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4.15 Water Resources

This section discusses the existing water resources near the Project site, assesses the potential effects of construction and operations on water resources, and provides mitigation strategies to address the potential effects. This section discusses the potential effects related to the following areas:

- Water supply
- Wastewater management
- Stormwater discharge
- Flooding

Section 4.15.1 discusses the existing hydrologic environment. Potential environmental effects of the Project construction and operation on water resources are presented in Section 4.15.2. A discussion of cumulative project effects is presented in Section 4.15.3. Section 4.15.4 discusses proposed mitigation measures that will minimize significant impacts. Section 4.15.5 presents applicable laws, ordinances, regulations, and standards (LORS) related to water resources. Section 4.15.6 describes permits that relate to water resources, lists contacts with relevant regulatory agencies, and presents a schedule for obtaining permits. Section 4.15.7 provides the references used to prepare this subsection.

The following section is based on the Preliminary Drainage ~~and Hydrology Study~~ Report (Attachment 4.15A), ~~and~~ the Water Quality Management Plan (Attachment 4.15B) prepared for the Project, and the Preliminary Hydraulic Report for the Oso Creek Stabilization (Attachment 4.15C). The Preliminary Drainage and Hydrology ~~Study~~ Report describes the proposed stormwater management plan and analysis in accordance with the requirements set forth by the Technical Guidance Document (TGD) (Reference 6.1) for South Orange County, the Orange County Local Drainage Manual (Reference 6.2) and the City of San Juan Capistrano. The Water Quality Management Plan has been prepared to comply with the requirements of the local NPDES Stormwater Program. The hydraulic report for the creek stabilization work provides a hydraulic analysis of the current erosional conditions of the creek in the vicinity of the Project site and how the proposed stabilization measures can attenuate creek flows and stabilize the creek bank conditions to prevent further erosion and improve water quality.

4.15.1 Affected Environment

4.15.1.1 Water Features, Climate, and Drainage

The Project site is located at an elevation of approximately 200 feet above mean sea level (AMSL). A bluff to the west causes the Project site to gently slope to the east to Oso Creek. Oso Creek originates approximately 7 miles upstream of the City of Mission Viejo in the foothills of the Santa Ana Mountains at an elevation of 1,610 feet. The creek flows south-southeast until its confluence with Trabuco Creek about 2 miles upstream of downtown San Juan Capistrano. Trabuco Creek then flows south for 2 miles until it meets with San Juan Creek which then flows into the Pacific Ocean.

Oso Creek is located east of the Project site. In the vicinity of the BESS area, Oso Creek is an unmodified (i.e., no channelization or rock placement) meandering gully. In this area the creek exhibits channel stabilization concerns, however, there are no flood control issues (USACE and OCFCD 2002). In the vicinity of the offsite access road to the north of the BESS area, Oso Creek has been modified and is a rectangular open concrete channel with rip rap placed immediately downstream and then transitions to a vegetated unlined channel shortly after that, which continues well past the vicinity of the Project site. Based on a watershed management study prepared in 2002, there were no identified flood control of channel stabilization issues in this area and because of its heavily channelized nature, there is no ecosystem value (USACE and OCFCD 2002). However, the increased flows over time due to increases in stormwater runoff from development in the area has increased flow velocities that have caused vertical and horizontal erosion and bank instability in the creek channel.

The Project site is located in the Aliso-San Onofre Cataloging Unit of the Southern Coastal Subregion (USGS HUC 18070301). The Aliso-San Onofre Cataloging Unit begins in the Santa Ana Mountains of southern California and terminates at the Pacific Ocean. The Unit has a drainage area of 498 square miles (USGS 2019). The Project site is approximately five miles inland from the Pacific Ocean and experiences a cold semi-arid climate (Koppen climate classification: BSk). The average annual precipitation is approximately twelve inches, with most of the annual precipitation occurring from November through April (Western Regional Climate Center 2023). August is the warmest month, with mean daily temperatures ranging from 60° to 78°F, and January is the coolest month, with mean daily temperatures ranging from 43° to 65°F.

The Project site is located in the Santa Margarita Water District. Santa Margarita Water District is almost entirely reliant on imported water from the Metropolitan Water District of Southern California, which receives its water from northern California and the Colorado River via a system of pipes and aqueducts. While the Project site is within Santa Margarita Water District boundaries, Saddleback Church directly to the north is serviced by Moulton Niguel Water District. The applicant intends to use water from Moulton Niguel Water District for the Project.

4.15.1.2 Groundwater

The Project site is in the San Juan Valley Groundwater Basin (SJGWB) of the South Coast Hydrologic Region (Figure 4.15-1). The SJGWB is designated Basin Number 9-01 and covers a surface area of approximately 26 square miles in the San Juan Valley and other tributary valleys in Orange County, California (DWR 2004). The basin is bounded on the west by the Pacific Ocean and otherwise by tertiary semi-permeable marine deposits. The primary water-bearing unit within the SJGWB is quaternary alluvium. This alluvium ranges from a heterogeneous mixture of sand, silt, and gravel in the eastern portion of the basin, to coarse sand near the center, to fine-grained lagoonal sediments in the western portion of the basin (DWR 1972). Wells in the SJGWB typically yield from 450 to 1,000 gallons per minute (CDM 1987).

The total storage capacity in the SJGWB has been estimated to range from 63,220-acre feet (af) (NBS/Lowry 1994) to 90,000 af (DWR 1972; 1975; 1988). Recharge of the basin is from flow in San Juan Creek, Oso Creek, and Arroyo Trabuco and precipitation to the valley floor. Water from springs flows directly from Hot Spring Canyon into San Juan Creek, adding to recharge (DWR 1972).

4.15.1.2.1 Groundwater Use

Groundwater in this basin is primarily used for domestic water supply (San Juan Basin Authority 2011). Based on a review of the California Water Board: Groundwater Ambient Monitoring and Assessment Program (GAMA), three wells are located within the Project site and are listed as "Water Supply, Other." Within 0.5 miles of the Project site, there are seven "Water Supply, Other" wells and three "Municipal" wells. Among the three wells located within the Project site, well 07S08W25N002S has the most up to date data, with the last recordings of water quality information in 1977. The depth and current status of these three wells are unknown (GAMA 2023).

4.15.1.2.2 Groundwater Level and Flow

The closest identified USGS monitoring well to the Project site is Well No. 333147117401901, which is located approximately 0.5 miles to the south. The well depth is reportedly 130 feet, and the land surface elevation is 207 feet amsl. The depth to groundwater has been measured in this well once, in 2014. The reported measurement was a depth to water level of 72.04 feet on April 30, 2014 (USGS 2014).

In general, groundwater flow within the study area follows the surface topography: from areas of recharge in the surrounding highlands towards the central axis of the basin and then southwesterly along the axis of the basin before exiting into the Pacific Ocean (SJBA 2013). Given the geology of the basin, subsidence is not a concern for the management of this basin.

The Project does not propose groundwater pumping or well use.

4.15.1.3 Water Quality

The Regional Water Quality Control Boards (RWQCBs) make critical water quality decisions for their designated regions, including setting standards, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions. Federal regulations require that the Total Maximum Daily Loads (TMDL), at a minimum, account for contributions from point sources (federally permitted discharges) and contributions from nonpoint sources. TMDLs are established at the level necessary to implement the applicable water quality standards. In California, the State Water Resources Control Board (SWRCB) has interpreted state law (Porter-Cologne Water Quality Control Act, California Water Code Sections 13000 et. seq.) to require that implementation be addressed when TMDLs are incorporated into water quality control plans (Basin Plans). The Porter-Cologne Act requires each RWQCB to formulate and adopt Basin Plans for all areas within its region. It also requires that a program of implementation be developed that describes how water quality standards will be attained. TMDLs can be developed as a component of the program of implementation, thus triggering the need to describe the implementation features, or alternatively as a water quality standard. When the TMDL is established as a standard, the program of implementation must be designed to implement the TMDL.

