583
28	87.127	245.772
29	87.777	245.554
30	88.384	229.085
31	88.967	219.939
32	89.549	219.852
33	90.114	213.327
34	90.632	195.217
35	91.147	194.416

36	91.662	194.419
37	92.146	182.699
38	92.575	162.192
39	93.004	161.835
40	93.433	161.749
41	93.860	161.127
42	94.223	136.981
43	94.551	124.106
44	94.880	124.109
45	95.209	124.109
46	95.538	124.195
47	95.866	123.841
48	96.142	104.224
49	96.381	90.105
50	96.620	90.284
51	96.859	90.195
52	97.098	90.108
53	97.337	90.373
54	97.576	90.019
55	97.815	90.195
56	98.008	72.974
57	98.080	26.986
58	98.145	24.682
59	98.210	24.500
60	98.276	24.857
61	98.341	24.503
62	98.406	24.500
63	98.471	24.857
64	98.537	24.679
65	98.602	24.503
66	98.667	24.679
67	98.732	24.500
68	98.797	24.682
69	98.863	24.679
70	98.928	24.679
71	98.993	24.503
72	99.059	24.679
73	99.123	24.503
74	99.188	24.503
75	99.253	24.503
76	99.318	24.503
77	99.383	24.503
78	99.448	24.503
79	99.513	24.503
80	99.578	24.503
81	99.643	24.503
82	99.708	24.503
83	99.773	24.503
84	99.838	24.503
85	99.902	24.503
86	99.967	24.503
87	100.000	12.308

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0059	0.0054	0.0006
2	0.0071	0.0064	0.0007
3	0.0071	0.0064	0.0007
4	0.0071	0.0064	0.0007
5	0.0071	0.0064	0.0007
6	0.0083	0.0075	0.0008
7	0.0083	0.0075	0.0008
8	0.0083	0.0075	0.0008
9	0.0083	0.0075	0.0008
10	0.0083	0.0075	0.0008
11	0.0083	0.0075	0.0008
12	0.0095	0.0086	0.0010
13	0.0095	0.0086	0.0010
14	0.0095	0.0086	0.0010
15	0.0095	0.0086	0.0010
16	0.0095	0.0086	0.0010
17	0.0095	0.0086	0.0010
18	0.0095	0.0086	0.0010
19	0.0095	0.0086	0.0010
20	0.0095	0.0086	0.0010
21	0.0095	0.0086	0.0010
22	0.0095	0.0086	0.0010
23	0.0095	0.0086	0.0010
24	0.0107	0.0096	0.0011
25	0.0095	0.0086	0.0010
26	0.0107	0.0096	0.0011
27	0.0107	0.0096	0.0011
28	0.0107	0.0096	0.0011
29	0.0107	0.0096	0.0011
30	0.0107	0.0096	0.0011
31	0.0107	0.0096	0.0011
32	0.0107	0.0096	0.0011
33	0.0119	0.0107	0.0012
34	0.0119	0.0107	0.0012
35	0.0119	0.0107	0.0012
36	0.0119	0.0107	0.0012
37	0.0119	0.0107	0.0012
38	0.0131	0.0118	0.0013
39	0.0131	0.0118	0.0013

40	0.0131	0.0118	0.0013
41	0.0143	0.0128	0.0014
42	0.0155	0.0139	0.0015
43	0.0167	0.0150	0.0017
44	0.0167	0.0150	0.0017
45	0.0178	0.0161	0.0018
46	0.0178	0.0161	0.0018
47	0.0190	0.0171	0.0019
48	0.0190	0.0171	0.0019
49	0.0202	0.0182	0.0020
50	0.0214	0.0193	0.0021
51	0.0226	0.0196	0.0030
52	0.0238	0.0196	0.0042
53	0.0250	0.0196	0.0053
54	0.0250	0.0196	0.0053
55	0.0262	0.0196	0.0065
56	0.0274	0.0196	0.0077
57	0.0285	0.0196	0.0089
58	0.0285	0.0196	0.0089
59	0.0297	0.0196	0.0101
60	0.0309	0.0196	0.0113
61	0.0369	0.0196	0.0172
62	0.0428	0.0196	0.0232
63	0.0464	0.0196	0.0268
64	0.0500	0.0196	0.0303
65	0.0559	0.0196	0.0363
66	0.0666	0.0196	0.0470
67	0.0226	0.0196	0.0030
68	0.0107	0.0096	0.0011
69	0.0071	0.0064	0.0007
70	0.0059	0.0054	0.0006
71	0.0036	0.0032	0.0004
72	0.0024	0.0021	0.0002

TOTAL STORM RAINFALL(INCHES) = 1.19
TOTAL SOIL-LOSS(INCHES) = 0.87
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.32

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    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =     227.4116
    TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =      81.9067
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                          6 - H O U R   S T O R M
                    R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
       (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       175.0     350.0     525.0     700.0
----------------------------------------------------------------------------
   0.083      0.0029      0.41  Q         .         .         .         .
   0.167      0.0138      1.59  Q         .         .         .         .
   0.250      0.0385      3.59  Q         .         .         .         .
   0.333      0.0850      6.74  Q         .         .         .         .
   0.417      0.1532      9.90  Q         .         .         .         .
   0.500      0.2377     12.27  Q         .         .         .         .
   0.583      0.3353     14.17  Q         .         .         .         .
   0.667      0.4436     15.72  Q         .         .         .         .
   0.750      0.5623     17.24  Q         .         .         .         .
   0.833      0.6904     18.60  VQ        .         .         .         .
   0.917      0.8259     19.68  VQ        .         .         .         .
   1.000      0.9683     20.67  VQ        .         .         .         .
   1.083      1.1174     21.66  VQ        .         .         .         .
   1.167      1.2739     22.71  VQ        .         .         .         .
   1.250      1.4383     23.87  VQ        .         .         .         .
   1.333      1.6100     24.93  VQ        .         .         .         .
   1.417      1.7875     25.78  VQ        .         .         .         .
   1.500      1.9701     26.51  VQ        .         .         .         .
   1.583      2.1568     27.11  .Q        .         .         .         .
   1.667      2.3472     27.65  .Q        .         .         .         .
   1.750      2.5412     28.16  .Q        .         .         .         .
   1.833      2.7382     28.61  .Q        .         .         .         .
   1.917      2.9380     29.02  .Q        .         .         .         .
   2.000      3.1410     29.48  .Q        .         .         .         .
   2.083      3.3473     29.96  .Q        .         .         .         .
   2.167      3.5574     30.50  .Q        .         .         .         .
   2.250      3.7724     31.22  .Q        .         .         .         .
   2.333      3.9915     31.82  .Q        .         .         .         .
   2.417      4.2152     32.48  .QV       .         .         .         .
   2.500      4.4436     33.16  .QV       .         .         .         .
   2.583      4.6756     33.68  .QV       .         .         .         .
   2.667      4.9108     34.15  .QV       .         .         .         .
   2.750      5.1493     34.63  .QV       .         .         .         .
   2.833      5.3917     35.19  . Q       .         .         .         .
   2.917      5.6388     35.88  . Q       .         .         .         .
   3.000      5.8919     36.74  . Q       .         .         .         .
   3.083      6.1505     37.56  . QV      .         .         .         .
   3.167      6.4139     38.25  . QV      .         .         .         .
   3.250      6.6824     38.98  . QV      .         .         .         .
   3.333      6.9563     39.76  . QV      .         .         .         .
   3.417      7.2372     40.79  . QV      .         .         .         .
   3.500      7.5261     41.96  . QV      .         .         .         .
   3.583      7.8242     43.28  . QV      .         .         .         .
   3.667      8.1339     44.97  . QV      .         .         .         .
   3.750      8.4572     46.94  . Q V     .         .         .         .
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   3.833      8.7947     49.02  . Q V     .         .         .         .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      175.0     350.0     525.0     700.0
----------------------------------------------------------------------------
   3.917      9.1458     50.97  . Q V     .         .         .         .
   4.000      9.5101     52.89  .  QV     .         .         .         .
   4.083      9.8872     54.76  .  QV     .         .         .         .
   4.167     10.2780     56.74  .  Q V    .         .         .         .
   4.250     10.6868     59.36  .  Q V    .         .         .         .
   4.333     11.1260     63.78  .  Q V    .         .         .         .
   4.417     11.6172     71.32  .   QV    .         .         .         .
   4.500     12.1865     82.67  .   QV    .         .         .         .
   4.583     12.8588     97.62  .    QV   .         .         .         .
   4.667     13.6510    115.02  .     Q   .         .         .         .
   4.750     14.5675    133.08  .      Q  .         .         .         .
   4.833     15.6194    152.73  .      VQ .         .         .         .
   4.917     16.8192    174.22  .       VQ.         .         .         .
   5.000     18.1734    196.63  .       V .Q        .         .         .
   5.083     19.7040    222.24  .        V. Q       .         .         .
   5.167     21.4837    258.41  .         V   Q     .         .         .
   5.250     23.6177    309.86  .         .V     Q  .         .         .
   5.333     26.2440    381.33  .         . V       .Q        .         .
   5.417     29.4794    469.78  .         .   V     .     Q   .         .
   5.500     33.4051    570.01  .         .     V   .         . Q       .
   5.583     37.8746    648.98  .         .       V .         .      Q  .
   5.667     42.5793    683.13  .         .         V         .        Q.
   5.750     47.1749    667.27  .         .         .  V      .       Q .
   5.833     50.9796    552.44  .         .         .   V     .Q        .
   5.917     53.8973    423.65  .         .         .   Q V   .         .
   6.000     56.2409    340.30  .         .        Q.      V  .         .
   6.083     58.1758    280.94  .         .     Q   .       V .         .
   6.167     59.8642    245.17  .         .   Q     .        V.         .
   6.250     61.3701    218.66  .         . Q       .        V.         .
   6.333     62.7073    194.16  .         .Q        .         V         .
   6.417     63.9177    175.75  .         Q         .         .V        .
   6.500     65.0154    159.38  .        Q.         .         .V        .
   6.583     66.0199    145.86  .       Q .         .         . V       .
   6.667     66.9303    132.18  .      Q  .         .         . V       .
   6.750     67.7740    122.52  .      Q  .         .         .  V      .
   6.833     68.5599    114.11  .     Q   .         .         .  V      .
   6.917     69.2910    106.15  .     Q   .         .         .  V      .
   7.000     69.9697     98.54  .    Q    .         .         .   V     .
   7.083     70.6062     92.43  .    Q    .         .         .   V     .
   7.167     71.2007     86.31  .   Q     .         .         .   V     .
   7.250     71.7511     79.93  .   Q     .         .         .    V    .
   7.333     72.2675     74.97  .   Q     .         .         .    V    .
   7.417     72.7538     70.62  .   Q     .         .         .    V    .
   7.500     73.2144     66.88  .  Q      .         .         .    V    .
   7.583     73.6575     64.34  .  Q      .         .         .    V    .
   7.667     74.0807     61.44  .  Q      .         .         .     V   .
   7.750     74.4884     59.20  .  Q      .         .         .     V   .
   7.833     74.8817     57.11  .  Q      .         .         .     V   .
   7.917     75.2582     54.67  .  Q      .         .         .     V   .
   8.000     75.6212     52.71  .  Q      .         .         .     V   .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      175.0     350.0     525.0     700.0
----------------------------------------------------------------------------
   8.083     75.9720     50.94  . Q       .         .         .      V  .
   8.167     76.3078     48.75  . Q       .         .         .      V  .
   8.250     76.6276     46.44  . Q       .         .         .      V  .
   8.333     76.9359     44.76  . Q       .         .         .      V  .
   8.417     77.2315     42.93  . Q       .         .         .      V  .
   8.500     77.5117     40.68  . Q       .         .         .      V  .
   8.583     77.7766     38.46  . Q       .         .         .      V  .
   8.667     78.0311     36.96  . Q       .         .         .       V .
   8.750     78.2746     35.36  . Q       .         .         .       V .
   8.833     78.5056     33.54  .Q        .         .         .       V .
   8.917     78.7212     31.31  .Q        .         .         .       V .
   9.000     78.9265     29.81  .Q        .         .         .       V .
   9.083     79.1239     28.66  .Q        .         .         .       V .
   9.167     79.3125     27.38  .Q        .         .         .       V .
   9.250     79.4909     25.91  .Q        .         .         .       V .
   9.333     79.6575     24.19  .Q        .         .         .       V .
   9.417     79.8100     22.14  .Q        .         .         .       V .
   9.500     79.9531     20.78  .Q        .         .         .        V.
   9.583     80.0910     20.02  .Q        .         .         .        V.
   9.667     80.2226     19.12  .Q        .         .         .        V.
   9.750     80.3456     17.85  .Q        .         .         .        V.
   9.833     80.4575     16.25  Q         .         .         .        V.
   9.917     80.5566     14.39  Q         .         .         .        V.
  10.000     80.6412     12.29  Q         .         .         .        V.
  10.083     80.7081      9.71  Q         .         .         .        V.
  10.167     80.7589      7.38  Q         .         .         .        V.
  10.250     80.8077      7.09  Q         .         .         .        V.
  10.333     80.8558      6.99  Q         .         .         .        V.
  10.417     80.9035      6.91  Q         .         .         .        V.
  10.500     80.9505      6.83  Q         .         .         .        V.
  10.583     80.9972      6.78  Q         .         .         .        V.
  10.667     81.0437      6.74  Q         .         .         .        V.
  10.750     81.0898      6.69  Q         .         .         .        V.
  10.833     81.1355      6.65  Q         .         .         .        V.
  10.917     81.1810      6.61  Q         .         .         .        V.
  11.000     81.2262      6.56  Q         .         .         .        V.
  11.083     81.2711      6.52  Q         .         .         .        V.
  11.167     81.3156      6.47  Q         .         .         .        V.
  11.250     81.3598      6.41  Q         .         .         .        V.
  11.333     81.4036      6.36  Q         .         .         .        V.
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  11.417     81.4469      6.29  Q          .          .          .          V.
  11.500     81.4896      6.20  Q          .          .          .          V.
  11.583     81.5315      6.08  Q          .          .          .          V.
  11.667     81.5725      5.95  Q          .          .          .          V.
  11.750     81.6125      5.81  Q          .          .          .          V.
  11.833     81.6513      5.63  Q          .          .          .          V.
  11.917     81.6886      5.43  Q          .          .          .          V.
  12.000     81.7245      5.21  Q          .          .          .          V.
  12.083     81.7588      4.98  Q          .          .          .          V.
  12.167     81.7913      4.71  Q          .          .          .          V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.       175.0      350.0      525.0     700.0
----------------------------------------------------------------------------
  12.250     81.8213      4.36  Q          .          .          .          V.
  12.333     81.8480      3.87  Q          .          .          .          V.
  12.417     81.8704      3.26  Q          .          .          .          V.
  12.500     81.8880      2.56  Q          .          .          .          V.
  12.583     81.9000      1.74  Q          .          .          .          V.
  12.667     81.9050      0.72  Q          .          .          .          V.
  12.750     81.9058      0.11  Q          .          .          .          V.
  12.833     81.9062      0.06  Q          .          .          .          V.
  12.917     81.9064      0.04  Q          .          .          .          V.
  13.000     81.9066      0.02  Q          .          .          .          V.
  13.083     81.9067      0.01  Q          .          .          .          V.
  13.167     81.9067      0.00  Q          .          .          .           V
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                   Duration
        Peak Flow Rate                        (minutes)
    =======================                   =========
              0%                                790.0
             10%                                185.0
             20%                                110.0
             30%                                 75.0
             40%                                 55.0
             50%                                 40.0
             60%                                 35.0
             70%                                 25.0
             80%                                 25.0
             90%                                 15.0
============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
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36	91.662	194.419
37	92.146	182.699
38	92.575	162.192
39	93.004	161.835
40	93.433	161.749
41	93.860	161.127
42	94.223	136.981
43	94.551	124.106
44	94.880	124.109
45	95.209	124.109
46	95.538	124.195
47	95.866	123.841
48	96.142	104.224
49	96.381	90.105
50	96.620	90.284
51	96.859	90.195
52	97.098	90.108
53	97.337	90.373
54	97.576	90.019
55	97.815	90.195
56	98.008	72.974
57	98.080	26.986
58	98.145	24.682
59	98.210	24.500
60	98.276	24.857
61	98.341	24.503
62	98.406	24.500
63	98.471	24.857
64	98.537	24.679
65	98.602	24.503
66	98.667	24.679
67	98.732	24.500
68	98.797	24.682
69	98.863	24.679
70	98.928	24.679
71	98.993	24.503
72	99.059	24.679
73	99.123	24.503
74	99.188	24.503
75	99.253	24.503
76	99.318	24.503
77	99.383	24.503
78	99.448	24.503
79	99.513	24.503
80	99.578	24.503
81	99.643	24.503
82	99.708	24.503
83	99.773	24.503
84	99.838	24.503
85	99.902	24.503
86	99.967	24.503
87	100.000	12.308

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0042	0.0038	0.0004
2	0.0051	0.0046	0.0005
3	0.0051	0.0046	0.0005
4	0.0051	0.0046	0.0005
5	0.0051	0.0046	0.0005
6	0.0059	0.0053	0.0006
7	0.0059	0.0053	0.0006
8	0.0059	0.0053	0.0006
9	0.0059	0.0053	0.0006
10	0.0059	0.0053	0.0006
11	0.0059	0.0053	0.0006
12	0.0068	0.0061	0.0007
13	0.0068	0.0061	0.0007
14	0.0068	0.0061	0.0007
15	0.0068	0.0061	0.0007
16	0.0068	0.0061	0.0007
17	0.0068	0.0061	0.0007
18	0.0068	0.0061	0.0007
19	0.0068	0.0061	0.0007
20	0.0068	0.0061	0.0007
21	0.0068	0.0061	0.0007
22	0.0068	0.0061	0.0007
23	0.0068	0.0061	0.0007
24	0.0076	0.0068	0.0008
25	0.0068	0.0061	0.0007
26	0.0076	0.0068	0.0008
27	0.0076	0.0068	0.0008
28	0.0076	0.0068	0.0008
29	0.0076	0.0068	0.0008
30	0.0076	0.0068	0.0008
31	0.0076	0.0068	0.0008
32	0.0076	0.0068	0.0008
33	0.0085	0.0076	0.0008
34	0.0085	0.0076	0.0008
35	0.0085	0.0076	0.0008
36	0.0085	0.0076	0.0008
37	0.0085	0.0076	0.0008
38	0.0093	0.0084	0.0009
39	0.0093	0.0084	0.0009

```
****************************************************************************

             F L O O D   R O U T I N G   A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                  (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2017 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 21.1)
                 Release Date: 01/17/2017  License ID 1419

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 2 YR - 6 HR                                                              *
* US GYPSUM - PROPOSED CONDITION                                           *
* 9571 - 1/17/17 - JO                                                      *
 **************************************************************************

  FILE NAME: TOTAL2.DAT
  TIME/DATE OF STUDY: 11:11 01/24/2017


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   32377.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   16956.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1883.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    3121.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.502 HOURS
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  0.85 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9912


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  16.608


============================================================================
                      UNIT HYDROGRAPH DETERMINATION
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	1.846	696.788
2	6.732	1844.299
3	14.631	2981.381
4	27.118	4713.090
5	38.690	4367.786
6	46.572	2974.965
7	52.450	2218.843
8	56.615	1571.769
9	60.034	1290.663
10	63.123	1165.772
11	65.720	980.377
12	68.096	896.685
13	70.200	794.404
14	72.193	752.191
15	73.868	632.191
16	75.402	578.923
17	76.836	541.441
18	78.177	506.194
19	79.375	452.067
20	80.524	433.620
21	81.628	416.846
22	82.599	366.284
23	83.497	338.855
24	84.324	312.310
25	85.062	278.667
26	85.798	277.777
27	86.475	255.583
28	87.127	245.772
29	87.777	245.554
30	88.384	229.085
31	88.967	219.939
32	89.549	219.852
33	90.114	213.327
34	90.632	195.217
35	91.147	194.416

```
 11.750    265.8043     11.97  Q          .         .         .        V.
 11.833    265.8748     10.25  Q          .         .         .        V.
 11.917    265.9322      8.33  Q          .         .         .        V.
 12.000    265.9750      6.21  Q          .         .         .        V.
 12.083    266.0009      3.77  Q          .         .         .        V.
 12.167    266.0061      0.76  Q          .         .         .        V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      500.0    1000.0    1500.0    2000.0
----------------------------------------------------------------------------
 12.250    266.0073      0.16  Q          .         .         .        V.
 12.333    266.0080      0.10  Q          .         .         .        V.
 12.417    266.0085      0.07  Q          .         .         .        V.
 12.500    266.0087      0.03  Q          .         .         .        V.
 12.583    266.0088      0.01  Q          .         .         .         V
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated             Duration
       Peak Flow Rate                  (minutes)
   =======================             =========
             0%                          755.0
            10%                          225.0
            20%                          140.0
            30%                          105.0
            40%                           75.0
            50%                           50.0
            60%                           35.0
            70%                           30.0
            80%                           20.0
            90%                           15.0
============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
```

40	0.0093	0.0084	0.0009
41	0.0101	0.0091	0.0010
42	0.0110	0.0099	0.0011
43	0.0118	0.0107	0.0012
44	0.0118	0.0107	0.0012
45	0.0127	0.0114	0.0013
46	0.0127	0.0114	0.0013
47	0.0135	0.0122	0.0014
48	0.0135	0.0122	0.0014
49	0.0144	0.0129	0.0014
50	0.0152	0.0137	0.0015
51	0.0161	0.0145	0.0016
52	0.0169	0.0152	0.0017
53	0.0178	0.0160	0.0018
54	0.0178	0.0160	0.0018
55	0.0186	0.0167	0.0019
56	0.0194	0.0175	0.0019
57	0.0203	0.0183	0.0020
58	0.0203	0.0183	0.0020
59	0.0211	0.0190	0.0021
60	0.0220	0.0196	0.0023
61	0.0262	0.0196	0.0066
62	0.0304	0.0196	0.0108
63	0.0330	0.0196	0.0133
64	0.0355	0.0196	0.0159
65	0.0397	0.0196	0.0201
66	0.0473	0.0196	0.0277
67	0.0161	0.0145	0.0016
68	0.0076	0.0068	0.0008
69	0.0051	0.0046	0.0005
70	0.0042	0.0038	0.0004
71	0.0025	0.0023	0.0003
72	0.0017	0.0015	0.0002

```
        TOTAL STORM RAINFALL(INCHES) =  0.85
        TOTAL SOIL-LOSS(INCHES) =  0.69
        TOTAL EFFECTIVE RAINFALL(INCHES) =  0.16

----------------------------------------------------------------------------
    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =     178.8355
    TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =      41.0470
----------------------------------------------------------------------------

============================================================================

                          6 - H O U R   S T O R M
                    R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
       (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      100.0     200.0     300.0     400.0
----------------------------------------------------------------------------
   0.083     0.0020      0.29  Q         .         .         .         .
   0.167     0.0098      1.13  Q         .         .         .         .
   0.250     0.0274      2.55  Q         .         .         .         .
   0.333     0.0604      4.79  Q         .         .         .         .
   0.417     0.1089      7.04  Q         .         .         .         .
   0.500     0.1690      8.72  Q         .         .         .         .
   0.583     0.2383     10.07  VQ        .         .         .         .
   0.667     0.3153     11.17  VQ        .         .         .         .
   0.750     0.3997     12.25  VQ        .         .         .         .
   0.833     0.4907     13.22  VQ        .         .         .         .
   0.917     0.5871     13.99  VQ        .         .         .         .
   1.000     0.6883     14.70  VQ        .         .         .         .
   1.083     0.7943     15.40  VQ        .         .         .         .
   1.167     0.9055     16.14  VQ        .         .         .         .
   1.250     1.0224     16.97  VQ        .         .         .         .
   1.333     1.1444     17.72  .Q        .         .         .         .
   1.417     1.2706     18.33  .Q        .         .         .         .
   1.500     1.4004     18.84  .Q        .         .         .         .
   1.583     1.5331     19.27  .Q        .         .         .         .
   1.667     1.6685     19.66  .Q        .         .         .         .
   1.750     1.8063     20.02  .VQ       .         .         .         .
   1.833     1.9464     20.33  .VQ       .         .         .         .
   1.917     2.0884     20.63  . Q       .         .         .         .
   2.000     2.2327     20.95  . Q       .         .         .         .
   2.083     2.3794     21.29  . Q       .         .         .         .
   2.167     2.5287     21.68  . Q       .         .         .         .
   2.250     2.6815     22.19  . Q       .         .         .         .
   2.333     2.8373     22.62  . Q       .         .         .         .
   2.417     2.9963     23.09  . Q       .         .         .         .
   2.500     3.1587     23.57  . QV      .         .         .         .
   2.583     3.3236     23.94  . QV      .         .         .         .
   2.667     3.4908     24.28  . QV      .         .         .         .
   2.750     3.6603     24.62  . QV      .         .         .         .
   2.833     3.8326     25.02  . QV      .         .         .         .
   2.917     4.0083     25.51  . QV      .         .         .         .
   3.000     4.1881     26.12  . Q V     .         .         .         .
   3.083     4.3720     26.70  . Q V     .         .         .         .
   3.167     4.5592     27.19  . Q V     .         .         .         .
   3.250     4.7501     27.71  . Q V     .         .         .         .
   3.333     4.9447     28.26  . Q V     .         .         .         .
   3.417     5.1444     28.99  . Q  V    .         .         .         .
   3.500     5.3498     29.82  . Q  V    .         .         .         .
   3.583     5.5617     30.76  .  Q V    .         .         .         .
   3.667     5.7818     31.96  .  Q V    .         .         .         .
   3.750     6.0116     33.37  .  Q V    .         .         .         .
```

```
   3.833      6.2516     34.84  .  Q  V   .         .         .         .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      100.0     200.0     300.0     400.0
----------------------------------------------------------------------------
   3.917      6.5011     36.23  .  Q  V   .         .         .         .
   4.000      6.7601     37.60  .  Q  V   .         .         .         .
   4.083      7.0282     38.93  .  Q  V   .         .         .         .
   4.167      7.3059     40.33  .   Q  V  .         .         .         .
   4.250      7.5941     41.84  .   Q  V  .         .         .         .
   4.333      7.8939     43.53  .   Q  V  .         .         .         .
   4.417      8.2070     45.46  .   Q  V  .         .         .         .
   4.500      8.5340     47.48  .   Q   V .         .         .         .
   4.583      8.8752     49.53  .   Q   V .         .         .         .
   4.667      9.2303     51.57  .    Q  V .         .         .         .
   4.750      9.5987     53.50  .    Q   V.         .         .         .
   4.833      9.9807     55.47  .    Q   V.         .         .         .
   4.917     10.3768     57.50  .    Q    V         .         .         .
   5.000     10.7877     59.66  .    Q    V         .         .         .
   5.083     11.2342     64.84  .     Q   V         .         .         .
   5.167     11.7708     77.92  .      Q  .V        .         .         .
   5.250     12.4774    102.60  .         Q V       .         .         .
   5.333     13.4674    143.75  .         .  VQ     .         .         .
   5.417     14.8380    199.01  .         .   V    Q.         .         .
   5.500     16.6565    264.05  .         .     V   .     Q   .         .
   5.583     18.8509    318.62  .         .       V .         .Q        .
   5.667     21.2486    348.15  .         .         V         .   Q     .
   5.750     23.6529    349.10  .         .         .  V      .   Q     .
   5.833     25.6476    289.64  .         .         .   V   Q .         .
   5.917     27.1607    219.69  .         .         .Q    V   .         .
   6.000     28.3652    174.91  .         .      Q  .      V  .         .
   6.083     29.3490    142.84  .         .   Q     .       V .         .
   6.167     30.2036    124.09  .         . Q       .        V.         .
   6.250     30.9633    110.32  .         .Q        .         V         .
   6.333     31.6338     97.35  .        Q.         .         V         .
   6.417     32.2390     87.87  .       Q .         .         .V        .
   6.500     32.7862     79.46  .      Q  .         .         .V        .
   6.583     33.2863     72.62  .      Q  .         .         . V       .
   6.667     33.7374     65.50  .     Q   .         .         . V       .
   6.750     34.1555     60.71  .     Q   .         .         .  V      .
   6.833     34.5450     56.56  .    Q    .         .         .  V      .
   6.917     34.9071     52.58  .    Q    .         .         .   V     .
   7.000     35.2426     48.71  .   Q     .         .         .   V     .
   7.083     35.5570     45.66  .   Q     .         .         .   V     .
   7.167     35.8499     42.53  .   Q     .         .         .   V     .
   7.250     36.1195     39.14  .  Q      .         .         .    V    .
   7.333     36.3713     36.56  .  Q      .         .         .    V    .
   7.417     36.6075     34.29  .  Q      .         .         .    V    .
   7.500     36.8302     32.34  .  Q      .         .         .    V    .
   7.583     37.0443     31.08  .  Q      .         .         .     V   .
   7.667     37.2481     29.59  . Q       .         .         .     V   .
   7.750     37.4445     28.52  . Q       .         .         .     V   .
   7.833     37.6342     27.54  . Q       .         .         .     V   .
   7.917     37.8155     26.32  . Q       .         .         .     V   .
   8.000     37.9904     25.40  . Q       .         .         .      V  .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      100.0     200.0     300.0     400.0
----------------------------------------------------------------------------
   8.083     38.1598     24.60  . Q       .         .         .      V  .
   8.167     38.3219     23.54  . Q       .         .         .      V  .
   8.250     38.4761     22.39  . Q       .         .         .      V  .
   8.333     38.6251     21.63  . Q       .         .         .      V  .
   8.417     38.7683     20.79  . Q       .         .         .      V  .
   8.500     38.9038     19.67  .Q        .         .         .      V  .
   8.583     39.0315     18.54  .Q        .         .         .       V .
   8.667     39.1544     17.84  .Q        .         .         .       V .
   8.750     39.2719     17.06  .Q        .         .         .       V .
   8.833     39.3831     16.15  .Q        .         .         .       V .
   8.917     39.4865     15.01  .Q        .         .         .       V .
   9.000     39.5851     14.31  .Q        .         .         .       V .
   9.083     39.6803     13.83  .Q        .         .         .       V .
   9.167     39.7716     13.25  .Q        .         .         .       V .
   9.250     39.8583     12.59  .Q        .         .         .       V .
   9.333     39.9396     11.81  .Q        .         .         .       V .
   9.417     40.0142     10.82  .Q        .         .         .       V .
   9.500     40.0848     10.25  .Q        .         .         .        V.
   9.583     40.1540     10.05  .Q        .         .         .        V.
   9.667     40.2213      9.78  Q         .         .         .        V.
   9.750     40.2851      9.25  Q         .         .         .        V.
   9.833     40.3435      8.48  Q         .         .         .        V.
   9.917     40.3954      7.54  Q         .         .         .        V.
  10.000     40.4396      6.41  Q         .         .         .        V.
  10.083     40.4737      4.95  Q         .         .         .        V.
  10.167     40.4983      3.58  Q         .         .         .        V.
  10.250     40.5218      3.41  Q         .         .         .        V.
  10.333     40.5448      3.34  Q         .         .         .        V.
  10.417     40.5675      3.29  Q         .         .         .        V.
  10.500     40.5897      3.23  Q         .         .         .        V.
  10.583     40.6117      3.20  Q         .         .         .        V.
  10.667     40.6335      3.17  Q         .         .         .        V.
  10.750     40.6551      3.13  Q         .         .         .        V.
  10.833     40.6764      3.10  Q         .         .         .        V.
  10.917     40.6976      3.07  Q         .         .         .        V.
  11.000     40.7185      3.04  Q         .         .         .        V.
  11.083     40.7393      3.01  Q         .         .         .        V.
  11.167     40.7598      2.98  Q         .         .         .        V.
  11.250     40.7800      2.94  Q         .         .         .        V.
  11.333     40.7999      2.90  Q         .         .         .        V.
```

```
 11.417     40.8196      2.86  Q         .          .          .        V.
 11.500     40.8390      2.82  Q         .          .          .        V.
 11.583     40.8581      2.77  Q         .          .          .        V.
 11.667     40.8769      2.73  Q         .          .          .        V.
 11.750     40.8954      2.68  Q         .          .          .        V.
 11.833     40.9136      2.64  Q         .          .          .        V.
 11.917     40.9314      2.59  Q         .          .          .        V.
 12.000     40.9489      2.54  Q         .          .          .        V.
 12.083     40.9660      2.49  Q         .          .          .        V.
 12.167     40.9828      2.43  Q         .          .          .        V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)  Q(CFS) 0.      100.0     200.0     300.0    400.0
----------------------------------------------------------------------------
 12.250     40.9988      2.32  Q         .          .          .        V.
 12.333     41.0134      2.11  Q         .          .          .        V.
 12.417     41.0259      1.82  Q         .          .          .        V.
 12.500     41.0359      1.46  Q         .          .          .        V.
 12.583     41.0429      1.02  Q         .          .          .        V.
 12.667     41.0459      0.43  Q         .          .          .        V.
 12.750     41.0464      0.07  Q         .          .          .        V.
 12.833     41.0467      0.04  Q         .          .          .        V.
 12.917     41.0469      0.03  Q         .          .          .        V.
 13.000     41.0470      0.02  Q         .          .          .        V.
 13.083     41.0470      0.01  Q         .          .          .        V.
-------------------------------------------------------------------------------
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	785.0
10%	210.0
20%	90.0
30%	60.0
40%	50.0
50%	40.0
60%	30.0
70%	25.0
80%	20.0
90%	15.0