The Project site is within the jurisdictional boundaries of the San Diego RWQCB. The San Diego RWQCB Basin Plan establishes water quality objectives to ensure the reasonable protection of beneficial uses and a program of implementation for achieving water quality objectives. For those waters not attaining water quality standards, the RWQCB establishes TMDLs and a program of implementation to meet the TMDL. Section 303(d) of the Clean Water Act (CWA) requires that the states make a list of waters that are not attaining water quality standards. For waters on this list, the states are to develop TMDLs.

Several waters of the SJGWB are listed as impaired per Section 303(d) of the CWA. Oso Creek, which runs adjacent to the Project site, is listed as impaired due to elevated concentrations of selenium, chloride, nitrogen, phosphorus, sulfates, total dissolved solids (TDS), and toxicity (WRCB 2022).

Seawater intrusion threatens the SJGWB, which has limited hydrology and water in storage; both natural and anthropogenic degradation sources; and very high concentrations of iron and manganese (SMWD 2014). TDS, an indicator of overall total salts and mineral content, are present in the groundwater at an average concentration of 2200 milligrams per liter (mg/L), which is above the California Upper Secondary maximum contaminant level (MCL) of 1000 mg/L for drinking water (SMWD 2014). Seawater intrusion, which elevates TDS and chloride levels in groundwater, is a constant concern in the SJGWB.

4.15.1.4 Flooding Potential

The Project site (BESS area) does not overlap with a Federal Emergency Management Agency (FEMA) 100-year floodplain area and would not be subject to inundation by a 1% annual chance flood (Figure 4.15-2). A portion of the Project's offsite access road would be located within a FEMA 100-year floodplain area (Zone A, no base flood elevations determined). A permit is required before construction or development begins within any Special Flood Hazard Area (SFHA). FEMA Zone A is considered a SFHA per FEMA.

The Project is not located within a tsunami hazard area (DOC 2023).

4.15.1.5 Water Supply

4.15.1.5.1 Construction Phase

During construction of the proposed project, water will be required for common construction-related purposes, including but not limited to dust suppression, soil compaction, and grading. Dust-control water may be used during ingress and egress of on-site construction vehicle and equipment traffic and during the construction of the energy storage equipment. A sanitary water supply will not be required during construction because restroom facilities will be provided by portable units serviced by licensed providers. The water used is anticipated to be supplied by purchase from the local water purveyor. Construction of the Project is expected to require approximately 35 af of water.

4.15.1.5.2 Operations Phase

Water during the operation of the Project will be limited to water necessary for landscape irrigation and to supply on-site fire hydrants. The water used is anticipated to be supplied by purchase from the local water purveyor. Operation and maintenance water demand for the Project is assumed to be non-existent because it would be operated remotely and would not have any permanent on-site staff.

4.15.1.6 Wastewater Collection, Treatment, Discharge and Disposal

4.15.1.6.1 Construction Phase

Sanitary waste, stormwater runoff, equipment washdown water, and dewatering activities from general construction activities will be potential wastewater waste streams. Wastewaters will be collected and managed based on the type and levels of contamination. Depending on water quality, wastewater could be considered nonhazardous or hazardous. Nonhazardous wastewater will be collected in an ~~above~~inground storage ~~tanks~~system and piped to an existing water pond located north of the project site. All hazardous wastewater will be collected and disposed of offsite.

Sanitary Waste. Portable toilets will be housed on site during construction phase. Sanitary wastewater from portable toilets will be collected in the self-contained toilets. The vendor of the portable toilets will be responsible of proper handling and transporting sanitary waste offsite for disposal.

Stormwater. Prior to the start of construction, a stormwater permit will be obtained to outline best management practices for managing stormwater as noted in Section 4.15.5.2.3. Through the course of construction, stormwater will be controlled to prevent stormwater leaving the site. Stormwater will flow to ~~above~~an inground storage~~ tanks~~

system and be pumped to an existing water pond to the north where the water will be allowed to evaporate or infiltrate.

Nonhazardous wastewater. For all other wastewater generated, it will be managed by source reduction techniques, water conservation and reuse measures.

54.15.1.6.2 Operations Phase

Following construction, no sanitary facilities will be located at the Project site. Stormwater will be controlled as described in Section 4.15.1.7 below.

4.15.1.7 Stormwater

Stormwater runoff from the Project site (BESS area) currently outflows to an unchannelized section of Oso Creek. The onsite stormwater runoff from the Project will be detained in an underground detention basin system located under and adjacent to the internal access roads, and is sized for the 100-year storm event. From here, the water will be routed to the north through a storm drain where it will meet with the northerly offsite flow location at the proposed culvert location. From here, the onsite and offsite flows will discharge together by gravity flow into the creek at a discharge point located within the existing rip rap just south of the existing concrete channelized portion of Oso Creek.

Stormwater runoff from the offsite area will be re-routed through a series of drainage ditches, culverts, and storm drain facilities sized for the 100-year storm event. The offsite flows are split into two areas, northerly and southerly. The northerly offsite flows will be collected at a low point on the west side of the proposed access road, just north of the proposed BESS yard. The northerly runoff will be routed into box culverts to cross under the proposed access road. The northerly runoff will then be routed through a storm drain system northeasterly to outfall within the existing rip rap in Oso Creek, just south of the existing concrete channel. The northerly runoff will exit the storm drain system through a proposed headwall above the channel limits. The runoff velocity will be decreased by proposed rip rap immediately below the proposed headwall that extends to the bottom of the channel. The southerly offsite flows will be collected in a drainage ditch along the westerly and southerly portions of the proposed BESS yard. The southerly runoff will enter a series of culverts to bypass the two proposed access roads that exit the southerly portion of the yard. The southerly runoff will then be routed into a storm drain system and directed southeasterly to an outfall above the stabilized channel limits of Oso Creek. The runoff velocity will be decreased by internal energy dissipaters and be integrated into the proposed creek restoration rip rap immediately below the proposed headwall that extends to the bottom of the channel. This design will reduce erosion from the current site conditions as it will ensure that the flow will no longer discharge over the channel cliff and will also reduce the tributary area by the 12.2-acre site area. This stormwater design will facilitate the purpose of the separate, but related, Oso Creek stabilization design and will comply with the requirements of the CWA, including pursuant to Nationwide Permit 39.

~~Once the Project is complete the site will drain to existing Orange County Flood Control District (OCFCD) storm drainpipes/outfalls which are located northeast of the Project site. The onsite stormwater runoff from the Project site would be detained in an underground storage chamber system located under or adjacent to the access roads and would be sized for the 100-year storm event. From here, the water will be pumped north to the existing OCFCD outfalls. The buried underground detention design would be implemented in accordance with the South Orange County TGD (Reference 6.1) and the South Orange County WQMP checklist (Reference 6.4), to meet the stormwater management requirements for an underground detention basin. The below grade detention system would discharge into a sump and be pumped north to an existing outfall. Water pumped to the existing outfall would then discharge~~

~~into a channelized segment of Oso Creek. The Project's onsite discharge pumped into the channelized portion of Oso Creek would be incorporated into, and consistent with the OCFCD's National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region (Order No. R9-2013-0001, NPDES No. CAS0109266, as amended by Order No. R9-2015-0001) authorized by the San Diego RWQCB MS4 authorization by the SWRCB and RWQCB.~~

~~With respect to offsite flows, based on the existing topography, an additional area of approximately 59 acres drains toward the project site from the west. A portion of the offsite flow (approximately 12.4 acres of the total 59 acres) would be collected in the same underground detention system discussed above for the onsite flows. The remaining portion of the offsite flows (approximately 45 acres) would be designed to reroute to a drainage ditch along the western and southern boundaries of the Project site to prevent these flows from draining through the site. The drainage ditches would be sized for the 100-year storm event. A high point in the drainage ditch would be used to separate flows into two areas. One area would collect flow in a portion of the drainage ditch and would route into a double barrel box culvert that runs at grade underneath the center portion of the site. The double barrel box culvert would then discharge into a riprap protected grass lined swale that terminates into the northern portion of the proposed level spreader. The other area would collect flow in the other portion of the drainage ditch and would wrap around the south of the site, discharging into the midpoint of the proposed level spreader. The proposed level spreader would receive flow from both drainage areas and would maintain offsite peak flow at or below predeveloped peak flow rates to prevent increased erosion caused by discharge into Oso Creek. To recreate existing flow conditions and mitigate erosive impacts associated with this discharge, the design ties both release points to the level spreader. The level spreader distributes the stormwater runoff evenly along the entire east edge of the site, promoting even and controlled release to the existing grade. This concept would reduce erosion from the current site conditions as it will both ensure the flow is spread over the entire north to south portion of the site. See Appendix 4.15A, Preliminary Drainage and Hydrology Study, for additional details including calculations, assumptions, and methodology.~~

4.15.2 Environmental Analysis

Project effects on water resources can be evaluated relative to significance criteria derived from the California Environmental Quality Act Appendix G checklist. The project is considered to have a potentially significant effect on water resources if it would do the following:

- Substantially alter the existing drainage pattern of the site or area, including the course of a stream or river, in a manner that will result in substantial erosion or siltation on- or offsite, or in flooding on- or offsite.
- Create or contribute runoff water that will exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Violate any water quality standards or waste discharge requirements, or otherwise substantially degrade water quality.
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there will be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells will drop to a level that will not support existing land uses or planned uses for which permits have been granted).
- Place structures that will impede or redirect flood flows within a 100-year flood hazard area.
- Cause inundation by seiche, tsunami, or mudflow.

4.15.2.1 Water Quality

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants can have a detrimental effect on water quality. During construction activities, excavated soil would be exposed, and there would be an increased potential for soil erosion and sedimentation compared to existing conditions. In addition, chemicals, liquid products, petroleum products (e.g., paints, solvents, and fuels), and concrete-related waste may be spilled or leaked and have the potential to be transported via stormwater runoff into receiving waters (Oso Creek).

Because construction of the proposed project would disturb greater than 1 acre of soil, the project is subject to the requirements of the State Water Resources Control Board's (SWRCB) National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2022-0057-DWQ) (Construction General Permit). Therefore, coverage under the Construction General Permit would be obtained for the proposed project. The Construction General Permit requires preparation of a Storm Water Pollution Prevention Plan (SWPPP) and implementation of construction Best Management Practices (BMPs) detailed in the SWPPP during construction activities. Potential water quality impacts from construction will be controlled through implementing a stormwater pollution prevention plan (SWPPP) and associated best management practices, and through practicing proper housekeeping at the construction site. The site grading and drainage will be designed to comply with all applicable LORS. Successful implementation of the SWPPP will ensure that construction impacts on water resources are mitigated to a less-than-significant level. SWPPP procedures include submitting a Notice of Intent to the San Diego RWQCB and developing the SWPPP before the start of construction activities.

Potential pollutants of concern from long-term operations of the development include suspended solids/sediments, nutrients, pathogens (bacteria/virus), pesticides, oil and grease, trash and debris, and dry weather runoff. The project would comply with the requirements of Title 8, Chapter 14 of the Municipal Code and San Diego Regional Water Quality Control Board's (RWQCB) National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds Within the San Diego Region (Order No. R9-2013-0001, NPDES No. CAS010266, as amended by Order No, R9-2015-0001) (South Orange County MS4 Permit).

The City Municipal Code and the South Orange County MS4 Permits require that a Water Quality Management Plan (WQMP) be prepared for new development projects. WQMPs specify the site design, source control, low impact development (LID) BMPs that would be implemented to capture, treat, and reduce pollutants of concern in stormwater runoff. A Water Quality Management Plan (see Attachment 4.15B) has been prepared for the Project. According to the WQMP, proposed site design BMPs include:[1]

- Minimize Impervious Area
- Preserve Existing Drainage Patterns and Time of Concentration-
- Protect Existing Vegetation and Sensitive Areas

[1] Hydraulically the road will create a negligible increase in flow with less than a 10% increase in flow for the 2 year and 10 year storm in its basin. The Project has been designed to size the onsite treatment system to treat the full proposed area of the project, including the impervious area of the access road. The access road runoff impacts will be offset by the overtreatment on site. Supplemental calculations may be performed based on direction from the CEC.

- Revegetate Disturbed Areas
- Water Efficient Landscaping
- Slopes and Channel Buffers

Proposed non-structural source control BMPs include:

- Common Area Landscape Management
- BMP Maintenance
- California Code of Regulations Title 22 Compliance
- Spill Contingency Plan
- Hazardous Materials Disclosure Compliance
- Uniform Fire Code Implementation
- Employee Training
- Common Area Catch Basin Inspection

Proposed structural source control BMPs include:

- Use efficient irrigation systems and landscape design, water conservation, smart controllers, and source control
- Protect slopes and channels and provide energy dissipation
- Incorporate requirements allocable to individual priority categories (from San Diego RWQCB NPDES Permit)

Proposed LID BMPs include an underground detention system with biofiltration treatment in the form of a modular wetland system (MWS) (Appendix 4.15B). This BMP type treats TSS, nutrients and oil and grease. Flows entering onsite grate inlets will be routed to the MWS prior to the detention systems, with flows exceeding treatment capacity bypassing via an internal weir. The ~~BMP~~ surface detention basin is made up of several chambers within a perimeter stone envelope. The chambers are wrapped in a non-woven geotextile and have a layer of stone under the chambers. This BMP system~~, in conjunction with a pump,~~ would be designed to manage the 100-year storm event while meeting OCFCD drawdown requirements (a detention basin shall have a 36-to-48-hour drawdown time).

Stormwater runoff from the project site will be conveyed to the underground detention ~~facility~~ basin where it will be detained~~ and pumped~~. This basin would not incorporate infiltration due to higher percolation rates in the upper 5 feet of the soils compared to deeper soils, which would allow perched water to move laterally. When combined, the site design, source control, and LID BMPs would target and reduce pollutants of concern in stormwater runoff from the project site.

As noted above, in addition, the proposed Project includes the construction and implementation of bank stabilization measures within Oso Creek in the vicinity of the site to address existing erosional issues. The bank stabilization measures include raising the grade of the creek bottom and constructing low-head drop structures consisting of rock weirs and ramps followed by pools and stilling basins which are all hydraulic controlling structures to attenuate flow velocities. Rock structures will also be spaced apart through the targeted region of the creek to reduce flow velocities. The placement of native vegetation and recontouring of the bank sidewalls will also provide improvements on bank stabilization which will not only improve habitat but also water quality.

Compliance with the City Municipal Code and South Orange County MS4 Permit requirements, including incorporation of post-construction BMPs to target pollutants of concern, combined with the Oso Creek stabilization measures, would reduce operation impacts related to water quality standards, degradation of water quality, and beneficial uses to a less than significant level. The bank stabilization measures will also comply with the CWA, including pursuant to Nationwide Permit 27.

4.15.2.2 Flooding Potential

The offsite access road is partially located within 100-year floodplain Zone A; all remaining Project areas are located within Zone X (refer to Figure 4.15-2). Zone A is defined by FEMA as areas subject to inundation by a 1-percent-annual-chance (100-year) flood for which base flood elevations have not been determined. Zone X is defined by FEMA as areas of minimal flood hazard, which are the areas outside of the Special Flood Hazard Area and higher than the elevation of the 0.2 percent annual chance flood. Because the project would place improvements (offsite access road) within a 100-year flood zone, there is potential for the project to impede or redirect flood flows. However, the proposed project would process all necessary map revisions with FEMA and the road would be built to ensure the project does not impede or redirect flood flows that would impact adjacent or downstream property.