END OF FLOODSCx ROUTING ANALYSIS

```
****************************************************************************

             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2017 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 21.1)
                 Release Date: 01/17/2017  License ID 1419

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* 100 YR - 6 HR                                                            *
* US GYPSUM - PROPOSED WEST                                                *
* 9571 - 2/21/17 - JO                                                      *
 **************************************************************************

  FILE NAME: TOTALW.DAT
  TIME/DATE OF STUDY: 17:41 02/21/2017


****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =   29227.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =   14259.000 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =    1478.000 FEET
         BASIN FACTOR = 0.020
         WATERSHED AREA =    3881.000 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.464 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         MOUNTAIN S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.236
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         USER-ENTERED RAINFALL =  2.92 INCHES
         RCFC&WCD 6-Hour Storm (5-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9891


         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  17.958


============================================================================
                      UNIT HYDROGRAPH DETERMINATION
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	2.015	945.769
2	7.502	2575.395
3	16.876	4399.666
4	30.805	6537.602
5	41.889	5202.379
6	49.415	3532.752
7	54.792	2523.725
8	58.725	1845.581
9	62.224	1642.708
10	65.149	1372.467
11	67.766	1228.707
12	70.065	1078.935
13	72.219	1010.701
14	74.021	846.150
15	75.666	772.082
16	77.196	718.096
17	78.594	655.874
18	79.870	598.855
19	81.082	569.094
20	82.218	533.335
21	83.197	459.371
22	84.129	437.316
23	84.936	378.919
24	85.733	374.020
25	86.470	345.842
26	87.174	330.576
27	87.874	328.589
28	88.521	303.626
29	89.151	295.866
30	89.781	295.254
31	90.364	273.711
32	90.921	261.361

33	91.478	261.461
34	92.019	254.313
35	92.492	221.849
36	92.955	217.459
37	93.419	217.459
38	93.879	216.134
39	94.265	181.216
40	94.621	166.921
41	94.977	166.925
42	95.332	166.821
43	95.688	167.025
44	96.025	158.141
45	96.290	124.451
46	96.548	121.186
47	96.807	121.390
48	97.065	121.186
49	97.324	121.390
50	97.582	121.286
51	97.840	121.082
52	98.026	87.188
53	98.097	33.489
54	98.168	33.281
55	98.238	33.077
56	98.309	33.081
57	98.379	33.077
58	98.450	33.077
59	98.521	33.285
60	98.591	32.873
61	98.662	33.281
62	98.732	32.876
63	98.803	33.281
64	98.873	33.081
65	98.944	33.077
66	99.014	33.077
67	99.085	33.077
68	99.155	33.077
69	99.226	33.077
70	99.296	33.077
71	99.366	33.077
72	99.437	33.077
73	99.507	33.077
74	99.578	33.077
75	99.648	33.077
76	99.719	33.077
77	99.789	33.077
78	99.860	33.077
79	99.930	33.077
80	100.000	32.726

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0144	0.0130	0.0014
2	0.0173	0.0156	0.0017
3	0.0173	0.0156	0.0017
4	0.0173	0.0156	0.0017
5	0.0173	0.0156	0.0017
6	0.0202	0.0182	0.0020
7	0.0202	0.0182	0.0020
8	0.0202	0.0182	0.0020
9	0.0202	0.0182	0.0020
10	0.0202	0.0182	0.0020
11	0.0202	0.0182	0.0020
12	0.0231	0.0196	0.0035
13	0.0231	0.0196	0.0035
14	0.0231	0.0196	0.0035
15	0.0231	0.0196	0.0035
16	0.0231	0.0196	0.0035
17	0.0231	0.0196	0.0035
18	0.0231	0.0196	0.0035
19	0.0231	0.0196	0.0035
20	0.0231	0.0196	0.0035
21	0.0231	0.0196	0.0035
22	0.0231	0.0196	0.0035
23	0.0231	0.0196	0.0035
24	0.0260	0.0196	0.0064
25	0.0231	0.0196	0.0035
26	0.0260	0.0196	0.0064
27	0.0260	0.0196	0.0064
28	0.0260	0.0196	0.0064
29	0.0260	0.0196	0.0064
30	0.0260	0.0196	0.0064
31	0.0260	0.0196	0.0064
32	0.0260	0.0196	0.0064
33	0.0289	0.0196	0.0092
34	0.0289	0.0196	0.0092
35	0.0289	0.0196	0.0092
36	0.0289	0.0196	0.0092
37	0.0289	0.0196	0.0092
38	0.0318	0.0196	0.0121
39	0.0318	0.0196	0.0121
40	0.0318	0.0196	0.0121
41	0.0347	0.0196	0.0150
42	0.0375	0.0196	0.0179
43	0.0404	0.0196	0.0208

44	0.0404	0.0196	0.0208
45	0.0433	0.0196	0.0237
46	0.0433	0.0196	0.0237
47	0.0462	0.0196	0.0266
48	0.0462	0.0196	0.0266
49	0.0491	0.0196	0.0295
50	0.0520	0.0196	0.0324
51	0.0549	0.0196	0.0352
52	0.0578	0.0196	0.0381
53	0.0607	0.0196	0.0410
54	0.0607	0.0196	0.0410
55	0.0635	0.0196	0.0439
56	0.0664	0.0196	0.0468
57	0.0693	0.0196	0.0497
58	0.0693	0.0196	0.0497
59	0.0722	0.0196	0.0526
60	0.0751	0.0196	0.0555
61	0.0895	0.0196	0.0699
62	0.1040	0.0196	0.0843
63	0.1126	0.0196	0.0930
64	0.1213	0.0196	0.1017
65	0.1357	0.0196	0.1161
66	0.1617	0.0196	0.1421
67	0.0549	0.0196	0.0352
68	0.0260	0.0196	0.0064
69	0.0173	0.0156	0.0017
70	0.0144	0.0130	0.0014
71	0.0087	0.0078	0.0009
72	0.0058	0.0052	0.0006

TOTAL STORM RAINFALL(INCHES) = 2.89
TOTAL SOIL-LOSS(INCHES) = 1.35
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.54

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----------------------------------------------------------------------------
    TOTAL SOIL-LOSS VOLUME(ACRE-FEET) =     435.0731
    TOTAL STORM RUNOFF VOLUME(ACRE-FEET) =     498.7373
----------------------------------------------------------------------------

============================================================================

                          6 - H O U R   S T O R M
                    R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
        (Note: Time indicated is at END of Each Unit Intervals)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      825.0    1650.0    2475.0    3300.0
----------------------------------------------------------------------------
   0.083      0.0094      1.37  Q         .         .         .         .
   0.167      0.0463      5.36  Q         .         .         .         .
   0.250      0.1321     12.46  Q         .         .         .         .
   0.333      0.2916     23.17  Q         .         .         .         .
   0.417      0.5159     32.57  Q         .         .         .         .
   0.500      0.7876     39.44  Q         .         .         .         .
   0.583      1.0965     44.85  Q         .         .         .         .
   0.667      1.4375     49.52  Q         .         .         .         .
   0.750      1.8116     54.31  Q         .         .         .         .
   0.833      2.2129     58.27  Q         .         .         .         .
   0.917      2.6362     61.46  Q         .         .         .         .
   1.000      3.0871     65.47  Q         .         .         .         .
   1.083      3.5796     71.51  Q         .         .         .         .
   1.167      4.1297     79.88  Q         .         .         .         .
   1.250      4.7572     91.12  VQ        .         .         .         .
   1.333      5.4478    100.27  VQ        .         .         .         .
   1.417      6.1838    106.86  VQ        .         .         .         .
   1.500      6.9542    111.87  VQ        .         .         .         .
   1.583      7.7516    115.78  VQ        .         .         .         .
   1.667      8.5734    119.32  VQ        .         .         .         .
   1.750      9.4160    122.34  VQ        .         .         .         .
   1.833     10.2773    125.07  VQ        .         .         .         .
   1.917     11.1553    127.48  VQ        .         .         .         .
   2.000     12.0678    132.49  VQ        .         .         .         .
   2.083     13.0264    139.19  .Q        .         .         .         .
   2.167     14.0527    149.02  .Q        .         .         .         .
   2.250     15.1848    164.37  .Q        .         .         .         .
   2.333     16.3887    174.81  .VQ       .         .         .         .
   2.417     17.6998    190.36  .VQ       .         .         .         .
   2.500     19.1041    203.91  .VQ       .         .         .         .
   2.583     20.5745    213.51  .VQ       .         .         .         .
   2.667     22.0995    221.43  .VQ       .         .         .         .
   2.750     23.6827    229.88  .VQ       .         .         .         .
   2.833     25.3544    242.73  . Q       .         .         .         .
   2.917     27.1449    259.99  . VQ      .         .         .         .
   3.000     29.0952    283.18  . VQ      .         .         .         .
   3.083     31.1735    301.78  . VQ      .         .         .         .
   3.167     33.3660    318.34  . VQ      .         .         .         .
   3.250     35.6814    336.20  . V Q     .         .         .         .
   3.333     38.1405    357.07  .  VQ     .         .         .         .
   3.417     40.7997    386.12  .  VQ     .         .         .         .
   3.500     43.6774    417.83  .  V Q    .         .         .         .
   3.583     46.8235    456.82  .  V Q    .         .         .         .
   3.667     50.3247    508.39  .   V Q   .         .         .         .
   3.750     54.2373    568.10  .   V Q   .         .         .         .
   3.833     58.5663    628.57  .   V  Q  .         .         .         .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      825.0    1650.0    2475.0    3300.0
```

```
----------------------------------------------------------------------------
   3.917     63.2808    684.55  .    V  Q .         .         .         .
   4.000     68.3834    740.90  .    V  Q .         .         .         .
   4.083     73.8609    795.34  .    V   Q.         .         .         .
   4.167     79.7478    854.78  .     V   Q         .         .         .
   4.250     86.0680    917.69  .     V   .Q        .         .         .
   4.333     92.8913    990.74  .      V  . Q       .         .         .
   4.417    100.2864   1073.77  .       V .  Q      .         .         .
   4.500    108.2759   1160.08  .       V .   Q     .         .         .
   4.583    116.8624   1246.76  .        V.    Q    .         .         .
   4.667    126.0310   1331.28  .         V     Q   .         .         .
   4.750    135.7620   1412.94  .         V      Q  .         .         .
   4.833    146.0784   1497.94  .         .V      Q .         .         .
   4.917    156.9996   1585.76  .         . V      Q.         .         .
   5.000    168.5218   1673.02  .         .  V      Q         .         .
   5.083    180.7055   1769.07  .         .   V     .Q        .         .
   5.167    193.7970   1900.88  .         .    V    .  Q      .         .
   5.250    208.1569   2085.07  .         .     V   .    Q    .         .
   5.333    224.2355   2334.62  .         .      V  .       Q .         .
   5.417    242.3342   2627.92  .         .        V.         .Q        .
   5.500    262.6665   2952.25  .         .         .V        .    Q    .
   5.583    284.7564   3207.45  .         .         . V       .       Q .
   5.667    307.3844   3285.59  .         .         .   V     .        Q.
   5.750    328.8344   3114.55  .         .         .     V   .      Q  .
   5.833    346.5459   2571.71  .         .         .      V  .Q        .
   5.917    360.5035   2026.64  .         .         .   Q   V .         .
   6.000    371.8016   1640.48  .         .        Q.        V.         .
   6.083    381.3385   1384.76  .         .     Q   .         V         .
   6.167    389.7390   1219.76  .         .   Q     .         .V        .
   6.250    397.2079   1084.48  .         .  Q      .         .V        .
   6.333    403.9326    976.42  .         .Q        .         . V       .
   6.417    410.0256    884.71  .         Q         .         . V       .
   6.500    415.5925    808.31  .        Q.         .         .  V      .
   6.583    420.6656    736.62  .       Q .         .         .  V      .
   6.667    425.3512    680.34  .       Q .         .         .   V     .
   6.750    429.7034    631.94  .      Q  .         .         .   V     .
   6.833    433.7498    587.53  .      Q  .         .         .   V     .
   6.917    437.5193    547.34  .     Q   .         .         .    V    .
   7.000    441.0450    511.93  .     Q   .         .         .    V    .
   7.083    444.3367    477.95  .    Q    .         .         .    V    .
   7.167    447.4027    445.19  .    Q    .         .         .    V    .
   7.250    450.2894    419.14  .    Q    .         .         .     V   .
   7.333    453.0113    395.22  .   Q     .         .         .     V   .
   7.417    455.6071    376.92  .   Q     .         .         .     V   .
   7.500    458.0806    359.14  .   Q     .         .         .     V   .
   7.583    460.4460    343.46  .   Q     .         .         .     V   .
   7.667    462.7124    329.08  .  Q      .         .         .      V  .
   7.750    464.8739    313.84  .  Q      .         .         .      V  .
   7.833    466.9413    300.20  .  Q      .         .         .      V  .
   7.917    468.9160    286.72  .  Q      .         .         .      V  .
   8.000    470.7897    272.06  .  Q      .         .         .      V  .

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      825.0    1650.0    2475.0    3300.0
----------------------------------------------------------------------------
   8.083    472.5714    258.69  .  Q      .         .         .      V  .
   8.167    474.2696    246.58  . Q       .         .         .       V .
   8.250    475.8770    233.39  . Q       .         .         .       V .
   8.333    477.3865    219.18  . Q       .         .         .       V .
   8.417    478.8168    207.68  . Q       .         .         .       V .
   8.500    480.1728    196.89  . Q       .         .         .       V .
   8.583    481.4494    185.36  . Q       .         .         .       V .
   8.667    482.6361    172.31  . Q       .         .         .       V .
   8.750    483.7518    162.00  .Q        .         .         .       V .
   8.833    484.8085    153.44  .Q        .         .         .       V .
   8.917    485.8058    144.81  .Q        .         .         .       V .
   9.000    486.7395    135.57  .Q        .         .         .        V.
   9.083    487.6034    125.44  .Q        .         .         .        V.
   9.167    488.3971    115.25  .Q        .         .         .        V.
   9.250    489.1451    108.60  .Q        .         .         .        V.
   9.333    489.8522    102.67  .Q        .         .         .        V.
   9.417    490.5107     95.62  .Q        .         .         .        V.
   9.500    491.1135     87.53  .Q        .         .         .        V.
   9.583    491.6554     78.68  Q         .         .         .        V.
   9.667    492.1299     68.89  Q         .         .         .        V.
   9.750    492.5258     57.49  Q         .         .         .        V.
   9.833    492.8578     48.21  Q         .         .         .        V.
   9.917    493.1722     45.65  Q         .         .         .        V.
  10.000    493.4809     44.81  Q         .         .         .        V.
  10.083    493.7850     44.17  Q         .         .         .        V.
  10.167    494.0844     43.47  Q         .         .         .        V.
  10.250    494.3785     42.71  Q         .         .         .        V.
  10.333    494.6678     42.00  Q         .         .         .        V.
  10.417    494.9515     41.19  Q         .         .         .        V.
  10.500    495.2299     40.43  Q         .         .         .        V.
  10.583    495.5021     39.53  Q         .         .         .        V.
  10.667    495.7684     38.67  Q         .         .         .        V.
  10.750    496.0279     37.68  Q         .         .         .        V.
  10.833    496.2800     36.60  Q         .         .         .        V.
  10.917    496.5240     35.43  Q         .         .         .        V.
  11.000    496.7593     34.17  Q         .         .         .        V.
  11.083    496.9853     32.81  Q         .         .         .        V.
  11.167    497.2020     31.46  Q         .         .         .        V.
  11.250    497.4086     30.00  Q         .         .         .        V.
  11.333    497.6046     28.45  Q         .         .         .        V.
  11.417    497.7892     26.81  Q         .         .         .        V.
  11.500    497.9625     25.17  Q         .         .         .        V.
  11.583    498.1238     23.43  Q         .         .         .        V.
  11.667    498.2725     21.59  Q         .         .         .        V.
```

```
 11.750    498.4052     19.27  Q          .         .         .        V.
 11.833    498.5187     16.48  Q          .         .         .        V.
 11.917    498.6109     13.40  Q          .         .         .        V.
 12.000    498.6800     10.03  Q          .         .         .        V.
 12.083    498.7226      6.18  Q          .         .         .        V.
 12.167    498.7330      1.52  Q          .         .         .        V.

----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)   Q(CFS) 0.      825.0    1650.0    2475.0    3300.0
----------------------------------------------------------------------------
 12.250    498.7355      0.36  Q          .         .         .        V.
 12.333    498.7365      0.15  Q          .         .         .        V.
 12.417    498.7372      0.10  Q          .         .         .        V.