4.15.2.3 Water Supply

During construction, water will be provided through a local purveyor and water trucks. A sanitary water supply will not be required during construction because restroom facilities will be provided by portable units serviced by licensed providers. After construction is complete, operational water will be limited to water necessary for landscape irrigation and to supply on-site fire hydrants. It will be the responsibility of the water purveyor to ensure the quantity provided to the Project site does not exceed safe productions right and the annual safe yield. Water supply impacts would be less than significant.

4.15.2.4 Wastewater Collection, Treatment, Discharge, and Disposal

Following construction, no sanitary facilities will be located at the Project site. No impact would occur.

4.15.2.5 Stormwater Runoff and Drainage

In the existing condition, stormwater sheet flows into the unmodified portion of Oso Creek. According to the Preliminary Drainage ~~and Hydrology Study~~Report prepared for the project (Appendix 4.15A), in the proposed condition, the overall site drainage patterns would generally remain the same as existing drainage patterns. Storm flows would continue to reach Oso Creek through different points of discharge including a northern existing box culvert for flows from the access road, a new outfall where there are rip rap rock linings to dissipate flow velocities just south of the channelized portion, and a southern new discharge point at one of the proposed constructed pools/stilling basins. ~~Storm flows would continue to reach Oso Creek but would be diverted north to existing outfalls that discharge into the channelized portion of Oso Creek.~~ Furthermore, while the project would ~~not~~ alter the course of Oso Creek in the vicinity of the Project site through implementation of the bank stabilization measures (regrading side slopes of western bank, revegetation, placement of six instream rock stabilization structures, with pool/stilling basins all elevated above the existing eroded grade) that will improve flow conditions in the creek by reducing flow velocities and minimizing erosion potential.~~, as drainage patterns would remain similar to the existing condition during project implementation~~. In the event of a 100-year flood event, stormflows would ~~be conveyed similar to existing conditions~~ be mitigated by the proposed subsurface detention basin which will be sized to meet City requirements with the ability to store the 100-year 24-hour volume with discharge flow velocities that are reduced from the existing conditions (Appendix 4.15A). Currently, the project site is undeveloped and consists of primarily pervious surfaces (the Project site currently contains approximately 1 acre of impervious surface area). As detailed in the Preliminary Drainage and Hydrology StudyReport prepared for the project, stormwater runoff from the project site and offsite area is has a flow rate that totals 9.14397.78 cubic feet per second (cfs) during a 25-year storm and 13.89 cfs during 100-year storm under existing conditions. Even with the increase in impervious surfaces through development of the project, the 100-year storm flows would be 365.29 cfs (Appendix 4.15A). Development of the project would increase impervious surface area, which would increase stormwater runoff. However, the underground detention basin and proposed pump structure would provide a maximum pump rate of 1,580 GPM (3.52 cfs) and also be capable of pumping at lower rates to accommodate small rainfall events. At the maximum pump rate, a 100-year rainfall event will drawdown within approximately 34.7 hours. According to the Preliminary Drainage and Hydrology Study, the total peak discharge flow rate to the existing outfalls would be below existing conditions after implementation of the proposed BMPs (peak flow would decrease to 3.52 cfs due to the underground detention system and proposed pump) (see Table 4.15-1).

In addition, the project would result in similar offsite stormwater runoff during a 25-year storm event and 100-year storm event by incorporating the use of the proposed drainage ditch and level spreaders, and use of the underground detention system (see Table 4.15-1).

In summary, the underground storage detention basin provided onsite would have the capacity to handle a 100-year rainfall event and dewater within 36 hourshelp to decrease peak storm flows compared to existing conditions (see Attachment 4.15A). Proposed peak runoff rates would be maintained at or below existing rates, and thus have a positive impact on the offsite drainage systems (see Table 4.15-1). Pre- and Post-Construction runoff rates are compared in Table 4.15-1. Bank stabilization measures would reduce existing erosional conditions, provide bank stability and improve water quality within the creek. Impacts would be less than significant.

Table 4.15-1. Discharge Summary

Storm Event	Pre-Construction Runoff Rate (cfs)	Post-Construction Peak Discharge Rate (cfs)	% Reduction in Peak Discharge
Onsite and Offsite			
25-Year	9.14	3.52	61.49%
100-Year	397.78 13.89	365.29 3.52	8.17% 74.66%
Offsite			
25-Year	104.27	98.64 / 3.52[a]	2.02%
100-Year	141.78	134.03 / 3.52[a]	2.98%

NotesSource: Appendix 4.15A

[a] Because offsite flows would be routed through the proposed level spreader and the onsite underground detention system, post-construction peak discharge values are provided. The first value in this column reflects the post construction peak discharge rate from the level spreader. The second value in this column reflects the post-construction peak discharge rate from the onsite underground detention system and pump.

4.15.3 Cumulative Effects

A cumulative impact refers to a proposed project's incremental effect together with other closely related past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project (Public Resources Code Section 21083; Title 14 California Code of Regulations, Sections 15064[h], 15065[c], 15130, and 15355). Existing land uses surrounding the project site include open space, transportation infrastructure, commercial, and residential. The San Diego Gas and Electric (SDG&E) Trabuco to Capistrano 138 kV transmission line is located approximately 250 feet to the east of the Project site and runs alongside Union Pacific Railroad tracks and Intertstate-5.

It is anticipated that the Project will have a negligible impact on groundwater resources in the SJGWB. Water used during Project operations will be primarily for landscape irrigation. Irrigation water not taken up by plants or lost to evaporation will return to the aquifer and contribute to groundwater recharge. For these reasons, there are no anticipated significant cumulative impacts to water supply. As with the proposed Project, cumulative projects would be required to adhere to existing drainage control requirements as described for the proposed Project. The bank stabilization measures proposed as part of the proposed Project would be of benefit to cumulative projects by providing increased stabilization of the creek banks and improving water quality for downstream beneficial uses. Compliance with local and regional standards and regulations will ensure that the Project will not result in significant cumulative impacts.

4.15.4 Mitigation Measures

The project would mitigate for potential adverse impacts by complying with the requirements of applicable LORS (described in Section 4.15-5). Therefore, no mitigation other than compliance with permit conditions will be required.

4.15.5 Laws, Ordinance, Regulations, and Standards

Federal, state, and local LORS applicable to water resources and anticipated compliance are discussed in this subsection.

4.15.5.1 Federal LORS

In California, discharges of wastewater and stormwater into surface waters are regulated by SWRCB and RWQCBs under the CWA and the Porter-Cologne Water Quality Control Act. Relevant NPDES permits for stormwater quality management are discussed in Section 4.15.5.2.

4.15.5.2 State LORS

4.15.5.2.1 California Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (California Water Code, Division 7) is the state law governing water quality of all state waters, including both surface waters and groundwater. Under the Porter-Cologne Water Quality Control Act, SWRCB has the ultimate authority over water quality policy on a state-wide level, and nine RWQCBs establish and implement water quality standards specific for each respective region. The San Diego RWQCB regulates water quality in the Project area, jointly implementing the federal CWA and the state Porter Cologne Water Quality Control Act.

4.15.5.2.2 NPDES Construction Stormwater Permit

The federal CWA effectively prohibits discharges of stormwater from construction sites unless the discharge is in compliance with an NPDES permit. SWRCB is the permitting authority in California and has adopted a statewide General Permit for Stormwater Discharges Associated with Construction Activity (SWRCB Water Quality Order No. 99-08-DWQ]) that applies to projects resulting in one acre or more of soil disturbance. The proposed project will result in disturbance of more than one acre of soil. Therefore, the project will require the preparation of a construction SWPPP that will specify site management activities to be implemented during site development. These management activities will include construction stormwater best management practices, dewatering runoff controls, and construction equipment decontamination. The RWQCB requires a Notice of Intent to be filed before any stormwater discharge from construction activities, and it requires that the SWPPP be implemented and maintained onsite. A Construction Drainage Erosion and Sediment Control Plan/SWPPP will be completed before the beginning of construction activities.

4.15.5.2.3 NPDES Stormwater Industrial General Permit

There will be no industrial stormwater discharges during the operation phases of the project; therefore, a NPDES Stormwater Industrial General Permit is not required.

4.15.5.3 Local LORS

4.15.5.3.1 Orange County National Pollutant Discharge Elimination System Permit

The City is a Permittee of the National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4) Draining the Watersheds within the San Diego Region (South Orange County MS4 Permit), Order R9-2013-0001, NPDES No. CAS6010266, as amended by Order No. R9-2015-0001. The South Orange County MS4 Permit regulates discharges into the MS4 system in the cities and county areas within Orange County that are in the jurisdiction of the San Diego RWQCB. As discussed further below, the South Orange County MS4 Permit requires preparation of a Water Quality Management Plan (WQMP) and implementation of post-construction BMPs for new development and significant redevelopment projects that qualify as Priority Development Projects. The proposed project is considered a Priority Development Project under the following categories specified in the South Orange County MS4 Permit:

- Category (a) New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
- Category (c) New and redevelopment projects that create 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: ○ (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
- Category (f) New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.

While OCPW would normally incorporate this project into the current MS4 permit, the CEC may include this action as part of the Opt-in certification.

4.15.5.3.2 Drainage Area Management Program

The Drainage Area Management Plan (DAMP) was created by the County of Orange, the OCFCD, and incorporated cities (permittees), and includes specific water pollutant requirements of the Orange County Stormwater Program. The DAMP is the principal guidance and compliance document for the county-wide implementation of the Stormwater Program. It is the foundation for the permittees to implement model programs designed to prevent pollutants from entering receiving waters to the maximum extent practicable. Section 7 of the DAMP discusses issues relating to new developments and significant redevelopments.

4.15.5.3.3 Model Water Quality Management Plan

The Model Water Quality Management Plan (Model WQMP) for South Orange County was developed to aid Orange County, the OCFCD, the cities in Orange County (permittees), and developers in Orange County to address post-construction urban runoff and stormwater pollution from new development and significant redevelopment projects that qualify as Priority Development Projects. Priority Development Projects are required to develop a Project WQMP to minimize adverse impacts of development to on-site hydrology, volume and rate of runoff, and pollutants of concern. Project WQMPs include project-specific BMPs to minimize these effects (e.g., Low Impact Development [LID], site design measures, source control BMPs). The requirements identified in the Project WQMPs are subject to Section 7 of the DAMP.

4.15.5.3.4 Technical Guidance Document

The County of Orange developed the Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs) in South Orange County (TGD) in cooperation with the incorporated cities of South Orange County to aid agency staff and project proponents with addressing post-construction urban runoff and stormwater pollution from new development and significant redevelopment projects in Orange County. The TGD serves as a technical guidance to complete the Project WQMP.

4.15.5.3.5 Hydromodification Plan

Pursuant to the requirements of the South Orange County MS4 Permit, the County prepared the South Orange County Hydromodifcation Management Plan (HMP). All priority development projects that do not meet the exemption criteria are required to comply with hydromodification criteria in the HMP. The goal of hydromodification control is to integrate hydrologic controls into a proposed project so that post-project runoff discharge rates and durations do not exceed predevelopment (naturally occurring) discharge rates and durations.

4.15.5.3.6 Orange County Construction Runoff Guidance Manual

The Construction Runoff Guidance Manual for Contractors, Project Owners, and Developers presents the requirements related to construction from the DAMP. The goal of this Guidance Manual is to control pollutant discharges from construction sites. As such, it helps applicants with building and grading permits to understand the water quality requirements during the construction phase of development projects.

4.15.5.3.7 City of San Juan Capistrano Water Quality Control Ordinance

Title 8, Chapter 14 of the City's Municipal Code contains certain requirements and prohibitions to help prevent runoff from polluting streams, and to comply with the federal requirements to control pollutants entering the City's storm water system. The Project will comply with this ordinance and employ best management practices to prevent construction debris and discharges from leaving the Project site and entering Oso Creek.

4.15.6 Agency Contacts, Permits, and Permit Schedule

Local agency contacts and permits are included for reference in Table 4.15-2, but the building and grading permits from the City of San Juan Capistrano Building Division would be superseded by CEC approval of the project under the opt-in program. ~~Agency contacts and required permits are listed in Table 4.15-2.~~

Table 4.15-2. Permits and Agency Contacts

Permit	Agency Contact	~~Schedule~~
City of San Juan Capistrano Grading and Building Permit*	City of San Juan Capistrano Public Works and Engineering Department 30448 Rancho Viejo Road San Juan Capistrano, California 92675 (949) 443-6337	~~Building and Grading Permits~~ N/A*
NPDES – Construction General Permit	Submit online using Stormwater Multiple Application and Report Tracking System (SMARTS) https://smarts.waterboards.ca.gov	Submit Notice of Intent for coverage under the statewide permit at least 30 days prior to construction.
NPDES – MS4 Permit	Orange County Public Works (Orange County Flood Control District) George Shimono P.E., Senior Civil Engineer, Development Coordination Office (714) 647-3955 Mobile (657) 450-3608 george.shimono@ocpw.ocgov.com 601 North Ross Street Santa Ana, CA 92701	Submit permit application to the CEC in cooperation with Orange County Public Works ~~Flood Control District~~ at least 120 days prior to construction.
Clean Water Act Section 404, Nationwide Permit 27 & 39	Eric R. Sweeney, Senior Project Manager South Coast Branch, Regulatory Division Carlsbad, CA Field Office Los Angeles District, U.S. Army Corps of Engineers Eric.R.Sweeney@usace.army.mil Office: 760-602-4837 Mobile: 213-392-0431	The Applicant has engaged with the U.S. Army Corps of Engineers to discuss the project. The Applicant plans to submit the permit application in Q1 2026.
Clean Water Act Section 401, Water Quality Certification	Eric Becker, P.E., Senior Water Resource Control Engineer R9 SAN DIEGO R9 Surface Water Protection | R9 Wetland & Riparian Protection Eric.Becker@waterboards.ca.gov Phone: (619) 521-3364 2375 Northside Drive, Suite 100, San Diego CA 92108	The Applicant has engaged with the San Diego Water Board to discuss the project. The Applicant plans to submit the permit application in Q1 2026.

* Building and grading permits from the City of San Juan Capistrano Building Division would be superseded by CEC approval of the project under the opt-in program.

4.15.7 References

CDM (Camp Dresser & McKee Inc). 1987. Task 5 – Field Program Sampling/Quality Assurance Plan for the San Juan Creek Basin Groundwater Management Plan. Updated February 1987.

DOC (California Department of Conservation). 2023. Tsunami Hazard Area Map Application. https://www.conservation.ca.gov/cgs/tsunami/maps

DWR (California Department of Water Resources). 1972. Planned Utilization of Water Resources in the San Juan Creek Basin Area. Bulletin No. 104-7. 210 p.

DWR. 1975. California's Ground Water. Bulletin 118. 135 p.

DWR. 1988. San Diego Region Ground Water Studies, Phase IV. Southern District Memorandum Report. 99 p

NBS/Lowry Engineers and Planners. 1994. San Juan Basin Groundwater Management and Facility Plan. Facility Plan.