 12.500    498.7375      0.05  Q          .         .         .         V
 12.583    498.7376      0.02  Q          .         .         .         V
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated               Duration
       Peak Flow Rate                    (minutes)
   =======================               =========
             0%                            755.0
            10%                            270.0
            20%                            170.0
            30%                            120.0
            40%                             90.0
            50%                             60.0
            60%                             45.0
            70%                             35.0
            80%                             20.0
            90%                             15.0
============================================================================

  END OF FLOODSCx ROUTING ANALYSIS
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APPENDIX D

HEC-RAS Hydraulics Results

E-Prop 2-year Results

HEC-RAS Plan: Plan 04   River: Eastern   Reach: Alignment - E   Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - E	24000	PF 1	350.00	550.00	552.09	550.99	552.20	0.001143	2.64	132.71	64.05	0.32
Alignment - E	23500	PF 1	350.00	550.00	550.50	550.50	550.75	0.016582	4.01	87.31	174.45	1.00
Alignment - E	23000	PF 1	350.00	525.00	525.25	525.66	527.61	0.403202	12.34	28.36	114.98	4.38
Alignment - E	22500	PF 1	350.00	475.00	503.66	475.78	503.66	0.000000	0.13	3053.12	217.97	0.00
Alignment - E	22000	PF 1	350.00	500.00	503.66		503.66	0.000015	0.44	791.20	216.93	0.04
Alignment - E	21500	PF 1	350.00	500.00	502.35	502.35	503.52	0.013177	8.65	40.46	17.58	1.01
Alignment - E	21000	PF 1	350.00	450.00	451.22	450.35	451.23	0.000299	0.97	359.98	295.79	0.16
Alignment - E	20500	PF 1	350.00	450.00	451.09		451.10	0.000230	0.79	441.75	405.51	0.13
Alignment - E	20000	PF 1	350.00	450.00	451.00		451.00	0.000160	0.62	560.65	562.71	0.11
Alignment - E	19500	PF 1	350.00	450.00	450.93		450.93	0.000119	0.51	680.48	732.48	0.09
Alignment - E	19000	PF 1	350.00	450.00	450.47	450.47	450.71	0.017012	3.91	89.61	190.05	1.00
Alignment - E	18500	PF 1	350.00	400.00	400.59	400.59	400.89	0.015972	4.38	79.93	135.64	1.01
Alignment - E	18000	PF 1	350.00	375.00	377.10	375.43	377.11	0.000089	0.76	462.31	220.90	0.09
Alignment - E	17500	PF 1	350.00	375.00	376.98		377.02	0.000412	1.55	225.35	114.07	0.19
Alignment - E	17000	PF 1	350.00	375.00	376.66		376.73	0.000879	2.02	173.12	104.36	0.28
Alignment - E	16500	PF 1	350.00	375.00	375.35	375.35	375.53	0.018551	3.36	104.28	296.58	1.00
Alignment - E	16000	PF 1	350.00	350.00	351.43	350.49	351.46	0.000482	1.36	256.51	180.02	0.20
Alignment - E	15500	PF 1	350.00	350.00	350.48	350.48	350.72	0.016885	3.93	88.96	185.29	1.00
Alignment - E	15000	PF 1	350.00	325.00	327.56	325.56	327.58	0.000105	0.93	376.13	147.07	0.10
Alignment - E	14500	PF 1	350.00	325.00	327.31		327.44	0.001270	2.92	119.85	52.28	0.34
Alignment - E	14000	PF 1	350.00	325.00	325.58	325.58	325.88	0.015821	4.33	80.76	138.19	1.00
Alignment - E	13500	PF 1	350.00	275.00	275.10	275.75	294.64	10.434060	35.46	9.87	94.42	19.34
Alignment - E	13000	PF 1	350.00	250.00	252.62	250.36	252.63	0.000025	0.47	752.13	287.24	0.05
Alignment - E	12500	PF 1	350.00	250.00	252.52		252.59	0.000572	2.09	167.13	66.81	0.23
Alignment - E	12000	PF 1	350.00	250.00	251.78		252.01	0.003058	3.86	90.74	51.29	0.51
Alignment - E	11500	PF 1	350.00	250.00	251.46		251.49	0.000440	1.32	264.35	181.38	0.19
Alignment - E	11000	PF 1	350.00	250.00	251.17		251.20	0.000751	1.50	234.10	200.53	0.24
Alignment - E	10500	PF 1	350.00	150.00	251.19		251.19	0.000000	0.01	57021.29	808.05	0.00
Alignment - E	10000	PF 1	350.00	171.30	251.19		251.19	0.000000	0.01	24255.13	647.82	0.00
Alignment - E	9500	PF 1	350.00	204.72	251.19		251.19	0.000000	0.03	11916.72	579.24	0.00
Alignment - E	9000	PF 1	350.00	250.00	251.18		251.19	0.000188	0.76	462.40	391.02	0.12
Alignment - E	8500	PF 1	350.00	250.00	250.57	250.57	250.86	0.015949	4.28	81.70	143.19	1.00
Alignment - E	8000	PF 1	350.00	225.00	226.83	225.57	226.85	0.000334	1.33	263.12	144.34	0.17
Alignment - E	7500	PF 1	350.00	225.00	225.87	225.87	226.31	0.014233	5.32	65.80	75.50	1.00
Alignment - E	7000	PF 1	350.00	175.00	175.62	175.62	175.93	0.015629	4.47	78.24	126.31	1.00
Alignment - E	6500	PF 1	350.00	150.00	152.10	150.77	152.15	0.000530	1.82	192.67	92.04	0.22
Alignment - E	6000	PF 1	350.00	150.00	151.86		151.90	0.000459	1.57	222.23	119.59	0.20
Alignment - E	5500	PF 1	350.00	122.57	151.89		151.89	0.000000	0.10	3472.37	228.08	0.00
Alignment - E	5000	PF 1	350.00	100.00	151.89		151.89	0.000000	0.03	12817.89	381.82	0.00
Alignment - E	4500	PF 1	350.00	150.00	151.82		151.88	0.000747	1.97	177.37	97.58	0.26
Alignment - E	3999.99	PF 1	350.00	150.00	151.51		151.54	0.000592	1.56	223.94	148.88	0.22
Alignment - E	3500	PF 1	350.00	150.00	151.33		151.34	0.000279	0.99	352.63	266.19	0.15
Alignment - E	3000	PF 1	350.00	150.00	150.59	150.59	150.88	0.015986	4.37	80.14	136.56	1.01
Alignment - E	2500	PF 1	350.00	75.00	76.50	76.50	77.25	0.012785	6.96	50.28	33.73	1.01
Alignment - E	2000	PF 1	350.00	50.00	50.19	50.72	55.59	1.326869	18.64	18.78	100.20	7.59
Alignment - E	1500	PF 1	350.00	50.00	50.73	50.73	51.09	0.014862	4.84	72.35	99.55	1.00

E-Prop 5-year Results

HEC-RAS Plan: Plan 05 River: Eastern Reach: Alignment - E Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - E	24000	PF 1	650.00	550.00	552.75	551.48	552.97	0.001607	3.71	175.12	64.45	0.40
Alignment - E	23500	PF 1	650.00	550.00	550.75	550.75	551.13	0.014716	4.95	131.36	174.59	1.01
Alignment - E	23000	PF 1	650.00	525.00	525.34	525.99	529.55	0.462542	16.46	39.49	115.01	4.95
Alignment - E	22500	PF 1	650.00	475.00	505.47	476.18	505.47	0.000000	0.21	3448.32	218.57	0.01
Alignment - E	22000	PF 1	650.00	500.00	505.47		505.47	0.000014	0.55	1184.18	217.54	0.04
Alignment - E	21500	PF 1	650.00	500.00	503.54	503.54	505.27	0.012901	10.55	61.60	17.98	1.01
Alignment - E	21000	PF 1	650.00	450.00	451.65	450.53	451.68	0.000377	1.33	487.63	295.98	0.18
Alignment - E	20500	PF 1	650.00	450.00	451.50		451.51	0.000276	1.07	606.45	405.68	0.15
Alignment - E	20000	PF 1	650.00	450.00	451.39		451.40	0.000183	0.83	781.44	562.89	0.12
Alignment - E	19500	PF 1	650.00	450.00	451.32		451.32	0.000129	0.67	963.18	732.71	0.10
Alignment - E	19000	PF 1	650.00	450.00	450.71	450.71	451.07	0.014949	4.81	135.22	190.33	1.01
Alignment - E	18500	PF 1	650.00	400.00	400.89	400.89	401.34	0.013851	5.36	121.17	135.74	1.00
Alignment - E	18000	PF 1	650.00	375.00	377.81	375.64	377.83	0.000116	1.05	621.03	221.17	0.11
Alignment - E	17500	PF 1	650.00	375.00	377.64		377.72	0.000550	2.16	301.03	114.32	0.23
Alignment - E	17000	PF 1	650.00	375.00	377.19		377.32	0.001219	2.85	228.41	104.56	0.34
Alignment - E	16500	PF 1	650.00	375.00	375.53	375.53	375.80	0.016448	4.14	156.82	296.65	1.01
Alignment - E	16000	PF 1	650.00	350.00	351.92	350.74	351.98	0.000619	1.88	345.66	180.17	0.24
Alignment - E	15500	PF 1	650.00	350.00	350.72	350.72	351.09	0.014851	4.84	134.17	185.37	1.00
Alignment - E	15000	PF 1	650.00	325.00	328.46	325.85	328.49	0.000135	1.28	508.07	147.31	0.12
Alignment - E	14500	PF 1	650.00	325.00	328.03		328.30	0.001810	4.12	157.85	52.47	0.42
Alignment - E	14000	PF 1	650.00	325.00	325.88	325.88	326.32	0.013939	5.34	121.83	138.27	1.00
Alignment - E	13500	PF 1	650.00	275.00	276.13	276.13	276.70	0.013043	6.06	107.24	94.75	1.00
Alignment - E	13000	PF 1	650.00	250.00	253.60	250.54	253.60	0.000030	0.63	1032.70	287.56	0.06
Alignment - E	12500	PF 1	650.00	250.00	253.42		253.55	0.000726	2.85	227.91	67.10	0.27
Alignment - E	12000	PF 1	650.00	250.00	252.29		252.77	0.004630	5.55	117.05	51.46	0.65
Alignment - E	11500	PF 1	650.00	250.00	251.98		252.03	0.000550	1.81	359.41	181.56	0.23
Alignment - E	11000	PF 1	650.00	250.00	251.63		251.69	0.000858	1.99	326.69	200.70	0.27
Alignment - E	10500	PF 1	650.00	150.00	251.67		251.67	0.000000	0.01	57409.42	808.21	0.00
Alignment - E	10000	PF 1	650.00	171.30	251.67		251.67	0.000000	0.03	24566.29	647.98	0.00
Alignment - E	9500	PF 1	650.00	204.72	251.67		251.67	0.000000	0.05	12194.93	579.40	0.00
Alignment - E	9000	PF 1	650.00	250.00	251.66		251.67	0.000212	1.00	647.32	391.18	0.14
Alignment - E	8500	PF 1	650.00	250.00	250.86	250.86	251.29	0.014021	5.27	123.32	143.29	1.00
Alignment - E	8000	PF 1	650.00	225.00	227.55	225.86	227.60	0.000383	1.77	367.42	144.50	0.20
Alignment - E	7500	PF 1	650.00	225.00	226.32	226.32	226.98	0.012522	6.53	99.60	75.60	1.00
Alignment - E	7000	PF 1	650.00	175.00	175.94	175.94	176.41	0.013765	5.51	118.07	126.39	1.00
Alignment - E	6500	PF 1	650.00	150.00	152.82	151.16	152.92	0.000697	2.51	258.82	92.20	0.26
Alignment - E	6000	PF 1	650.00	150.00	152.52		152.59	0.000588	2.16	300.45	119.74	0.24
Alignment - E	5500	PF 1	650.00	122.57	152.57		152.57	0.000000	0.19	3626.82	228.24	0.01
Alignment - E	5000	PF 1	650.00	100.00	152.57		152.57	0.000000	0.05	13076.49	381.98	0.00
Alignment - E	4500	PF 1	650.00	150.00	152.44		152.55	0.000990	2.74	237.50	97.73	0.31
Alignment - E	3999.99	PF 1	650.00	150.00	152.04		152.11	0.000747	2.14	303.65	149.01	0.26
Alignment - E	3500	PF 1	650.00	150.00	151.83		151.86	0.000327	1.33	488.21	266.30	0.17
Alignment - E	3000	PF 1	650.00	150.00	150.89	150.89	151.33	0.014008	5.37	121.10	136.63	1.01
Alignment - E	2500	PF 1	650.00	75.00	77.27	77.27	78.40	0.011688	8.54	76.14	33.99	1.01
Alignment - E	2000	PF 1	650.00	50.00	50.28	51.09	58.41	1.150885	22.86	28.43	100.22	7.57
Alignment - E	1500	PF 1	650.00	50.00	51.10	51.10	51.65	0.013201	5.96	109.01	99.61	1.00

E-Prop 10-year Results

HEC-RAS Plan: Plan 06 River: Eastern Reach: Alignment - E Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - E	24000	PF 1	1011.00	550.00	553.33	551.99	553.68	0.002093	4.76	212.34	64.81	0.46
Alignment - E	23500	PF 1	1011.00	550.00	551.01	551.01	551.52	0.013390	5.73	176.35	174.72	1.01
Alignment - E	23000	PF 1	1011.00	525.00	525.45	526.33	531.42	0.461117	19.61	51.55	115.05	5.16
Alignment - E	22500	PF 1	1011.00	475.00	507.28	476.59	507.28	0.000001	0.30	3843.69	219.18	0.01
Alignment - E	22000	PF 1	1011.00	500.00	507.27		507.28	0.000013	0.64	1577.34	218.14	0.04
Alignment - E	21500	PF 1	1011.00	500.00	504.74	504.74	507.03	0.012969	12.14	83.31	18.39	1.01
Alignment - E	21000	PF 1	1011.00	450.00	452.06	450.71	452.10	0.000437	1.66	608.60	296.16	0.20
Alignment - E	20500	PF 1	1011.00	450.00	451.89		451.91	0.000309	1.32	764.99	405.85	0.17
Alignment - E	20000	PF 1	1011.00	450.00	451.77		451.79	0.000197	1.01	997.11	563.07	0.13
Alignment - E	19500	PF 1	1011.00	450.00	451.70		451.71	0.000134	0.81	1241.85	732.93	0.11
Alignment - E	19000	PF 1	1011.00	450.00	450.96	450.96	451.44	0.013424	5.55	182.26	190.62	1.00
Alignment - E	18500	PF 1	1011.00	400.00	401.20	401.20	401.80	0.012750	6.23	162.20	135.84	1.01
Alignment - E	18000	PF 1	1011.00	375.00	378.48	375.87	378.51	0.000139	1.32	768.53	221.42	0.12
Alignment - E	17500	PF 1	1011.00	375.00	378.25		378.37	0.000675	2.73	370.50	114.55	0.27
Alignment - E	17000	PF 1	1011.00	375.00	377.66		377.87	0.001561	3.64	277.42	104.74	0.39
Alignment - E	16500	PF 1	1011.00	375.00	375.71	375.71	376.07	0.014933	4.80	210.53	296.72	1.01
Alignment - E	16000	PF 1	1011.00	350.00	352.38	350.99	352.47	0.000736	2.36	428.67	180.32	0.27
Alignment - E	15500	PF 1	1011.00	350.00	350.97	350.97	351.46	0.013403	5.60	180.55	185.44	1.00
Alignment - E	15000	PF 1	1011.00	325.00	329.31	326.14	329.34	0.000160	1.60	632.64	147.54	0.14
Alignment - E	14500	PF 1	1011.00	325.00	328.67		329.10	0.002370	5.28	191.44	52.65	0.49
Alignment - E	14000	PF 1	1011.00	325.00	326.18	326.18	326.78	0.012698	6.18	163.60	138.35	1.00
Alignment - E	13500	PF 1	1011.00	275.00	276.52	276.52	277.29	0.011916	7.02	144.09	94.88	1.00
Alignment - E	13000	PF 1	1011.00	250.00	254.56	250.73	254.57	0.000033	0.77	1309.64	287.88	0.06
Alignment - E	12500	PF 1	1011.00	250.00	254.31		254.51	0.000834	3.51	287.69	67.38	0.30
Alignment - E	12000	PF 1	1011.00	250.00	252.69		253.53	0.006674	7.35	137.52	51.60	0.79
Alignment - E	11500	PF 1	1011.00	250.00	252.48		252.56	0.000637	2.25	449.13	181.72	0.25
Alignment - E	11000	PF 1	1011.00	250.00	252.08		252.17	0.000922	2.42	417.49	200.87	0.30
Alignment - E	10500	PF 1	1011.00	150.00	252.15		252.15	0.000000	0.02	57791.70	808.37	0.00
Alignment - E	10000	PF 1	1011.00	171.30	252.15		252.15	0.000000	0.04	24872.78	648.14	0.00
Alignment - E	9500	PF 1	1011.00	204.72	252.15		252.15	0.000000	0.08	12468.95	579.55	0.00
Alignment - E	9000	PF 1	1011.00	250.00	252.12		252.14	0.000225	1.22	829.15	391.34	0.15
Alignment - E	8500	PF 1	1011.00	250.00	251.16	251.16	251.74	0.012774	6.11	165.57	143.39	1.00
Alignment - E	8000	PF 1	1011.00	225.00	228.25	226.15	228.33	0.000415	2.15	469.49	144.66	0.21
Alignment - E	7500	PF 1	1011.00	225.00	226.77	226.77	227.66	0.011585	7.57	133.50	75.70	1.01
Alignment - E	7000	PF 1	1011.00	175.00	176.25	176.25	176.89	0.012588	6.38	158.40	126.47	1.01
Alignment - E	6500	PF 1	1011.00	150.00	150.51	151.55	157.68	0.463170	21.47	47.08	91.67	5.28
Alignment - E	6000	PF 1	1011.00	150.00	153.13	151.30	153.24	0.000694	2.70	374.05	119.88	0.27
Alignment - E	5500	PF 1	1011.00	122.57	153.21		153.21	0.000001	0.28	3773.39	228.39	0.01
Alignment - E	5000	PF 1	1011.00	100.00	153.21		153.21	0.000000	0.08	13321.93	382.13	0.00
Alignment - E	4500	PF 1	1011.00	150.00	153.00		153.19	0.001208	3.45	292.93	97.86	0.35
Alignment - E	3999.99	PF 1	1011.00	150.00	152.55		152.66	0.000870	2.67	379.10	149.13	0.29
Alignment - E	3500	PF 1	1011.00	150.00	152.33		152.37	0.000359	1.63	620.07	266.42	0.19
Alignment - E	3000	PF 1	1011.00	150.00	151.19	151.19	151.79	0.012764	6.22	162.60	136.70	1.01
Alignment - E	2500	PF 1	1011.00	75.00	78.04	78.04	79.55	0.011088	9.86	102.49	34.26	1.01
Alignment - E	2000	PF 1	1011.00	50.00	50.39	51.46	60.63	0.942232	25.67	39.39	100.24	7.22
Alignment - E	1500	PF 1	1011.00	50.00	51.47	51.47	52.21	0.012084	6.91	146.34	99.67	1.01

W-Prop 2-year Results

HEC-RAS Plan: Plan 04 River: USG Reach: CNTR-LINE Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CNTR-LINE	23000	PF 1	450.00	804.79	806.61	806.61	807.24	0.011974	6.39	70.44	54.80	0.99
CNTR-LINE	22500	PF 1	450.00	774.87	775.64	776.87	787.37	0.710600	27.47	16.38	30.63	6.62
CNTR-LINE	22000	PF 1	450.00	742.43	743.72	743.87	744.26	0.028669	5.86	76.85	131.67	1.35
CNTR-LINE	21500	PF 1	450.00	716.83	718.04	718.75	720.55	0.090827	12.70	35.43	45.00	2.52
CNTR-LINE	21000	PF 1	450.00	694.43	695.70	695.97	696.64	0.028554	7.77	57.88	64.53	1.45
CNTR-LINE	20500	PF 1	450.00	664.74	665.79	666.69	669.54	0.135502	15.54	28.96	36.66	3.08
CNTR-LINE	20000	PF 1	450.00	664.84	665.72	665.72	666.02	0.015356	4.40	103.53	176.17	1.00
CNTR-LINE	19500	PF 1	450.00	649.51	650.08	650.21	650.49	0.092632	5.12	87.82	443.11	2.03
CNTR-LINE	19000	PF 1	450.00	632.36	633.66	633.69	634.02	0.016695	4.83	93.15	141.98	1.05
CNTR-LINE	18500	PF 1	450.00	616.08	616.94	617.33	618.22	0.079637	9.09	49.51	94.39	2.21
CNTR-LINE	18000	PF 1	450.00	600.64	602.26	602.26	602.44	0.018489	3.45	130.52	354.72	1.00
CNTR-LINE	17500	PF 1	450.00	586.11	587.43	587.62	588.02	0.050653	6.19	72.78	250.82	2.03
CNTR-LINE	17000	PF 1	450.00	570.00	571.90	572.35	572.75	0.020348	7.39	60.93	55.71	1.25
CNTR-LINE	16500	PF 1	450.00	556.99	557.97	558.06	558.26	0.043321	4.31	104.34	423.94	1.53
CNTR-LINE	16000	PF 1	450.00	543.14	543.90	543.94	544.23	0.019641	4.61	97.67	180.61	1.10
CNTR-LINE	15500	PF 1	450.00	528.54	529.75	529.98	530.32	0.042179	6.09	73.91	159.56	1.58
CNTR-LINE	15000	PF 1	450.00	513.05	514.11	514.23	514.60	0.024265	5.62	80.03	128.63	1.26
CNTR-LINE	14500	PF 1	450.00	496.81	497.72	497.97	498.51	0.044539	7.10	63.36	113.12	1.67
CNTR-LINE	14000	PF 1	450.00	489.95	492.66	490.52	492.66	0.000062	0.67	676.24	304.44	0.08
CNTR-LINE	13500	PF 1	450.00	490.19	492.11	492.11	492.52	0.010434	5.10	88.15	107.73	0.99
CNTR-LINE	13000	PF 1	450.00	484.91	485.40	485.41	485.62	0.018730	3.78	118.89	285.05	1.03
CNTR-LINE	12500	PF 1	450.00	474.63	475.24	475.28	475.52	0.021833	4.21	106.92	245.14	1.12
CNTR-LINE	12000	PF 1	450.00	465.00	465.90	465.90	466.21	0.016088	4.48	100.46	166.84	1.02
CNTR-LINE	11500	PF 1	450.00	456.73	457.91	457.91	458.09	0.017435	3.47	129.79	344.33	1.00
CNTR-LINE	11000	PF 1	450.00	445.84	446.71	446.82	447.14	0.028222	5.26	85.50	169.96	1.31
CNTR-LINE	10500	PF 1	450.00	434.96	435.87	435.77	436.10	0.010193	3.89	115.71	168.68	0.83
CNTR-LINE	10000	PF 1	450.00	428.54	429.21	429.21	429.39	0.018332	3.37	133.39	373.87	1.00
CNTR-LINE	9500	PF 1	450.00	419.11	419.81	419.75	419.97	0.012978	3.20	140.77	330.08	0.86
CNTR-LINE	9000	PF 1	450.00	411.04	412.46	412.46	412.72	0.016254	4.09	110.14	211.47	1.00
CNTR-LINE	8500	PF 1	450.00	403.91	405.59	405.33	405.78	0.005372	3.57	126.12	127.61	0.63
CNTR-LINE	8000	PF 1	450.00	399.51	401.32	401.32	401.67	0.014120	4.76	94.52	133.75	1.00
CNTR-LINE	7500	PF 1	450.00	386.24	386.68	386.91	387.45	0.083390	7.06	63.77	184.03	2.11
CNTR-LINE	7000	PF 1	450.00	376.18	377.72	377.72	378.16	0.013890	5.36	84.03	95.10	1.00
CNTR-LINE	6500	PF 1	450.00	367.88	368.67	368.79	369.22	0.023819	5.96	75.50	109.15	1.26
CNTR-LINE	6000	PF 1	450.00	354.66	355.32	355.37	355.56	0.031196	3.91	114.95	384.02	1.26
CNTR-LINE	5500	PF 1	450.00	343.69	344.38	344.38	344.56	0.018288	3.43	131.13	357.32	1.00
CNTR-LINE	5000	PF 1	450.00	333.43	334.20	334.23	334.41	0.022636	3.66	123.09	358.19	1.10
CNTR-LINE	4500	PF 1	450.00	323.63	324.10	324.10	324.22	0.020808	2.80	160.62	654.14	1.00
CNTR-LINE	4000	PF 1	450.00	312.61	313.42	313.47	313.66	0.021386	3.91	115.03	289.83	1.09
CNTR-LINE	3500	PF 1	450.00	303.03	303.83	303.83	304.05	0.017351	3.81	118.20	265.17	1.01
CNTR-LINE	3000	PF 1	450.00	293.67	294.25	294.27	294.43	0.021411	3.39	132.92	416.32	1.06
CNTR-LINE	2500	PF 1	450.00	284.11	284.81	284.78	284.91	0.014972	2.49	180.95	688.35	0.86
CNTR-LINE	2000	PF 1	450.00	275.65	276.09	276.09	276.21	0.020449	2.82	159.54	634.82	0.99
CNTR-LINE	1500	PF 1	450.00	265.90	266.51	266.49	266.67	0.017457	3.27	137.57	389.27	0.97
CNTR-LINE	1000	PF 1	450.00	257.14	257.79	257.79	258.03	0.017115	3.88	116.11	251.00	1.00

W-Prop 5-year Results

HEC-RAS Plan: Plan 05 River: USG Reach: CNTR-LINE Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CNTR-LINE	23000	PF 1	900.00	804.79	807.42	807.42	808.28	0.011072	7.45	120.77	70.27	1.00
CNTR-LINE	22500	PF 1	900.00	774.87	776.03	777.63	790.07	0.529265	30.05	29.95	39.22	6.06
CNTR-LINE	22000	PF 1	900.00	742.43	744.03	744.28	744.89	0.031997	7.43	121.17	157.79	1.49
CNTR-LINE	21500	PF 1	900.00	716.83	718.60	719.49	721.62	0.072134	13.94	64.55	59.97	2.37
CNTR-LINE	21000	PF 1	900.00	694.43	696.24	696.64	697.57	0.033126	9.27	97.07	92.83	1.60
CNTR-LINE	20500	PF 1	900.00	664.74	666.37	667.58	671.00	0.095535	17.27	52.12	43.25	2.77
CNTR-LINE	20000	PF 1	900.00	664.84	666.08	666.08	666.52	0.013631	5.40	168.03	188.19	1.00
CNTR-LINE	19500	PF 1	900.00	649.51	650.16	650.38	650.95	0.129162	7.11	126.63	501.95	2.49
CNTR-LINE	19000	PF 1	900.00	632.36	634.10	634.12	634.55	0.014536	5.38	167.33	195.69	1.03
CNTR-LINE	18500	PF 1	900.00	616.08	617.20	617.82	619.39	0.094191	11.88	75.78	109.69	2.52
CNTR-LINE	18000	PF 1	900.00	600.64	602.49	602.49	602.73	0.016394	3.92	229.69	469.27	0.99
CNTR-LINE	17500	PF 1	900.00	586.11	587.61	587.85	588.35	0.062220	6.92	130.14	403.60	2.15
CNTR-LINE	17000	PF 1	900.00	570.00	572.42	572.65	573.10	0.018017	6.61	136.16	311.23	1.76
CNTR-LINE	16500	PF 1	900.00	556.99	558.10	558.23	558.53	0.054220	5.25	171.30	595.30	1.73
CNTR-LINE	16000	PF 1	900.00	543.14	544.25	544.30	544.70	0.016717	5.40	166.76	215.51	1.08
CNTR-LINE	15500	PF 1	900.00	528.54	530.02	530.24	530.72	0.055671	6.71	134.04	307.73	1.79
CNTR-LINE	15000	PF 1	900.00	513.05	514.53	514.67	515.18	0.019767	6.47	139.04	155.12	1.21
CNTR-LINE	14500	PF 1	900.00	496.81	497.98	498.43	499.41	0.057305	9.60	93.76	128.68	1.98
CNTR-LINE	14000	PF 1	900.00	489.95	493.40	490.82	493.42	0.000104	0.99	913.08	333.81	0.11
CNTR-LINE	13500	PF 1	900.00	490.19	492.62	492.62	493.19	0.010579	6.04	148.97	131.68	1.00
CNTR-LINE	13000	PF 1	900.00	484.91	485.61	485.67	485.99	0.020343	4.98	180.76	305.52	1.14
CNTR-LINE	12500	PF 1	900.00	474.63	475.50	475.57	475.92	0.019945	5.21	173.29	281.66	1.15
CNTR-LINE	12000	PF 1	900.00	465.00	466.22	466.29	466.72	0.017038	5.63	159.73	196.28	1.10
CNTR-LINE	11500	PF 1	900.00	456.73	458.14	458.14	458.40	0.015964	4.08	220.76	427.09	1.00
CNTR-LINE	11000	PF 1	900.00	445.84	446.99	447.17	447.62	0.030417	6.40	140.53	220.11	1.41
CNTR-LINE	10500	PF 1	900.00	434.96	436.11	436.17	436.61	0.016582	5.68	158.38	188.31	1.09
CNTR-LINE	10000	PF 1	900.00	428.54	429.43	429.43	429.70	0.015931	4.12	218.47	408.37	0.99
CNTR-LINE	9500	PF 1	900.00	419.11	419.93	420.01	420.30	0.022472	4.86	185.26	366.28	1.20
CNTR-LINE	9000	PF 1	900.00	411.04	412.78	412.78	413.15	0.014746	4.87	184.65	252.92	1.01
CNTR-LINE	8500	PF 1	900.00	403.91	406.07	405.76	406.42	0.005811	4.80	187.57	128.49	0.70
CNTR-LINE	8000	PF 1	900.00	399.51	401.76	401.76	402.25	0.012850	5.65	159.37	159.13	0.99
CNTR-LINE	7500	PF 1	900.00	386.24	386.83	387.23	388.26	0.099402	9.57	94.06	196.08	2.44
CNTR-LINE	7000	PF 1	900.00	376.18	378.30	378.30	378.84	0.012870	5.93	151.73	139.16	1.00
CNTR-LINE	6500	PF 1	900.00	367.88	369.02	369.27	369.98	0.025648	7.87	114.40	114.92	1.39
CNTR-LINE	6000	PF 1	900.00	354.66	355.49	355.58	355.86	0.030411	4.93	182.58	423.46	1.32
CNTR-LINE	5500	PF 1	900.00	343.69	344.60	344.60	344.86	0.016563	4.15	217.19	413.90	1.01
CNTR-LINE	5000	PF 1	900.00	333.43	334.39	334.46	334.70	0.025500	4.46	201.82	476.72	1.21
CNTR-LINE	4500	PF 1	900.00	323.63	324.26	324.26	324.42	0.018193	3.28	274.48	798.23	0.99
CNTR-LINE	4000	PF 1	900.00	312.61	313.65	313.71	313.96	0.024237	4.51	199.38	445.14	1.19
CNTR-LINE	3500	PF 1	900.00	303.03	304.10	304.10	304.43	0.015397	4.60	195.54	301.73	1.01
CNTR-LINE	3000	PF 1	900.00	293.67	294.41	294.48	294.71	0.025283	4.36	206.32	500.49	1.20
CNTR-LINE	2500	PF 1	900.00	284.11	284.95	284.94	285.11	0.015874	3.16	285.25	793.43	0.93
CNTR-LINE	2000	PF 1	900.00	275.65	276.24	276.24	276.42	0.019107	3.41	264.02	751.50	1.01
CNTR-LINE	1500	PF 1	900.00	265.90	266.65	266.72	266.92	0.036651	4.16	216.23	743.55	1.36
CNTR-LINE	1000	PF 1	900.00	257.14	258.10	258.10	258.38	0.016162	4.23	212.69	386.07	1.01

W-Prop 10-year Results

HEC-RAS Plan: Plan 06 River: USG Reach: CNTR-LINE Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CNTR-LINE	23000	PF 1	1300.00	804.79	808.35	808.35	808.84	0.013171	5.62	231.21	233.92	1.00
CNTR-LINE	22500	PF 1	1300.00	774.87	776.38	778.25	788.88	0.384416	28.37	45.82	51.47	5.30
CNTR-LINE	22000	PF 1	1300.00	742.43	744.23	744.58	745.32	0.033715	8.38	155.08	175.16	1.57
CNTR-LINE	21500	PF 1	1300.00	716.83	718.96	719.97	722.33	0.064896	14.72	88.30	69.84	2.31
CNTR-LINE	21000	PF 1	1300.00	694.43	696.50	697.02	698.23	0.035898	10.55	123.24	103.14	1.70
CNTR-LINE	20500	PF 1	1300.00	664.74	666.78	668.19	671.97	0.081289	18.27	71.14	48.00	2.65
CNTR-LINE	20000	PF 1	1300.00	664.84	666.33	666.33	666.89	0.012895	6.02	217.24	196.87	1.01
CNTR-LINE	19500	PF 1	1300.00	649.51	650.22	650.50	651.32	0.153610	8.44	154.00	537.01	2.78
CNTR-LINE	19000	PF 1	1300.00	632.36	634.37	634.39	634.89	0.013711	5.84	222.66	220.39	1.02
CNTR-LINE	18500	PF 1	1300.00	616.08	617.38	618.24	620.17	0.097622	13.38	97.13	120.71	2.63
CNTR-LINE	18000	PF 1	1300.00	600.64	602.63	602.64	602.93	0.016375	4.33	299.95	526.63	1.01
CNTR-LINE	17500	PF 1	1300.00	586.11	587.71	587.97	588.57	0.062095	7.44	174.94	449.57	2.10
CNTR-LINE	17000	PF 1	1300.00	570.00	572.62	572.77	573.12	0.018234	5.69	228.64	598.89	1.62
CNTR-LINE	16500	PF 1	1300.00	556.99	558.18	558.34	558.70	0.052267	5.80	224.22	637.38	1.72
CNTR-LINE	16000	PF 1	1300.00	543.14	544.47	544.55	545.03	0.016769	6.02	215.81	237.10	1.11
CNTR-LINE	15500	PF 1	1300.00	528.54	530.13	530.42	531.04	0.055372	7.65	170.04	319.99	1.85
CNTR-LINE	15000	PF 1	1300.00	513.05	514.78	514.96	515.60	0.019612	7.25	179.42	167.99	1.24
CNTR-LINE	14500	PF 1	1300.00	496.81	498.19	498.74	499.93	0.056899	10.61	122.57	144.07	2.03
CNTR-LINE	14000	PF 1	1300.00	489.95	493.91	491.04	493.93	0.000141	1.19	1089.45	376.60	0.12
CNTR-LINE	13500	PF 1	1300.00	490.19	492.98	492.98	493.64	0.010319	6.52	199.34	151.02	1.00
CNTR-LINE	13000	PF 1	1300.00	484.91	485.75	485.86	486.27	0.022366	5.79	224.36	324.29	1.23
CNTR-LINE	12500	PF 1	1300.00	474.63	475.69	475.79	476.20	0.018212	5.75	229.62	316.63	1.13
CNTR-LINE	12000	PF 1	1300.00	465.00	466.45	466.57	467.05	0.018380	6.19	210.18	237.71	1.16
CNTR-LINE	11500	PF 1	1300.00	456.73	458.28	458.29	458.61	0.015264	4.58	283.75	444.40	1.01
CNTR-LINE	11000	PF 1	1300.00	445.84	447.16	447.40	447.96	0.031403	7.19	180.84	243.95	1.47
CNTR-LINE	10500	PF 1	1300.00	434.96	436.36	436.44	436.96	0.016111	6.22	208.89	212.04	1.11
CNTR-LINE	10000	PF 1	1300.00	428.54	429.58	429.58	429.91	0.014979	4.61	282.20	425.94	1.00
CNTR-LINE	9500	PF 1	1300.00	419.11	420.05	420.16	420.55	0.024027	5.65	230.19	378.91	1.28
CNTR-LINE	9000	PF 1	1300.00	411.04	413.01	413.01	413.44	0.013909	5.30	245.19	283.33	1.00
CNTR-LINE	8500	PF 1	1300.00	403.91	406.40	406.08	406.89	0.006150	5.64	230.66	129.11	0.74
CNTR-LINE	8000	PF 1	1300.00	399.51	402.06	402.06	402.66	0.012404	6.20	209.79	176.36	1.00
CNTR-LINE	7500	PF 1	1300.00	386.24	386.95	387.47	388.85	0.103134	11.06	117.53	202.61	2.56
CNTR-LINE	7000	PF 1	1300.00	376.18	378.64	378.64	379.28	0.012161	6.44	202.01	156.47	1.00
CNTR-LINE	6500	PF 1	1300.00	367.88	369.26	369.63	370.54	0.026653	9.08	143.10	119.00	1.46
CNTR-LINE	6000	PF 1	1300.00	354.66	355.60	355.73	356.09	0.030391	5.64	230.34	435.86	1.37
CNTR-LINE	5500	PF 1	1300.00	343.69	344.73	344.75	345.08	0.016574	4.71	275.92	433.87	1.04
CNTR-LINE	5000	PF 1	1300.00	333.43	334.51	334.59	334.89	0.025620	4.95	262.63	532.48	1.24
CNTR-LINE	4500	PF 1	1300.00	323.63	324.35	324.35	324.56	0.017417	3.67	353.75	839.18	1.00
CNTR-LINE	4000	PF 1	1300.00	312.61	313.82	313.88	314.13	0.025416	4.47	290.90	683.26	1.21
CNTR-LINE	3500	PF 1	1300.00	303.03	304.34	304.34	304.68	0.014913	4.65	279.67	415.09	1.00
CNTR-LINE	3000	PF 1	1300.00	293.67	294.53	294.63	294.89	0.026794	4.82	269.66	588.12	1.25
CNTR-LINE	2500	PF 1	1300.00	284.11	285.04	285.04	285.25	0.017556	3.64	357.39	866.12	1.00
CNTR-LINE	2000	PF 1	1300.00	275.65	276.35	276.35	276.56	0.017200	3.62	358.99	862.50	0.99
CNTR-LINE	1500	PF 1	1300.00	265.90	266.80	266.82	267.04	0.021184	3.93	331.05	823.47	1.09
CNTR-LINE	1000	PF 1	1300.00	257.14	258.27	258.27	258.61	0.015089	4.68	277.81	411.84	1.00

W-Prop 25-year Results

HEC-RAS Plan: Plan 08 River: USG Reach: CNTR-LINE Profile: PF 1

Reach	River Sta	Profile	Q Total	Max Chl Dpth	Min El	Flow Area	Top Width	Invert Slope	Frctn Slope	E.G. Slope	Vel Chnl	Froude # XS
			(cfs)	(ft)	(ft)	(sq ft)	(ft)		(ft/ft)	(ft/ft)	(ft/s)	
CNTR-LINE	23000	PF 1	2000.00	3.90	804.79	310.78	239.66	0.0598	0.012825	0.012034	6.44	1.00
CNTR-LINE	22500	PF 1	2000.00	1.87	774.87	66.17	61.51	0.0649	0.034085	0.339099	30.23	5.14
CNTR-LINE	22000	PF 1	2000.00	2.09	742.43	210.05	206.90	0.0512	0.082336	0.036243	9.52	1.67
CNTR-LINE	21500	PF 1	2000.00	2.65	716.83	127.93	83.76	0.0448	0.044831	0.056877	15.63	2.23
CNTR-LINE	21000	PF 1	2000.00	2.39	694.43	156.92	106.46	0.0594	0.047102	0.039647	12.75	1.85
CNTR-LINE	20500	PF 1	2000.00	2.65	664.74	102.11	54.85	-0.0002	0.051312	0.068999	19.59	2.53
CNTR-LINE	20000	PF 1	2000.00	2.07	664.84	404.19	486.15	0.0307	0.013353	0.012001	4.81	0.97
CNTR-LINE	19500	PF 1	2000.00	0.78	649.51	192.96	563.04	0.0343	0.030412	0.182598	10.36	3.12
CNTR-LINE	19000	PF 1	2000.00	2.39	632.36	317.63	270.83	0.0326	0.032540	0.013070	6.30	1.02
CNTR-LINE	18500	PF 1	2000.00	1.59	616.08	133.59	138.35	0.0309	0.027880	0.095788	14.97	2.69
CNTR-LINE	18000	PF 1	2000.00	2.18	600.64	403.27	602.30	0.0291	0.034036	0.017269	4.96	1.07
CNTR-LINE	17500	PF 1	2000.00	2.29	585.60	268.21	621.33	0.0322	0.028793	0.057318	7.46	2.00
CNTR-LINE	17000	PF 1	2000.00	2.80	570.00	342.40	659.20	0.0260	0.030633	0.019024	5.84	1.43
CNTR-LINE	16500	PF 1	2000.00	1.32	556.99	304.27	658.29	0.0277	0.028669	0.048052	6.57	1.70
CNTR-LINE	16000	PF 1	2000.00	1.63	543.14	292.39	270.67	0.0292	0.026941	0.017209	6.84	1.16
CNTR-LINE	15500	PF 1	2000.00	1.77	528.54	229.15	341.57	0.0310	0.027910	0.052885	8.73	1.88
CNTR-LINE	15000	PF 1	2000.00	2.07	513.05	239.39	182.65	0.0325	0.030536	0.019855	8.35	1.29
CNTR-LINE	14500	PF 1	2000.00	1.68	496.81	170.20	166.41	0.0137	0.030918	0.054652	11.75	2.05
CNTR-LINE	14000	PF 1	2000.00	4.61	489.95	1342.39	390.06	-0.0005	0.000545	0.000175	1.49	0.14
CNTR-LINE	13500	PF 1	2000.00	4.43	489.06	285.70	186.76	0.0106	0.010780	0.009867	7.00	1.00
CNTR-LINE	13000	PF 1	2000.00	1.02	484.91	286.20	350.40	0.0206	0.015129	0.026076	6.99	1.36
CNTR-LINE	12500	PF 1	2000.00	1.35	474.63	335.58	391.89	0.0193	0.020130	0.016007	6.19	1.16
CNTR-LINE	12000	PF 1	2000.00	1.73	465.00	281.87	282.87	0.0165	0.018097	0.020625	7.10	1.25
CNTR-LINE	11500	PF 1	2000.00	1.73	456.73	362.46	510.07	0.0218	0.017136	0.019497	5.52	1.15
CNTR-LINE	11000	PF 1	2000.00	1.69	445.84	280.52	303.73	0.0218	0.021157	0.023038	7.13	1.31
CNTR-LINE	10500	PF 1	2000.00	1.65	434.96	265.04	239.92	0.0128	0.021620	0.020329	7.55	1.27
CNTR-LINE	10000	PF 1	2000.00	1.27	428.54	383.17	452.39	0.0189	0.013536	0.013859	5.22	1.00
CNTR-LINE	9500	PF 1	2000.00	1.11	419.11	293.91	382.54	0.0161	0.018534	0.026044	6.81	1.37
CNTR-LINE	9000	PF 1	2000.00	2.29	411.04	342.81	324.11	0.0143	0.009125	0.012886	5.83	1.00
CNTR-LINE	8500	PF 1	2000.00	3.26	403.61	291.09	129.97	0.0088	0.008748	0.006799	6.87	0.81
CNTR-LINE	8000	PF 1	2000.00	2.98	399.51	290.37	197.76	0.0265	0.011817	0.011672	6.89	1.00
CNTR-LINE	7500	PF 1	2000.00	0.88	386.24	151.75	207.87	0.0201	0.026436	0.107889	13.18	2.72
CNTR-LINE	7000	PF 1	2000.00	2.93	376.18	283.04	182.30	0.0166	0.011803	0.011510	7.07	1.00
CNTR-LINE	6500	PF 1	2000.00	2.02	367.88	226.17	214.62	0.0264	0.017461	0.029580	8.84	1.52
CNTR-LINE	6000	PF 1	2000.00	1.12	354.66	313.18	469.61	0.0219	0.029049	0.028532	6.39	1.38
CNTR-LINE	5500	PF 1	2000.00	1.22	343.69	354.72	441.40	0.0205	0.021929	0.017378	5.64	1.11
CNTR-LINE	5000	PF 1	2000.00	1.24	333.43	350.98	555.85	0.0196	0.020456	0.024432	5.70	1.26
CNTR-LINE	4500	PF 1	2000.00	0.85	323.63	466.57	890.58	0.0220	0.020683	0.017735	4.29	1.04
CNTR-LINE	4000	PF 1	2000.00	1.35	312.61	393.35	745.57	0.0192	0.020794	0.024720	5.08	1.23
CNTR-LINE	3500	PF 1	2000.00	1.51	303.03	375.99	548.42	0.0187	0.018933	0.019080	5.32	1.13
CNTR-LINE	3000	PF 1	2000.00	1.09	293.67	446.51	886.79	0.0191	0.019736	0.020427	4.48	1.11
CNTR-LINE	2500	PF 1	2000.00	1.06	284.11	473.72	941.77	0.0169	0.019245	0.018163	4.22	1.05
CNTR-LINE	2000	PF 1	2000.00	0.84	275.65	479.74	909.29	0.0195	0.017364	0.016618	4.17	1.01
CNTR-LINE	1500	PF 1	2000.00	1.01	265.90	429.41	849.67	0.0175	0.019013	0.021966	4.66	1.15
CNTR-LINE	1000	PF 1	2000.00	1.37	257.14	384.18	467.84			0.013609	5.22	1.02

W-Prop 100-year Results

HEC-RAS Plan: Plan 08 River: USG Reach: CNTR-LINE Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CNTR-LINE	23000	PF 1	3300.00	804.79	809.21	809.21	810.09	0.010833	7.53	438.32	246.35	0.99
CNTR-LINE	22500	PF 1	3300.00	774.87	777.28	778.86	793.24	0.305575	32.07	102.91	80.99	5.01
CNTR-LINE	22000	PF 1	3300.00	742.43	744.94	745.54	746.75	0.038877	10.81	305.38	262.26	1.76
CNTR-LINE	21500	PF 1	3300.00	716.83	720.48	721.34	723.35	0.056813	13.59	242.88	196.11	2.15
CNTR-LINE	21000	PF 1	3300.00	694.43	697.43	698.48	700.78	0.036586	14.69	224.70	115.97	1.86
CNTR-LINE	20500	PF 1	3300.00	664.74	668.14	670.26	675.97	0.068112	22.45	147.01	63.68	2.60
CNTR-LINE	20000	PF 1	3300.00	664.84	667.22	667.22	667.77	0.011682	5.81	558.25	491.79	0.97
CNTR-LINE	19500	PF 1	3300.00	649.51	650.42	650.96	652.79	0.177333	12.36	266.97	585.16	3.22
CNTR-LINE	19000	PF 1	3300.00	632.36	635.36	635.38	635.93	0.013223	6.05	545.54	509.36	1.03
CNTR-LINE	18500	PF 1	3300.00	616.08	618.10	619.02	622.07	0.083357	15.98	206.48	231.38	2.98
CNTR-LINE	18000	PF 1	3300.00	600.64	603.03	603.14	603.62	0.019039	6.14	537.73	627.75	1.17
CNTR-LINE	17500	PF 1	3300.00	586.11	588.09	588.41	589.13	0.049038	8.16	404.54	682.74	1.87
CNTR-LINE	17000	PF 1	3300.00	570.00	573.05	573.22	573.64	0.021021	6.21	531.59	883.69	1.41
CNTR-LINE	16500	PF 1	3300.00	556.99	558.51	558.78	559.38	0.040744	7.48	441.34	688.02	1.64
CNTR-LINE	16000	PF 1	3300.00	543.14	545.28	545.48	546.05	0.018712	7.06	467.70	440.00	1.21
CNTR-LINE	15500	PF 1	3300.00	528.54	530.61	531.07	532.10	0.045360	9.80	336.79	376.11	1.82
CNTR-LINE	15000	PF 1	3300.00	513.05	515.61	516.01	517.15	0.021155	9.97	331.12	203.16	1.38
CNTR-LINE	14500	PF 1	3300.00	496.81	498.96	499.77	501.56	0.049585	12.96	254.73	200.02	2.02
CNTR-LINE	14000	PF 1	3300.00	489.95	495.45	491.89	495.51	0.000232	1.95	1693.03	405.86	0.17
CNTR-LINE	13500	PF 1	3300.00	490.19	494.17	494.17	495.07	0.009570	7.61	433.41	240.85	1.00
CNTR-LINE	13000	PF 1	3300.00	484.91	486.19	486.55	487.34	0.028886	8.61	392.27	495.64	1.49
CNTR-LINE	12500	PF 1	3300.00	474.63	476.33	476.45	477.12	0.014905	7.29	471.22	392.90	1.11
CNTR-LINE	12000	PF 1	3300.00	465.00	467.14	467.42	468.08	0.022523	7.77	424.64	401.36	1.33
CNTR-LINE	11500	PF 1	3300.00	456.73	458.84	458.84	459.34	0.013593	5.66	582.58	599.04	1.01
CNTR-LINE	11000	PF 1	3300.00	445.84	447.83	448.20	448.91	0.035455	8.35	395.14	466.29	1.60
CNTR-LINE	10500	PF 1	3300.00	434.96	437.35	437.42	437.99	0.014491	6.44	512.37	456.34	1.07
CNTR-LINE	10000	PF 1	3300.00	428.54	430.10	430.17	430.73	0.014537	6.37	518.96	482.28	1.07
CNTR-LINE	9500	PF 1	3300.00	419.11	420.53	420.78	421.52	0.023853	8.02	411.86	388.15	1.37
CNTR-LINE	9000	PF 1	3300.00	411.04	413.76	413.76	414.46	0.011784	6.73	490.27	350.50	1.00
CNTR-LINE	8500	PF 1	3300.00	403.91	407.54	407.34	408.72	0.007868	8.72	378.59	131.20	0.90
CNTR-LINE	8000	PF 1	3300.00	399.51	403.12	403.12	404.06	0.010843	7.76	425.20	227.96	1.00
CNTR-LINE	7500	PF 1	3300.00	386.24	387.39	388.38	391.27	0.107500	15.82	208.55	216.33	2.84
CNTR-LINE	7000	PF 1	3300.00	376.18	379.80	379.80	380.72	0.010844	7.70	428.61	231.90	1.00
CNTR-LINE	6500	PF 1	3300.00	367.88	370.28	370.77	371.95	0.032397	10.37	318.38	254.09	1.63
CNTR-LINE	6000	PF 1	3300.00	354.66	356.06	356.28	356.89	0.027159	7.34	449.60	527.24	1.40
CNTR-LINE	5500	PF 1	3300.00	343.69	345.20	345.32	345.90	0.018028	6.69	493.97	489.78	1.17
CNTR-LINE	5000	PF 1	3300.00	333.43	334.91	335.09	335.63	0.023612	6.81	484.63	572.65	1.30
CNTR-LINE	4500	PF 1	3300.00	323.63	324.69	324.74	325.07	0.018671	4.97	663.49	1052.98	1.10
CNTR-LINE	4000	PF 1	3300.00	312.61	314.19	314.29	314.69	0.023147	5.71	577.78	875.59	1.24
CNTR-LINE	3500	PF 1	3300.00	303.03	304.93	304.95	305.31	0.015403	4.98	666.13	936.93	1.03
CNTR-LINE	3000	PF 1	3300.00	293.67	294.92	295.04	295.39	0.026468	5.46	603.90	1080.73	1.29
CNTR-LINE	2500	PF 1	3300.00	284.11	285.32	285.40	285.76	0.021566	5.34	618.21	983.33	1.19
CNTR-LINE	2000	PF 1	3300.00	275.65	276.72	276.72	277.05	0.014926	4.61	716.51	1079.04	1.00
CNTR-LINE	1500	PF 1	3300.00	265.90	267.08	267.20	267.59	0.024648	5.77	571.84	894.47	1.27