SJBA (San Juan Basin Authority), 2013. San Juan Basin Groundwater and Facilities Management Plan. https://www.mwdoc.com/wp-content/uploads/2021/04/Appendix-E-San-Juan-Basin-Groundwater-and-Facilities-Management-Plan-reduced-size.pdf

SMWD (Santa Margarita Water District), 2014. San Juan Groundwater Basin Recharge, Reclamation, & Reuse Feasibility Study. https://www.usbr.gov/watersmart/title/docs/applications/feasibility/2014/SantaMargheritaWaterDistrict.pdf

Western Regional Climate Center. 2023. Period of Record Monthly Climate Summary. Laguna Beach, California. https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca4647

WRCB (State of California: State Water Resources Control Board), 2022. California 2020-2022 Integrated Report (303(d) List/305(b) Report). https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2020_2022_integrated_report.html

USACE and OCFCD. 2002. San Juan Creek Flood Risk Management Feasibility Study, Feasibility Phase, F-5 Report. August. https://ocip.ocpublicworks.com/san-juan-creek-flood-risk-management-feasibility-study

USGS (United States Geological Survey), 2014. National Water Information System. https://nwis.waterdata.usgs.gov/usa/nwis/gwlevels/?site_no=333147117401901

USGS. 2019. Boundary Descriptions and Names of Regions, Subregions, Accounting Units and Cataloging Units. https://water.usgs.gov/GIS/huc_name.html#Region18

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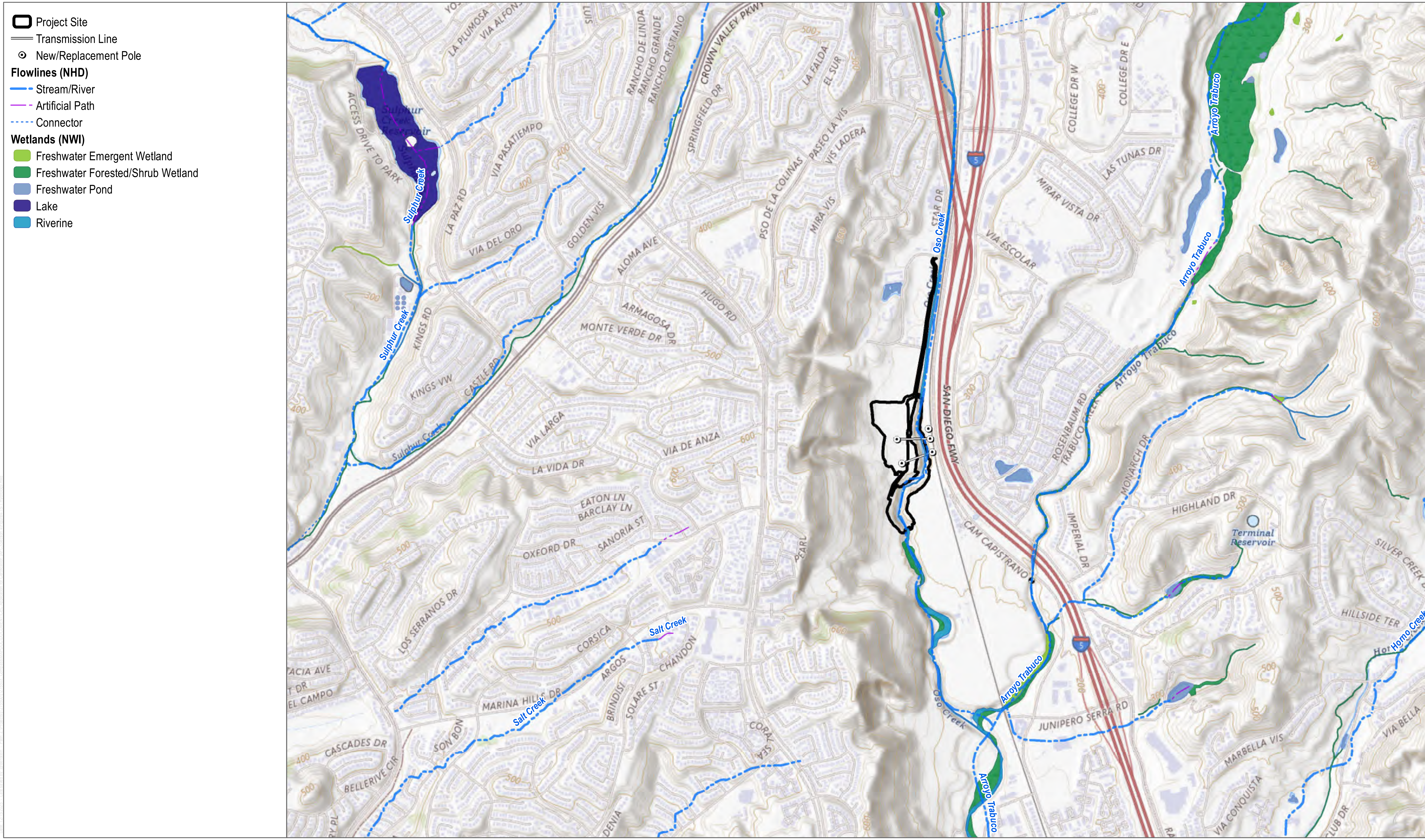

SOURCE: USGS National Map 2023; NHD 2023; NWI 2023

DUDEK

0 1,000 2,000 Feet

FIGURE 4.15-1

Hydrology

Compass Energy Storage Project

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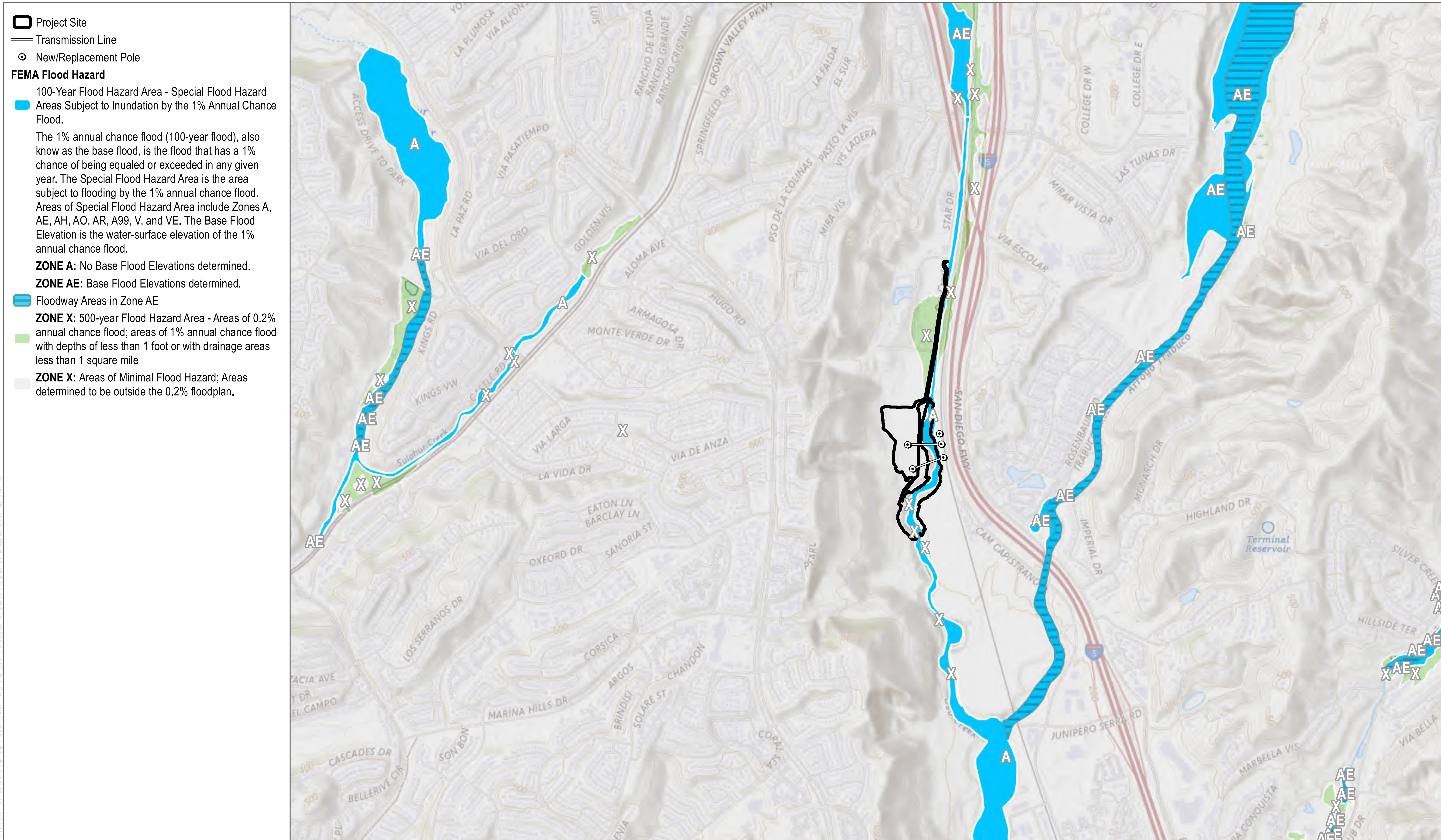