CNTR-LINE	1000	PF 1	3300.00	257.14	258.86	258.86	259.42	0.012086	6.01	554.12	493.37	0.98

Ex 10-year Results

HEC-RAS Plan: Plan 05 River: Gyp-FL Reach: Alignment - (1) Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - (1)	22500	PF 1	2200.00	804.64	806.74	806.74	807.41	0.012011	6.58	336.06	267.07	1.00
Alignment - (1)	22000	PF 1	2200.00	765.36	766.91	768.49	786.16	0.938896	35.21	62.49	99.30	7.82
Alignment - (1)	21500	PF 1	2200.00	737.52	740.63	740.81	741.33	0.026231	6.48	330.72	438.52	1.34
Alignment - (1)	21000	PF 1	2200.00	709.52	712.52	714.34	719.20	0.087581	20.73	106.12	62.68	2.81
Alignment - (1)	20500	PF 1	2200.00	688.34	691.47	692.40	694.41	0.029604	13.75	160.03	76.86	1.68
Alignment - (1)	20000	PF 1	2200.00	664.77	667.69	669.26	673.23	0.063596	18.88	116.56	62.30	2.43
Alignment - (1)	19500	PF 1	2200.00	654.00	658.45	658.72	660.20	0.012338	10.63	207.06	76.51	1.14
Alignment - (1)	19000	PF 1	2200.00	646.86	648.93	649.24	649.96	0.038130	8.13	270.46	350.54	1.63
Alignment - (1)	18500	PF 1	2200.00	630.32	632.42	632.71	633.40	0.028963	7.94	277.14	303.11	1.46
Alignment - (1)	18000	PF 1	2200.00	614.97	616.28	616.54	617.19	0.036413	7.69	286.20	390.05	1.58
Alignment - (1)	17500	PF 1	2200.00	596.75	598.86	599.20	600.03	0.032305	8.66	253.99	264.57	1.56
Alignment - (1)	17000	PF 1	2200.00	583.18	585.06	585.35	586.07	0.022838	8.44	274.10	249.30	1.36
Alignment - (1)	16500	PF 1	2200.00	571.38	572.25	572.36	572.69	0.032871	5.34	417.99	940.37	1.39
Alignment - (1)	16000	PF 1	2200.00	557.30	558.02	558.13	558.41	0.024650	4.06	464.84	1047.52	1.16
Alignment - (1)	15500	PF 1	2200.00	540.64	542.77	543.10	543.88	0.032180	8.49	259.11	277.21	1.55
Alignment - (1)	15000	PF 1	2200.00	509.61	510.82	511.92	515.46	0.121801	17.29	127.27	126.63	3.04
Alignment - (1)	14500	PF 1	2200.00	504.68	506.77	506.77	507.73	0.010814	7.87	279.67	146.98	1.00
Alignment - (1)	14000	PF 1	2200.00	494.99	495.87	496.32	497.39	0.053232	9.89	222.50	276.34	1.94
Alignment - (1)	13500	PF 1	2200.00	487.86	489.80	489.80	490.30	0.013427	5.67	387.76	394.48	1.01
Alignment - (1)	13000	PF 1	2200.00	479.12	480.66	480.83	481.40	0.024585	6.91	318.39	379.35	1.33
Alignment - (1)	12500	PF 1	2200.00	470.43	472.53	472.53	473.11	0.012786	6.09	361.02	318.02	1.01
Alignment - (1)	12000	PF 1	2200.00	461.64	463.55	463.88	464.52	0.023993	7.92	277.74	264.71	1.36
Alignment - (1)	11500	PF 1	2200.00	454.42	455.63	455.63	456.09	0.013880	5.42	405.96	453.48	1.01
Alignment - (1)	11000	PF 1	2200.00	444.95	446.29	446.51	447.14	0.023706	7.39	297.89	312.53	1.33
Alignment - (1)	10500	PF 1	2200.00	435.24	436.86	436.89	437.35	0.016120	5.61	392.12	465.28	1.08
Alignment - (1)	10000	PF 1	2200.00	427.03	428.66	428.68	429.07	0.016916	5.17	425.87	592.40	1.07
Alignment - (1)	9500	PF 1	2200.00	419.38	420.34	420.37	420.67	0.016671	4.84	487.66	866.32	1.05
Alignment - (1)	9000	PF 1	2200.00	409.10	410.48	410.61	411.09	0.022292	6.27	350.97	449.59	1.25
Alignment - (1)	8500	PF 1	2200.00	389.73	394.67	393.11	395.04	0.001989	4.88	450.89	134.71	0.47
Alignment - (1)	8000	PF 1	2200.00	390.90	392.56	392.56	392.90	0.014920	4.68	469.69	689.45	1.00
Alignment - (1)	7500	PF 1	2200.00	379.39	380.69	381.05	381.77	0.035640	8.34	263.73	312.47	1.60
Alignment - (1)	7000	PF 1	2200.00	372.73	374.21	374.21	374.53	0.013712	4.63	496.79	764.12	0.97
Alignment - (1)	6500	PF 1	2200.00	361.62	362.98	363.31	364.11	0.032620	8.55	263.03	392.68	1.56
Alignment - (1)	6000	PF 1	2200.00	351.72	352.78	352.78	353.11	0.015264	4.67	470.96	705.44	1.01
Alignment - (1)	5500	PF 1	2200.00	339.96	341.01	341.20	341.65	0.037926	6.43	342.06	628.23	1.54
Alignment - (1)	5000	PF 1	2200.00	329.96	331.19	331.19	331.54	0.015518	4.70	467.70	701.84	1.02
Alignment - (1)	4500	PF 1	2200.00	319.97	320.97	321.08	321.40	0.027569	5.28	416.98	811.31	1.30
Alignment - (1)	4000	PF 1	2200.00	309.87	311.04	311.10	311.47	0.015034	5.32	426.99	615.04	1.04
Alignment - (1)	3500	PF 1	2200.00	300.63	301.58	301.62	301.86	0.025377	4.32	510.44	1263.54	1.20
Alignment - (1)	3000	PF 1	2200.00	290.38	291.56	291.56	291.88	0.016170	4.51	488.03	805.71	1.02
Alignment - (1)	2500	PF 1	2200.00	280.41	281.96	282.04	282.38	0.022798	5.24	420.57	733.26	1.21
Alignment - (1)	2000	PF 1	2200.00	271.54	272.60	272.63	272.93	0.015578	4.90	495.70	875.99	1.03
Alignment - (1)	1500	PF 1	2200.00	262.67	263.64	263.71	264.01	0.020412	4.84	461.76	951.16	1.13

Ex 25-year Results

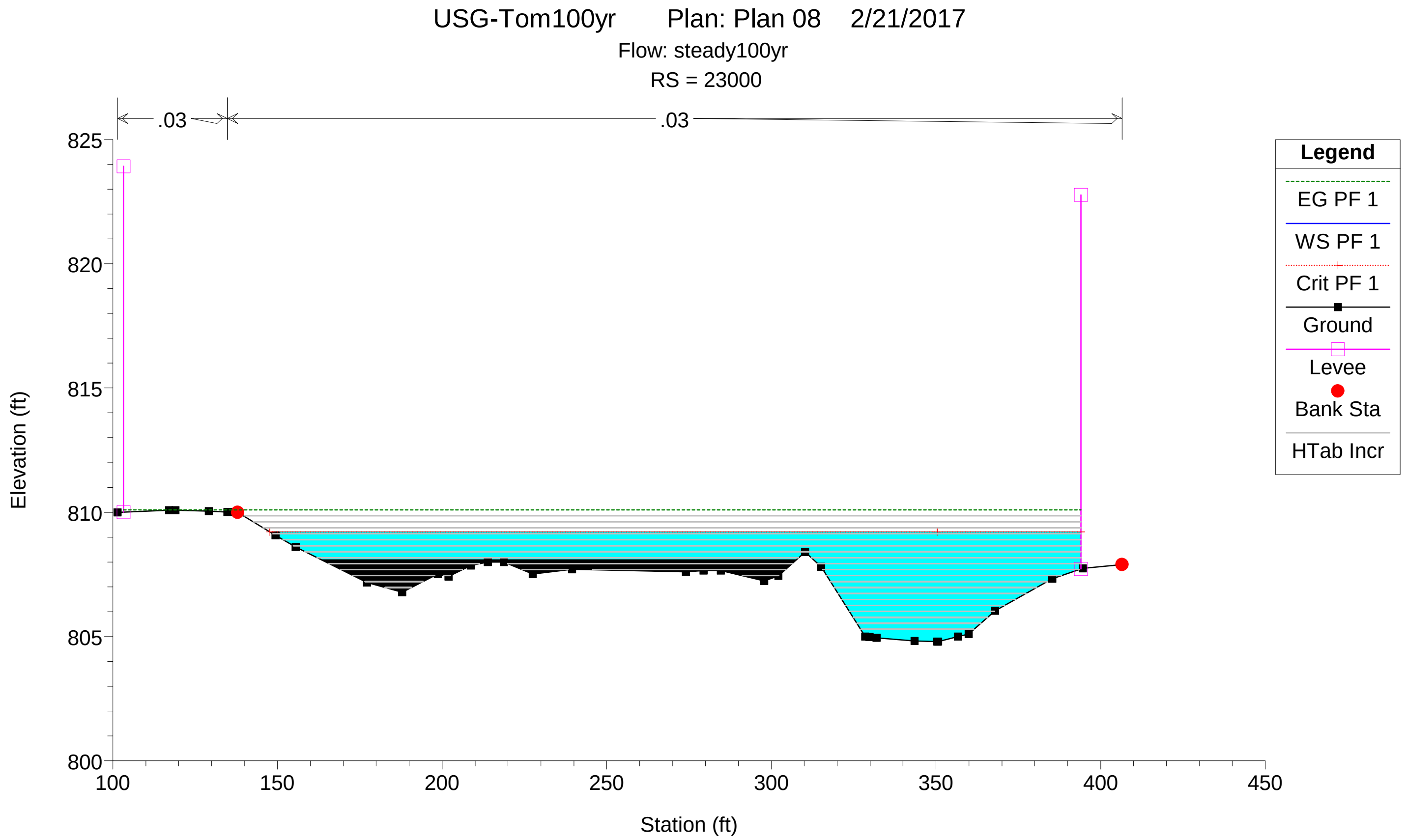
HEC-RAS Plan: Plan 04 River: Gyp-FL Reach: Alignment - (1) Profile: PF 1

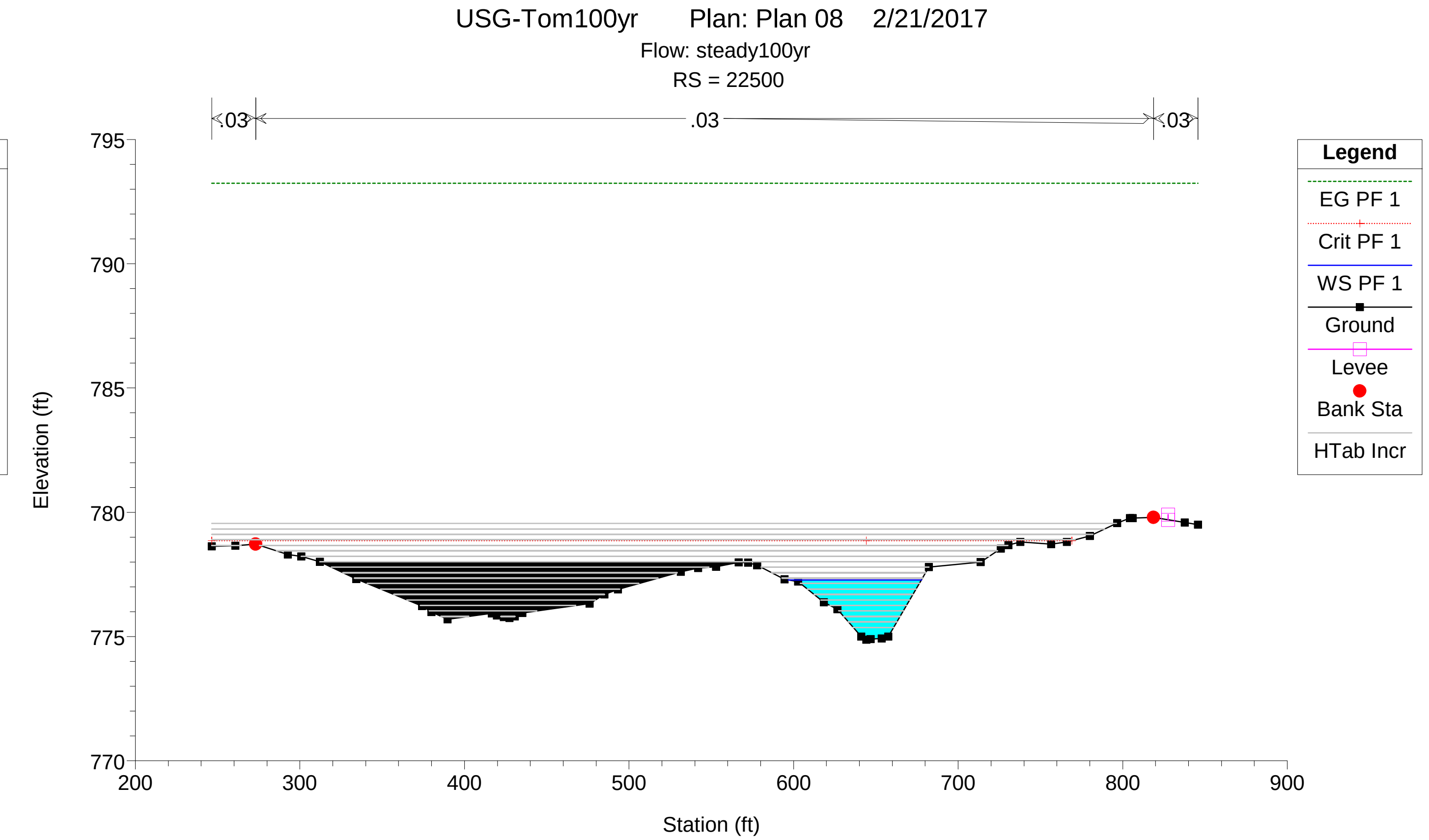
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - (1)	22500	PF 1	3500.00	804.64	807.33	807.33	808.05	0.010189	6.90	527.27	376.05	0.95
Alignment - (1)	22000	PF 1	3500.00	765.36	767.18	769.01	789.35	0.848264	37.78	92.63	122.70	7.66
Alignment - (1)	21500	PF 1	3500.00	737.52	740.89	741.20	741.83	0.028280	7.80	450.67	499.53	1.44
Alignment - (1)	21000	PF 1	3500.00	709.52	713.37	715.26	719.92	0.074778	20.54	170.42	90.75	2.64
Alignment - (1)	20500	PF 1	3500.00	688.34	692.18	693.44	696.19	0.031054	16.06	217.89	85.50	1.77
Alignment - (1)	20000	PF 1	3500.00	664.77	668.51	670.23	674.47	0.063601	19.60	178.57	90.18	2.45
Alignment - (1)	19500	PF 1	3500.00	654.00	659.48	659.86	661.72	0.011959	12.02	291.14	87.21	1.16
Alignment - (1)	19000	PF 1	3500.00	646.86	649.12	649.67	650.77	0.049796	10.29	340.01	378.19	1.91
Alignment - (1)	18500	PF 1	3500.00	630.32	632.85	633.19	633.91	0.023899	8.25	424.05	378.73	1.37
Alignment - (1)	18000	PF 1	3500.00	614.97	616.47	616.97	617.91	0.044699	9.65	362.72	409.71	1.81
Alignment - (1)	17500	PF 1	3500.00	596.75	599.26	599.67	600.71	0.027307	9.66	362.46	282.77	1.50
Alignment - (1)	17000	PF 1	3500.00	583.18	585.44	585.91	586.76	0.026363	9.22	379.12	308.20	1.47
Alignment - (1)	16500	PF 1	3500.00	571.38	572.42	572.56	573.00	0.029729	6.18	574.18	984.97	1.39
Alignment - (1)	16000	PF 1	3500.00	557.30	558.15	558.30	558.71	0.027112	5.19	606.34	1059.06	1.28
Alignment - (1)	15500	PF 1	3500.00	540.64	543.16	543.57	544.52	0.027845	9.36	373.89	309.97	1.50
Alignment - (1)	15000	PF 1	3500.00	509.61	511.12	512.68	518.03	0.128575	21.09	165.96	127.40	3.26
Alignment - (1)	14500	PF 1	3500.00	504.68	507.46	507.46	508.76	0.009841	9.15	382.62	148.99	1.01
Alignment - (1)	14000	PF 1	3500.00	494.99	496.08	496.77	498.51	0.063694	12.51	279.80	279.37	2.20
Alignment - (1)	13500	PF 1	3500.00	487.86	490.18	490.19	490.81	0.012524	6.36	550.59	448.23	1.01
Alignment - (1)	13000	PF 1	3500.00	479.12	480.92	481.22	482.01	0.026978	8.38	417.75	399.68	1.44
Alignment - (1)	12500	PF 1	3500.00	470.43	472.99	472.99	473.66	0.012394	6.55	534.19	412.36	1.01
Alignment - (1)	12000	PF 1	3500.00	461.64	464.03	464.32	465.03	0.025517	8.02	436.21	427.07	1.40
Alignment - (1)	11500	PF 1	3500.00	454.42	455.96	455.96	456.58	0.012479	6.31	554.96	455.83	1.01
Alignment - (1)	11000	PF 1	3500.00	444.95	446.66	447.04	447.71	0.026857	8.24	424.73	415.14	1.44
Alignment - (1)	10500	PF 1	3500.00	435.24	437.18	437.23	437.81	0.014860	6.38	548.44	504.67	1.08
Alignment - (1)	10000	PF 1	3500.00	427.03	428.88	428.98	429.47	0.018798	6.17	567.40	654.49	1.17
Alignment - (1)	9500	PF 1	3500.00	419.38	420.55	420.58	420.99	0.015359	5.53	670.20	875.48	1.05
Alignment - (1)	9000	PF 1	3500.00	409.10	410.72	410.93	411.63	0.023263	7.62	459.11	452.49	1.33
Alignment - (1)	8500	PF 1	3500.00	389.73	392.83	393.98	396.58	0.038766	15.54	225.28	111.12	1.92
Alignment - (1)	8000	PF 1	3500.00	390.90	392.83	392.83	393.23	0.013695	5.08	689.37	840.91	0.99
Alignment - (1)	7500	PF 1	3500.00	379.39	381.01	381.45	382.32	0.038791	9.18	381.43	417.28	1.69
Alignment - (1)	7000	PF 1	3500.00	372.73	374.43	374.43	374.86	0.014089	5.38	670.96	809.93	1.01
Alignment - (1)	6500	PF 1	3500.00	361.62	363.29	363.78	364.64	0.030017	9.55	396.83	452.77	1.55
Alignment - (1)	6000	PF 1	3500.00	351.72	352.98	353.02	353.47	0.016653	5.60	626.73	782.63	1.09
Alignment - (1)	5500	PF 1	3500.00	339.96	341.22	341.48	342.05	0.032968	7.28	483.81	730.98	1.50
Alignment - (1)	5000	PF 1	3500.00	329.96	331.50	331.50	331.86	0.014929	4.83	724.19	1013.70	1.01
Alignment - (1)	4500	PF 1	3500.00	319.97	321.15	321.28	321.71	0.029620	6.05	578.46	966.98	1.38
Alignment - (1)	4000	PF 1	3500.00	309.87	311.33	311.41	311.85	0.014126	5.90	634.24	814.34	1.04
Alignment - (1)	3500	PF 1	3500.00	300.63	301.69	301.79	302.13	0.028514	5.26	658.75	1300.47	1.31
Alignment - (1)	3000	PF 1	3500.00	290.38	291.79	291.79	292.21	0.014310	5.17	679.51	856.26	1.01
Alignment - (1)	2500	PF 1	3500.00	280.41	282.12	282.33	282.76	0.026007	6.43	555.62	925.32	1.33
Alignment - (1)	2000	PF 1	3500.00	271.54	272.84	272.85	273.22	0.014037	5.21	721.97	988.08	1.00
Alignment - (1)	1500	PF 1	3500.00	262.67	263.79	263.92	264.33	0.022720	5.96	608.80	1000.00	1.24

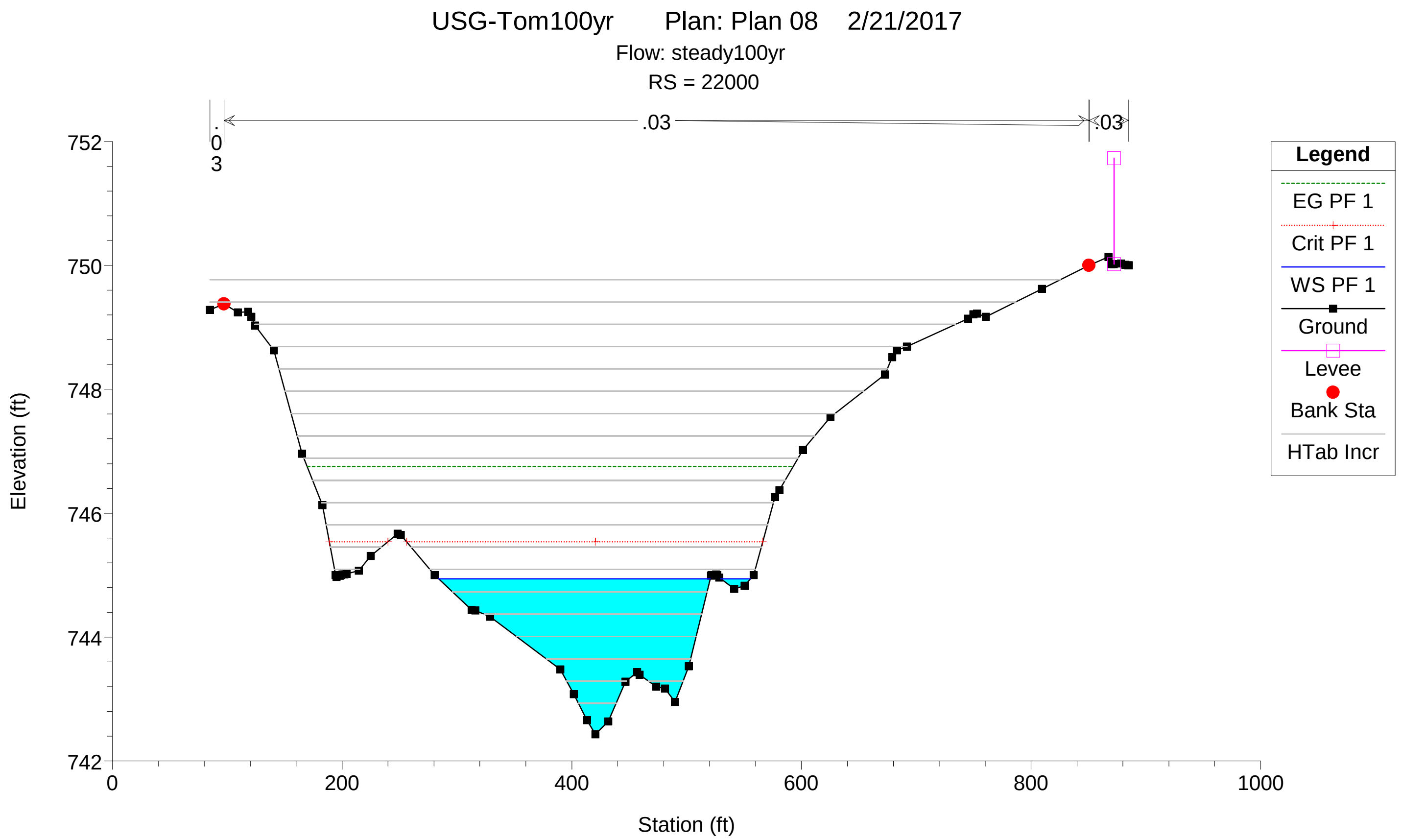
Ex 100-year Results

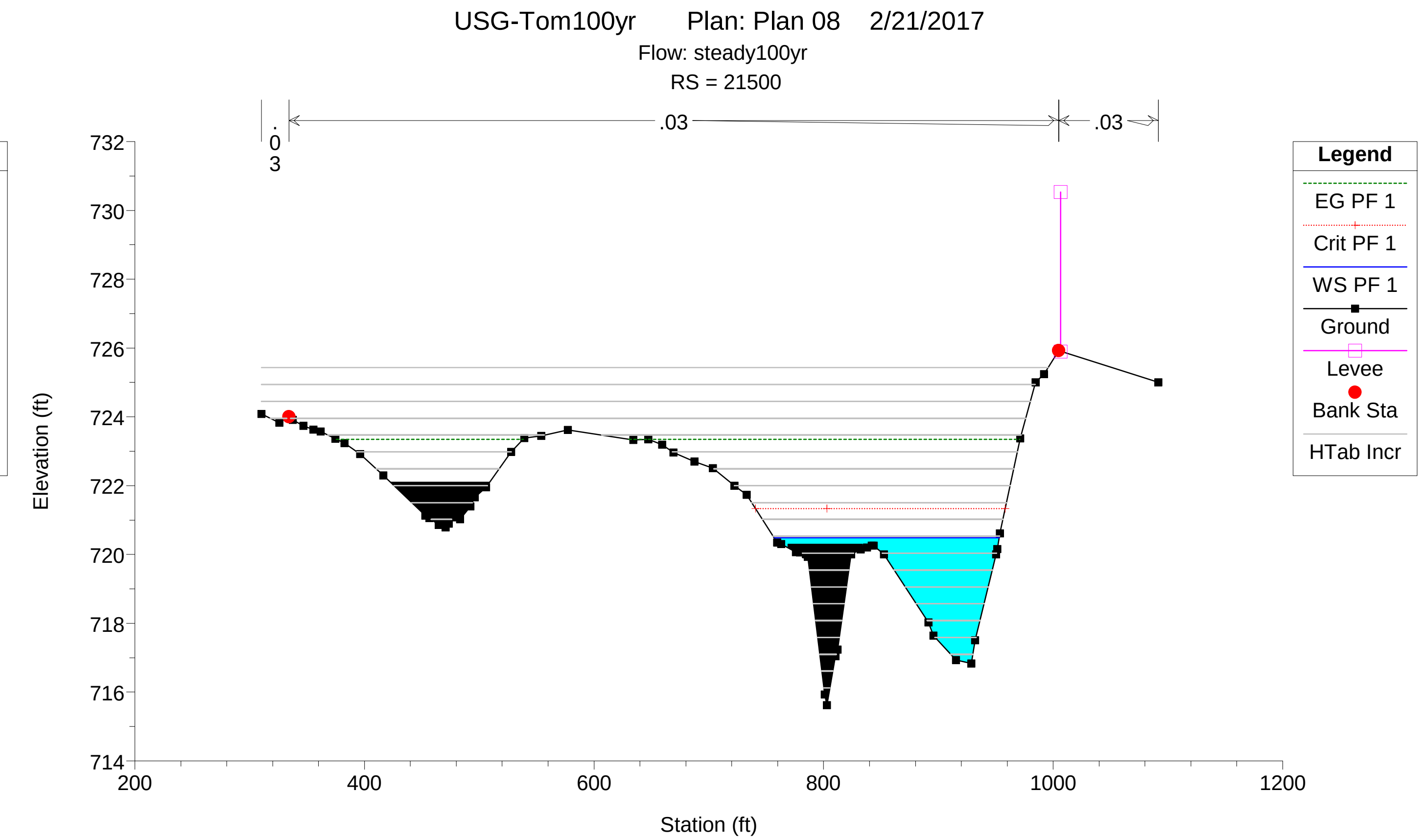
HEC-RAS Plan: Plan 05 River: Gyp-FL Reach: Alignment - (1) Profile: PF 1

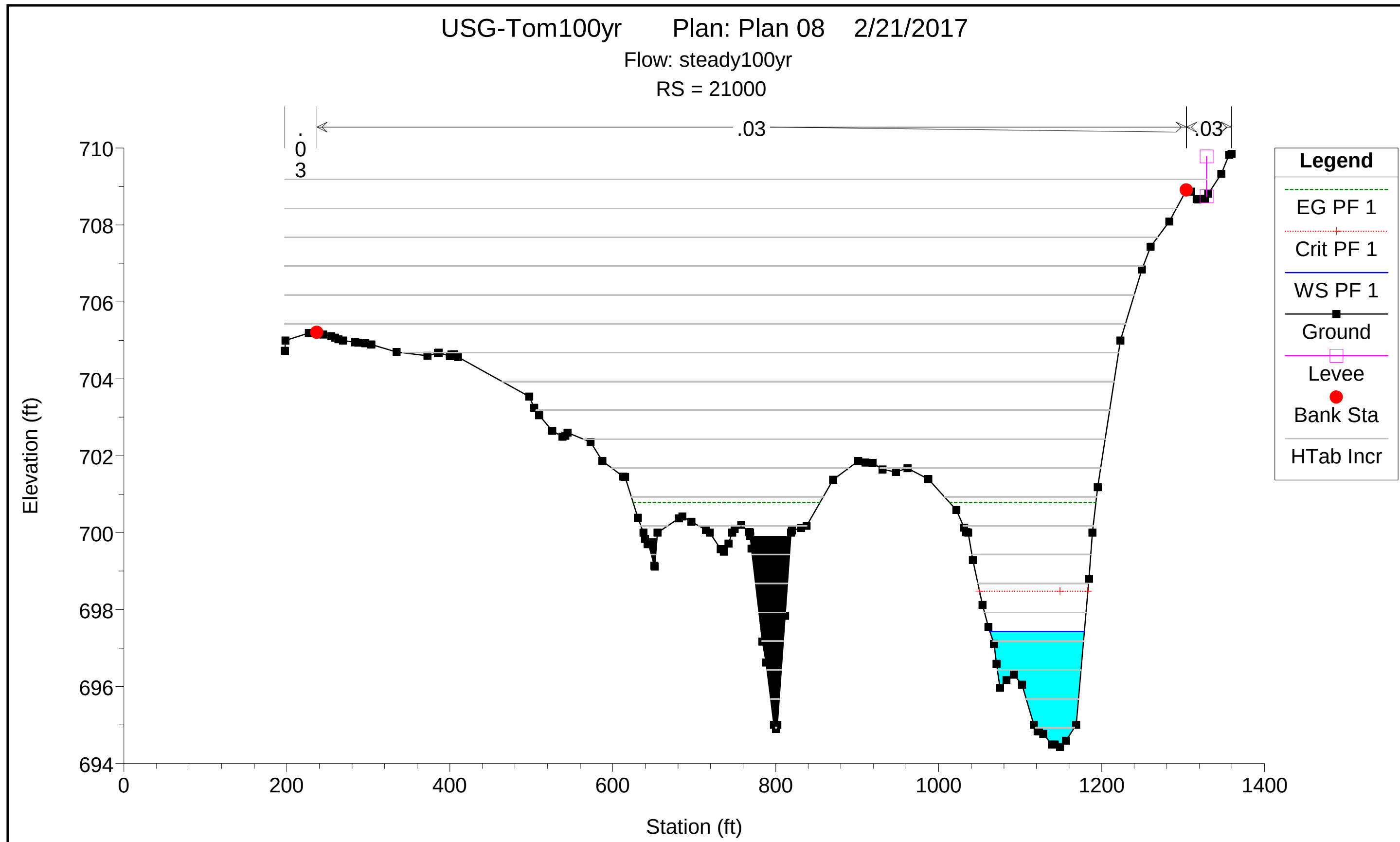
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alignment - (1)	22500	PF 1	5800.00	804.64	807.93	807.93	808.88	0.009134	7.99	760.56	396.79	0.95
Alignment - (1)	22000	PF 1	5800.00	765.36	767.58	769.75	791.86	0.684093	39.54	146.67	154.41	7.15
Alignment - (1)	21500	PF 1	5800.00	737.52	741.27	741.57	742.40	0.030634	8.32	682.54	702.11	1.51
Alignment - (1)	21000	PF 1	5800.00	709.52	714.44	716.02	720.46	0.067080	19.68	294.72	154.34	2.51
Alignment - (1)	20500	PF 1	5800.00	688.34	693.22	695.63	698.57	0.030326	18.56	312.52	96.43	1.82
Alignment - (1)	20000	PF 1	5800.00	664.77	669.34	671.33	676.86	0.065648	22.01	263.57	114.48	2.56
Alignment - (1)	19500	PF 1	5800.00	654.00	660.84	661.41	663.80	0.011872	13.81	419.91	101.43	1.20
Alignment - (1)	19000	PF 1	5800.00	646.86	649.37	650.17	652.10	0.064587	13.26	437.94	464.29	2.25
Alignment - (1)	18500	PF 1	5800.00	630.32	633.46	633.69	634.48	0.021125	8.13	713.69	594.60	1.31
Alignment - (1)	18000	PF 1	5800.00	614.97	616.86	617.37	618.54	0.053071	10.39	558.02	641.09	1.96
Alignment - (1)	17500	PF 1	5800.00	596.75	599.87	600.52	601.64	0.023366	10.68	542.83	323.68	1.45
Alignment - (1)	17000	PF 1	5800.00	583.18	585.91	586.51	587.67	0.031220	9.79	553.16	428.04	1.59
Alignment - (1)	16500	PF 1	5800.00	571.38	572.66	572.86	573.46	0.026703	7.28	808.69	984.97	1.39
Alignment - (1)	16000	PF 1	5800.00	557.30	558.34	558.56	559.18	0.030250	6.68	809.12	1130.05	1.42
Alignment - (1)	15500	PF 1	5800.00	540.64	543.73	544.23	545.35	0.023998	10.21	568.16	369.97	1.45
Alignment - (1)	15000	PF 1	5800.00	509.61	511.62	513.81	521.52	0.121491	25.25	229.72	128.66	3.33
Alignment - (1)	14500	PF 1	5800.00	504.68	508.60	508.60	510.25	0.008999	10.29	563.73	171.50	1.00
Alignment - (1)	14000	PF 1	5800.00	494.99	496.39	497.45	500.23	0.071209	15.71	369.11	284.56	2.43
Alignment - (1)	13500	PF 1	5800.00	487.86	490.67	490.68	491.54	0.011336	7.48	775.35	458.80	1.01
Alignment - (1)	13000	PF 1	5800.00	479.12	481.29	481.75	482.87	0.029156	10.10	574.21	439.89	1.56
Alignment - (1)	12500	PF 1	5800.00	470.43	473.55	473.56	474.41	0.011364	7.46	777.37	462.66	1.01
Alignment - (1)	12000	PF 1	5800.00	461.64	464.39	464.88	465.83	0.029623	9.66	600.70	498.28	1.55
Alignment - (1)	11500	PF 1	5800.00	454.42	456.44	456.44	457.31	0.011282	7.46	776.99	459.36	1.01
Alignment - (1)	11000	PF 1	5800.00	444.95	447.07	447.46	448.37	0.032037	9.17	632.41	600.94	1.58
Alignment - (1)	10500	PF 1	5800.00	435.24	437.67	437.72	438.46	0.013125	7.16	810.37	572.01	1.06
Alignment - (1)	10000	PF 1	5800.00	427.03	429.20	429.41	430.02	0.022474	7.27	797.61	821.78	1.30
Alignment - (1)	9500	PF 1	5800.00	419.38	420.87	420.90	421.45	0.013430	6.32	957.60	891.62	1.04
Alignment - (1)	9000	PF 1	5800.00	409.10	411.06	411.42	412.46	0.025038	9.50	610.36	456.43	1.45
Alignment - (1)	8500	PF 1	5800.00	389.73	393.82	395.23	398.30	0.030810	16.98	341.56	123.29	1.80
Alignment - (1)	8000	PF 1	5800.00	390.90	393.14	393.14	393.72	0.013196	6.09	951.87	858.88	1.02
Alignment - (1)	7500	PF 1	5800.00	379.39	381.42	381.91	383.00	0.039688	10.07	575.73	556.82	1.75
Alignment - (1)	7000	PF 1	5800.00	372.73	374.78	374.78	375.35	0.012058	6.20	966.43	904.60	0.99
Alignment - (1)	6500	PF 1	5800.00	361.62	363.79	364.10	364.85	0.040320	8.11	704.42	935.97	1.67
Alignment - (1)	6000	PF 1	5800.00	351.72	353.34	353.37	353.98	0.013498	6.42	911.24	801.44	1.04
Alignment - (1)	5500	PF 1	5800.00	339.96	341.41	341.83	342.77	0.043401	9.40	631.43	825.70	1.78
Alignment - (1)	5000	PF 1	5800.00	329.96	331.79	331.79	332.27	0.014004	5.55	1044.18	1130.50	1.02
Alignment - (1)	4500	PF 1	5800.00	319.97	321.35	321.58	322.21	0.031035	7.43	780.60	992.84	1.48
Alignment - (1)	4000	PF 1	5800.00	309.87	311.70	311.80	312.29	0.013770	6.43	968.94	989.24	1.05
Alignment - (1)	3500	PF 1	5800.00	300.63	301.87	302.05	302.52	0.030193	6.23	901.21	1396.86	1.40
Alignment - (1)	3000	PF 1	5800.00	290.38	292.12	292.13	292.68	0.013043	6.02	974.71	939.85	1.01
Alignment - (1)	2500	PF 1	5800.00	280.41	282.34	282.62	283.26	0.029360	7.84	791.14	1232.90	1.47
Alignment - (1)	2000	PF 1	5800.00	271.54	273.14	273.14	273.64	0.013115	5.87	1035.91	1066.83	1.01
Alignment - (1)	1500	PF 1	5800.00	262.67	264.01	264.21	264.81	0.024192	7.34	824.86	1000.00	1.34

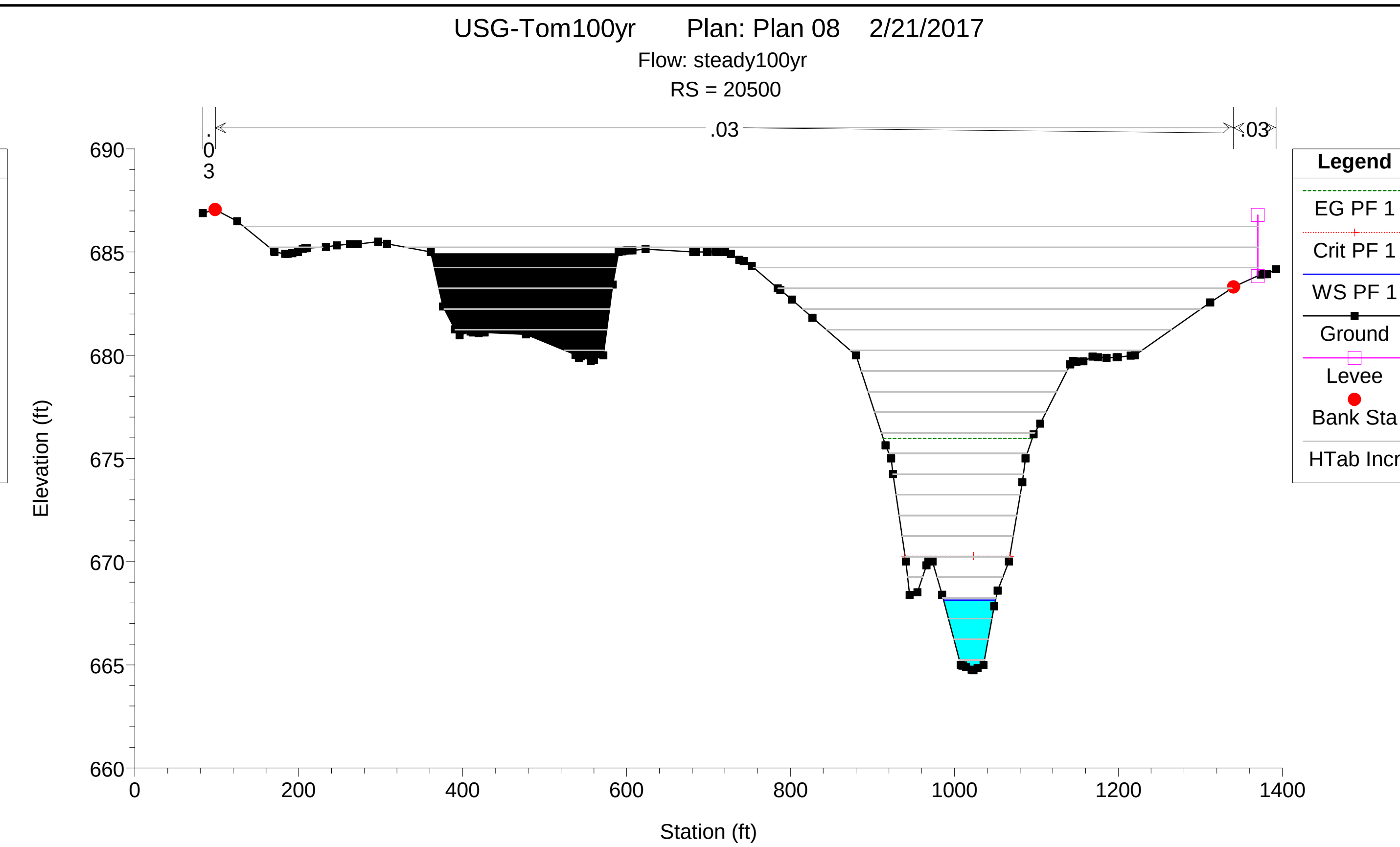

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 23000
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

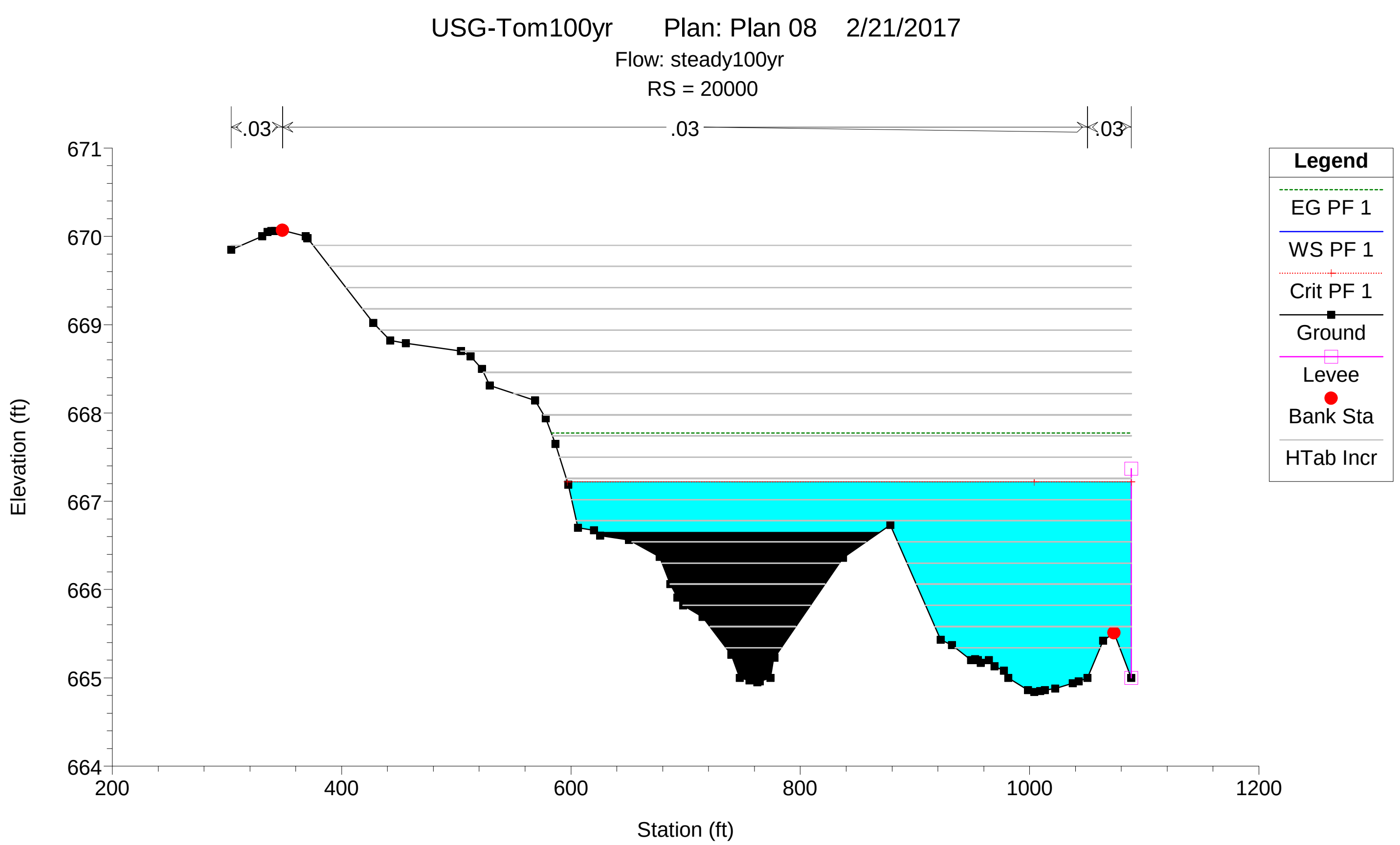

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 22500
.03
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

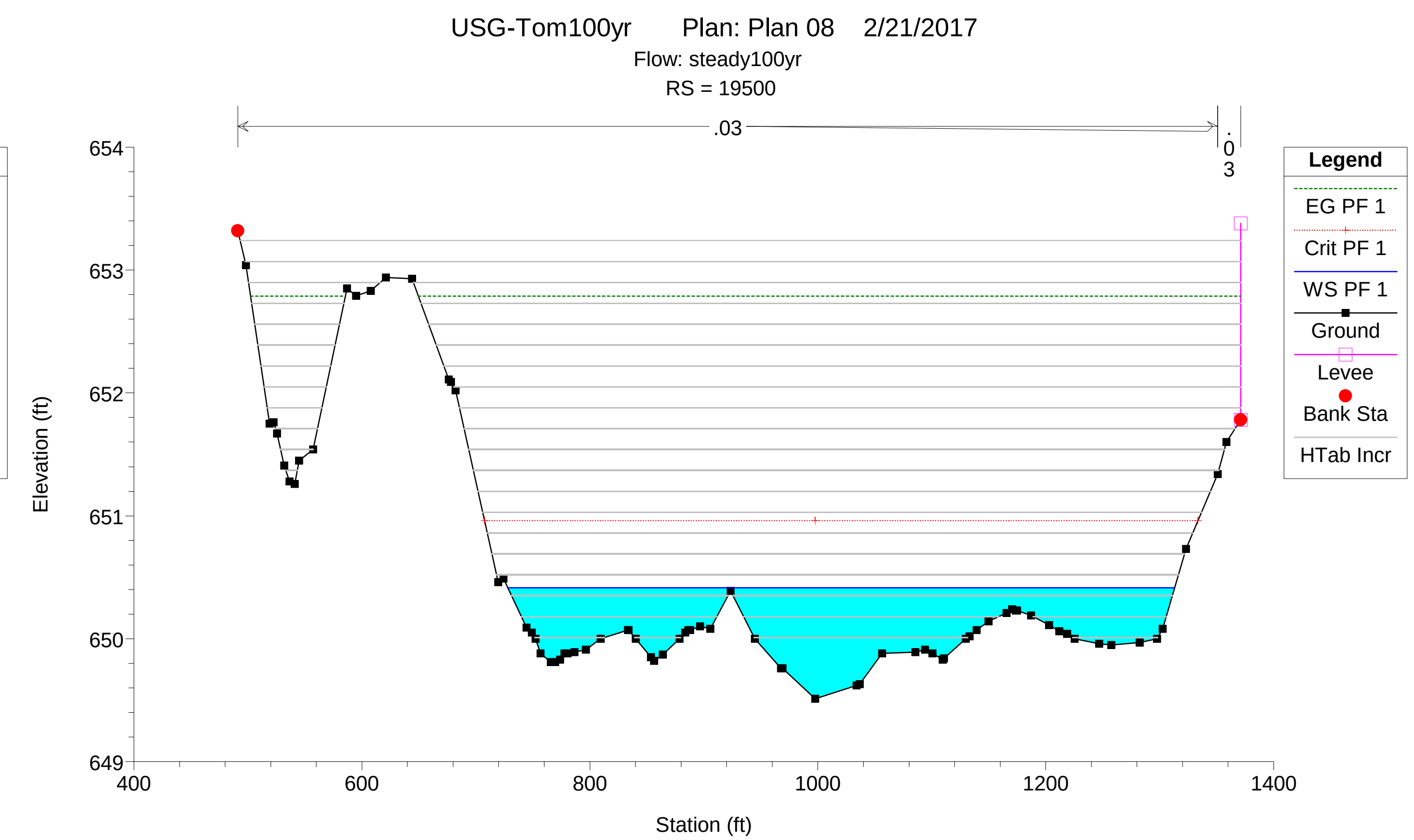

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 22000
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

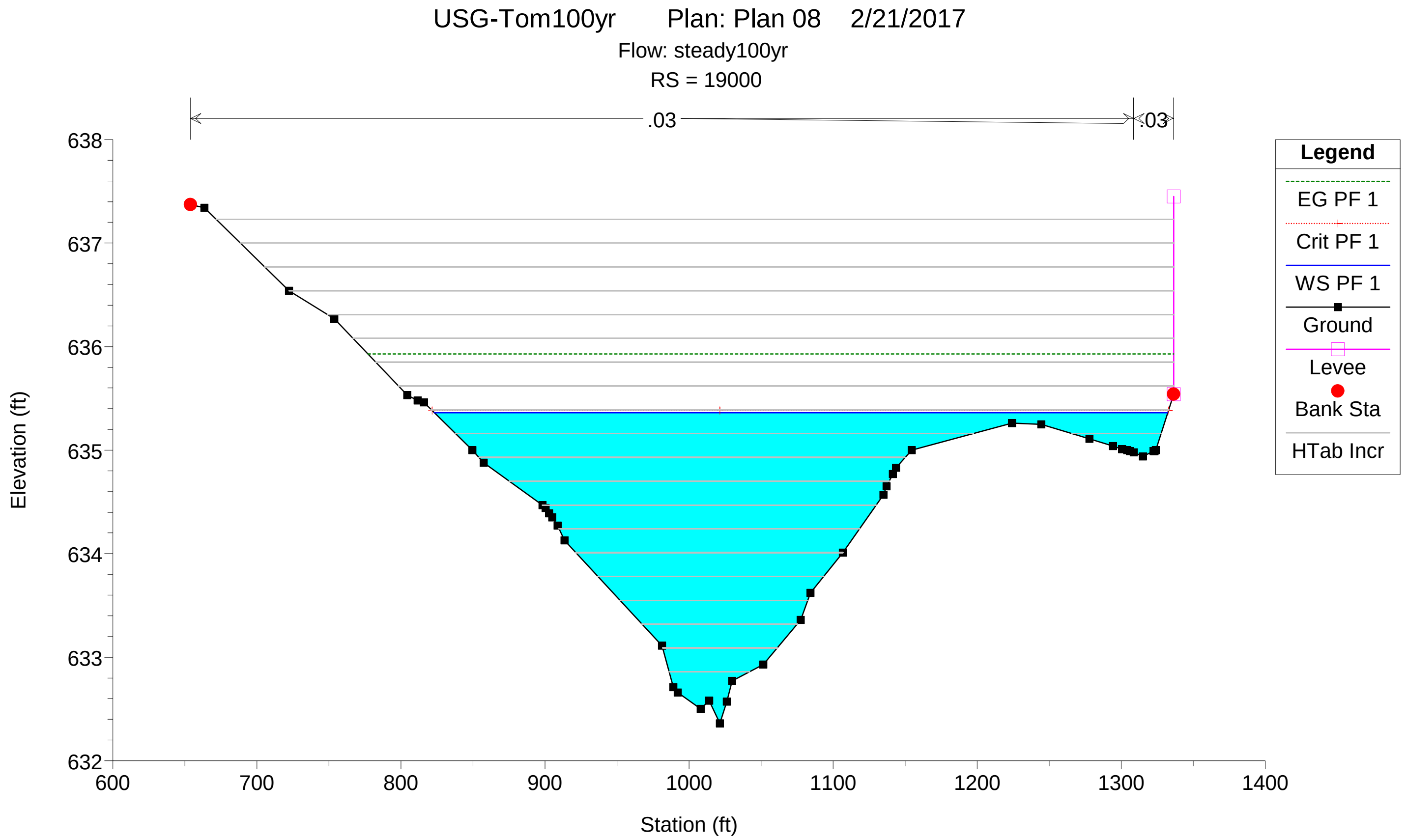

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 21500
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

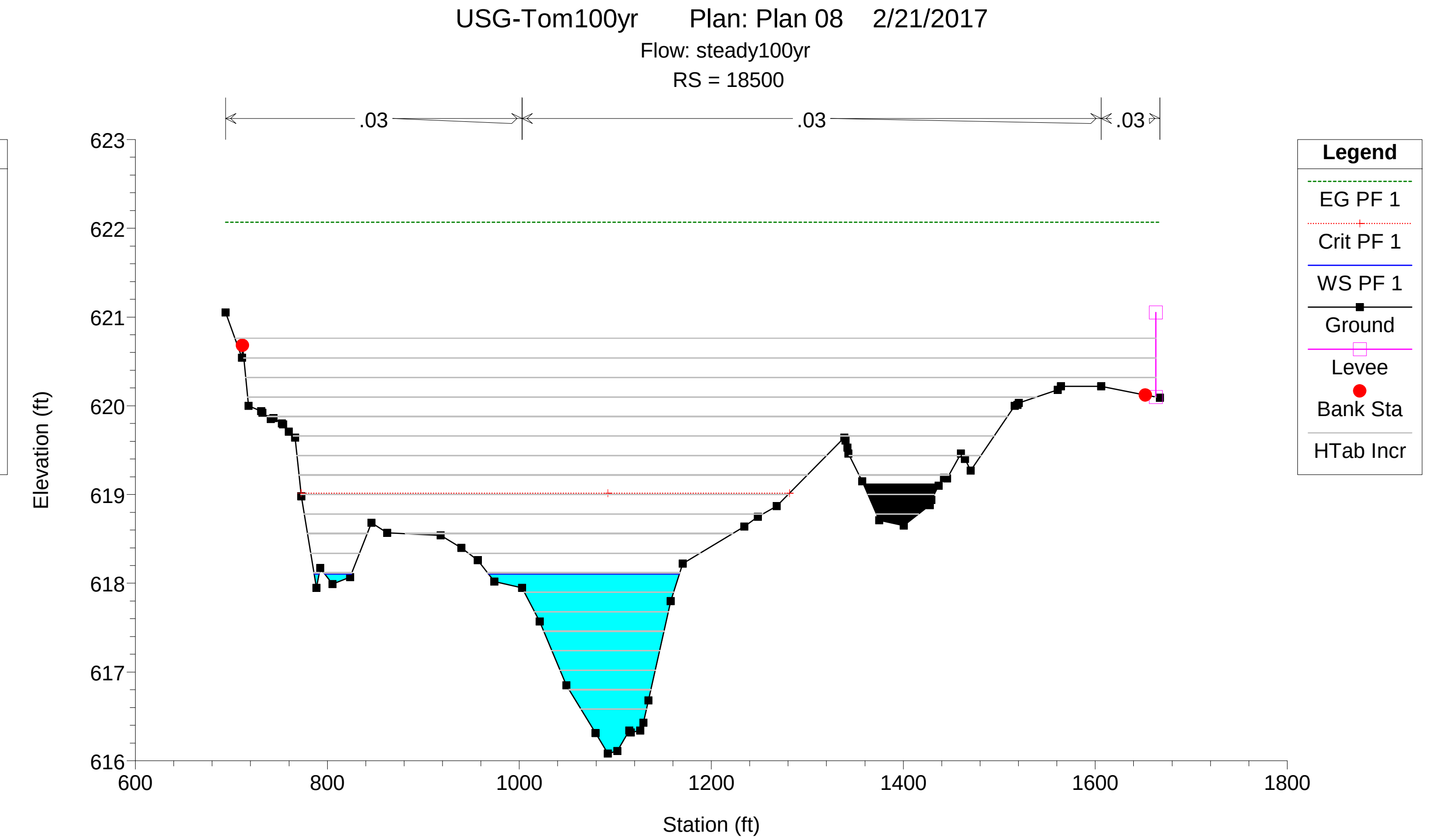

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 21000
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

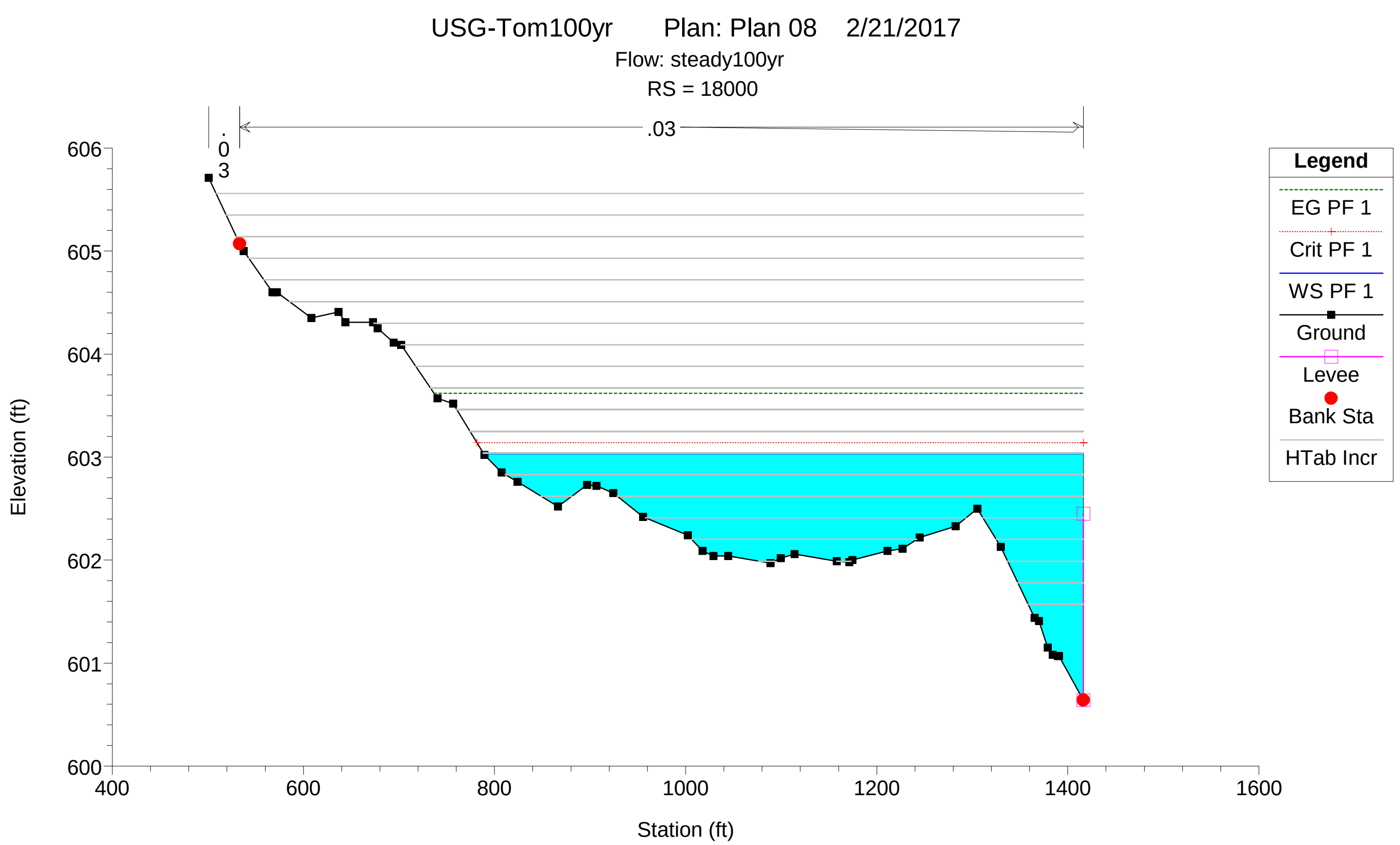

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 20500
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

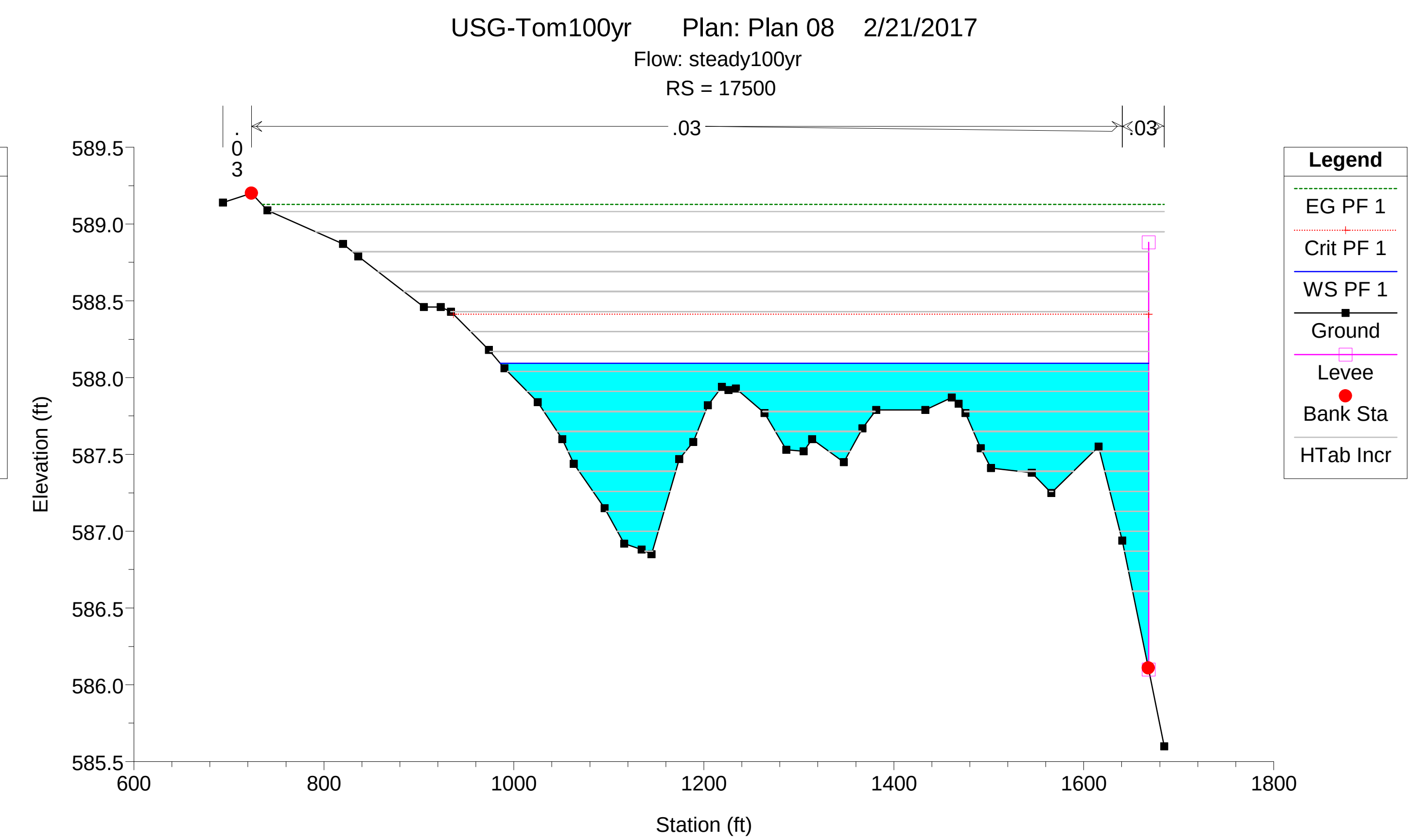

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 20000
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)

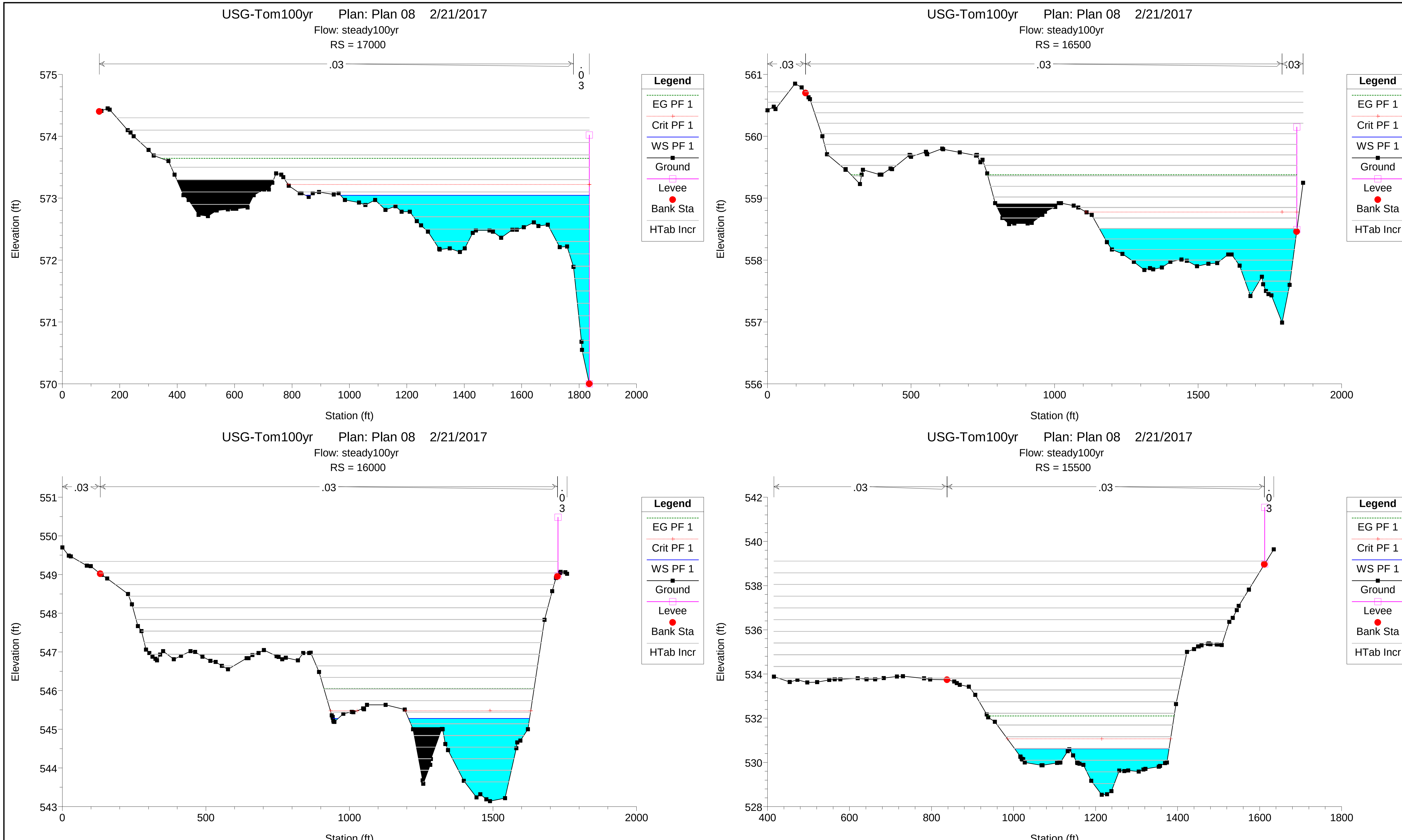

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 19500
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)


USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 19000
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
638
637
636
635
634
633
632
600
700
800
900
1000
1100
1200
1300
1400
Station (ft)

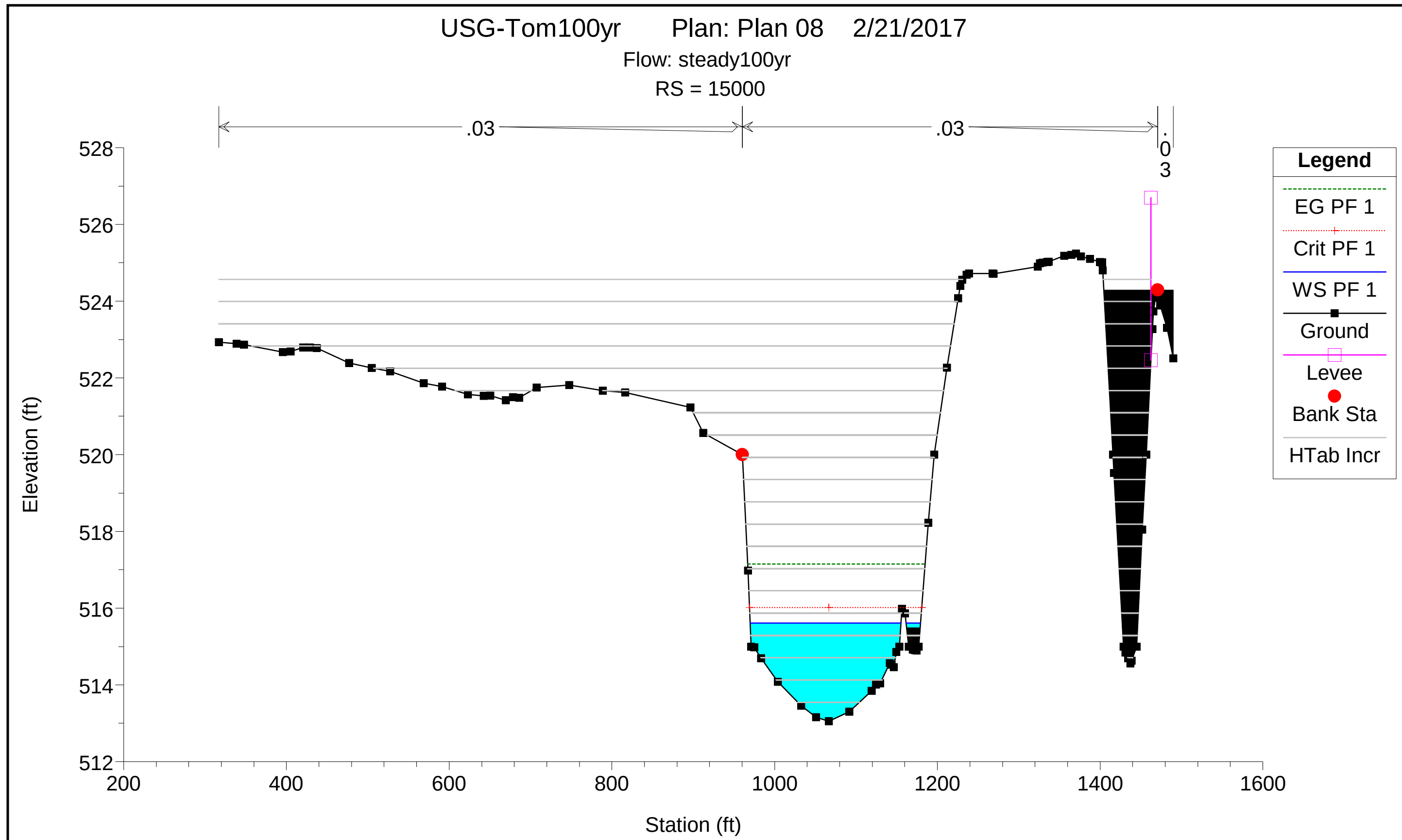

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 18500
.03
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
623
622
621
620
619
618
617
616
600
800
1000
1200
1400
1600
1800
Station (ft)

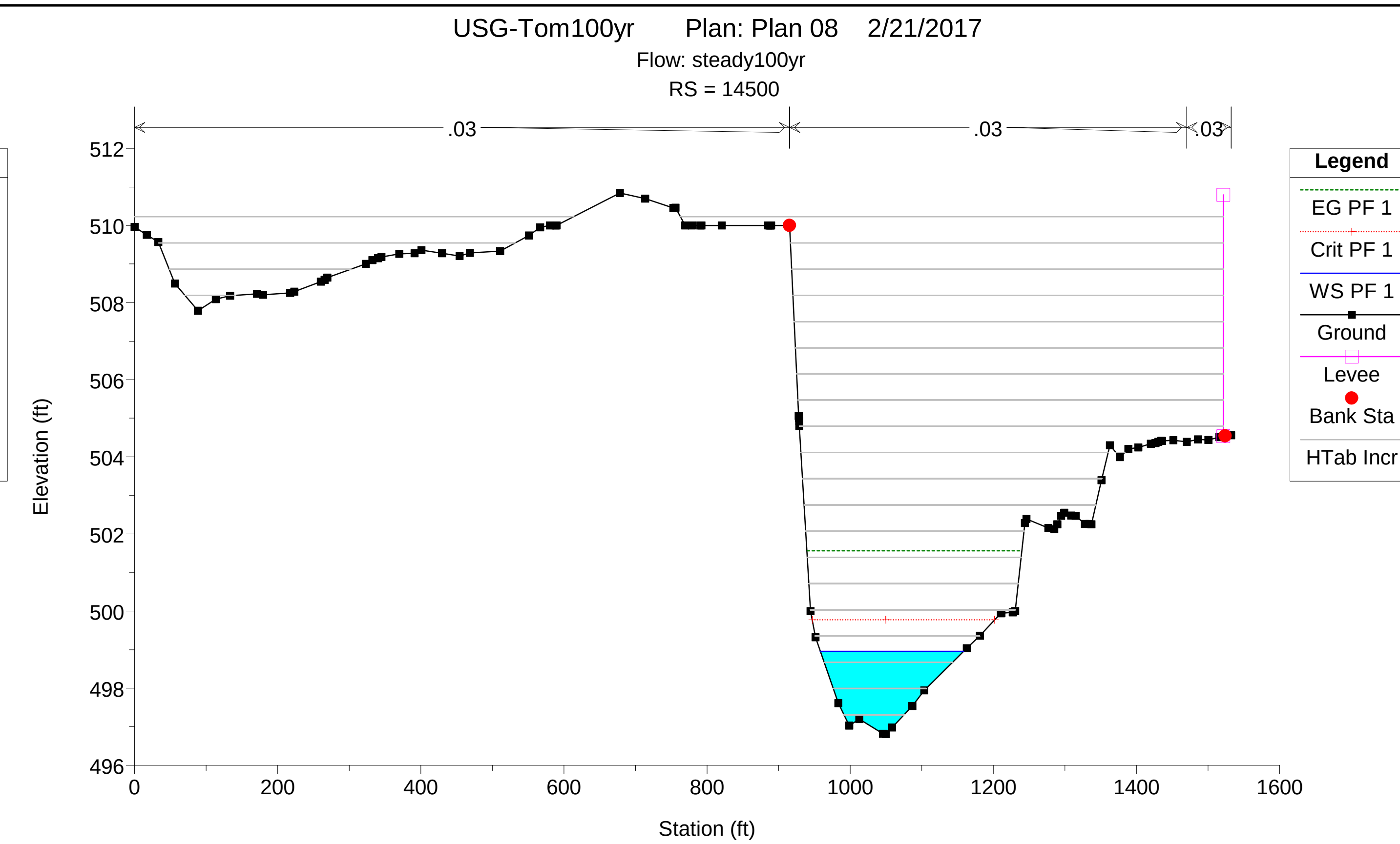

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 18000
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
606
605
604
603
602
601
600
400
600
800
1000
1200
1400
1600
Station (ft)

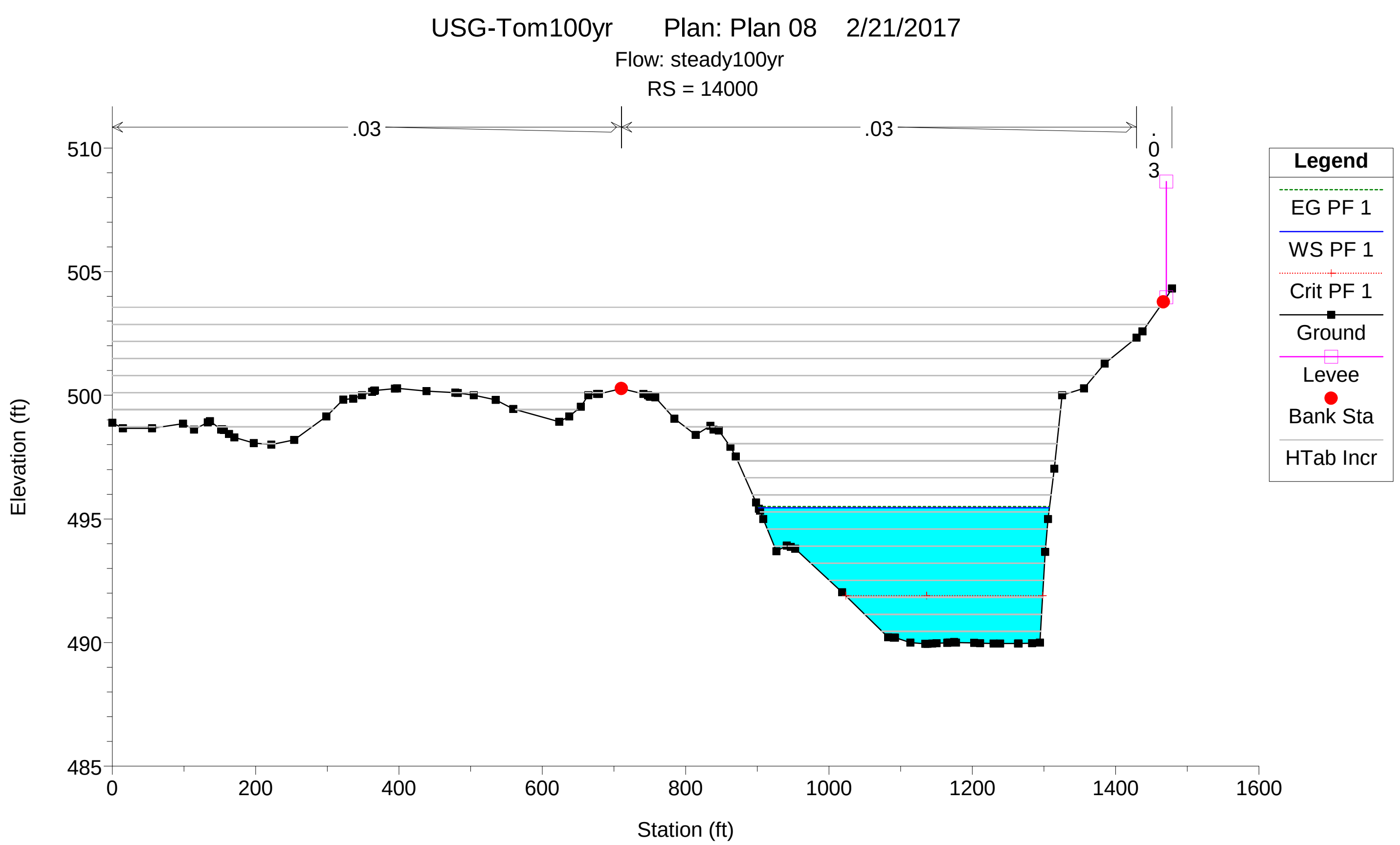

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 17500
.03
.03
.03
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
589.5
589.0
588.5
588.0
587.5
587.0
586.5
586.0
585.5
600
800
1000
1200
1400
1600
1800
Station (ft)

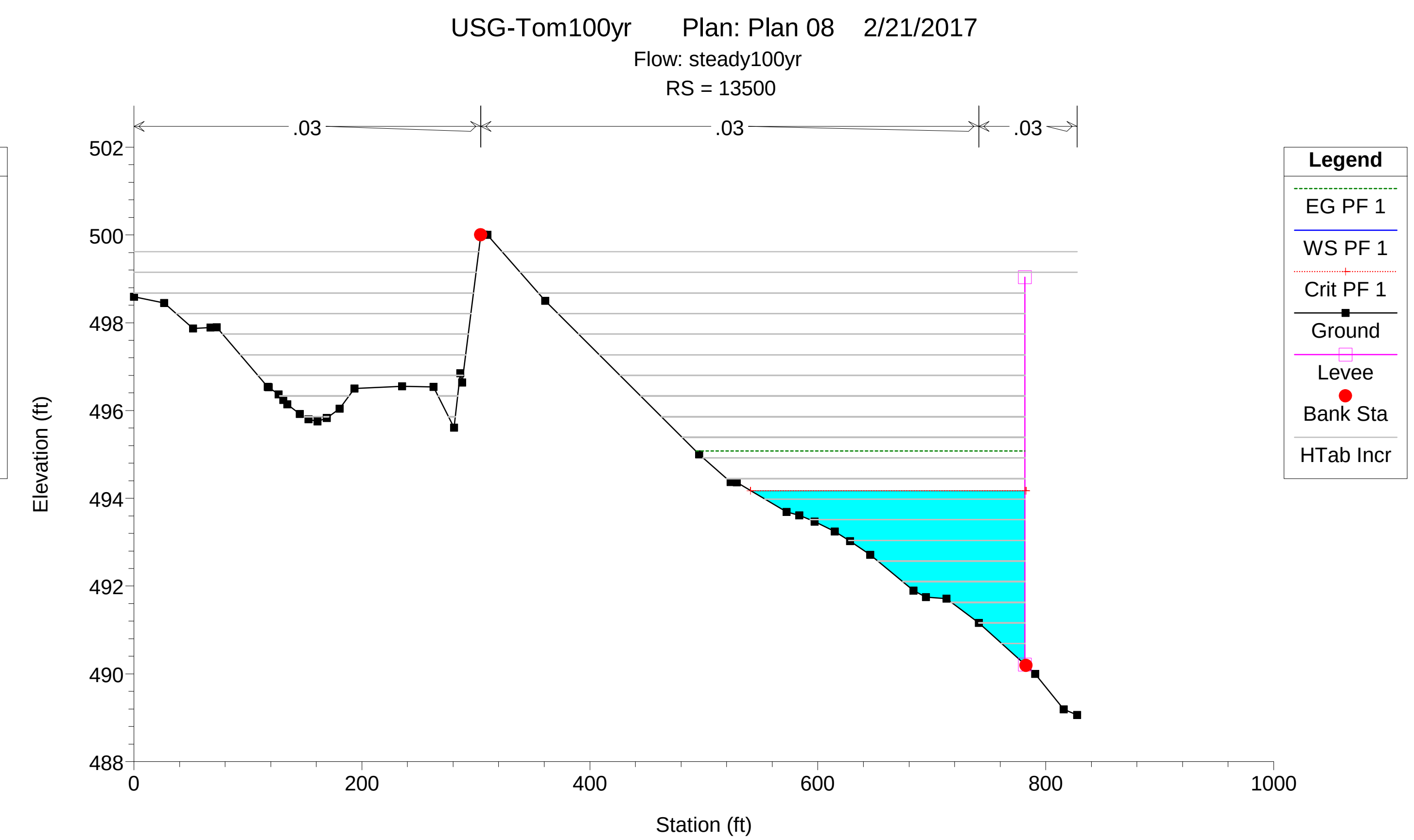


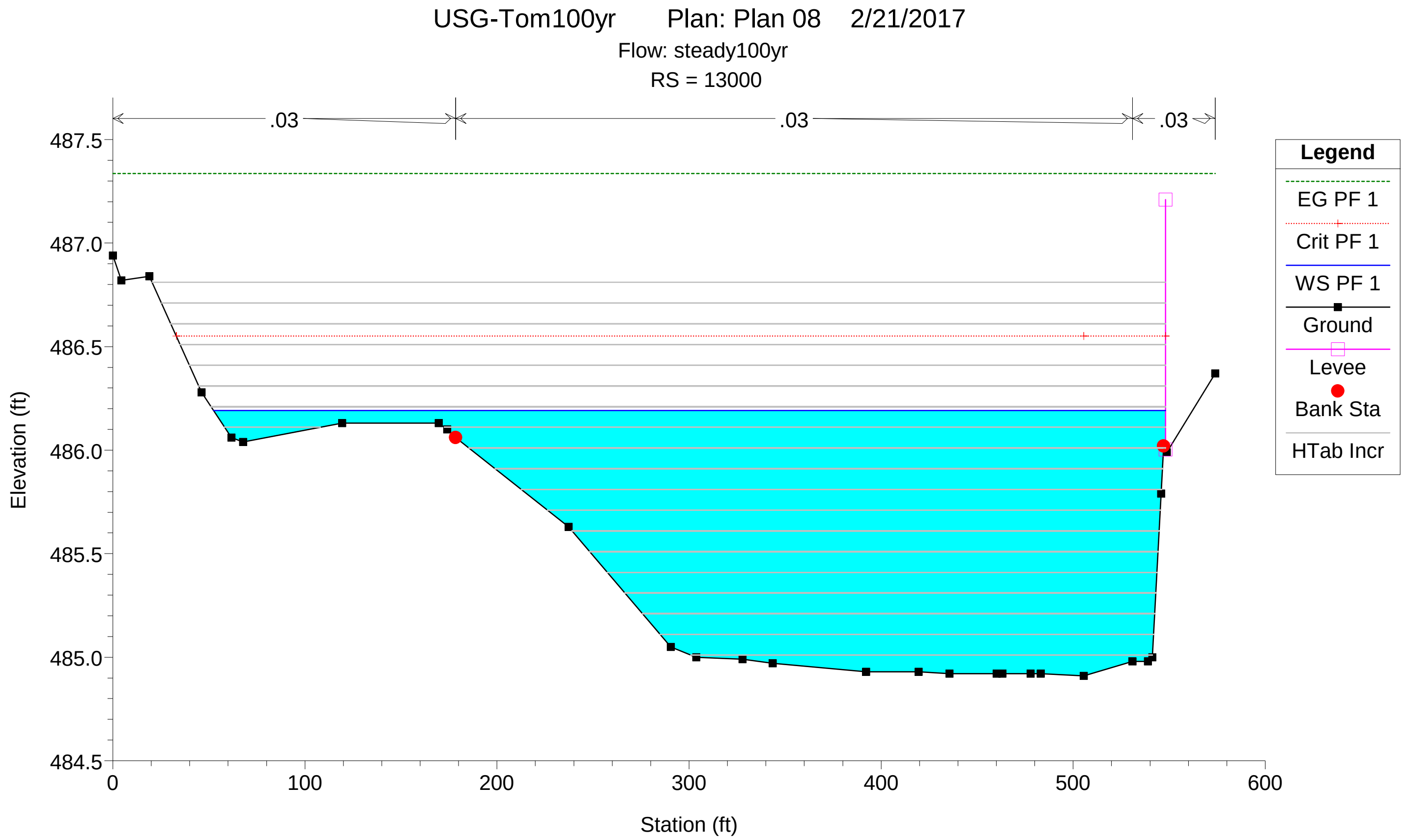
USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 17000
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 16500
USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 16000
USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 15500

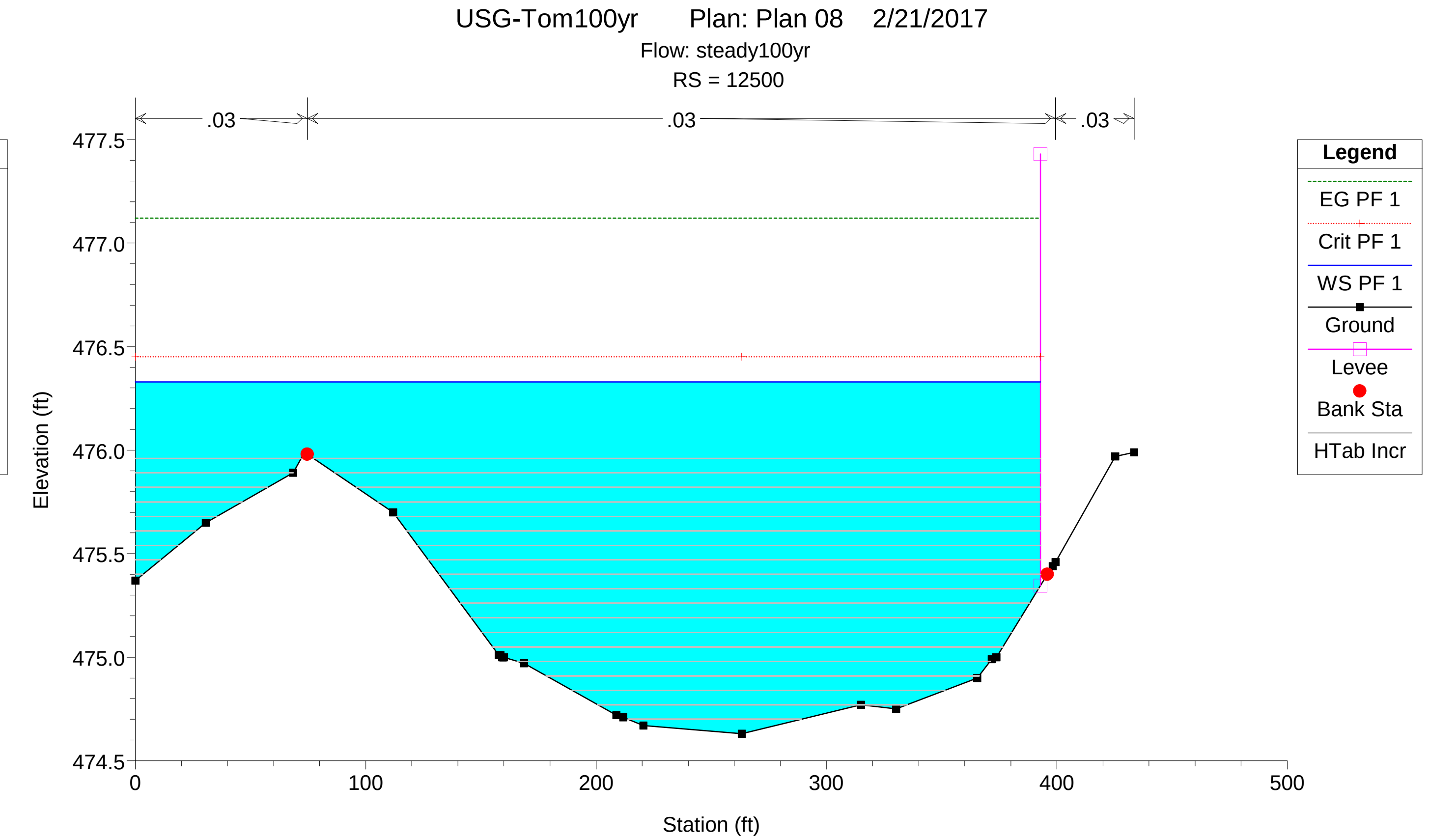

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 15000
.03
.03
0
3
Elevation (ft)
Station (ft)
528
526
524
522
520
518
516
514
512
200
400
600
800
1000
1200
1400
1600
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

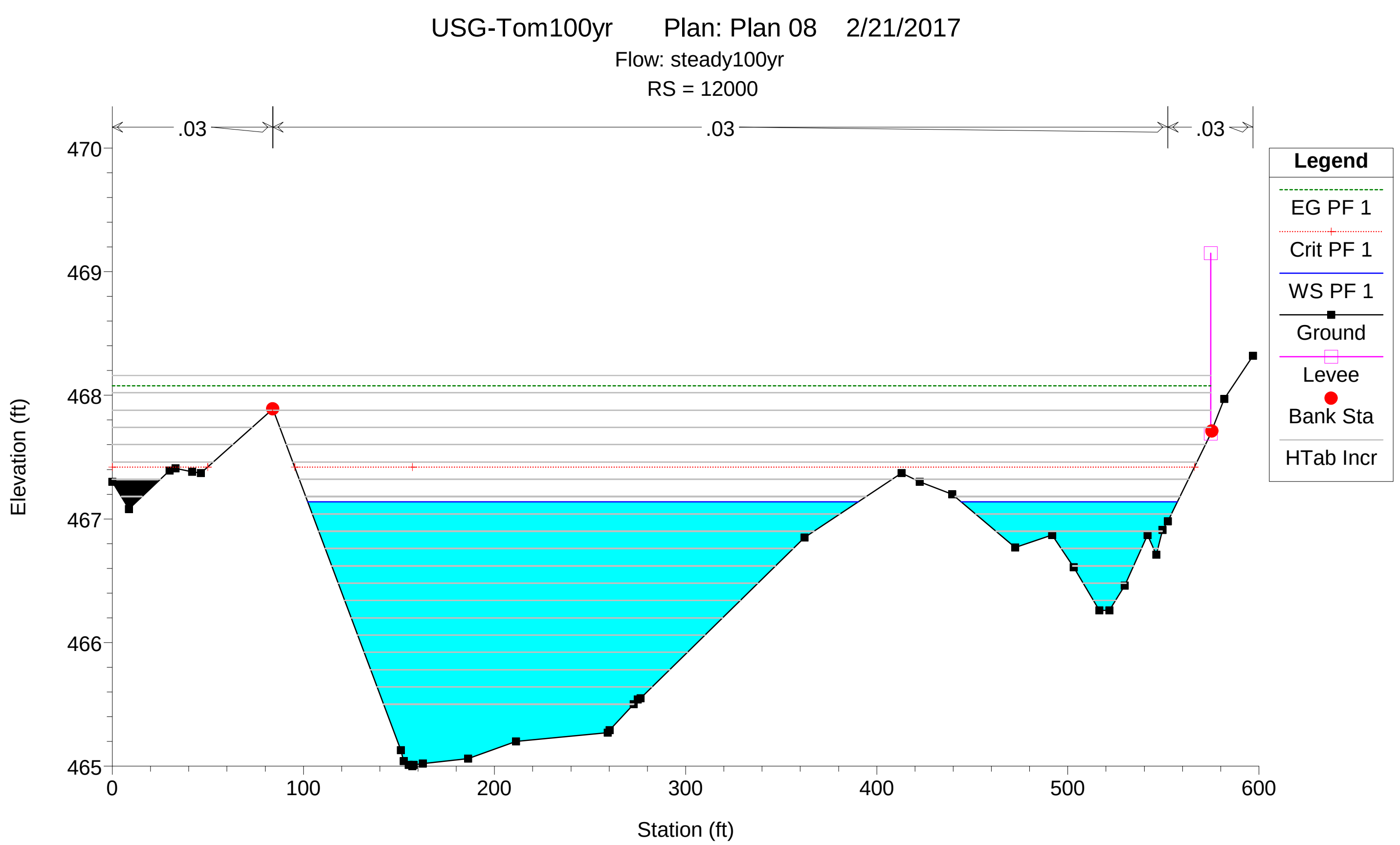

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 14500
.03
.03
.03
Elevation (ft)
Station (ft)
512
510
508
506
504
502
500
498
496
0
200
400
600
800
1000
1200
1400
1600
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

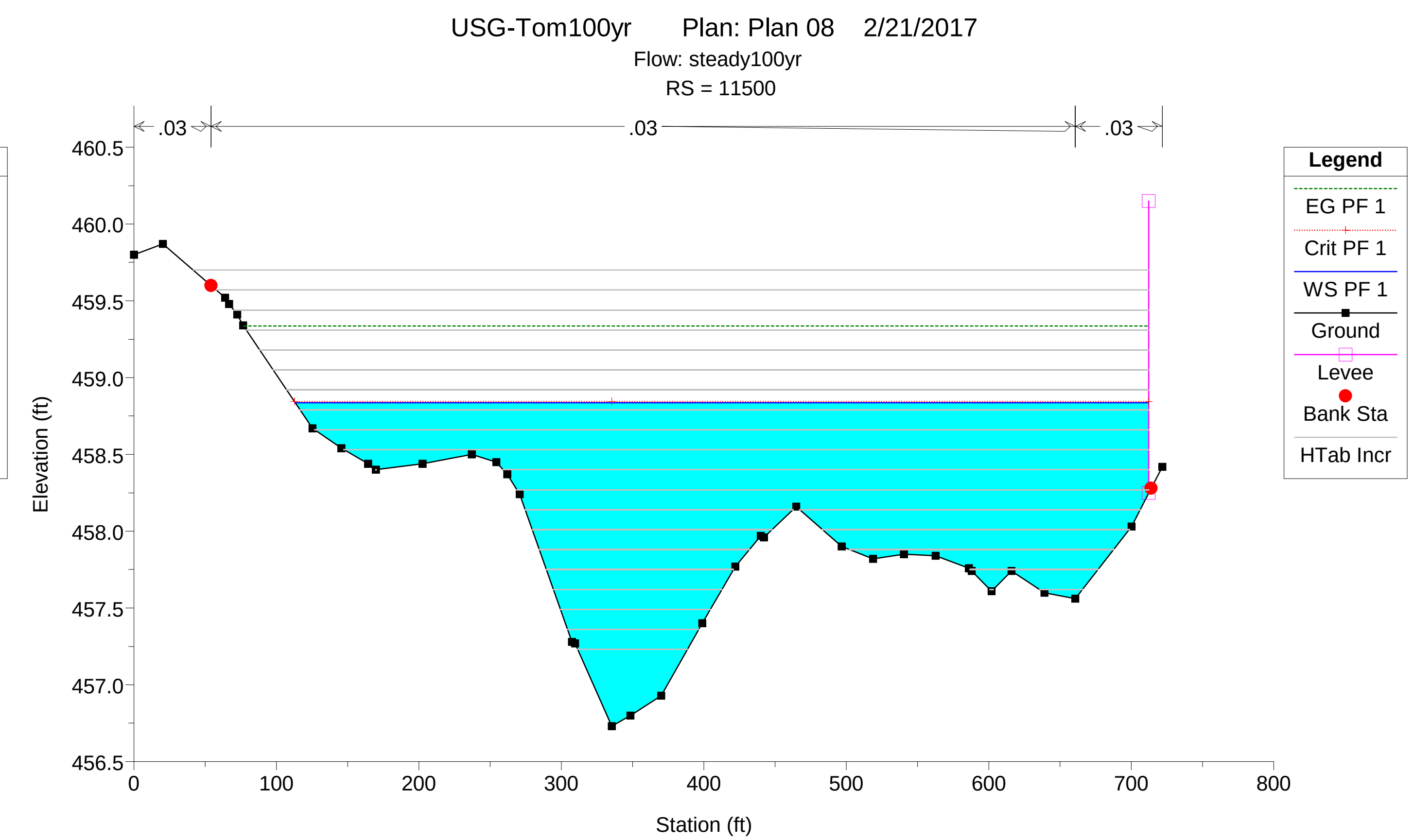

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 14000
.03
.03
0
3
Elevation (ft)
Station (ft)
510
505
500
495
490
485
0
200
400
600
800
1000
1200
1400
1600
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr

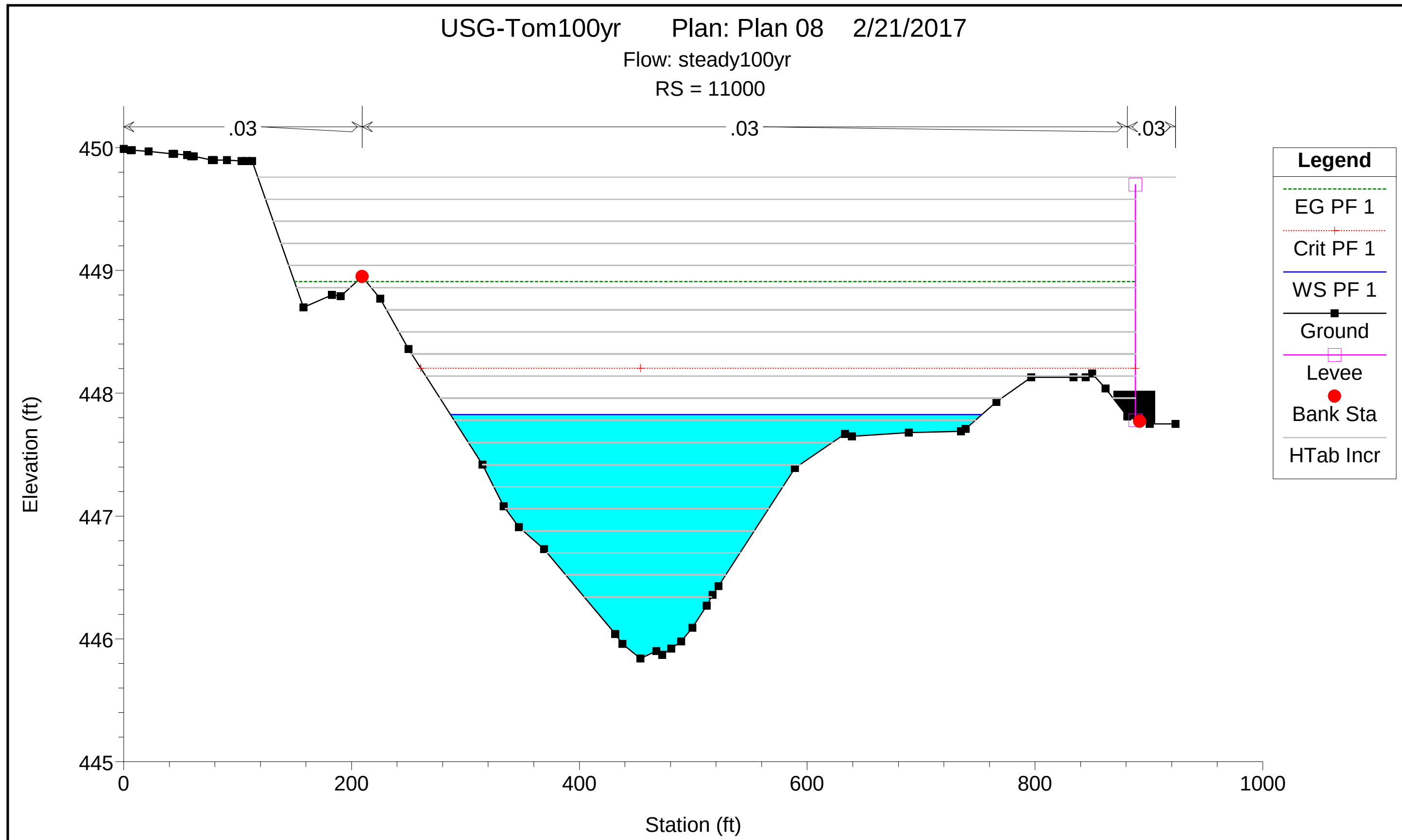

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 13500
.03
.03
.03
Elevation (ft)
Station (ft)
502
500
498
496
494
492
490
488
0
200
400
600
800
1000
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr

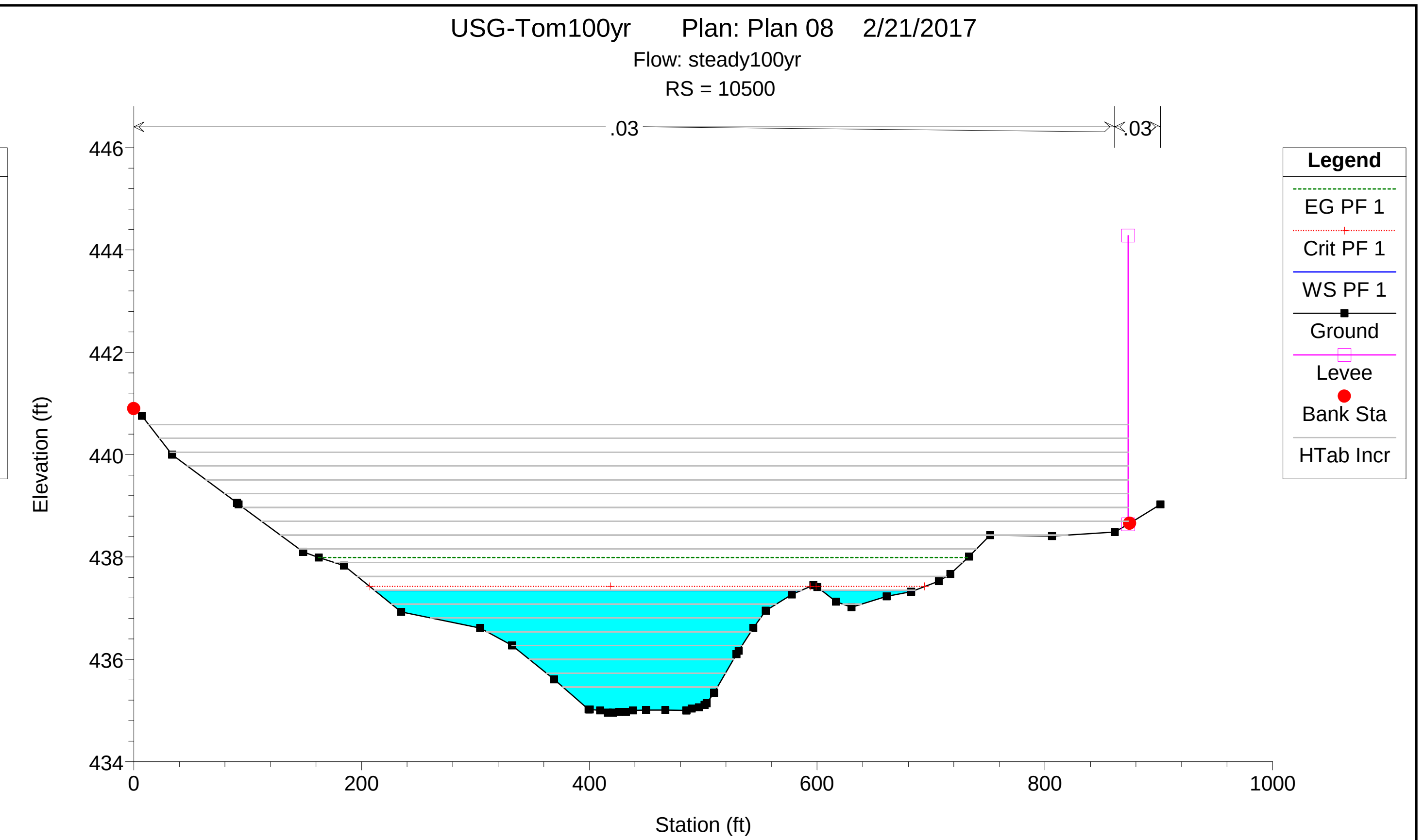

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 13000
.03
.03
.03
Elevation (ft)
487.5
487.0
486.5
486.0
485.5
485.0
484.5
0
100
200
300
400
500
600
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

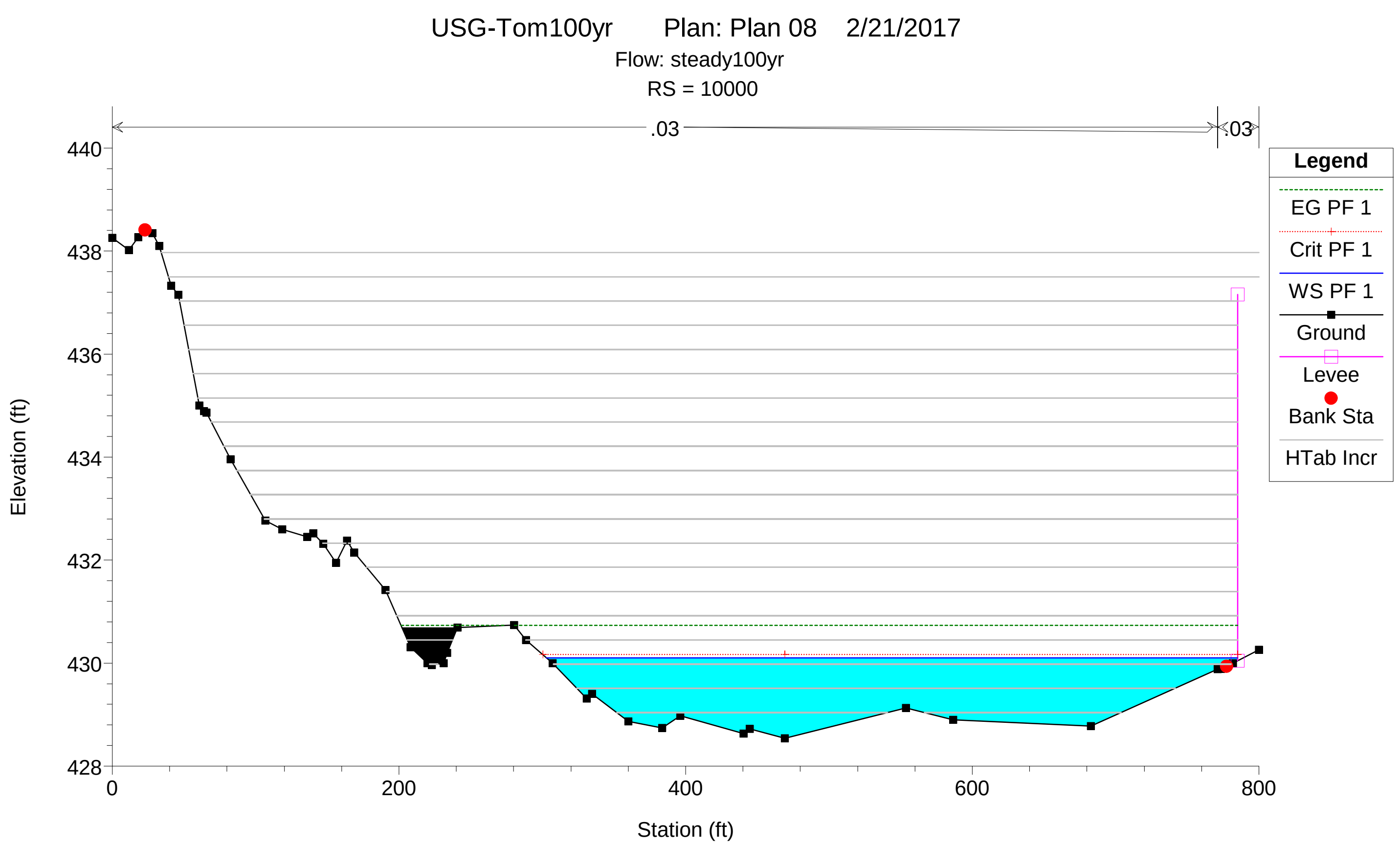

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 12500
.03
.03
.03
Elevation (ft)
477.5
477.0
476.5
476.0
475.5
475.0
474.5
0
100
200
300
400
500
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

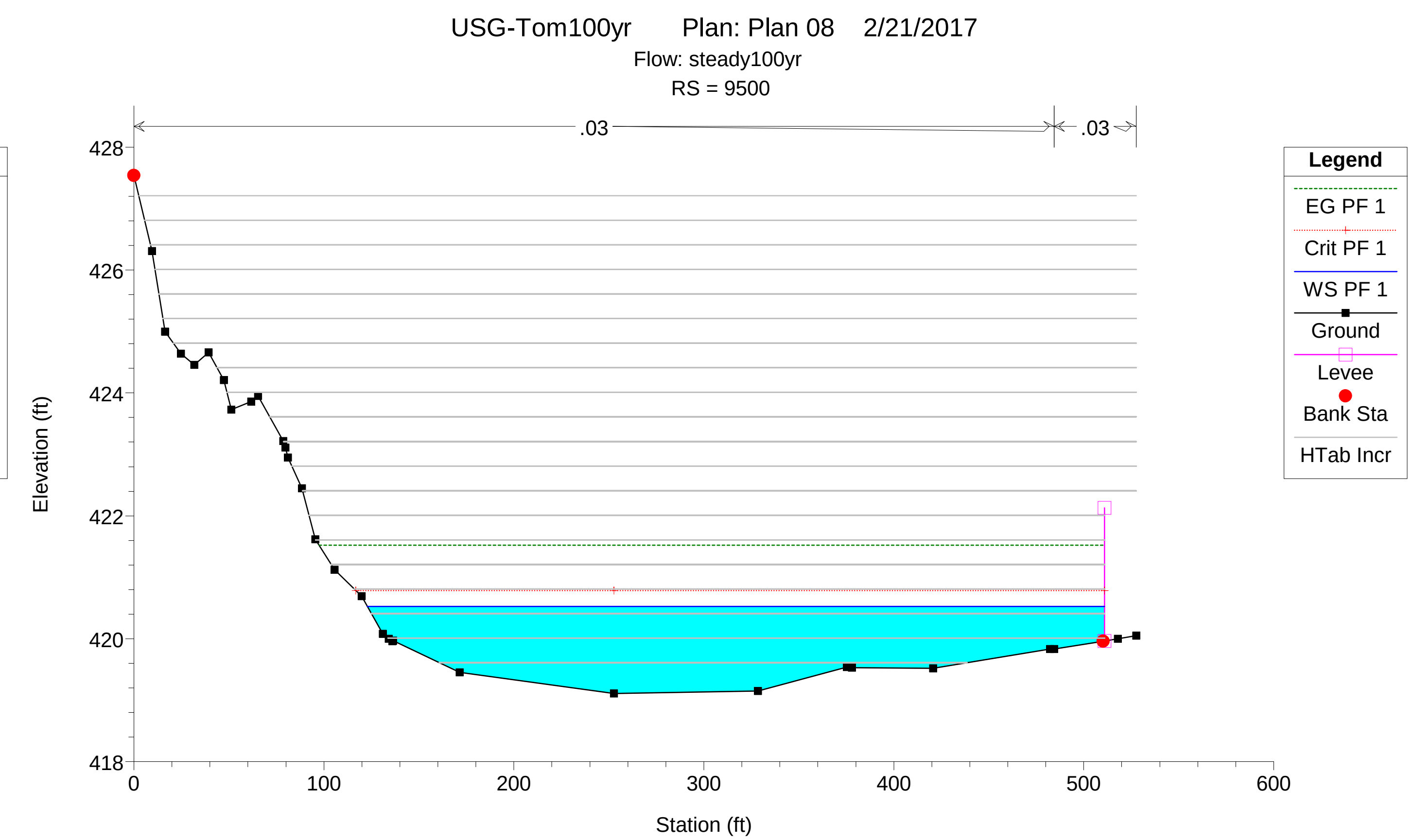

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 12000