SOURCE: USGS National Map 2023; FEMA 2023

DUDEK

FIGURE 4.15-2

Flood Zones

Compass Energy Storage Project

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Appendix 4.15A

Drainage Report

Preliminary Drainage Report

Compass Battery Storage Project

29343 Camino Capistrano,
San Juan Capistrano, California.

Prepared for:

Broad Reach Power Company
29343 Camino Capistrano,
San Juan Capistrano, California.

DECEMBER 2025 | PRELIMINARY

Prepared By:

Kimley»Horn

This Preliminary Drainage Report has been prepared by Kimley-Horn and Associates, Inc. under the direct supervision of the following Registered Civil engineer. The undersigned attests to the technical data contained in this study, and to the qualifications of technical specialists providing engineering computations upon which the recommendations and conclusions are based.

Ashley Teani   12/05/25

Ashley Teani   Date

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1 INTRODUCTION

1.1 PROJECT DESCRIPTION AND PURPOSE

Kimely-Horn and Associates has been retained to prepare a Drainage Study for the proposed Battery Energy Storage System (BESS) site in the City of San Juan Capistrano, California. The project site is approximately 14.88 acres and is bound by Saddleback Church to the north, Interstate 5 to the east, Oso Creek to the south, and steep hills to the west. The project development includes battery storage units and associated equipment with concrete pads, access roads, and proposed drainage structures.

The project site is mainly vacant but does contain existing dirt roads and structures. See **Figure 1-1** for the Project Location Map.

This drainage report includes engineering calculations in support of the proposed development, which will:

1. Calculate and analyze the existing and proposed condition hydrological runoff and peak flow rates of the site by using the Rational Method following the City San Juan Capistrano and Orange County hydrology requirements.
2. Provide calculations in support of the project's Water Quality Management Plan. It will also provide the recommended BMP's information supporting the proposed improvements.

Figure 1–1 Project Location Map

2 PROJECT SETTING

2.1 TOPOGRAPHY

The existing topography generally drains from the west to east toward Oso Creek. Since the project is located adjacent to steep hills, run-on is expected and will be analyzed as part of this report.

2.2 PRECIPITATION

Precipitation values for the hydrologic analysis were determined from site-specific precipitation frequency estimates published online in the NOAA Atlas 14. For this site (San Juan Capistrano, California) the 100-year and 2-year 24-hour storm precipitation depths are 6.54 and 2.43 inches respectively. Both values were used for volume and stormwater flow calculations. **Appendix A** contains the site-specific tabular output from NOAA Atlas 14.

2.3 SOIL TYPES

The type of soil and soil conditions are major factors affecting infiltration and resultant storm water runoff. The Natural Resources Conservation Service (NRCS) has classified soils into four general hydrologic soil groups for comparing infiltration and runoff rates. The groups are based on properties that influence runoff, such as water infiltration rate, texture, natural discharge and moisture condition. The runoff potential is based on the amount of runoff at the end of a long duration storm that occurs after wetting and swelling of the soil not protected by vegetation.

Using the NRCS Web Soil Survey soil data, it was determined that the hydrologic soil group classification for the area is a mixture of soil types A, C, and D. The western half of the site is primarily soil types C and D and the eastern half of the site is primarily soil type A. Soil type A soils are defined to have high infiltration rates (low runoff potential), Soil type C having slow infiltration rates, and Soil type D typically have very slow infiltration rates (high runoff potential) when thoroughly wet. Based on the Geotechnical Evaluation Report prepared by LGC Geotechnical, Inc., due to low infiltration rates and the risk of affecting the existing stability of the proposed development, onsite infiltration is not feasible. **See Appendix B** for soil type classifications and **Appendix H for** the Geotechnical Study.

2.4 LAND USE

The project site is zoned as Planned Community District PC (TBD) and has a Planned Community Land use per the City of San Juan Capistrano Interactive GIS Map. Existing dirt roads and structures are located within the project limits.

2.5 GROUNDWATER

According to the Geotechnical Evaluation Report prepared by LGC Geotechnical, Inc., dated April 4th, 2024, groundwater was encountered at depths ranging from approximately 31 feet to 41 feet below the existing grade. It was also mentioned that historic groundwater is estimated at 5 feet below grade within the development area [LGC Geotechnical, 2024].

2.6 FEMA MAPPING

The project site is covered by Map Number 06059C0441J and 06059C0443J of the FEMA Flood Insurance Rate Map (FIRM) for Orange County, California, and Incorporated Areas. The City of San Juan Capistrano, community number 060231, is included in this FIRM. The site is mainly classified as Zone X with a small portion of the site located in a Special Flood Hazard Area (SFHA) Zone A (associated with Oso Creek). Zone A indicates an area that is subject to inundation by the 1% annual chance flood. The effective FEMA map(s) is dated December 03, 2009, and is provided in **Appendix C.**

3 SITE CONDITIONS

3.1 EXISTING SITE CONDITIONS

The site will encounter run-on from the nearby hills west of the subject property and other previous/imperious areas. In existing conditions there are four (4) identified points of compliance (POC). The site, under existing conditions, primarily drains from west to east toward Oso Creek. The project site is generally pervious and vacant with a few existing facilities. Existing drainage infrastructure (e.g. grate inlets and manholes) are located north of the project site that collect and convey runoff to Oso Creek. Offsite and Onsite areas are analyzed separately; refer to the existing conditions hydrology exhibits included in **Appendix D** for drainage area(s) breakdowns and POCs as well as Section 4.2 for Hydrologic Results. Onsite and offsite runoff within the project analysis limits ultimately discharges into Oso Creek and continues downstream.

3.2 PROPOSED SITE CONDITIONS

The post-development project site will discharge into Oso Creek in the northern and southern portions of the site. In proposed conditions there are three (3) identified POCs that discharge to Oso Creek. The proposed development will accommodate battery storage units. The project development includes battery storage units and associated equipment with concrete pads, access roads, and proposed drainage structures. Additionally, a road connecting the proposed development to the existing private road located south of the Sprinter Lagna Niguel dealership is proposed.

Due to the proposed development, peak flows will increase from the increased pervious areas. To comply with the NPDES and the City of San Juan Capistrano WQMP requirements, the required stormwater treatment LID volume must be treated. The project proposes an underground detention basin and a modular wetland system to treat the required flow rate. Peak flows will be routed to the underground detention system to mitigate any increases of onsite flow. For the proposed development drainage patterns and drainage system locations refer to the Proposed Hydrology Exhibit found in **Appendix D.**

3.3 OFFSITE CONDITIONS

As previously mentioned, the proposed development will utilize diversion channels and storm drain systems to intercept and reroute run-on produced from nearby hills. Offsite stormwater will outfall to Oso Creek at two locations and continue downstream. Offsite stormwater to the north of the site will sheet flow across the proposed road connecting the proposed development to the existing private road located south of the Sprinter Lagna Niguel dealership.