.03
.03
.03
Elevation (ft)
470
469
468
467
466
465
0
100
200
300
400
500
600
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

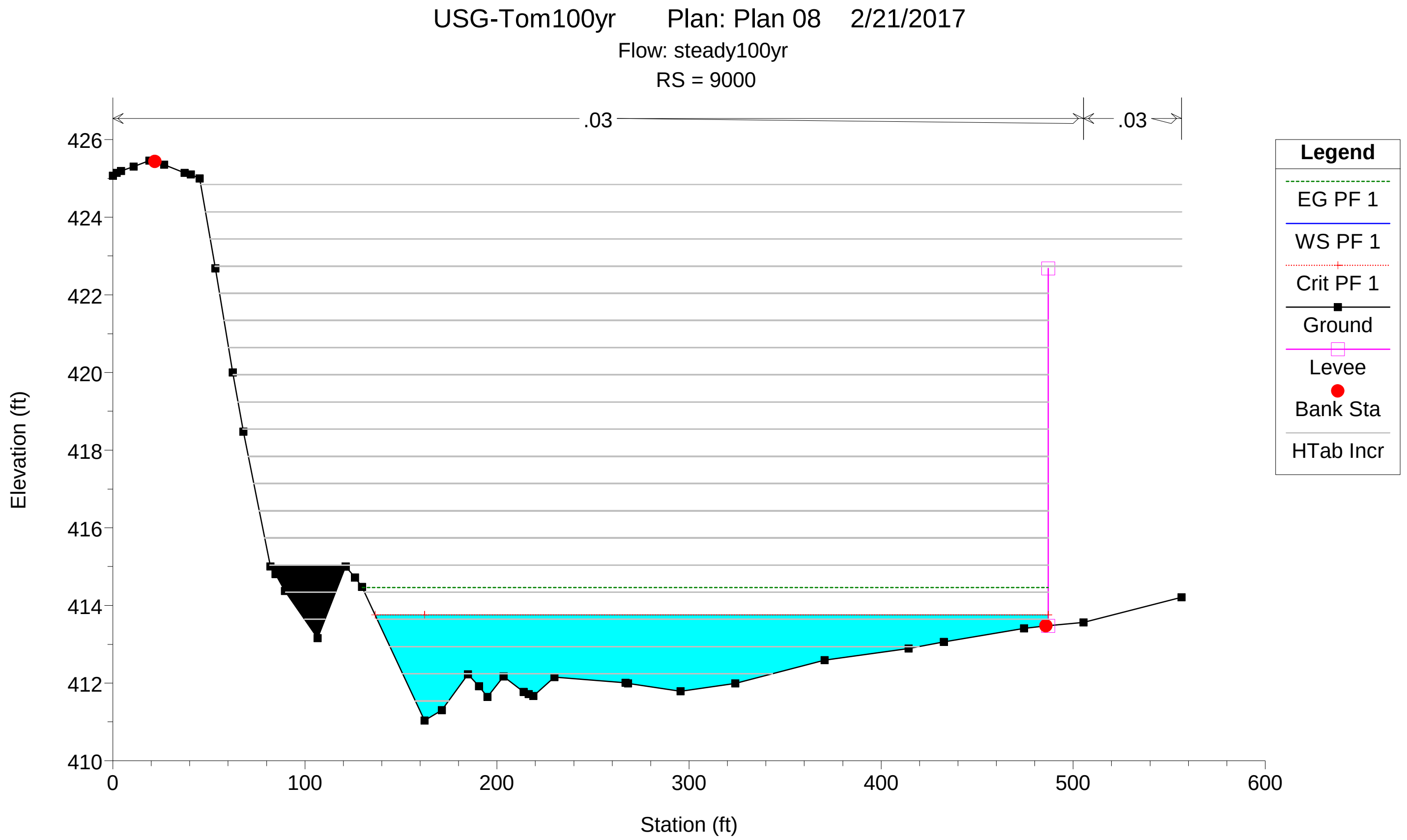

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 11500
.03
.03
.03
Elevation (ft)
460.5
460.0
459.5
459.0
458.5
458.0
457.5
457.0
456.5
0
100
200
300
400
500
600
700
800
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

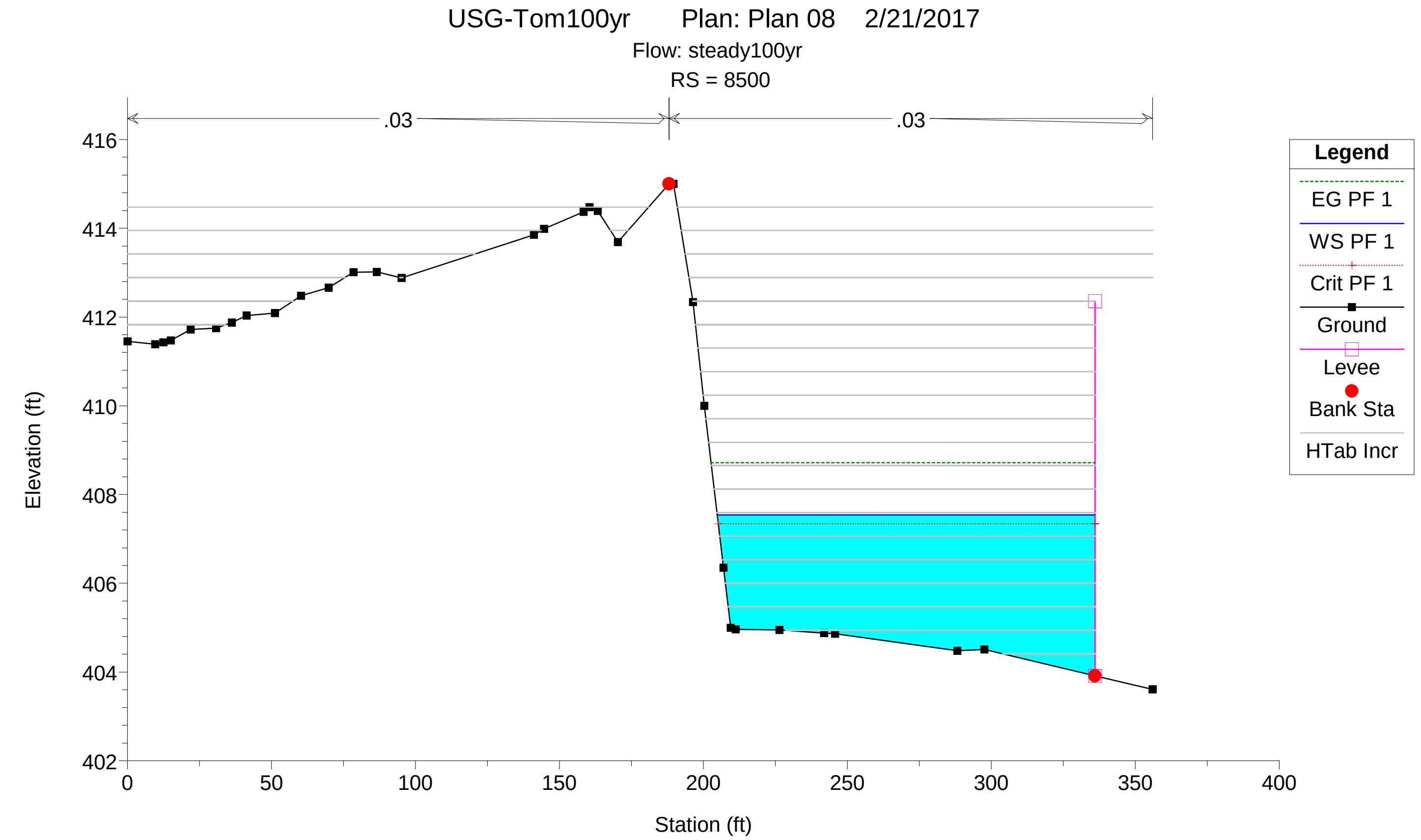

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 11000
.03
.03
.03
Elevation (ft)
Station (ft)
450
449
448
447
446
445
0
200
400
600
800
1000
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

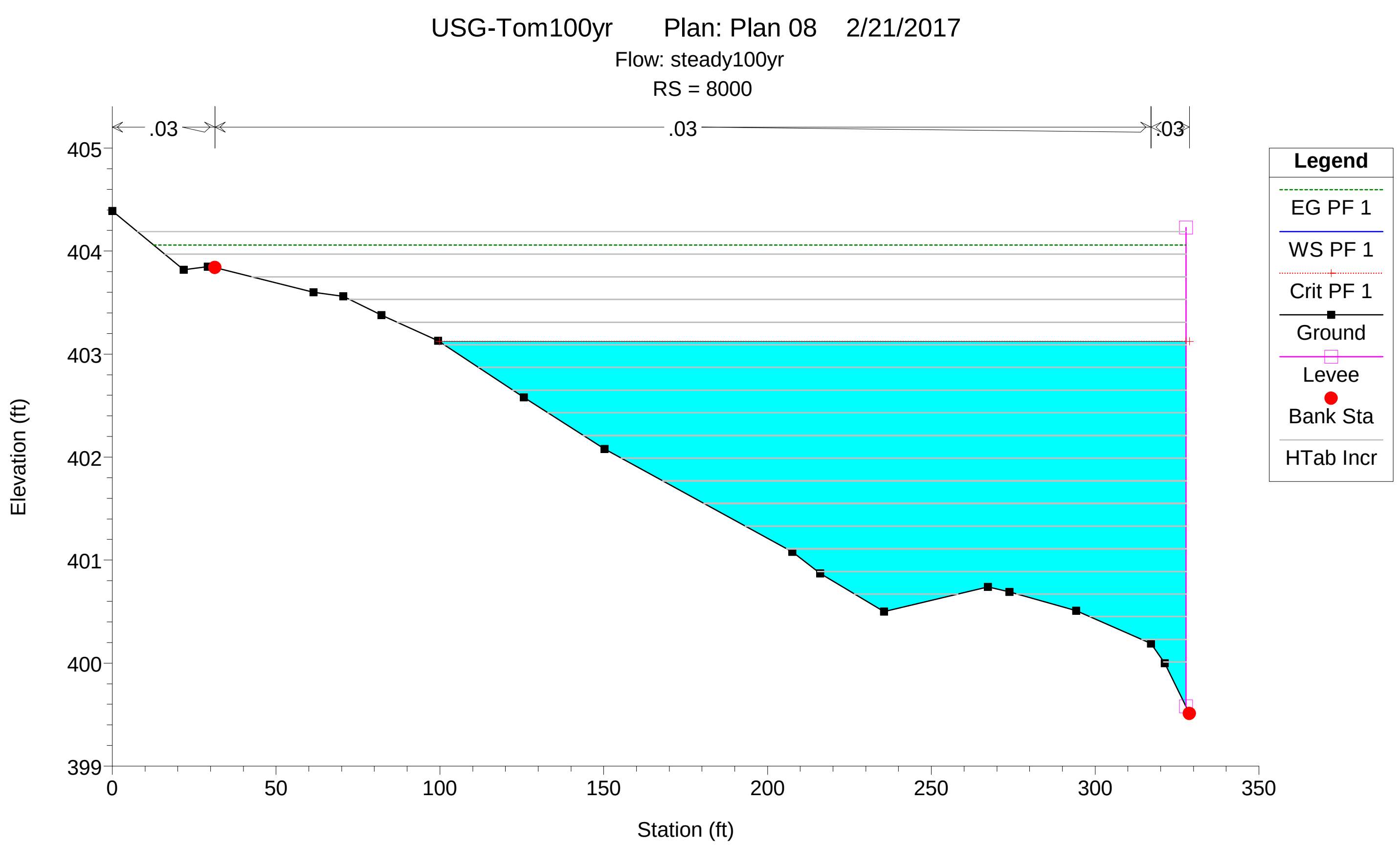

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 10500
.03
.03
Elevation (ft)
Station (ft)
446
444
442
440
438
436
434
0
200
400
600
800
1000
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

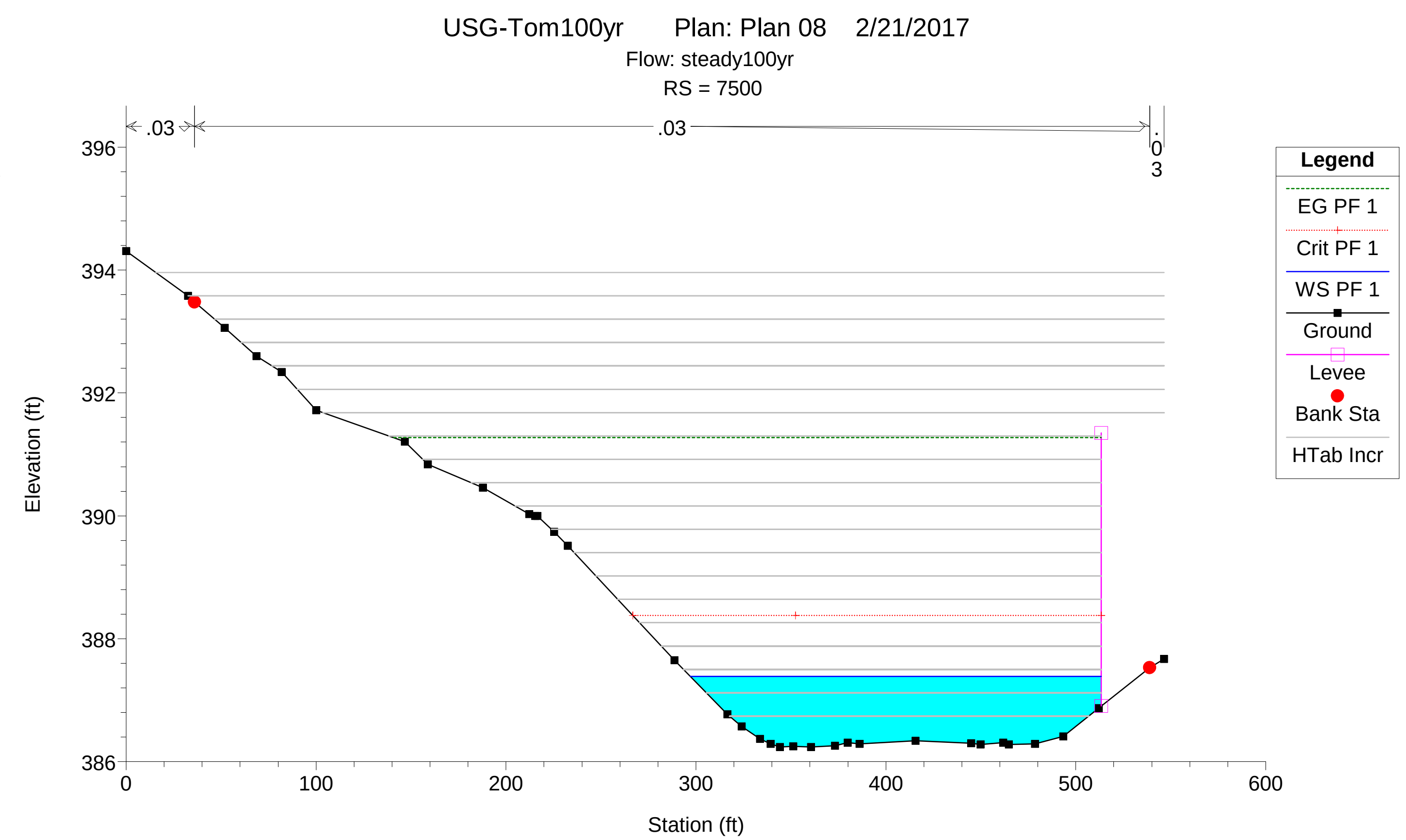

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 10000
.03
.03
Elevation (ft)
Station (ft)
440
438
436
434
432
430
428
0
200
400
600
800
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

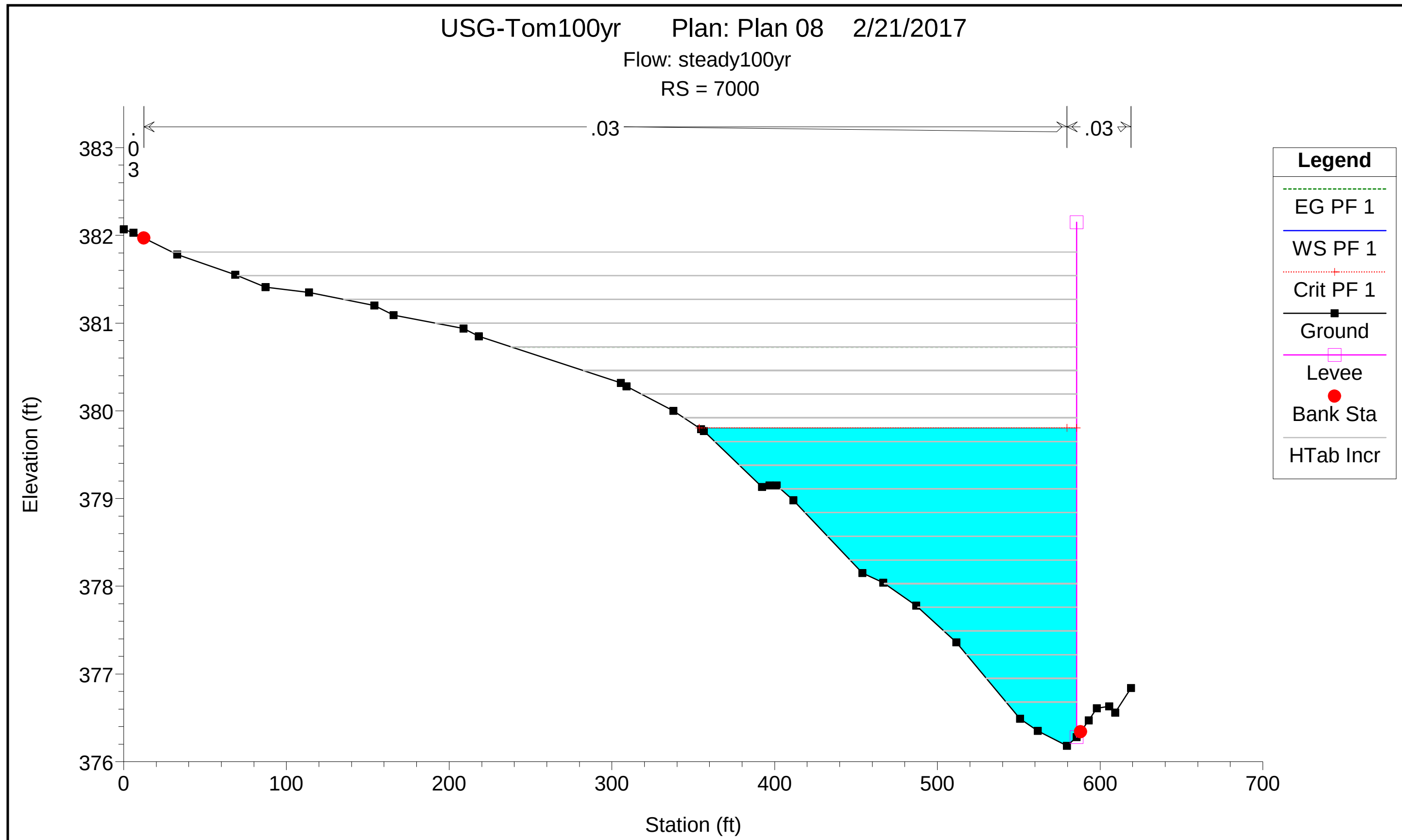

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 9500
.03
.03
Elevation (ft)
Station (ft)
428
426
424
422
420
418
0
100
200
300
400
500
600
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

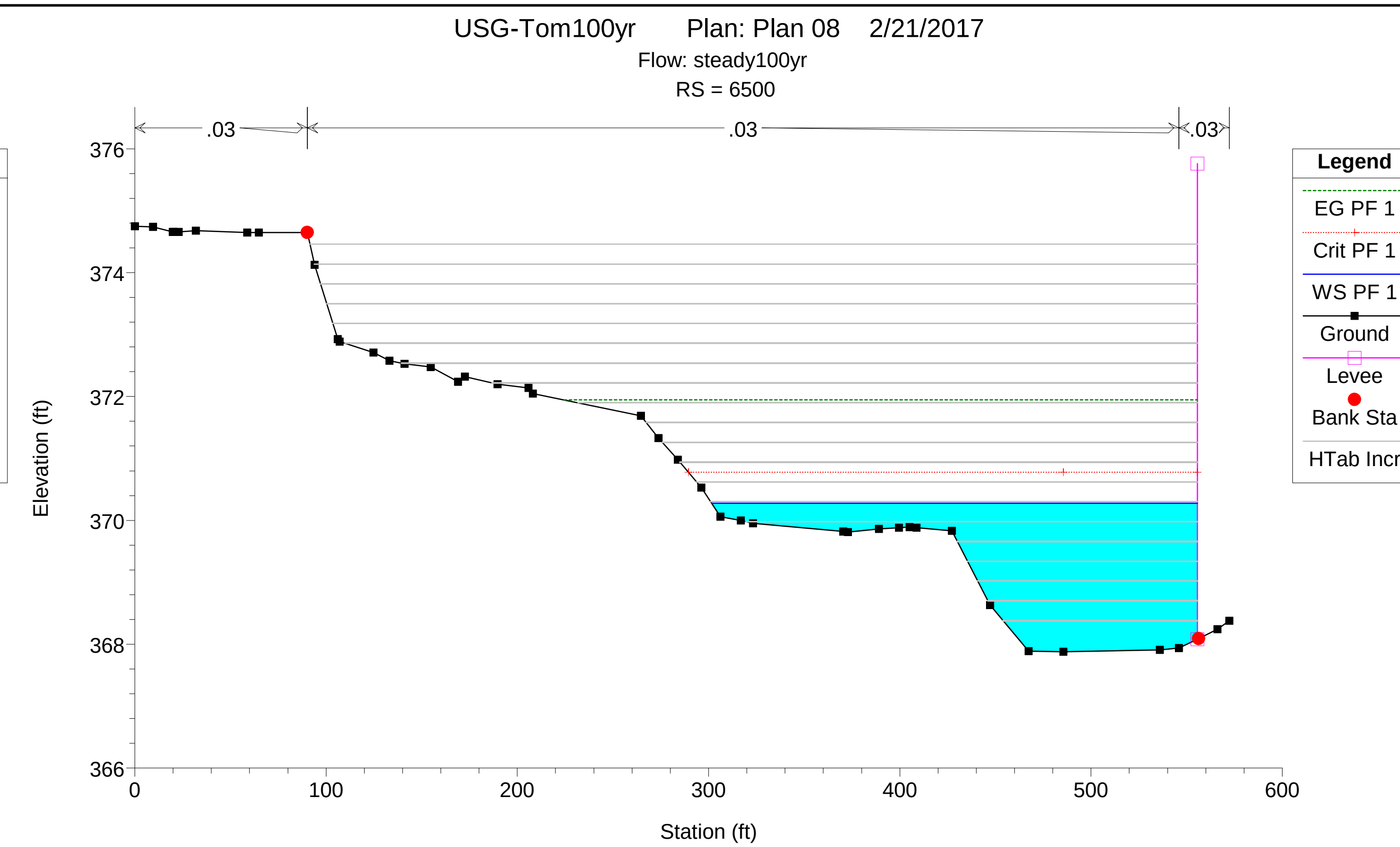

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 9000
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)
410
412
414
416
418
420
422
424
426
0
100
200
300
400
500
600

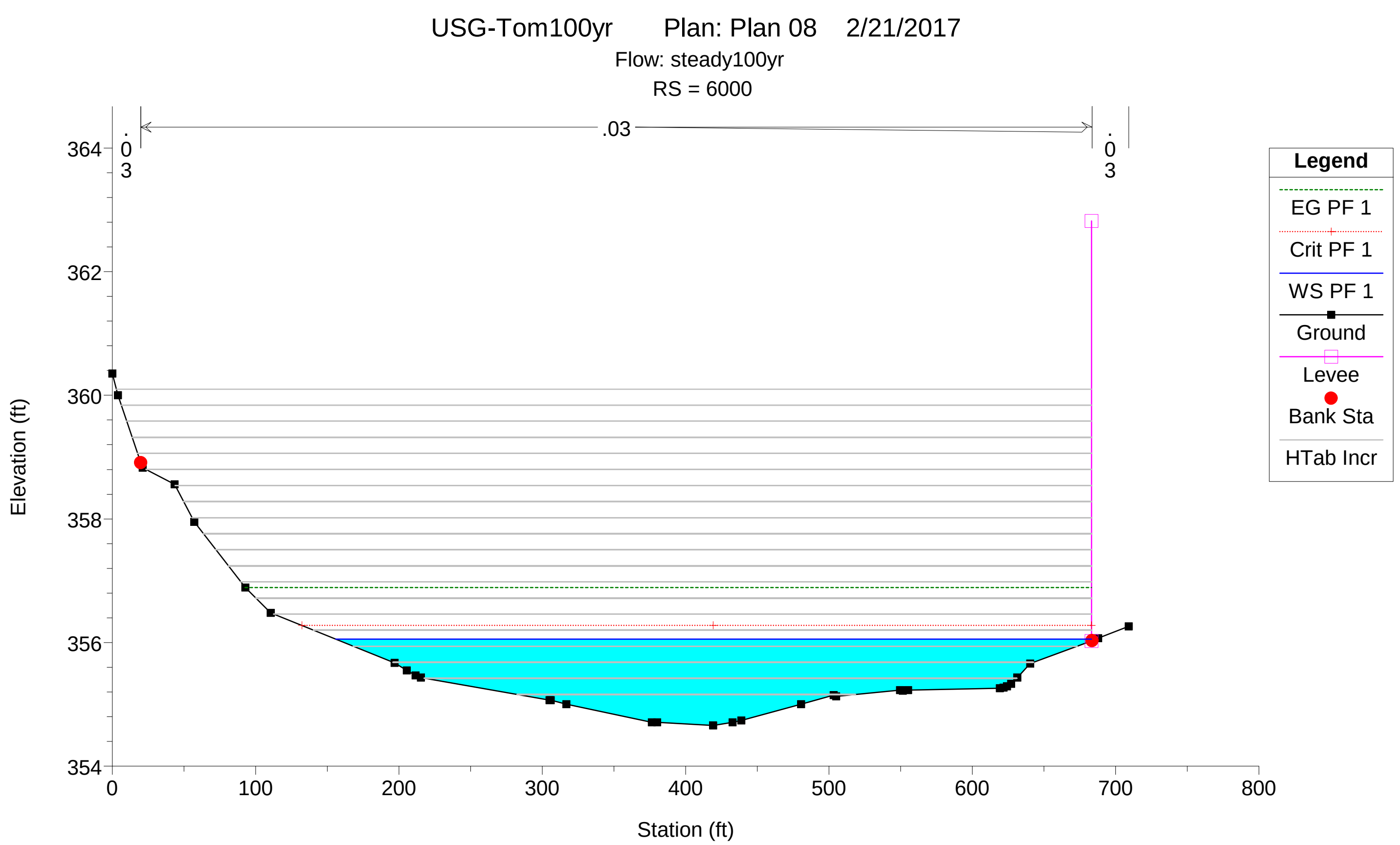

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 8500
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)
402
404
406
408
410
412
414
416
0
50
100
150
200
250
300
350
400

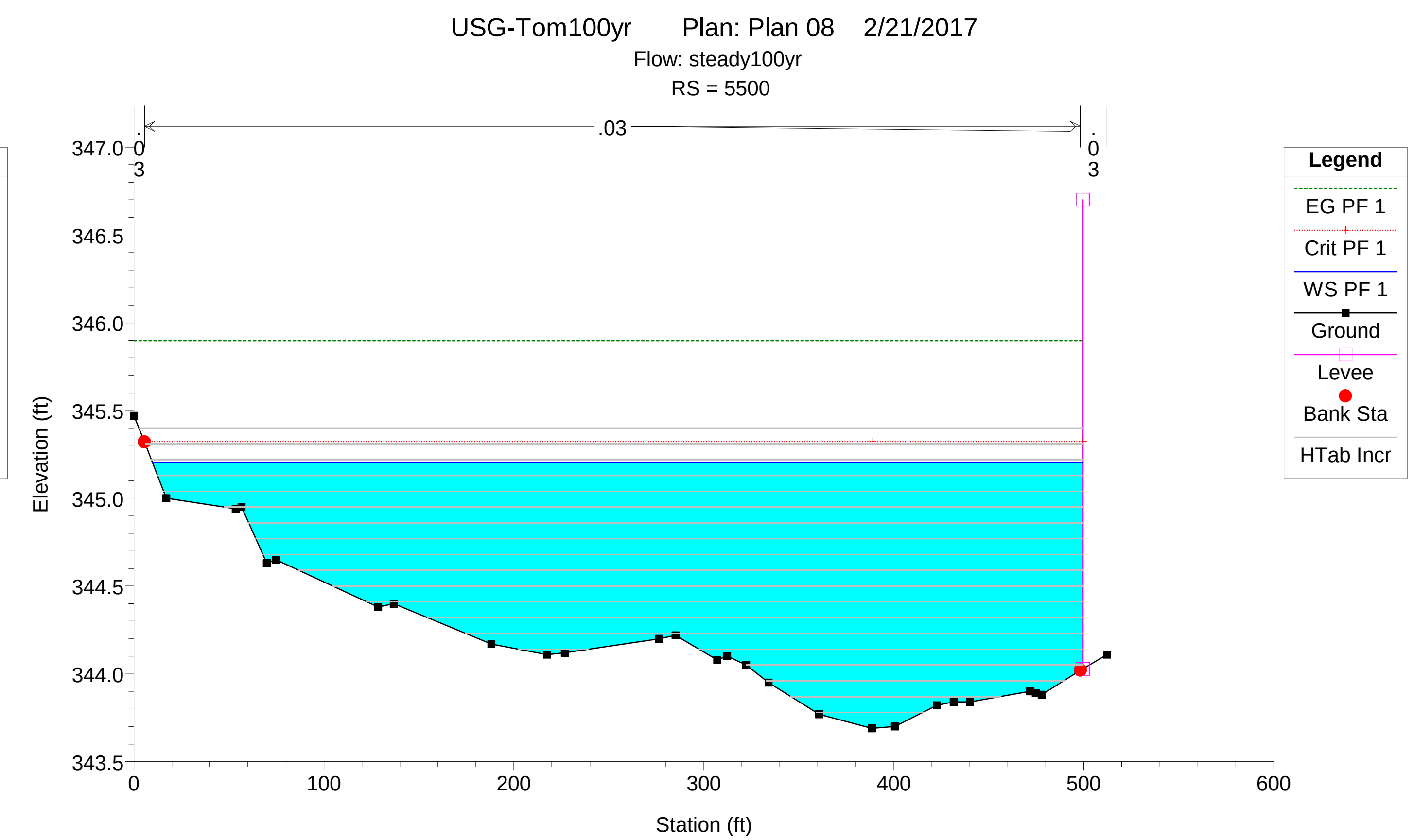

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 8000
.03
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)
399
400
401
402
403
404
405
0
50
100
150
200
250
300
350

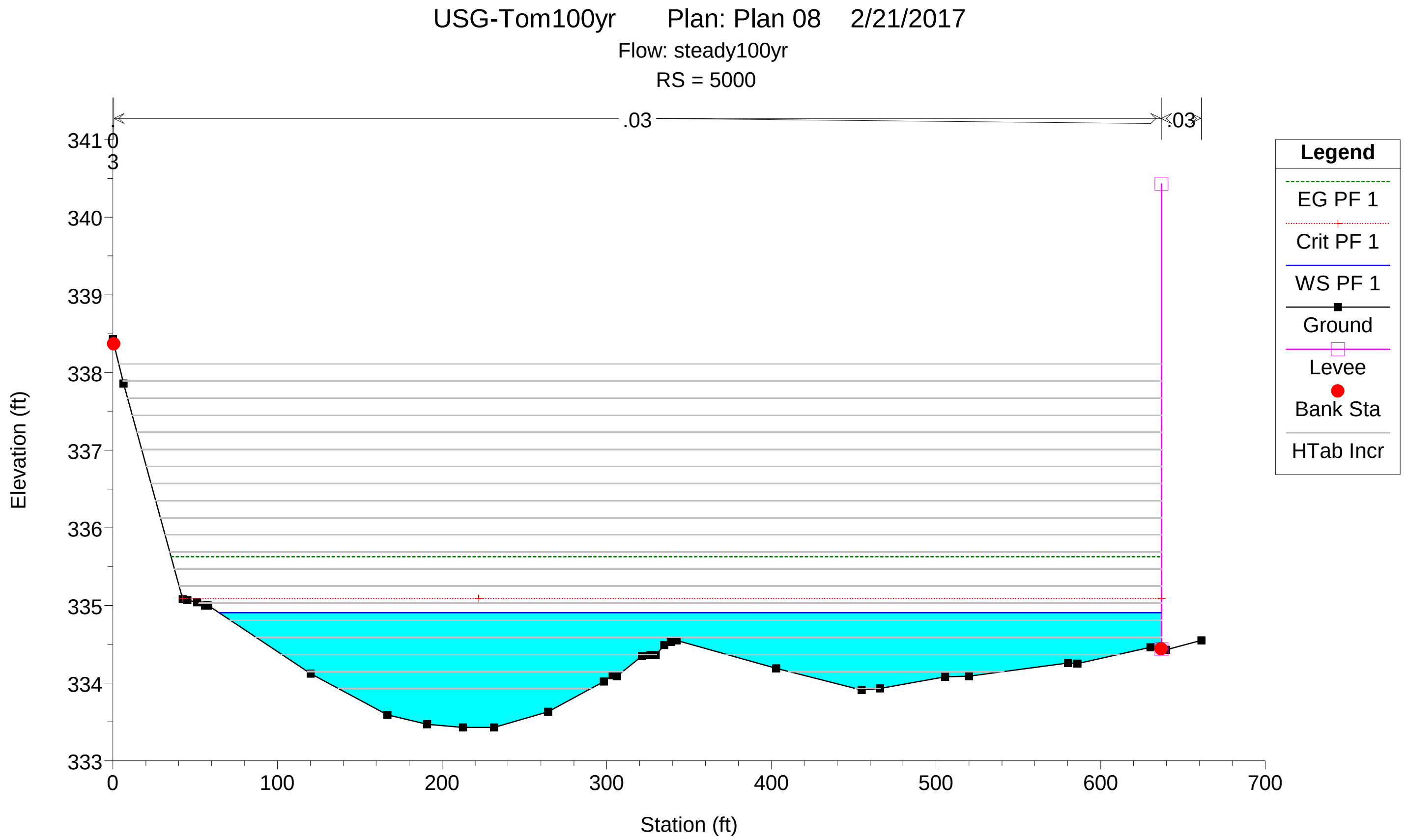

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 7500
.03
.03
0
3
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)
386
388
390
392
394
396
0
100
200
300
400
500
600

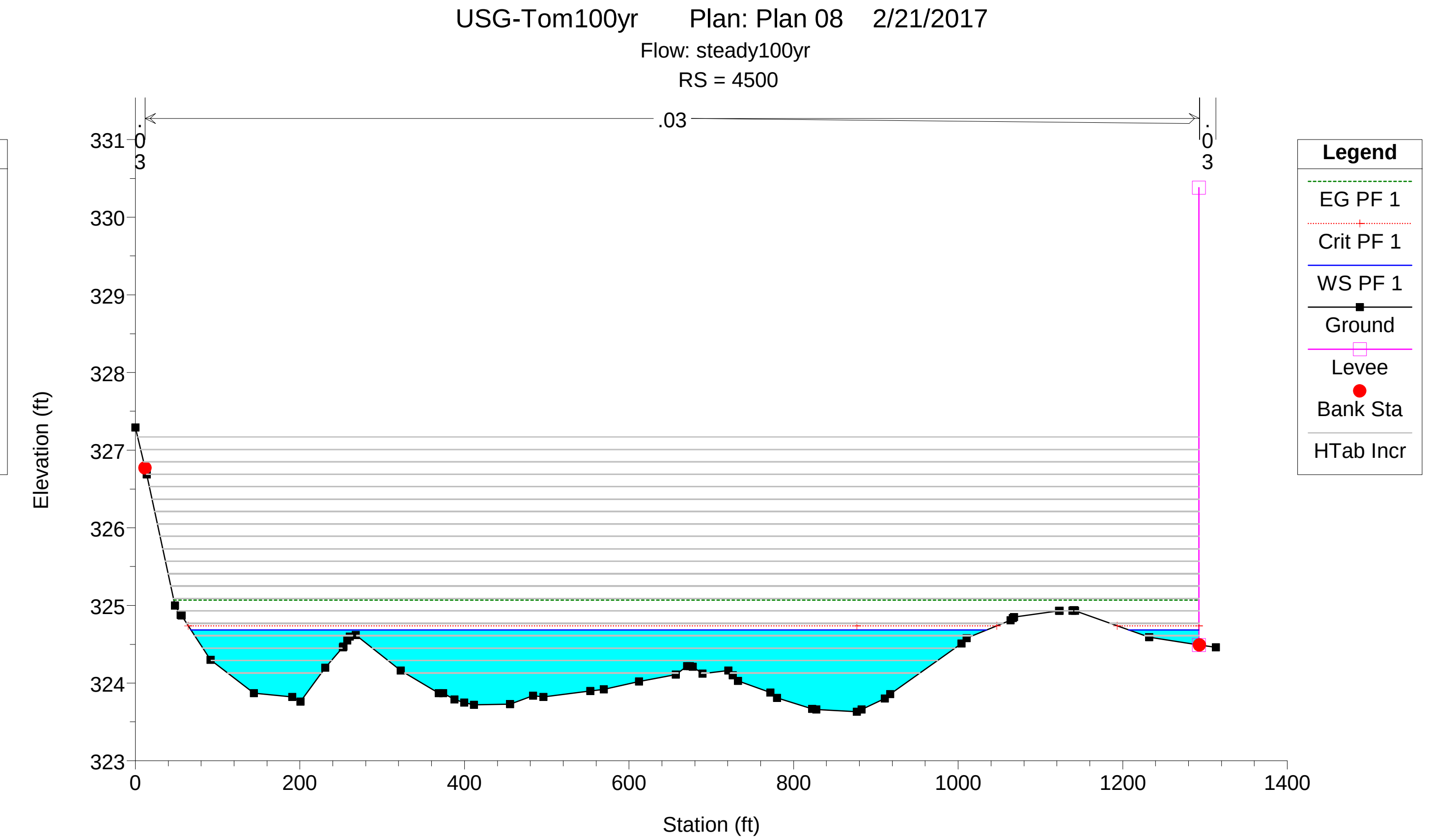

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 7000
.03
.03
Elevation (ft)
383
382
381
380
379
378
377
376
Station (ft)
0
100
200
300
400
500
600
700
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr

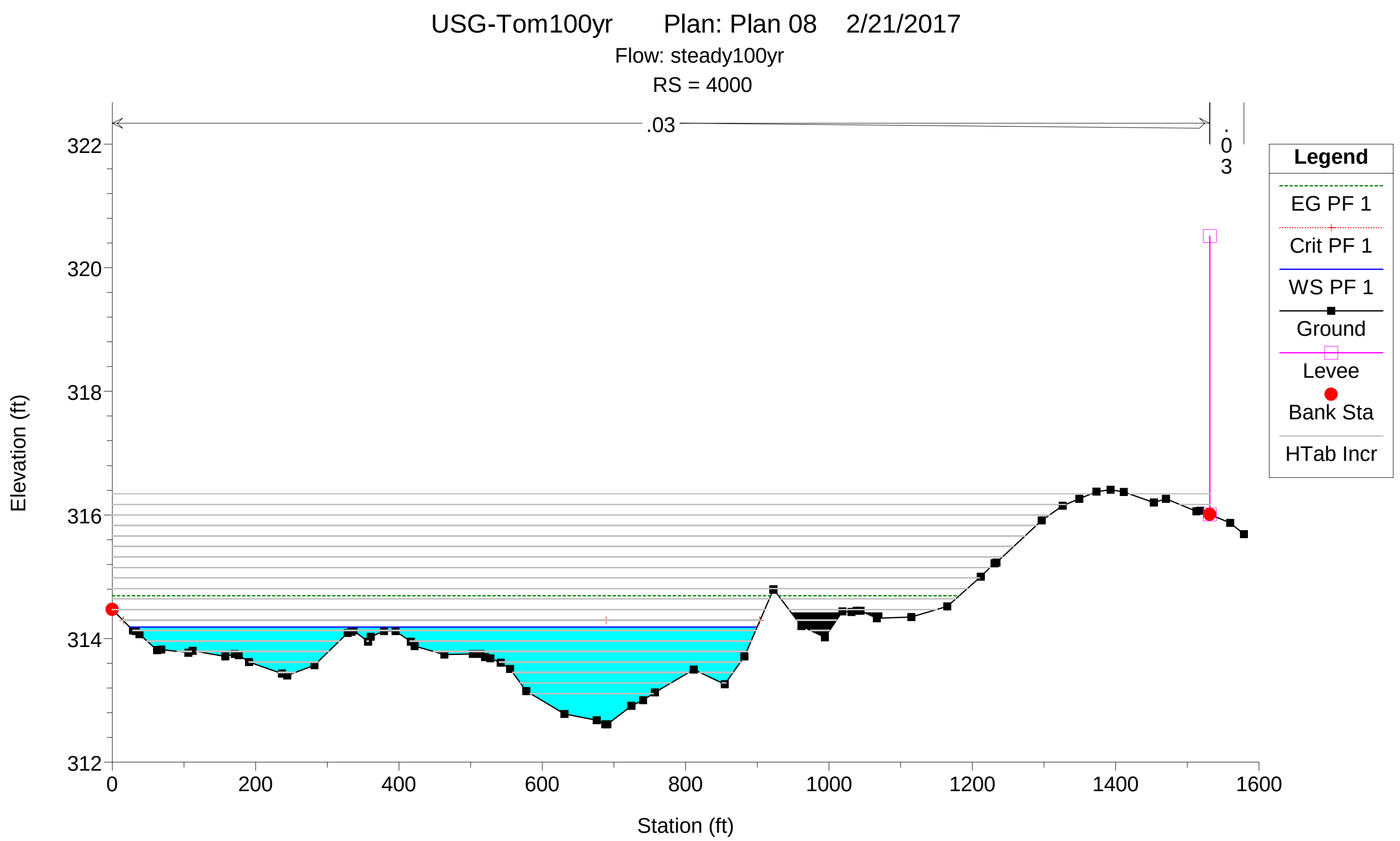

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 6500
.03
.03
.03
Elevation (ft)
376
374
372
370
368
366
Station (ft)
0
100
200
300
400
500
600
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

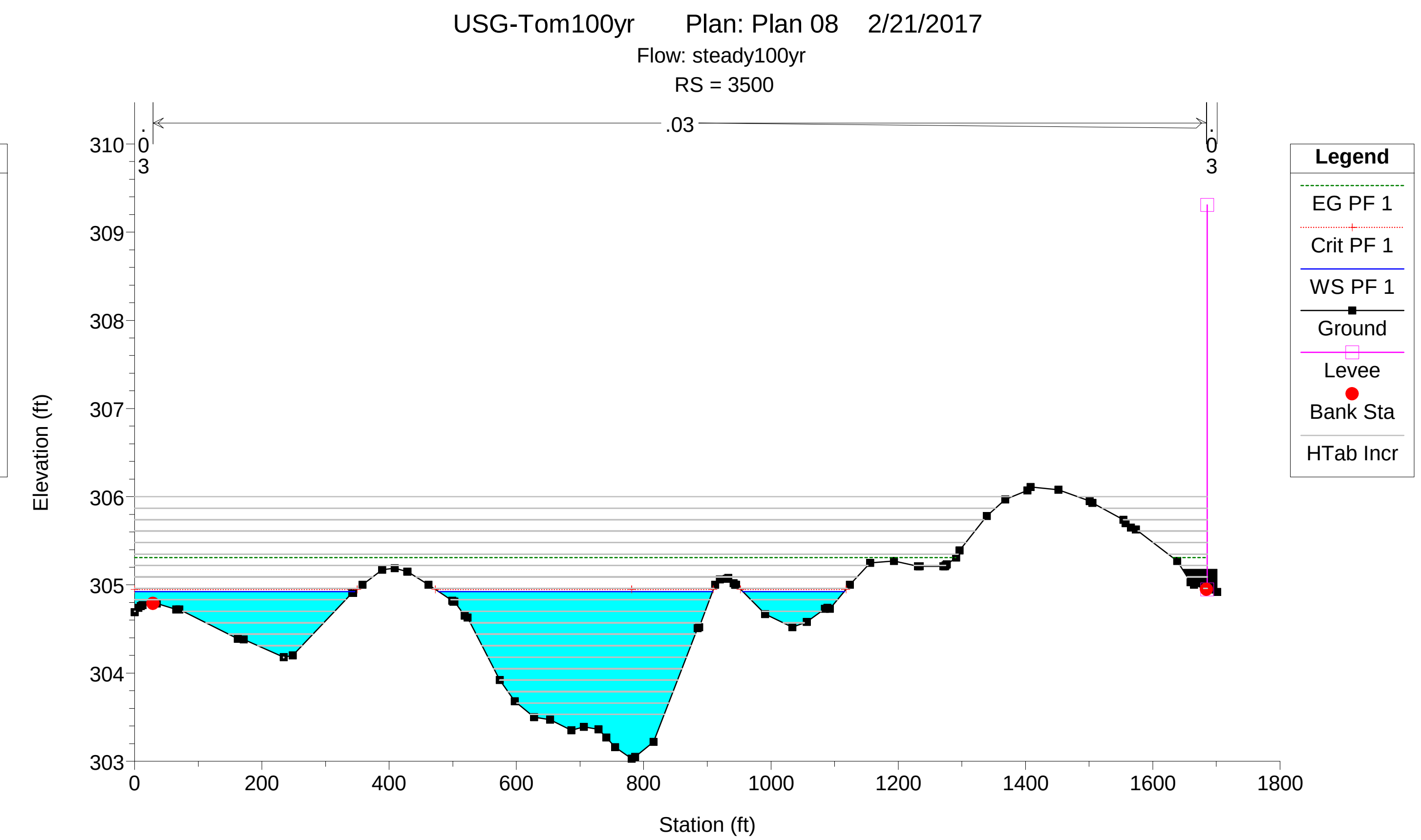

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 6000
.03
Elevation (ft)
364
362
360
358
356
354
Station (ft)
0
100
200
300
400
500
600
700
800
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

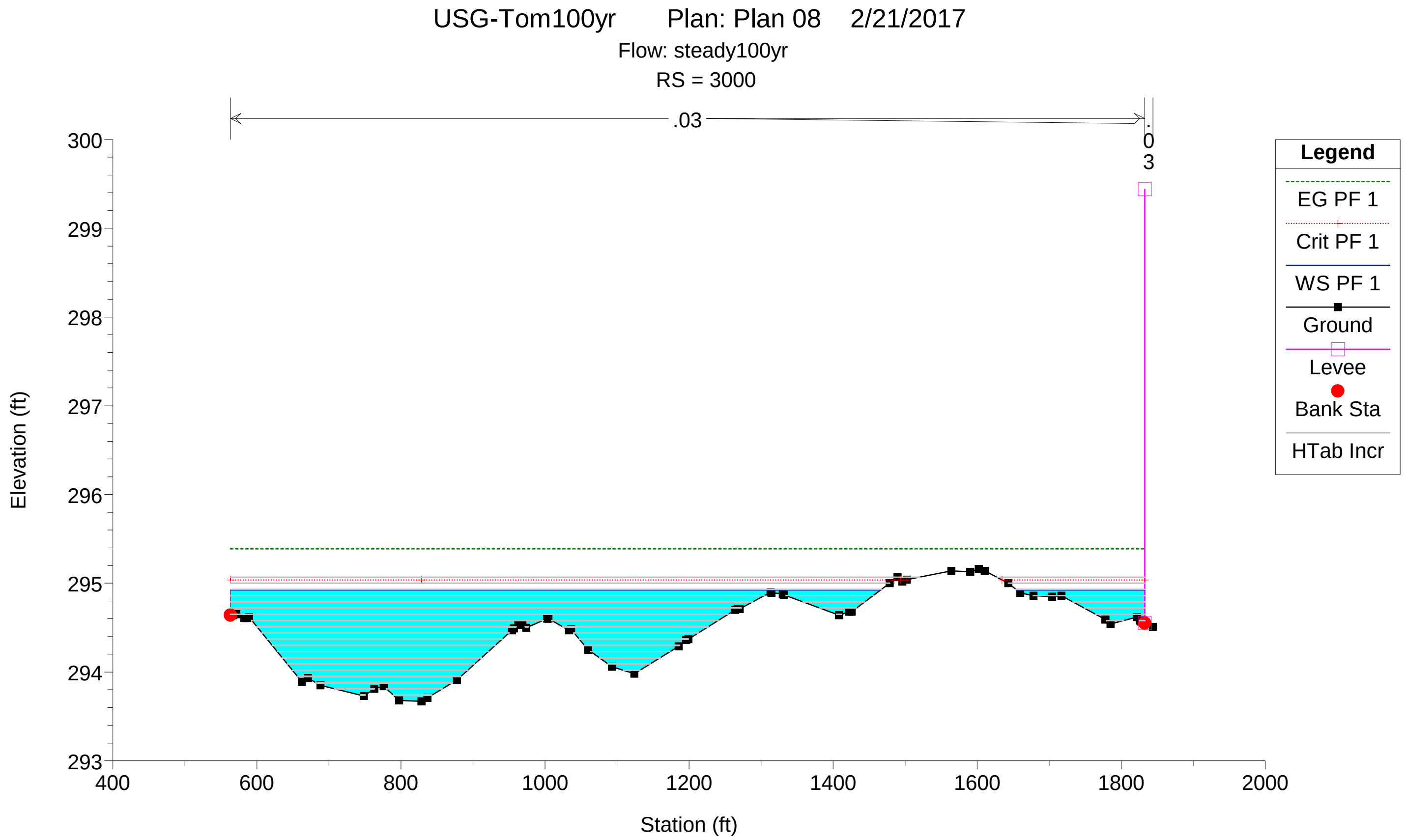

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 5500
.03
Elevation (ft)
347.0
346.5
346.0
345.5
345.0
344.5
344.0
343.5
Station (ft)
0
100
200
300
400
500
600
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

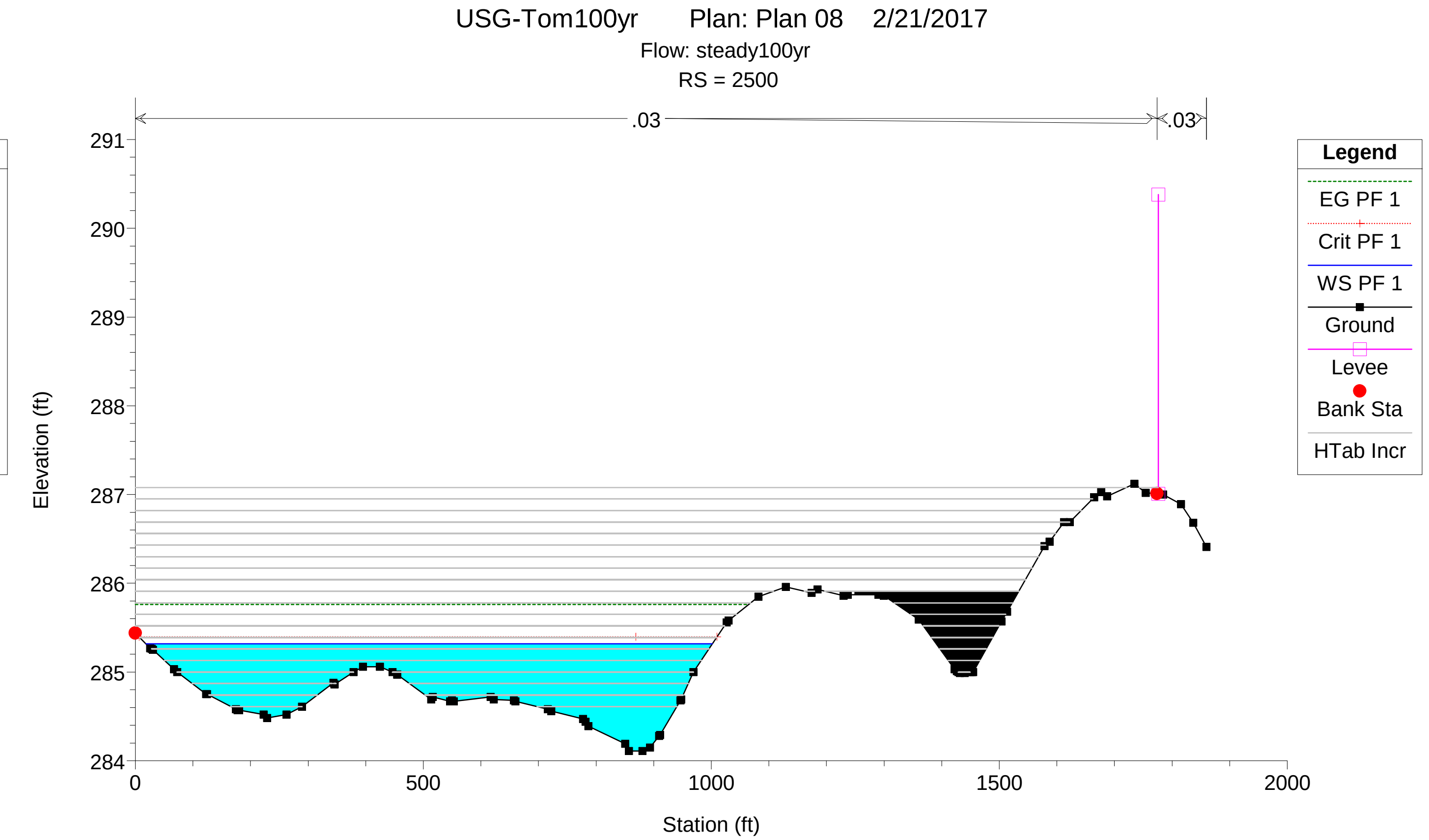

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 5000
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

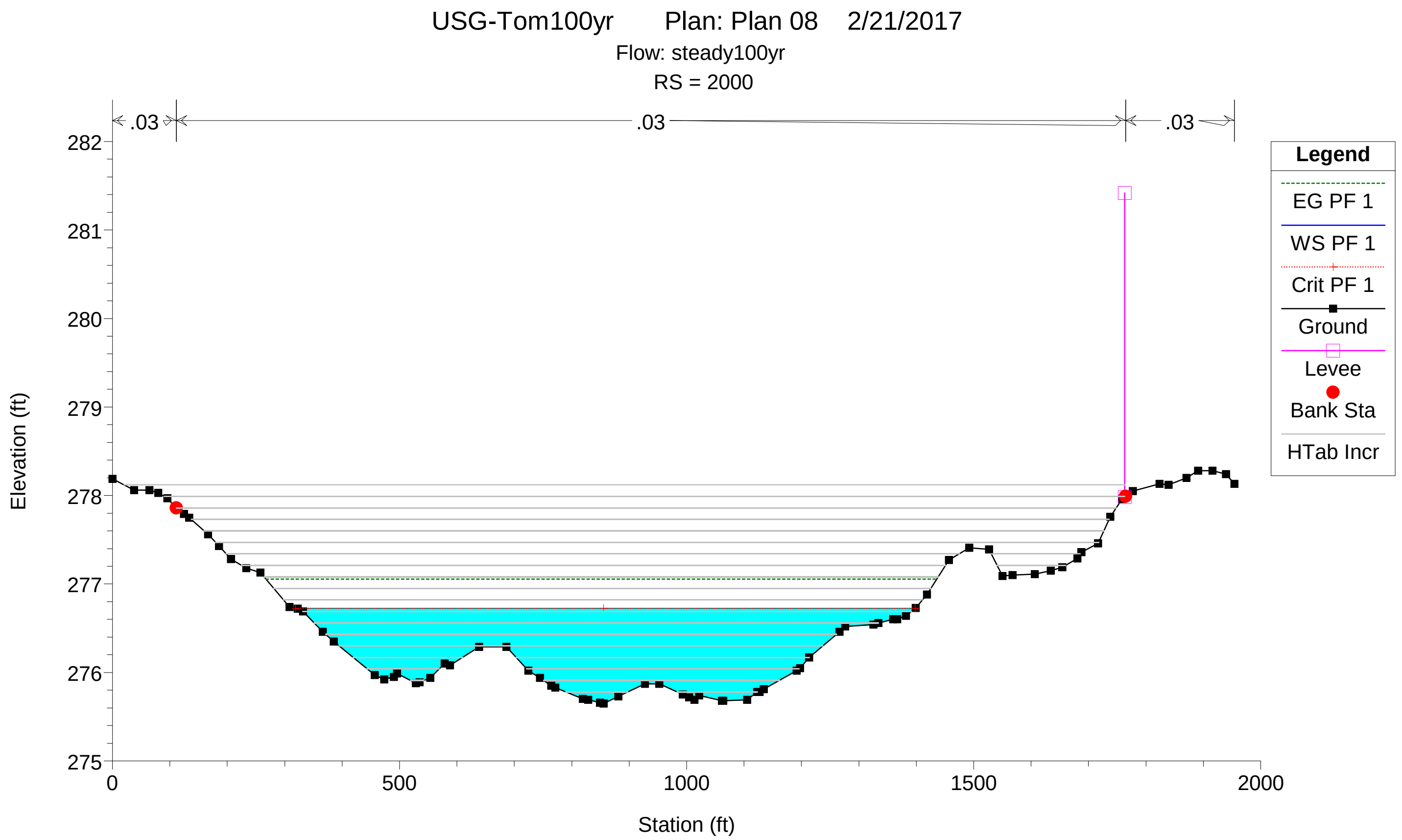

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 4500
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

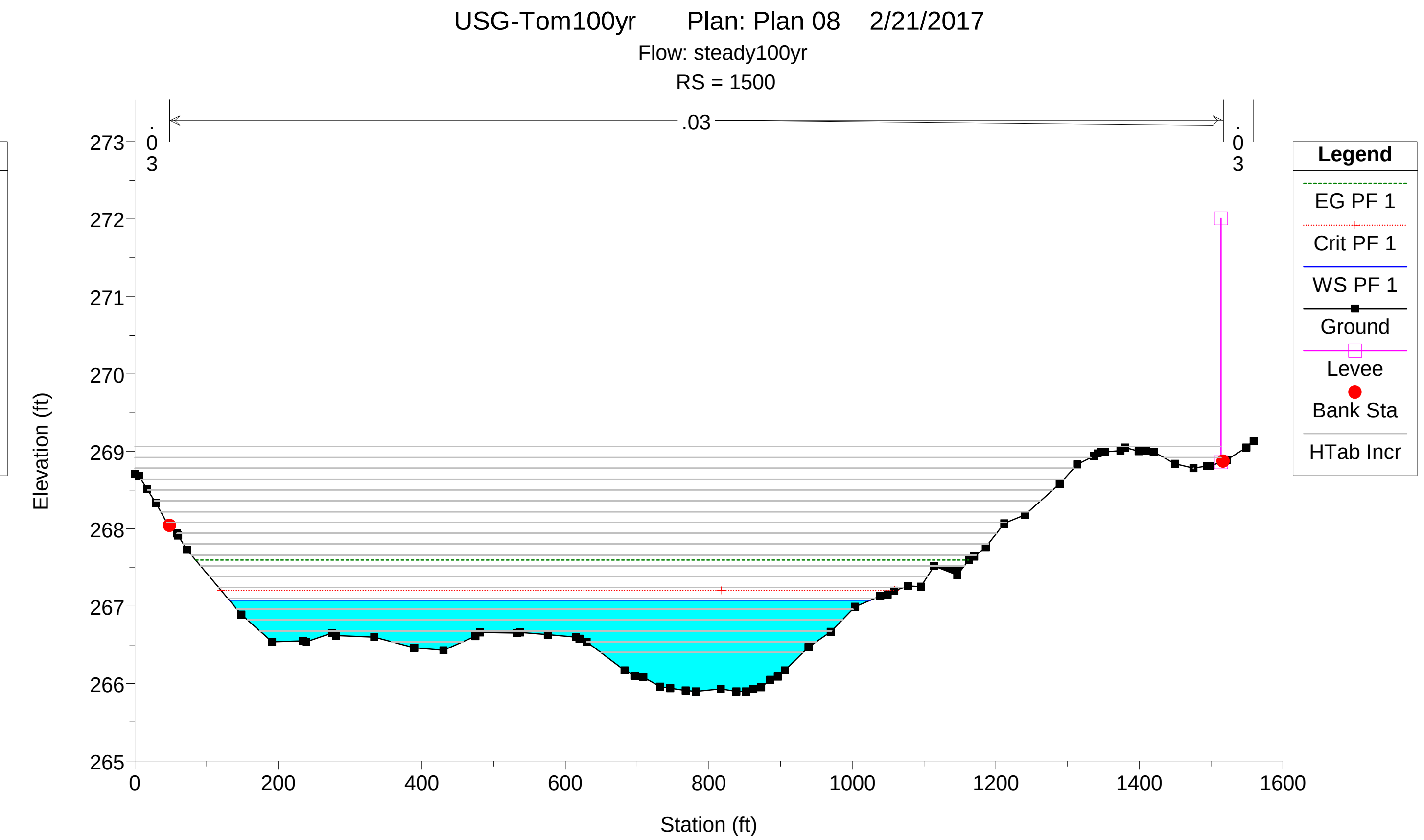

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 4000
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr

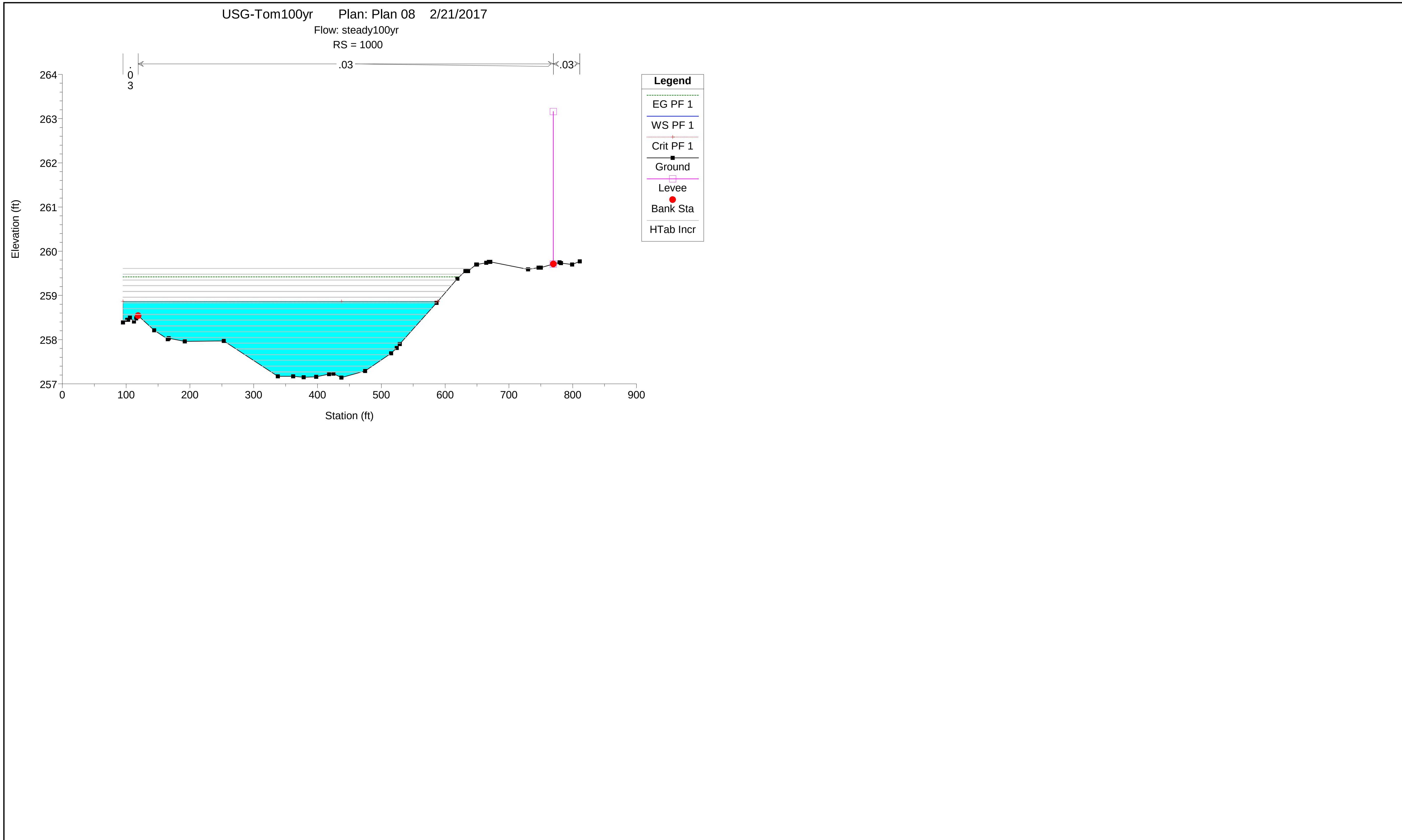

USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 3500
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr


USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 3000
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr


USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 2500
.03
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr


USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 2000
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr


USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 1500
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
HTab Incr



USG-Tom100yr Plan: Plan 08 2/21/2017
Flow: steady100yr
RS = 1000
.03
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
HTab Incr
Elevation (ft)
Station (ft)
264
263
262
261
260
259
258
257
0
100
200
300
400
500
600
700
800
900

APPENDIX E

Scour Calculations

GENERAL AND LOCAL SCOUR CALCULATION RESULTS

Normal Depth Hydraulics (Design Discharge)																			Dune/Antidune Scour (Simons&Li/Kennedy)				General Scour – Regime Equations – Blench (1969)				Lacey (1930)			Low Flow Incisement	Totals – Dune	Low Flow	Blench	Lacey	Controlling	Required Scour
Location	Section	Q (cfs)	n	b (feet)	z (feet)	A (sf)	P (feet)	R (feet)	T (feet)	s_o (ft/ft)	y (feet)	V_{avg} (ft/s)	q (cfs/ft)	Vc (ft)	EGL (ft)	y_h (feet)	V_{max} (ft/s)	s_e (ft/ft)	Froude Number	Dune (D) or Antidune (A)	ha (feet)	Ds (feet) 1	Z	F_{b0}	yfo (feet)	Ds (feet) 2	Z	ym (feet)	Ds (feet) 3	Ds (feet) 4	Ds (feet)	Ds (feet)	Ds (feet)	Ds (feet)	Ds (feet)	Ds (feet)
Reference XS	23000	3300	0.030	50	8.33	438	124	3.53	246	0.0598	4.42	7.53	33	4.89	810.09	4.42	7.53	0.0337	0.99	D	4.42	0.74	0.60	1.80	8.51	0.68	0.50	5.80	2.90	3.00	0.74	3.00	0.68	2.90	7.3	10
Gypsum	22500	3300	0.030	50	8.33	103	90	1.14	81	0.0649	2.41	32.07	77	4.42	793.24	2.41	32.07	0.0930	5.01	A	27.77	13.88	0.60	1.80	14.92	6.54	0.50	5.80	2.90	3.00	13.88	3.00	6.54	2.90	26.3	34
Gypsum	22000	3300	0.030	50	8.33	305	92	3.31	262	0.0512	2.51	10.81	27	4.45	746.75	2.51	10.81	0.0468	1.76	A	3.16	1.58	0.60	1.80	7.42	1.94	0.50	5.80	2.90	3.00	1.58	3.00	1.94	2.90	9.4	12
Gypsum	21500	3300	0.030	50	8.33	243	111	2.18	196	0.0448	3.65	13.59	50	4.74	723.35	3.65	13.59	0.0451	2.15	A	4.99	2.49	0.60	1.80	11.10	3.01	0.50	5.80	2.90	3.00	2.49	3.00	3.01	2.90	11.4	15
Gypsum	21000	3300	0.030	50	8.33	225	100	2.24	116	0.0594	3.00	14.69	44	4.59	700.78	3.00	14.69	0.0496	1.86	A	5.83	2.91	0.60	1.80	10.26	3.15	0.50	5.80	2.90	3.00	2.91	3.00	3.15	2.90	12.0	16
Gypsum	20500	3300	0.030	50	8.33	147	107	1.37	64	-0.0002	3.40	22.45	76	4.68	675.97	3.40	22.45	0.0164	2.60	A	13.61	6.80	0.60	1.80	14.79	5.48	0.50	5.80	2.90	3.00	6.80	3.00	5.48	2.90	18.2	24
Gypsum	20000	3300	0.030	50	8.33	568	90	6.32	492	0.0307	2.38	5.81	14	4.41	667.77	2.38	5.81	0.0300	0.99	D	2.38	0.40	0.60	1.80	4.74	0.46	0.50	5.80	2.90	3.00	0.40	3.00	0.46	2.90	6.8	9
Gypsum	19500	3300	0.030	400	4.55	267	408	0.65	585	0.0343	0.91	12.36	11	3.76	652.79	0.91	12.36	0.0337	3.22	A	4.12	2.06	0.60	1.80	4.13	1.57	0.50	5.80	2.90	1.00	2.06	1.00	1.57	2.90	7.5	10
Gypsum	19000	3300	0.030	400	4.55	545	428	1.27	509	0.0326	3.00	6.05	18	4.59	635.93	3.00	6.05	0.0277	1.03	A	0.99	0.49	0.60	1.80	5.68	0.41	0.50	5.80	2.90	1.00	0.49	1.00	0.41	2.90	4.8	6
Gypsum	18500	3300	0.030	400	4.55	207	419	0.49	231	0.0309	2.02	15.98	32	4.30	622.07	2.02	15.98	0.0369	2.98	A	6.89	3.45	0.60	1.80	8.33	2.98	0.50	5.80	2.90	1.00	3.45	1.00	2.98	2.90	10.3	13
Gypsum	18000	3300	0.030	400	4.55	537	422	1.27	628	0.0291	2.39	6.14	15	4.42	603.62	2.39	6.14	0.0290	1.17	A	1.02	0.51	0.60	1.80	4.93	0.57	0.50	5.80	2.90	1.00	0.51	1.00	0.57	2.90	5.0	6
Gypsum	17500	3300	0.030	400	4.55	404	423	0.96	683	0.0322	2.49	8.16	20	4.45	589.13	2.49	8.16	0.0310	1.87	A	1.80	0.90	0.60	1.80	6.12	1.18	0.50	5.80	2.90	1.00	0.90	1.00	1.18	2.90	6.0	8
Gypsum	17000	3300	0.030	400	4.55	531	428	1.24	884	0.0260	3.05	6.21	19	4.60	573.64	3.05	6.21	0.0285	1.41	A	1.04	0.52	0.60	1.80	5.84	0.45	0.50	5.80	2.90	1.00	0.52	1.00	0.45	2.90	4.9	6
Gypsum	16500	3300	0.030	400	4.55	441	414	1.07	688	0.0277	1.52	7.48	11	4.10	559.38	1.52	7.48	0.0267	1.65	A	1.51	0.76	0.60	1.80	4.16	0.97	0.50	5.80	2.90	1.00	0.76	1.00	0.97	2.90	5.6	7
Gypsum	16000	3300	0.030	400	4.55	467	420	1.11	440	0.0292	2.14	7.06	15	4.34	546.05	2.14	7.06	0.0279	1.21	A	1.35	0.67	0.60	1.80	5.02	0.87	0.50	5.80	2.90	1.00	0.67	1.00	0.87	2.90	5.4	7
Gypsum	15500	3300	0.030	400	4.55	337	419	0.80	376	0.0310	2.07	9.80	20	4.31	532.10	2.07	9.80	0.0299	1.82	A	2.59	1.30	0.60	1.80	6.11	1.60	0.50	5.80	2.90	1.00	1.30	1.00	1.60	2.90	6.8	9
Gypsum	15000	3300	0.030	400	4.55	331	424	0.78	203	0.0325	2.56	9.97	26	4.47	517.15	2.56	9.97	0.0312	1.38	A	2.68	1.34	0.60	1.80	7.13	1.72	0.50	5.80	2.90	1.00	1.34	1.00	1.72	2.90	7.0	9
Gypsum	14500	3300	0.030	400	4.55	255	420	0.61	200	0.0137	2.15	12.96	28	4.34	501.56	2.15	12.96	0.0121	2.02	A	4.53	2.27	0.60	1.80	7.56	2.38	0.50	5.80	2.90	1.00	2.27	1.00	2.38	2.90	8.5	11
Gypsum	14000	3300	0.030	400	4.55	1692	451	3.75	406	-0.0005	5.50	1.95	11	5.08	495.51	5.50	1.95	0.0009	0.17	D	5.50	0.92	0.60	1.80	4.00	0.00	0.50	5.80	2.90	1.00	0.92	1.00	0.00	2.90	4.8	6
Gypsum	13500	3300	0.030	400	4.55	434	448	0.97	241	0.0106	5.11	7.61	39	5.01	495.07	5.11	7.61	0.0155	1.00	D	5.11	0.85	0.60	1.80	9.44	0.55	0.50	5.80	2.90	1.00	0.85	1.00	0.55	2.90	5.3	7
Gypsum	13000	3300	0.030	400	4.55	383	412	0.93	496	0.0206	1.28	8.61	11	3.98	487.34	1.28	8.61	0.0204	1.70	A	2.00	1.00	0.60	1.80	4.07	1.16	0.50	5.80	2.90	1.00	1.00	1.00	1.16	2.90	6.1	8
Gypsum	12500	3300	0.030	400	4.55	453	416	1.09	393	0.0193	1.70	7.29	12	4.17	477.12	1.70	7.29	0.0181	1.15	A	1.43	0.72	0.60	1.80	4.40	0.94	0.50	5.80	2.90	1.00	0.72	1.00	0.94	2.90	5.6	7
Gypsum	12000	3300	0.030	400	4.55	425	420	1.01	401	0.0165	2.14	7.77	17	4.34	468.08	2.14	7.77	0.0175	1.33	A	1.63	0.82	0.60	1.80	5.36	1.07	0.50	5.80	2.90	1.00	0.82	1.00	1.07	2.90	5.8	8
Gypsum	11500	3300	0.030	400	4.55	583	420	1.39	599	0.0218	2.11	5.66	12	4.33	459.34	2.11	5.66	0.0209	1.01	A	0.86	0.43	0.60	1.80	4.30	0.47	0.50	5.80	2.90	1.00	0.43	1.00	0.47	2.90	4.8	6
Gypsum	11000	3300	0.030	400	4.55	395	419	0.94	466	0.0218	1.99	8.35	17	4.28	448.91	1.99	8.35	0.0218	1.60	A	1.88	0.94	0.60	1.80	5.35	1.22	0.50	5.80	2.90	1.00	0.94	1.00	1.22	2.90	6.1	8
Gypsum	10500	3300	0.030	400	4.55	512	422	1.21	456	0.0128	2.39	6.44	15	4.42	437.99	2.39	6.44	0.0145	1.07	A	1.12	0.56	0.60	1.80	5.09	0.66	0.50	5.80	2.90	1.00	0.56	1.00	0.66	2.90	5.1	7
Gypsum	10000	3300	0.030	400	4.55	518	415	1.25	482	0.0189	1.56	6.37	10	4.11	430.73	1.56	6.37	0.0184	1.08	A	1.10	0.55	0.60	1.80	3.80	0.72	0.50	5.80	2.90	1.00	0.55	1.00	0.72	2.90	5.2	7
Gypsum	9500	3300	0.030	400	4.55	411	413	1.00	388	0.0161	1.42	8.02	11	4.05	421.52	1.42	8.02	0.0141	1.37	A	1.74	0.87	0.60	1.80	4.16	1.08	0.50	5.80	2.90	1.00	0.87	1.00	1.08	2.90	5.8	8
Gypsum	9000	3300	0.030	400	4.55	490	425	1.15	351	0.0143	2.72	6.73	18	4.51	414.46	2.72	6.73	0.0115	1.00	A	2.72	0.45	0.60	1.80	5.71	0.71	0.50	5.80	2.90	1.00	0.45	1.00	0.71	2.90	5.1	7
Gypsum	8500	3300	0.030	400	4.55	378	437	0.87	131	0.0088	3.93	8.72	34	4.80	408.72	3.93	8.72	0.0093	0.90	D	3.93	0.66	0.60	1.80	8.67	1.27	0.50	5.80	2.90	1.00	0.66	1.00	1.27	2.90	5.8	8
Gypsum	8000	3300	0.030	400	4.55	425	434	0.98	228	0.0265	3.61	7.76	28	4.73	404.06	3.61	7.76	0.0256	1.00	D	3.61	0.60	0.60	1.80	7.58	0.94	0.50	5.80	2.90	1.00	0.60	1.00	0.94	2.90	5.4	7
Gypsum	7500	3300	0.030	400	4.55	209	411	0.51	216	0.0201	1.15	15.82	18	3.91	391.27	1.15	15.82	0.0211	2.84	A	6.76	3.38	0.60	1.80	5.69	2.26	0.50	5.80	2.90	1.00	3.38	1.00	2.26	2.90	9.5	12
Gypsum	7000	3300	0.030	400	4.55	429	434	0.99	232	0.0166	3.62	7.70	28	4.73	380.72	3.62	7.70	0.0175	1.00	D	3.62	0.60	0.60	1.80	7.56	0.91	0.50	5.80	2.90	1.00	0.60	1.00	0.91	2.90	5.4	7
Gypsum	6500	3300	0.030	400	4.55	318	422	0.75	254	0.0264	2.40	10.37	25	4.42	371.95	2.40	10.37	0.0301	1.63	A	2.90	1.45	0.60	1.80	7.01	1.80	0.50	5.80	2.90	1.00	1.45	1.00	1.80	2.90	7.2	9
Gypsum	6000	3300	0.030	400	4.55	450	413	1.09	527	0.0219	1.39	7.34	10	4.04	356.89	1.39	7.34	0.0220	1.40	A	1.45	0.73	0.60	1.80	3.87	0.93	0.50	5.80	2.90	1.00	0.73	1.00	0.93	2.90	5.6	7
Gypsum	5500	3300	0.030	400	4.55	493	414	1.19	490	0.0205	1.51	6.69	10	4.09	345.90	1.51	6.69	0.0205	1.17	A	1.21	0.60	0.60	1.80	3.84	0.79	0.50	5.80	2.90	1.00	0.60	1.00	0.79	2.90	5.3	7
Gypsum	5000	3300	0.030	400	50.00	485	548	0.88	573	0.0196	1.48	6.81	10	4.08	335.63	1.48	6.81	0.0211	1.30	A	1.25	0.63	0.60	1.80	3.84	0.82	0.50	5.80	2.90	0.50	0.63	0.50	0.82	2.90	4.8	6
Gypsum	4500	3300	0.030	400	50.00	664	506	1.31	1053	0.0220	1.06	4.97	5	3.86	325.07	1.06	4.97	0.0208	1.10	A	0.67	0.33	0.60	1.80	2.49	0.43	0.50	5.80	2.90	0.50	0.33	0.50	0.43	2.90	4.2	5
Gypsum	4000	3300	0.030	400	50.00	578	558	1.04	876	0.0192	1.58	5.71	9	4.12	314.69	1.58	5.71	0.0188	1.24	A	0.88	0.44	0.60	1.80	3.56	0.56	0.50	5.80	2.90	0.50	0.44	0.50	0.56	2.90	4.4	6
Gypsum	3500	3300	0.030	400	50.00	663	590	1.12	937	0.0187	1.90	4.98	9	4.25	305.31	1.90	4.98	0.0198	1.04	A	0.67	0.33	0.60	1.80	3.68	0.31	0.50	5.80	2.90	0.50	0.33	0.50	0.31	2.90	4.0	5
Gypsum	3000	3300	0.030	400	50.00	604	525	1.15	1081	0.0191	1.25	5.46	7	3.96	295.39	1.25	5.46	0.0193	1.29	A	0.80	0.40	0.60	1.80	2.96	0.52	0.50	5.80	2.90	0.50	0.40	0.50	0.52	2.90	4.3	6
Gypsum	2500	3300	0.030	400	50.00	618	521	1.19	983	0.0169	1.21	5.34	6	3.94	285.76	1.21	5.34	0.0174	1.19	A	0.77	0.38	0.60	1.80	2.85	0.50	0.50	5.80	2.90	0.50	0.38	0.50	0.50	2.90	4.3	6
Gypsum	2000	3300	0.030	400	50.00	716	507	1.41	1079	0.0195	1.07	4.61	5	3.86	277.05	1.07	4.61	0.0189	1.00	D	1.07	0.18	0.60	1.80	2.38	0.36	0.50	5.80	2.90	0.50	0.18	0.50	0.36	2.90	3.9	5
Gypsum	1500	3300	0.030	400	50.00	572	518	1.10	894	0.0175	1.18	5.77	7	3.93	267.59	1.18	5.77	0.0163	1.27	A	0.90	0.45	0.60	1.80	2.95	0.59	0.50	5.80	2.90	0.50	0.45	0.50	0.59	2.90	4.4	6
Reference XS	1000	3300	0.030	400	50.00	549	572	0.96	493	-	1.72	6.01	10	4.18	259.42	1.72	6.01	0.2594	1.00	D	1.72	0.29	0.60	1.80	3.90	0.62	0.50	5.80	2.90	0.50	0.29	0.50	0.62	2.90	4.3	6

TOTAL SCOUR SUMMARY:

Channel Characteristics:

Soft Bottom Channel **D_{50} = 1 mm**

Contracted sections exists at bridge crossings.

Q_{100} varies between super and sub-critical thru entire reach.

Vc is less than V thru entire reach. (Live-bed Contraction Scour only)

Contraction Scour Equations:

Calculate V_c:

$$Vc = K_u Y^{1/6} D^{1/3}$$

If Vc > V; then Clear-Water contraction scour exists. Solve for Clear-Water contraction scour.

If V > Vc; then Live-Bed contraction scour exists. Solve for Live-Bed contraction scour.

V_c: Critical velocity above which bed material of size D and smaller will be transported, m/s (ft/s)
Y: Average depth of flow upstream of the bridge, m (ft)
V: Average velocity upstream of the bridge, m/s (ft/s)
D: Particle size for Vc, m (ft)
D_{50}: Particle size in a mixture of which 50 percent are smaller, m (ft)
K_u: 6.19 SI Units
K_u: 11.17 English Units

Live-Bed Contraction Scour

$$Y_2/Y_1 = (Q_2/Q_1)^{6/7} * (W_1/W_2)^{k1}$$

$Y_s = Y_2 - Y_o$ = (average contraction scour depth)

Average depth in the upstream main channel, m (ft)
Average depth in the contracted section, m (ft)
Existing depth in the contracted section before scour, m (ft)
Flow in the upstream channel transporting sediment, m^3/s (ft^3/s)
Flow in the contracted channel, m^3/s (ft^3/s)
Bottom width of the upstream main channel that is transporting bed material, m (ft)
Bottom width of the main channel in the contracted section less pier widths, m (ft)
Exponent determined below
$(tau/roe)^{.5} = (gY_1S_1)^{.5}$, shear velocity in the upstream section, m/s (ft/s)
Fall Velocity of bed material based on the D50 (For fall velocity in English units, multiply w in m/s by 3.28)
Acceleration of gravity (9.81 m/s^2) (32.2 ft/s^2)
Slope of energy grade line of main channel, m/m (ft/ft)
Shear stress on the bed, Pa (N/m^2) (lb/ft^2)
Density of water (1000 kg/m^3) (1.94 $slugs/ft^3$)

General Scour Equations:

Zeller's Equation

$$y_{gs} = y_{max}[(0.0685*V_m^{0.8})/(y_h^{0.4}*S_e^{0.3})-1]$$

y_{gs}: general scour depth, (ft)
y_{max}: maximum depth of flow, (ft)
V_m: average velocity of flow, (ft/s)
y_h: hydraulic depth of flow, (ft)
S_e: energy slope (or bed slope for uniform flow), (ft)

Regime Equations:

Neill's Equation for Incised Channels
No incised sections; therefore N/A

Blench Equation

$$y_{fo} = q_f^{2/3}/F_{b0}^{1/3}$$

y_{f0}: water depth for zero bed sediment transport, (ft)
q_f: design discharge per unit width, ($ft^3/s/ft$)
F_{b0}: Blench's "zero bed factor" in ft/s^2 from Figure 9.

Lacey's Equation

$$y_m = 0.47*(Q/f)^{1/3}$$

y_m: mean water depth at design discharge, (ft)
Q: design discharge, (ft^3/s)
f: Lacey's silt factor = $1.76*D_m^{1/2}$
D_m: mean grain size of bed material, (mm)

Competent (Limiting) Velocity Approach Neill

$$ys = y_m(V_m/V_{co}-1)$$

y_s: Scoured depth below stream bed, (ft)
y_m: mean depth, (ft)
V_{co}: competent mean velocity, (ft/s)
V_m: mean velocity, (ft/s)

Competent Velocity Approach (Alvarez and Alfaro)
(For sands or gravel of d_{75} < 6 mm)

$$yms = 0.365 * Q^{0.784}/(T^{0.784} * d_{50}^{0.157})$$

y_{ms}: flow depth from the design water level to the mean scoured depth
Q: flow rate, (m^3/s)
T: water surface width, (m)
d_{50}: median sediment size (mm)

APPENDIX F

Sediment Deposition Calculations

Soil Group	Rainfall Factor - R	Erodability Factor - K	Topographic Factor - LS	Cover Factor - C	Soil Loss per Unit Area - A (tons per acre per year)	Area (acre)	Total Erosion (tons per year)	Sediment Delivery Ratio	Total Sediment Depositon (tons per year)
A	20	0.1	0.792	0.2	0.32	1400	444	-	-
D	20	0.51	8.120	0.2	16.56	2600	43068	-	-
Total	-	-	-	-	-	-	43512	0.2	8702.4

APPENDIX G

Riprap Design Calculations

Sta. 210+00 to Sta. 230+00


```
Date: 03/29/2017 Time: 15:04
************************************************************
*                RIPRAP DESIGN SYSTEM (RDS)                *
*                            BY                            *
*                  WEST Consultants, Inc.                  *
*                                                          *
*                                                          *
* Version 3.0                                 March, 2005 *
*                                                          *
*                                                          *
* COPYRIGHT (c) 2005                                       *
* WEST CONSULTANTS, INC.                                   *
* 16870 WEST BERNARDO DRIVE              PH: 858-487-9378 *
* SUITE 340                              FAX:858-487-9448 *
* SAN DIEGO, CA 92127          WEB:WWW.WESTCONSULTANTS.COM *
************************************************************


Project: USG-Top
Description: 25-YR Prop Westerly Sta. 21000-23000

______________________  USACE Method ______________________


Input Parameters:
-----------------
Velocity Type                                        Average
Channel Shape                                        Natural
Channel Type                                        Straight
Bend Angle (deg)                                         N/A
Average Channel Velocity                          14.00 ft/s
Bottom width                                             N/A
Bend Radius                                              N/A
Top Width                                                N/A
Unit Weight of Stone                          165. lbs/cu ft
Riprap Layer Thickness                                  1.00
Local Flow Depth                                     1.87 ft
Cotangent of Side Slope                                 2.00
Safety Factor                                            1.2
Riprap Placement                                Channel Bank
Rock Type                                            Angular


Output Results:
---------------

Computed D30                                         1.87 ft
Computed Local Depth Averaged Velocity            14.00 ft/s
Local Velocity/Avg. Velocity                            1.00
Side Slope Correction Factor                            1.18
Correction for Layer Thickness                          1.00
Correction for Secondary Currents                       1.00

  *** Using Gradations from COE ETL 1110-2-120 ***


Specific Weight     165.0 lbs/cu ft
Layer Thickness         4.000 ft
Selected Minimum D30     1.95 ft
Selected Minimum D90     2.82 ft
```

Percent Lighter by Weight	Stone Weight, lbs Minimum	Maximum
W100	2212.	5529.
W50	1106.	1637.
W15	346.	818.

Sta. 150+00 to Sta. 205+00


```
Date: 03/29/2017 Time: 15:14
************************************************************
*                RIPRAP DESIGN SYSTEM (RDS)                *
*                            BY                            *
*                  WEST Consultants, Inc.                  *
*                                                          *
*                                                          *
* Version 3.0                                 March, 2005 *
*                                                          *
*                                                          *
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* WEST CONSULTANTS, INC.                                   *
* 16870 WEST BERNARDO DRIVE               PH: 858-487-9378 *
* SUITE 340                               FAX:858-487-9448 *
* SAN DIEGO, CA 92127          WEB:WWW.WESTCONSULTANTS.COM *
************************************************************
```

Project: USG-Mid
Description: 25-YR Prop Westerly Sta. 20500-15000

______________________ USACE Method ______________________

Input Parameters:

Velocity Type	Average
Channel Shape	Natural
Channel Type	Straight
Bend Angle (deg)	N/A
Average Channel Velocity	9.00 ft/s
Bottom width	N/A
Bend Radius	N/A
Top Width	N/A
Unit Weight of Stone	165. lbs/cu ft
Riprap Layer Thickness	1.00
Local Flow Depth	1.59 ft
Cotangent of Side Slope	2.00
Safety Factor	1.2
Riprap Placement	Channel Bank
Rock Type	Angular

Output Results:

Computed D30	0.64 ft
Computed Local Depth Averaged Velocity	9.00 ft/s
Local Velocity/Avg. Velocity	1.00
Side Slope Correction Factor	1.18
Correction for Layer Thickness	1.00
Correction for Secondary Currents	1.00

*** Using Gradations from COE ETL 1110-2-120 ***

Specific Weight	165.0 lbs/cu ft
Layer Thickness	1.500 ft
Selected Minimum D30	0.73 ft
Selected Minimum D90	1.06 ft

Percent Lighter by Weight	Stone Weight, lbs Minimum	Stone Weight, lbs Maximum
W100	117.	292.
W50	58.	86.
W15	18.	43.

```
Date: 03/29/2017 Time: 15:22
************************************************************
*                RIPRAP DESIGN SYSTEM (RDS)                *
*                            BY                            *
*                   WEST Consultants, Inc.                 *
*                                                          *
*                                                          *
* Version 3.0                                March, 2005   *
*                                                          *
*                                                          *
* COPYRIGHT (c) 2005                                       *
* WEST CONSULTANTS, INC.                                   *
* 16870 WEST BERNARDO DRIVE              PH: 858-487-9378  *
* SUITE 340                              FAX:858-487-9448  *
* SAN DIEGO, CA 92127          WEB:WWW.WESTCONSULTANTS.COM *
************************************************************
```

Project: USG-Base
Description: 25-YR Prop Westerly Sta. 14500-1000

______________________ USACE Method ______________________

Input Parameters:

Velocity Type	Average
Channel Shape	Natural
Channel Type	Straight
Bend Angle (deg)	N/A
Average Channel Velocity	6.00 ft/s
Bottom width	N/A
Bend Radius	N/A
Top Width	N/A
Unit Weight of Stone	165. lbs/cu ft
Riprap Layer Thickness	1.00
Local Flow Depth	0.88 ft
Cotangent of Side Slope	2.00
Safety Factor	1.2
Riprap Placement	Channel Bank
Rock Type	Angular

Output Results:

Computed D30	0.27 ft
Computed Local Depth Averaged Velocity	6.00 ft/s
Local Velocity/Avg. Velocity	1.00
Side Slope Correction Factor	1.18
Correction for Layer Thickness	1.00
Correction for Secondary Currents	1.00

*** Using Gradations from COE ETL 1110-2-120 ***

Specific Weight	165.0 lbs/cu ft
Layer Thickness	0.750 ft
Selected Minimum D30	0.37 ft
Selected Minimum D90	0.53 ft

Percent Lighter by Weight	Stone Weight, lbs Minimum	Stone Weight, lbs Maximum
W100	15.	36.
W50	7.	11.
W15	2.	5.

APPENDIX G-2: 2018 GROUNDWATER CONDITIONS MEMORANDUM

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TODD GROUNDWATER

November 14, 2018

MEMORANDUM

To: Cheryl Tubbs, Lilburn Corporation

From: Maureen Reilly, PE and Iris Priestaf, PhD

Re: Update on Groundwater Conditions

The United States Gypsum (USG) Company Expansion/Modernization Final Project Environmental Impact Report/Environmental Impact Statement (EIR/EIS), adopted 2008 by Imperial County, provided an investigation of groundwater in Coyote Wells Valley Basin and the potential impacts from the expanded USG plant. Subsequently USG has been actively monitoring groundwater conditions in the Coyote Wells Groundwater Basin and providing Annual Reports. Recently, the Bureau of Land Management (BLM) has requested further analysis of groundwater conditions in the Coyote Wells Valley and Borrego Valley groundwater basins. A focus is recent change in groundwater conditions that may have contributed to the sudden onset of adverse flow conditions in San Felipe Creek and the San Sebastian Marsh, which is critical habitat for desert pupfish. Recognizing this concern, this memorandum provides an overview of the Borrego Valley Basin and Ocotillo-Clark Valley Groundwater Basin in relation to Coyote Wells Valley Basin, summarizes current monitoring of Coyote Wells Valley Basin, and examines changes in groundwater conditions in recent years.

1. SUMMARY

Four groundwater basins have been considered in this memorandum:

- Coyote Wells Valley (DWR No. 7-29)
- Borrego Valley- Borrego Springs (DWR No. 7-24.01)
- Borrego Valley- Ocotillo Wells (DWR No. 7-024.02)
- Ocotillo-Clark Valley (DWR No. 7-25)

This memorandum has focused on groundwater conditions in the **Coyote Wells Valley Basin**, where USG has developed and maintains a monitoring program for both water levels and water quality. Information from this program indicates no substantial changes in recent years.

Critical overdraft conditions in the **Borrego Springs Subbasin** are a long-term concern, but the ongoing pumping in this basin is not likely the cause of sudden changes in San Felipe Creek because the Borrego Springs pumping has continued over many years at a distance of over 20 miles from the San Sebastian Marsh.

The USG Quarry Well #2 is in the **Ocotillo Wells Subbasin**, adjacent to and upstream of San Felipe Creek. Pumping from Quarry Well #2 is unlikely to have caused the changes in San Felipe Creek because of its small pumping, distance from San Sebastian Marsh, and existence of intervening aquitards and fault barriers.

San Sebastian Marsh is in **Ocotillo-Clark Valley Basin** and was considered in this memorandum. Groundwater pumping has changed recently in proximity to San Sebastian Marsh. Specifically, groundwater pumping has been reduced by the conversion of historical agricultural lands to a solar farm. While no systematic analysis has been performed, it is possible that recent cessation of agricultural pumping from deep aquifers, with reduction of irrigation return flows that provide recharge to shallow aquifers, has resulted in downstream loss of San Felipe Creek flow.

2. DESCRIPTION OF GROUNDWATER BASINS

Figure 1 shows the Coyote Wells Valley Groundwater Basin, two subbasins of the Borrego Valley Basin, and Ocotillo-Clark Valley Groundwater Basin. The USG plant and its groundwater production wells are located in Coyote Wells Valley Groundwater Basin, as defined by the California Department of Water Resources (DWR, 2003).

Coyote Wells Valley Basin (Number 7-29) encompasses 64,000 acres (100 square miles) in the Yuha desert west of Imperial Valley, California. It is located mostly in Imperial County, with the western edge extending into San Diego County. The Basin is bounded by the Coyote Mountains to the north and the Jacumba Mountains to the west and southwest. These boundaries correspond generally to geologic contacts between alluvium and less permeable geologic formations as mapped by DWR. The southern basin boundary is the United States-Mexico border and the eastern boundary is a roughly north-south line from Superstition Mountain on the north to the international border and separates Coyote Wells Valley Basin from the Imperial Valley Groundwater Basin (Number 7-30). The major surface water drainage is Coyote Wash. Part of the northeastern boundary is a surface drainage divide connecting the Coyote Mountains with Superstition Mountain. Additional description is provided in the USG Annual reports. USG has three production wells in Coyote Wells Valley Basin (USG-4, USG-5, and USG-6).

Borrego Valley Groundwater Basin (7-24) was modified in 2016 by DWR. The basin was divided into two subbasins: Borrego Valley – Borrego Springs (7-24.01) and Borrego Valley – Ocotillo Wells (7-24.02). The active USG Quarry Well (specifically Quarry Well #2) is located in the Ocotillo Wells subbasin, as shown on Figure 1.

The Ocotillo Wells Subbasin underlies Lower Borrego Valley in eastern San Diego County and western Imperial County. As described in DWR's Bulletin 118, the subbasin is bound on the northeast and the east by the Coyote Creek fault and the Superstition Mountain fault. A surface drainage divide separates the Ocotillo Wells Subbasin from the adjoining Coyote Wells Valley groundwater basin to the south. The Fish Creek Mountains and Vallecito Mountains bound the west side of the subbasin. The subbasin is separated from the Borrego

Springs subbasin to the northwest by San Felipe Creek and is crossed by tributary washes to San Felipe Creek including Fish Creek Wash and Carrizo Wash. The aquifer is separated into an upper and lower aquifer by an aquitard estimated to be 100-200 feet thick; most pumping is expected to occur in the lower aquifer. US Gypsum has the one production well (Quarry Well #2) in the Ocotillo Wells Subbasin and is currently proposing to replace that well with a new nearby Well #3.

The Ocotillo-Clark Valley Groundwater Basin (Number 7-25) is east of Ocotillo Wells Subbasin. This subbasin is characterized by general groundwater flow toward Clark Dry Lake on the north end and the Salton Sea for the remainder of the basin. The groundwater basin has been developed historically for agricultural and domestic supply. Most of the agriculture near the Salton Sea is irrigated with imported water from Imperial Irrigation District; some farms have been supplied (at least historically) by groundwater, including fields farther west, visible on Figure 1 as green squares. Ocotillo-Clark Valley Basin includes the lower reaches of Fish Creek Wash, Carrizo Wash, and San Felipe Creek, and the San Sebastian Marsh.

3. CURRENT MONITORING PROGRAMS

3.1 Coyote Wells Valley Groundwater Basin

Since the 2008 EIR, USG (in partnership with the US Geological Survey) has been actively monitoring the Coyote Wells Valley Groundwater Basin; USG and their consultants have been preparing annual groundwater reports since 2012. These Annual Reports update the current monitoring network, assess water level and water quality data, and review if changes in groundwater conditions trigger previously-defined early warning thresholds. These thresholds (or performance standards) were derived from the 2008 EIR but have been updated through discussions with USG, the County, and the Sierra Club. The 2018 Annual Report provides an up-to-date summary of monitoring results and thresholds.

Table 1 identifies all active monitored wells within and just east of the groundwater basin. Water levels are monitored by the US Geological Survey (USGS) and US Gypsum, and water quality is monitored by USGS. In 2018, the USGS monitored 27 wells for water levels and 18 wells for water quality. The USGS provides water level and water quality data on a semi-annual basis. Water levels and quality are uploaded to the USGS portal and are included in subsequent year’s annual report. USG has probes in five wells monitoring both water levels and water quality. USG data collection includes data loggers in USG-4, USG- 5, and USG-6 that measure water levels in these wells daily.

Table 1 also lists the wells that were recently monitored, along with the monitoring entity (USGS or USG) and any reasons for interruption of monitoring.

Locations of monitored wells across and beyond the basin are shown on **Figure 2;** blue indicates wells that have both level and quality data from 2018, yellow indicates wells with water level data only, and green indicates water quality data only. Currently inactive wells also are shown.

3.1.1 Water Levels

Figure 3 shows the location of key wells and hydrographs of groundwater levels. Key wells were selected on the basis of relatively complete water level histories and representative locations that show trends within the groundwater basin.

Monitoring wells 31B1 and 36D2, located near the USG production wells, show similar trends (decrease from 1990s to 2008, slight increase from 2008 to 2015 and a slight decrease from 2015 to 2018). This pattern mirrors the pumping at the USG plant, with decreased water levels in times of greater pumping and relative recovery during lower pumping. These short-term changes are not visible in wells located farther from the plant, for example, wells 24D1 or 16J1. These wells continue a steady trend (decreasing and increasing respectively) although USG pumping was reduced to half from 2009 to 2015. Wells along the eastern edge of the basin, 42L1 and to a lesser extent 32R1, reflect a seasonal variation, showing sharp increases shortly after peak precipitation events (1993 and 1997).

Of the 27 wells monitored, nine showed increasing water levels, five showed stable water levels, and 13 showed decreasing water levels. USG-5 showed the largest increase in water level (5.9 ft over the past year) and USG-4 showed a 3.5-foot decrease; however, these wells do not reflect static conditions but represent the variable pumping rate by USG.

3.1.2 Water Quality

The 2006 Draft and 2008 Final EIR/EIS indicated that the primary causes of potential groundwater quality degradation from increased groundwater production would include:

- lateral migration of saline water from Tertiary marine sediments that crop out in the Ocotillo and No Mirage area and areas to the east of Coyote Wells, or
- vertical migration of saline water from the Tertiary marine sediments present at depth below the alluvial aquifer.

The monitoring program is designed to detect changes in TDS concentrations due to increased pumping by USG. Use of TDS as an indicator for general mineral groundwater quality is a simplified, but widely accepted method to detect changes in general water quality. This has continued since 2008 with semi-annual monitoring over the basin.

Figures 4a and **4b** shows TDS concentrations by well for each spring monitoring event. **Figure 4a** shows TDS concentrations in all wells using a scale of 0 to 1,600 mg/L and **Figure 4b** shows TDS data from all but two wells with a more focused scale from 0 to 600 mg/L. Most wells show relatively stable TDS concentrations over time. Wells 24B1 and 30R1 showed an increase in TDS from 2012-2017 but have since shown a decrease in concentration.

3.1.3 Assessment of Groundwater Changes

Groundwater conditions are assessed with respect to thresholds for short-term water level changes, long-term water level changes, and groundwater quality.

Groundwater level declines can represent the drawdown effects of nearby pumping, for example, from USG wells. This is a localized and short-term phenomenon. In addition, groundwater levels in the Coyote Wells Valley Basin are characterized by long-term regional decline; additional pumping could cause a declining trend that is more widespread or greater than the predicted rate.

Short-term, localized drawdown effects on well yield (i.e., well interference) are assessed with the following performance standard:

> *Well interference is defined as the combined pumping from all USG pumping wells so as **not to exceed 5 feet of drawdown at the nearest water-supply well.***

No private wells have reported well interference issues due to USG pumping; water levels vary when the well is pumping but recover quickly when wells are not pumping.

To assess potential impacts of USG pumping on long-term regional decline in groundwater levels, the performance standard is designed to act as an early warning system; it is stated as follows:

> *Water level decline is defined as four consecutive **annual** groundwater measurements (**spring only**) declining at a rate that is greater **than 0.1875 feet per year**, occurring at more than **10 percent of wells** in the regional monitoring program. As of 2016, there were 27 wells and therefore a significant decline would involve at least three (3) wells.*

In the 25 wells where water levels have been being monitored in 2018, none have showed a declining trend greater than the predicted rate for four consecutive sampling events. This indicates no additional steady groundwater decline attributable to USG pumping.

The following performance standard is used as an early warning of changing conditions from USG pumping and its potential effect on water quality:

> *A significant increasing trend in **total dissolved solids** (TDS) concentrations is defined as TDS concentrations in groundwater from any well in the groundwater basin whereby **four consecutive annual samples (collected each spring)** show a cumulative increase greater than **20 percent of the long-term average** for that well.*

TDS concentrations are steady, as defined by the updated 2018 USG performance standard. Eight of the eleven active monitoring wells with both 2017 and 2018 measurements showed a slight decrease in TDS concentrations. The three wells with any increase in TDS concentration (34B1, 36C2, and USG-6) showed a two, ten, and nine percent increase respectively. While 34B1 is located on the western edge of the alluvium, an area that may indicate poor water quality migration from other formations, the water levels at that well have declined only 0.05 ft over three years (2015-2018).

3.2 Ocotillo Wells Subbasin

There are only a few wells in Ocotillo Wells Subbasin. The USGS National Water Information System (NWIS) and DWR Water Data Library indicate only two wells in the subbasin with water level data. Well (12S/8E-22E1) located approximately 7 miles north-northwest of the Quarry Well, provides groundwater depth data for some time periods since 1951. Groundwater levels at this well in 2017 indicate that the depth to groundwater is 112.9 feet, which is within the range of observed groundwater levels at the well (102 to 117 feet below ground surface). Well 12S/9E-23D1, located about 7.5 miles northeast of the Quarry Well, shows groundwater depths greater than 150 feet from 1980 to 2014. The USG Quarry Well #2, located on the western margin of the subbasin, has a depth to groundwater of 307.5 feet.

Groundwater quality is only available for well 12S/9E-23D1 (7.5 miles away). Total dissolved solids (TDS) concentrations range between 1,650 and 1,740 milligrams per liter (mg/L).

4. CHANGES IN WATER USE

4.1 Coyote Wells Groundwater Basin

The main use of groundwater pumping within the Coyote Wells Valley Basin is industrial usage by the USG Plaster City plant. This groundwater is pumped from three US Gypsum production wells (USG- 4, 5, and 6) located in the center of the Basin as shown on **Figure 2.**

USG's pumping is shown in **Table 2**, groundwater pumping by USG in calendar year 2017 amounted to 362 AFY, the highest since 2008, and was as much as 575 AFY in 2005. **Figure 5** depicts the long-term pumping amounts with annual pumping data from 1970 to the present.

Other groundwater pumping from the basin occurs for residential, commercial, and industrial uses. Wells of two mutual water companies and individual domestic wells have been estimated to produce 127 AFY as of 2004 (Todd, 2007). No significant changes have occurred to water use in the basin.

4.2 Ocotillo Wells Subbasin

Water supply for Quarry operations, including dust suppression, was historically obtained from an on-site water well that was drilled on the eastern side of the wash and was permitted in 1983 under CUP No. 365-83. The water was non-potable (due to high dissolved solids) and was used exclusively for dust suppression. Production from the well declined due to incrustation, and the well ultimately became unusable. A second well, Quarry Well No. 2, was drilled in 1993 to replace the original well. CUP No. 635-83 was re-issued to the new well site with an approved withdrawal rate of 7,000 gallons per day (gpd). Quarry Well No. 2 is located in a wash northeast of the crushing facility. Water production from Well No. 2 has also declined over time from about 20 gallons per minute (gpm) to about 8 gpm. In 2000, the well was rehabilitated but did not achieve significant improvement in water production. Under existing conditions, water demand for operations at the Quarry is approximately 15,000 gpd. Quarry Well No. 2 currently produces 4,500 gpd. In 2017, USG's Quarry Well #2 produced 5.78 AF in 2017, with an average of 0.5 AF per month. This production is less than the current permitted limit of 7.8 AFY.

Figure 6 shows the location of Quarry Well #2 and the proposed replacement well Quarry Well #3.

Information on pumping in Ocotillo Wells is minimal, but the subbasin likely has very limited pumping. DWR estimated pumping of 257 AFY as part of its 2018 SGMA Basin Prioritization Process and Results (May 2018).

4.3 Ocotillo-Clark Valley Basin

Current groundwater uses in the basin include limited agriculture, domestic, and industrial (solar). Groundwater pumping has changed in recent years, as the Allegretti farm, located less than four miles northwest of San Sebastian Marsh, has since been developed as the Seville Solar Farm (EGI 2014). According to the Draft EIR and associated Water Supply Assessment for the solar project, the historical agricultural use of the area was about 2,800 AFY between 1996 and 2009. The current operation use of the Solar farm is estimated to use 215 AFY of water (EGI 2014). This change is noteworthy, because historical agricultural pumping from deep aquifers may have resulted in irrigation return flows. These return flows, that could represent recharge to shallow aquifers, would have ceased with conversion of the land use to a solar facility.

5. SURFACE WATER HYDROLOGY

The surface water hydrology generally is characterized by ephemeral streams (washes) that flow briefly after rain storms. The main drainages in Coyote Wells Valley are Coyote and Palm Canyon Wash, which drain east toward the Imperial Valley. Major channels draining the mountain front and crossing the Borrego Springs Subbasin and Ocotillo Wells subbasins are San Felipe Wash and Carrizo Wash; these are tributaries to San Felipe Creek, which crosses the Ocotillo-Clark Valley Basin to the Salton Sea.

San Felipe Creek is perennial in its lower reaches through San Sebastian Marsh. At least two springs (San Felipe Creek and Fish Creek springs) contribute to the perennial reach. The groundwater from the springs has been attributed to the shallow aquifer recharged by agricultural return flows based on deep aquifer pumping (EGI, 2014).

5.1 San Felipe Wash

San Felipe Creek is the main perennial stream crossing San Sebastian Marsh, which is designated natural critical habitat for the desert pupfish. The BLM and California Department of Fish and Wildlife (CDFW) have expressed concern over the reliability of perennial flows in San Felipe Creek and possible effects of groundwater pumping in upstream basins, including the Ocotillo Wells Subbasin.

An Information/Briefing Memorandum was prepared by BLM (Poff, 2017) to provide a potential explanation for adverse conditions affecting the marsh and pupfish, specifically the drastic dropping of water levels and drying of the creek. The memorandum explored seismic activities and impacts from pumping. With regard to the latter, the memo concluded that the sudden drop in groundwater levels was unlikely to be caused by distant groundwater pumping. Nonetheless, groundwater pumping could have long term effects.

5.2 Potential Quarry Impacts

The USG Quarry Well is upgradient from the Ocotillo-Clark Valley Groundwater Basin and thus potential impact of its pumping on San Felipe Creek and San Sebastian Marsh was considered. **Figure 6** shows the location of the Quarry Well #2 and #3 relative to the area of San Sebastian Marsh.

In brief, San Sebastian Marsh groundwater depletion is unlikely to be affected by pumping from the USG Quarry Well. The Quarry Well is located more than seven miles away, its pumping is small (5.78 AF in 2017), and its pumping occurs from the deeper aquifer as documented in the 2008 Final EIR/EIS. Moreover, Quarry Well #2 and the proposed Quarry Well #3 are in Ocotillo Wells Subbasin which is separated from Ocotillo-Clark Valley Groundwater Basin. The shared boundary of the Ocotillo Wells Subbasin and Ocotillo-Clark Valley Groundwater Basin is indicated in Figure 6. It is described in DWR Bulletin 118 as the trace of the Coyote Creek Fault and Superstition fault (DWR 2013). The faults are regarded as barriers to groundwater flow; DWR cites water level differences of 100 feet on opposite sides of the Coyote Creek fault as indicating that the fault is a barrier.

Based on the above and simplifying assumptions, the Theis equation was applied to calculate the expected drawdown from pumping Quarry Well #2. For estimation purposes, the following variables were used: the current maximum production rate of the well 6.25 gallons per minute, a hydraulic conductivity of 100 ft/day (average for a sandy/silty aquifer), an aquifer thickness of 700 feet, and storativity of 0.2 (DWR 2013). After one year of constant pumping, the expected drawdown is computed to be 0.01 feet 1,000 feet away, and 0.001 ft 7 miles away. These computed effects are insignificant, noting that the presence of intervening faults and aquitards would further reduce any impacts in Ocotillo-Clark Valley Basin.

6. CHANGES IN RELEVANT REGULATIONS

Since the 2008 Final EIR/EIS, the Sustainable Groundwater Management Act of 2014 (SGMA) was enacted and is currently being implemented. The SGMA applies to 127 groundwater basins defined by DWR and designated as medium- and high-priority. SGMA does not apply to the remaining groundwater basins (designated as very low- and low-priority); nonetheless, local agencies may choose to apply the SGMA framework. The Coyote Wells Valley Groundwater Basin (No. 7-29), which contains the U.S. Gypsum Plaster City facility, is designated by DWR as a very low priority basin. The Ocotillo Wells subbasin of Borrego

Valley (7-024.02) which contains the U.S. Gypsum Quarry, is also designated by DWR as a very low priority basin. Ocotillo-Clark Valley is low priority.

In September 2015, the Imperial County Board of Supervisors provided notice to DWR that Imperial County had resolved to assume the role of Groundwater Sustainability Agency (GSA) for all groundwater basins underlying the County. In its resolution to become a GSA (Imperial County Board of Supervisors Resolution No. 2015-122), the County expressed its commitment to sustainable groundwater use and cited its jurisdiction over groundwater basins county-wide. The County also cited its long experience and background in groundwater management and monitoring, including the County Groundwater Management Ordinance.

The Borrego Valley- Borrego Springs subbasin has been designated as critically overdrafted. The Borrego Valley GSA is the exclusive GSA of the San Diego portion of the Ocotillo Wells Subbasin and the neighboring Borrego Valley – Borrego Springs subbasin (7-24.01). The GSA is made up of the County of San Diego and Borrego Water district (through a Memorandum of Understanding).

The U.S. Environmental Protection Agency (USEPA) designated the Ocotillo-Coyote Wells Sole Source Aquifer in 1986. The Sole Source Aquifer program allows for USEPA environmental review of any project which is funded by federal money and evaluates the project's potential to contaminate a sole source aquifer. If there is such a potential, the project should be modified to reduce or eliminate the risk, or federal financial support may be withdrawn (USEPA 2000). The area includes portions of the Coyote Wells Groundwater Basin and extends further west and south from the DWR defined groundwater basin. There have been no changes in the area designation.

7. CONCLUSIONS

Four groundwater basins have been considered in this memorandum:

- Coyote Wells Valley (DWR No. 7-29)
- Borrego Valley- Borrego Springs (DWR No. 7-24.01)
- Borrego Valley- Ocotillo Wells (DWR No. 7-024.02)
- Ocotillo-Clark Valley (DWR No. 7-25)

Coyote Wells Valley. This memorandum has focused on groundwater conditions in the Coyote Wells Valley Basin, where USG has developed and maintained a monitoring program and implemented performance standards that serve as an early warning to changes in the Coyote Wells Valley Basin. Water levels and water quality data are compiled, analyzed, and reported annually. Only limited changes have occurred in the basin from groundwater users. Changes in the basin since 2008 do not change the findings in the 2008 Final EIR/EIS. We note also that Coyote Wash and Palm Canyon Wash drain toward Imperial Valley, not San Felipe Creek.

Borrego Valley- Borrego Springs. The Borrego Valley has been subdivided into the Borrego Springs Subbasin and Ocotillo Wells Subbasin. Critical overdraft conditions in the Borrego Springs Subbasin are a long-term concern that are being addressed through the SGMA process. As noted in the BLM Information/Briefing Memo, the intensive pumping in this basin is not likely the cause of sudden changes in San Felipe Creek flows because the Borrego Springs pumping has continued over many years at a considerable distance from San Felipe Creek.

Borrego Valley- Ocotillo Wells. The USG Quarry Well #2 and the proposed USG Quarry Well #3 are in the Ocotillo Wells Subbasin, adjacent to and upstream of San Felipe Creek. Pumping from Quarry Well #2 is unlikely to have caused the changes in San Felipe Creek because of its small pumping, pumping from the deep aquifer, distance from San Sebastian Marsh, and existence of intervening fault barriers. Other pumping in the basin is ongoing and minor. Any changes in the basin since 2008 do not change the findings in the 2008 Final EIR/EIS.

Ocotillo-Clark Valley. San Sebastian Marsh is in Ocotillo-Clark Valley Basin, and thus, this basin was considered in this memorandum. While emphasizing that we have not conducted a systematic impacts analysis, we have noted that groundwater pumping has changed recently in proximity to San Sebastian Marsh. Specifically, groundwater pumping has been reduced by the conversion of historical agricultural lands to a solar farm. While speculative, it is possible that recent cessation of agricultural pumping from deep aquifers, with reduction of irrigation return flows that provide recharge to shallow aquifers, has resulted in downstream loss of creek flow.

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Table 1. List of Actively Monitored Wells and Available Data for 2018 in Coyote Wells

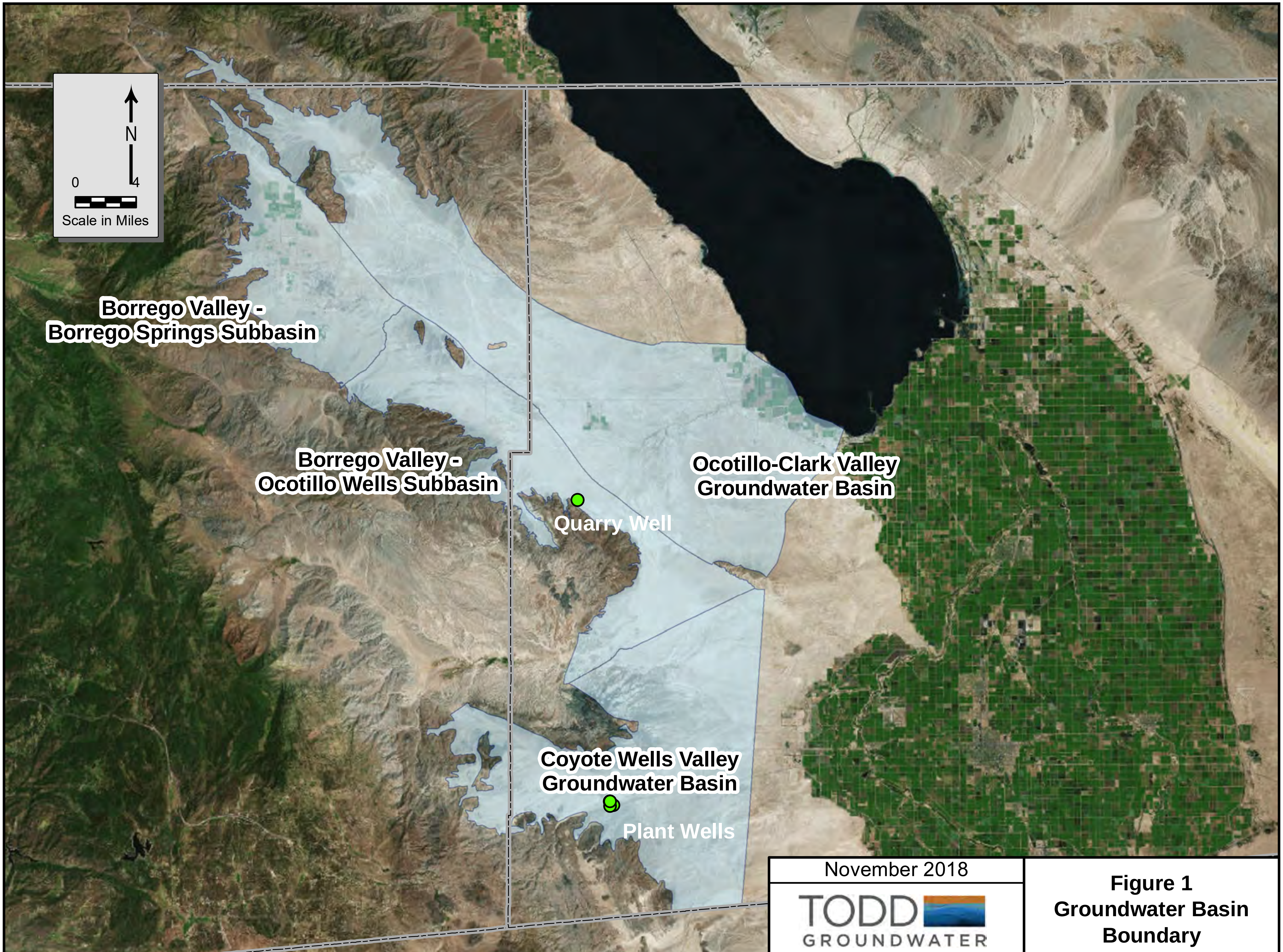
Well Name	Short Name	Active WL Network	Active WQ Network	First WL Measurement	First WQ Measurement	Agency
17S10E11H3	11H3	Y	Y	1987	1987	USGS
16S09E24B1	24B1	Y	Y	1976	1977	USGS
16S09E24D1	24D1	Y	Y	1976	1977	USGS
16S09E25K2	25K2	Y	Y	1972	1972	USGS
16S10E31B1	31B1	Y	Y	1993	2013	USGS
16S09E34B1	34B1	Y	Y	1998	1997	USGS
16S09E36A1	36A1 /MW-2B	Y	Y	2012	2013	US Gypsum
16S09E36A2	36A2 /MW-2A	Y	Y	2012	2013	US Gypsum
16S09E36H2	36H2 / USG-5	Y	Y	2015	2015	USGS / USG
17S10E11B1	11B1	Y		1975	*	USGS
17S10E11G4	11G4	Y		1978	*	USGS
17S11E16J1	16J1	Y		1970	1972	USGS
17S11E22E2	22E2	Y		1975	1975	USGS
16S11E23B1	23B1	Y		1974	1964	USGS
16S11E27F1	27F1	Y		1975	*	USGS
16S10E27R1	27R1	Y		1975	1975	USGS
16S10E28D1	28D1	Y		1974	1948	USGS
16S10E29H1	29H1	Y		1975	1975	USGS
16S10E32P1	32P1	Y		1992	*	USGS
15S11E32R1	32R1	Y		1974	1964	USGS
16S09E35M1	35M1	Y		1962	1962	USGS
16S09E36D2	36D2	Y		1975	1975	USGS
16S09E36G3	36G3 / USG-4	Y		2011	1963	US Gypsum
16S11E42L1	42L1	Y		1975	1975	USGS
16S09E25M2	25M2		Y	1991	1971	USGS
16S09E26F1	26F1		Y	1998	2013	USGS
16S10E30R1	30R1		Y	*	1959	USGS
16S09E36C2	36C2		Y	1975	1961	USGS
16S10E42A8	42A8		Y	*	1994	USGS

Wells Not Monitored in 2018 that were recently active

Well Name	Short Name	Agency	Reason
16S09E25M2	25M2	USGS	No reason given by USGS, WQ was monitored
16S09E26F1	26F1	USGS	No reason given by USGS, levels previously not measured due to active pumping, WQ was monitored
16S09E36B1	36B1 /USG-6	US Gypsum	Down for maintnance
17S10E11G1	11G1	USGS	No reason given by USGS, levels previously not measured due to active pumping

Table 2. Annual USG Pumping by Well (AFY)

Calendar Year Pumping	Well #4	Well #5	Well #6	Total
2005	226	199	149	575
2006	199	188	162	549
2007	192	174	135	501
2008	140	136	125	400
2009	75	84	78	237
2010	78	82	79	239
2011	81	83	82	247
2012	69	109	70	248
2013	106	66	78	250
2014	98	59	82	239
2015	87	93	91	271
2016	115	118	106	339
2017	93	148	121	362



November 2018

TODD GROUNDWATER

Figure 1
Groundwater Basin Boundary

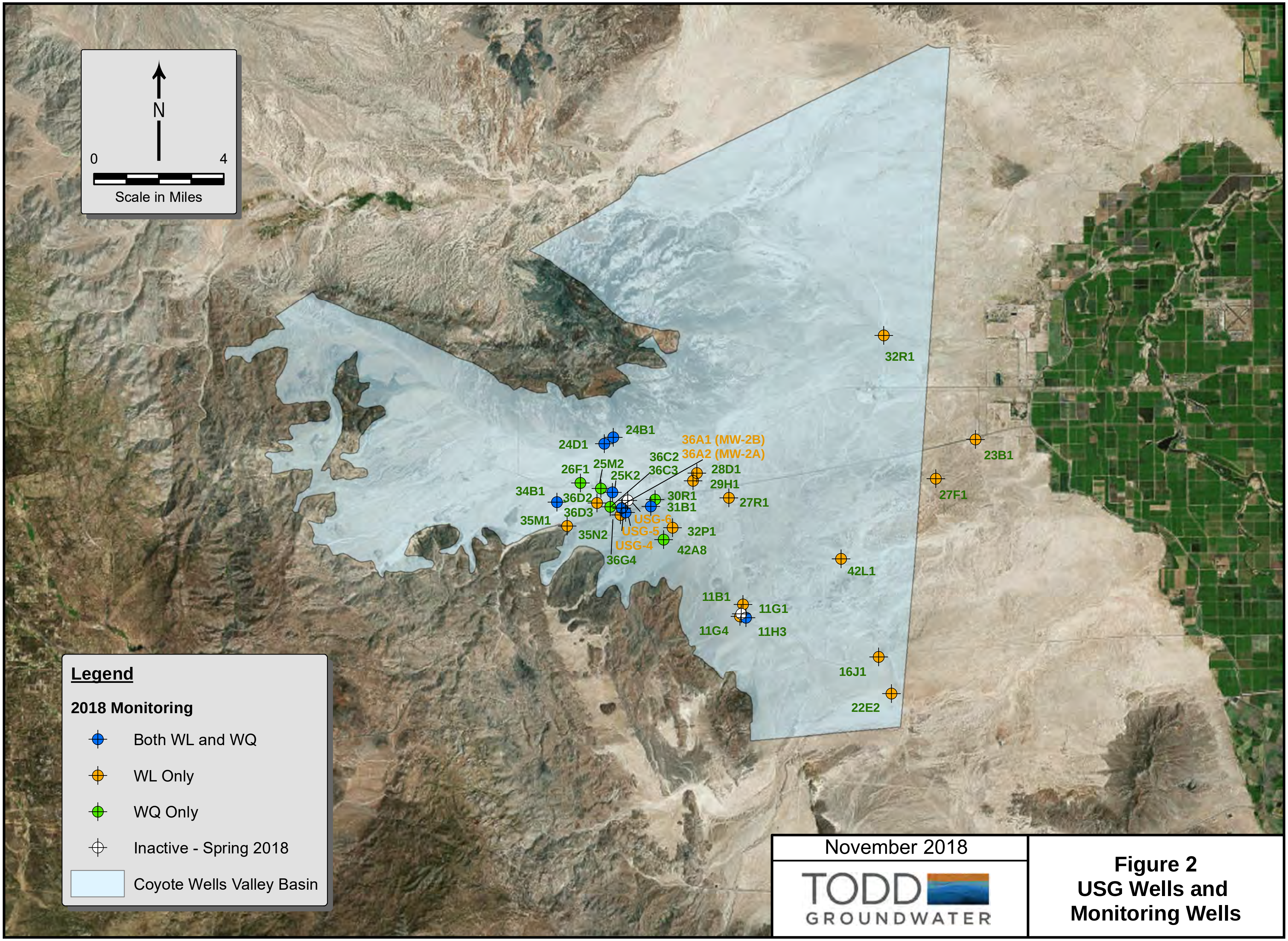


Figure 2
USG Wells and Monitoring Wells

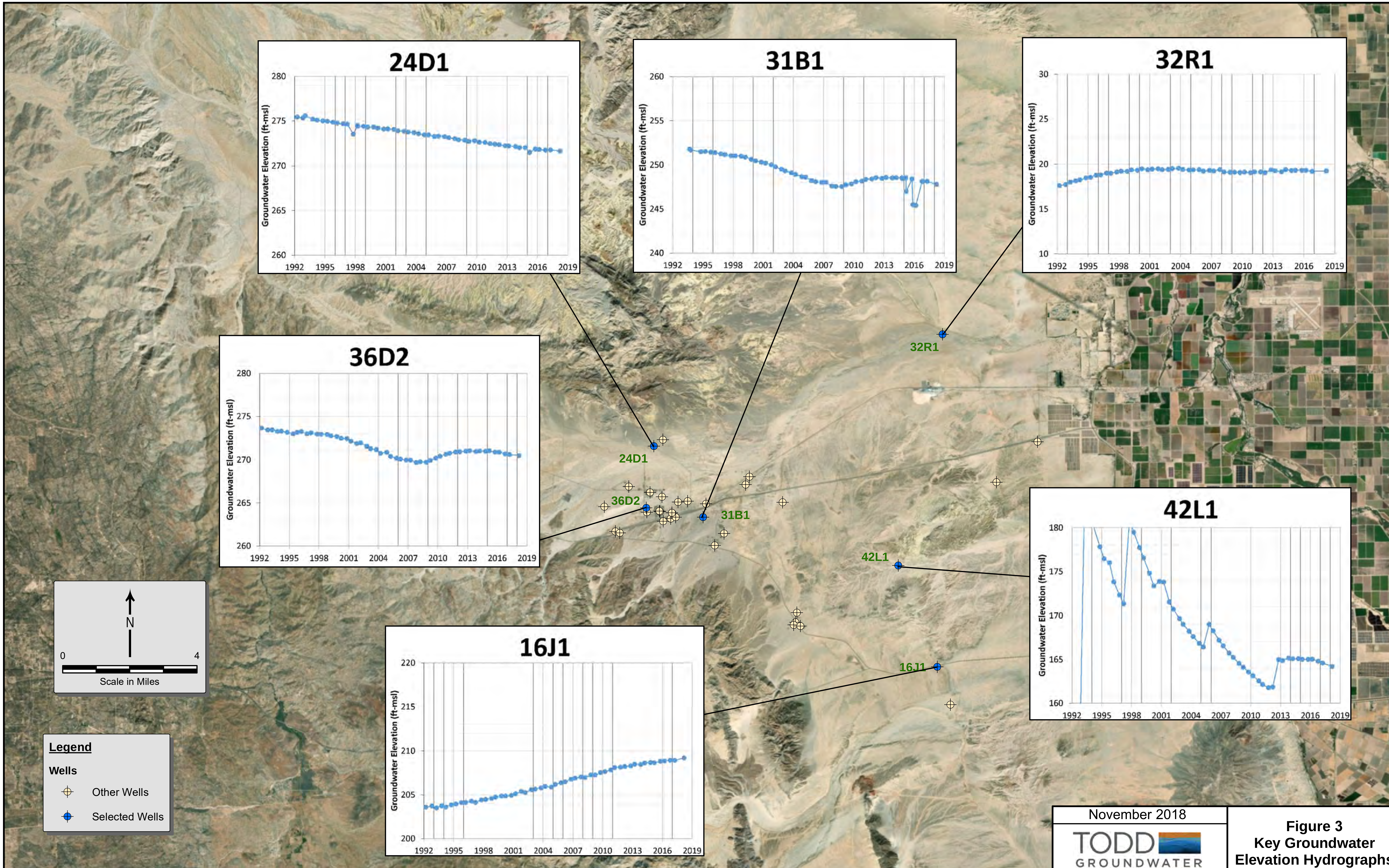


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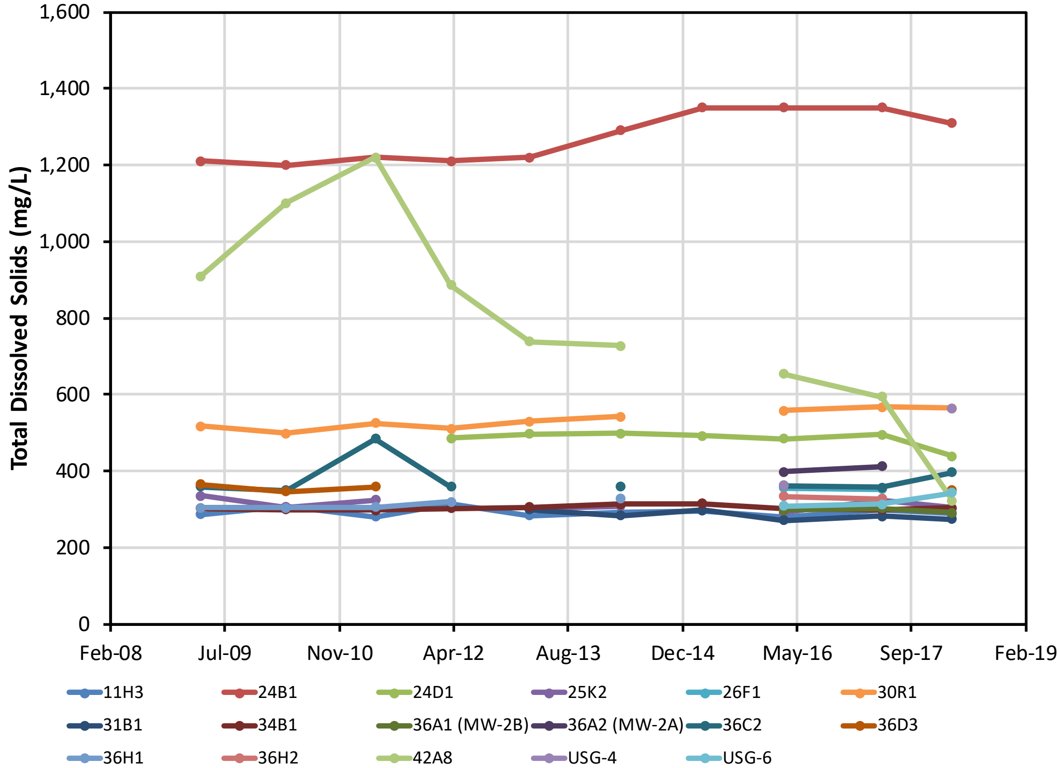
Figure 3
Key Groundwater Elevation Hydrographs



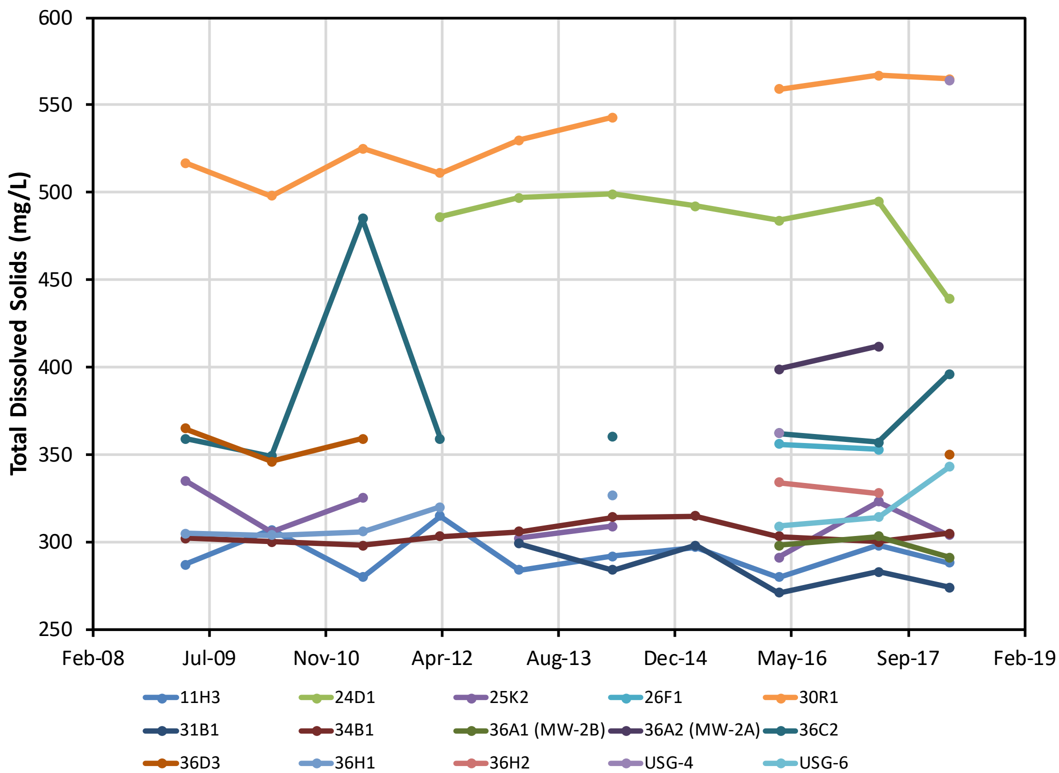


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Figure 4
TDS Concentrations Over Time

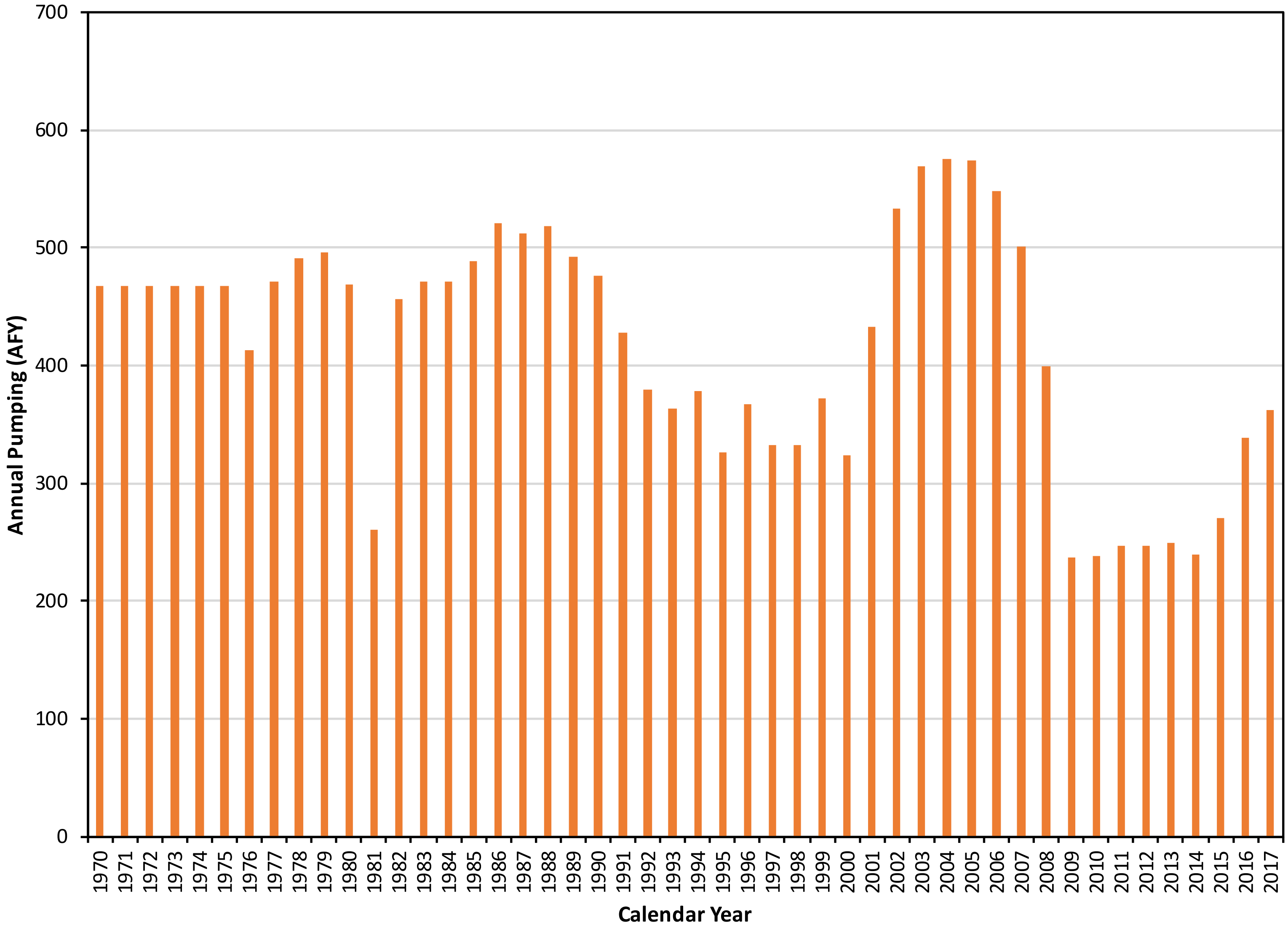

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Figure 5
USG Plant
Annual Pumping

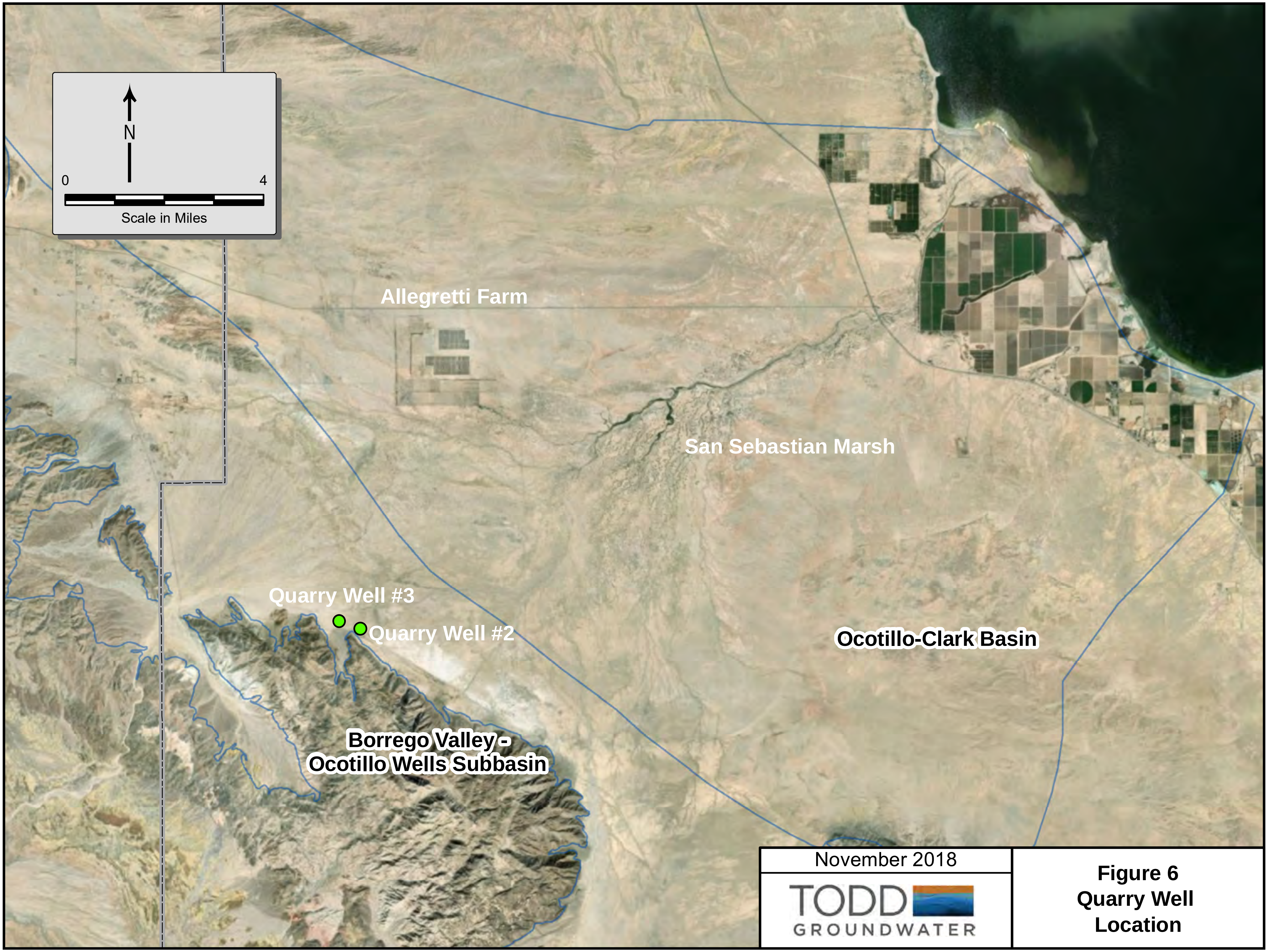

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Figure 6
Quarry Well Location