4 HYDROLOGIC & HYDRAULIC ANALYSIS

4.1 METHODOLOGY

The hydrologic and hydraulic analyses were completed following the methods outlined in the Orange County Hydrology Manual. The rational method was used to estimate time of concentrations and peak flow rates generated from the existing and proposed 100-year storm event. The synthetic unit hydrograph method was used to determine the onsite existing and proposed hydrographs for the 24-hour duration of the 100-year storm event to design for mitigation. To determine the outflow from the proposed BMP, a basin routing analysis was performed for the 100-year storm event. In addition, to verify that downstream conditions are not adversely impacted and that Hydrologic Condition of Concern (HCOC) requirements are adhered to, a continuous simulation hydrologic model was prepared to analyze the flow rates from 10% of the 2-year storm to the 10-year storm using the South Orange Hydrology Model (SOHM).

The Advanced Engineering Software (AES) Version 23.0 was used to complete the rational method and synthetic unit hydrograph analysis. The PondPack software was utilized for basin routing to ensure/confirm adequate detention sizing and discharge is less than the allowable amount. Existing conditions hydrology AES, Proposed conditions hydrology AES, Unit hydrograph, and PondPack results are included in **Appendix E, F, G** and **H** respectively. In addition, the South Orange County Hydrology Model (SOHM) program was used to verify that the proposed drainage systems meet HCOC requirements for up to the 10-year storm event, and the results are included in **Appendix H**.

Rainfall data from NOAA Atlas was used to compute the peak flow rates and time of concentration for each drainage area. The rainfall data was also used along with the stage-storage parameters of the underground detention system to obtain the runoff volume generated from each drainage area and the allowable peak outflows for the 100-year storm event. Rainfall data from the San Juan Capistrano gauge was used to compute the pre-development and post-development flow rates and verify that the post-development flow rates are within 10% of the pre-development (natural) flow rates for up to a 10-year storm event.

Antecedent moisture condition (AMC) III was used to calculate the peak flows and volumes for the 100-year storm event based on the hydrology manual. The land use selected for the proposed drainage subareas is “Commercial”. See **Appendix D** for existing and proposed drainage exhibits and Section 4.2 for a summary of results

4.2 HYDROLOGIC RESULTS

Drainage Areas were delineated for the project site’s existing and proposed drainage conditions. Existing elevations, slopes and flow paths were established from the topography available at the time of this drainage study. Proposed elevations, slopes and flow paths were based on the proposed site and grading plans.

Rational Method hydrologic results are summarized below for the existing conditions and proposed conditions in **Table 4.1, Table 4.2, and Table 4.3**. Refer to **Appendix E** and **Appendix F** for the existing and proposed conditions hydrology analysis results and **Appendix D** for existing and proposed drainage exhibits and hydraulic parameters.

Table 4.1 Offsite Hydrology Results Summary

Offsite Rational Method Flow Rates			
DA ID	**Area (AC)**	**Q_{100} (cfs)**	**T_C (min)**
DA 1.1	1.24	30.10	8.54
DA 1.2	26.14	73.54	14.62
DA 2.1	2.00	1.66	9.16
DA 2.2	13.51	21.64	12.42
DA 3.1	0.52	10.93	7.63
DA 3.2	42.62	48.54	17.18
DA 4.1	1.93	15.60	10.28
DA 4.2	5.76	106.20	17.54
Total	**93.72**	**360.24**	-

Table 4.2 Onsite Pre-Development Hydrology Results Summary

Existing Onsite Rational Method Flow Rates			
DA ID	**Area (AC)**	**Q_{100} (cfs)**	**T_C (min)**
DA 1	5.40	14.74	16.20
DA 2	7.43	18.39	16.84
DA 3	0.44	1.52	18.06
DA 4	1.61	4.41	19.56
Total	**14.88**	**39.06**	-

Table 4.3 Onsite Post-Development Hydrology Results Summary

Proposed Onsite Rational Method Flow Rates			
DA ID	**Area (AC)**	**Q_{100} (cfs)**	**T_C (min)**
DA 1	3.90	19.05	9.45
DA 2	2.78	13.92	8.49
DA 3	1.89	9.63	7.85
DA 4	1.72	8.78	7.78
DA 5.1	0.55	2.08	16.83
DA 5.2	0.62	1.64	25.21
DA 5.3	0.77	3.17	15.42
DA 6	0.70	3.45	9.09
DA 7	1.96	10.69	5.00
Total	**14.88**	**72.41**	-

4.3 DETENTION ANALYSIS

The Rational Method calculations demonstrate that post-development peak flow is greater than the pre-development peak flow pertaining to the proposed site area. Therefore, the impacts of the post-development peak flow for the onsite drainage areas will each be mitigated by an underground detention system with a storage volume of 156,308 CF. See **Appendix D** for the ADS underground detention detail sheet.

AES Unit Hydrograph method was used to obtain the onsite post development unit-hydrograph to design the detention system in Pondpack. **Appendix G** includes the proposed 100-year, 24-hour unit-hydrograph results. The offsite and underground detention peak flows were confluence and calculated in WSPGW, shown in **Appendix I**. See **Tables 4.4 and 4.5** for a summary of the existing and mitigated peak flow values at the points of compliance. See **Appendix H** for Pondpack output.

Table 4.4 Existing Points of Compliance Hydrology Summary

Existing POCs		
POC ID	**Area (AC)**	**Q_{100} (cfs)**
POC 1	8.26	26.38
POC 2	43.58	159.80
POC 3	22.94	85.83
POC 4	32.78	125.77
Total	**107.58**	**397.78**

Table 4.5 Proposed (Mitigated) Points of Compliance Hydrology Summary

Existing POCs		
POC ID	**Area (AC)**	**Q_{100} (cfs)**
POC 1	8.61	32.66
POC 2	54.13	162.53
POC 3	44.83	170.10
Total	**107.58**	**365.29**

4.4 HYDRAULIC SYSTEMS

4.4.1 STORM DRAIN SYSTEMS

Two (2) proposed storm drain systems, each designed for the 100-year storm, will be installed to collect and convey onsite and offsite runoff to Oso Creek.

The northern system will collect surface runoff at designated inlet locations and convey flows through the water-treatment MWS system and into the underground detention facility. Outflow from the detention system will confluence with offsite flows within the storm drain network before ultimately discharging into Oso Creek.

The southern storm drain system will capture diverted offsite flows conveyed through the proposed swale and will discharge further downstream in Oso Creek.

Hydraulic calculations for both systems were performed using WSPGW. The analysis evaluated hydraulic capacity, confluence peak flows, and flow velocities. WSPGW input and output files are provided in **Appendix I**.

Orange County Public Works (OCPW) requires a minimum velocity of 2.5 fps to prevent deposition and a maximum of 20 fps in standard concrete pipes to limit potential scouring. For vegetated channels, outlet velocities exceeding 5 fps require appropriate energy dissipation measures to reduce flows to non-erosive conditions.

The northern storm drain system is designed with an outlet velocity of 5.75 fps and the southern system with 8.66 fps. The segment of Oso Creek receiving these discharges will be armored with concrete and riprap (designed by others); therefore, the 5-fps vegetated channel limit does not apply, and no additional energy dissipation is required. A hydraulic jump occurs within the northern system at a concrete manhole structure, but joint stability is not a concern.

4.4.2 OFFSITE FLOW DIVERSION CHANNEL

The proposed diversion channel on the western portion of the project site, was confirmed in FlowMaster that it has adequate capacity to convey offsite flow. See **Appendix I** for FlowMaster Outputs.

4.4.3 CULVERT CROSSINGS

The proposed culvert crossings on the southern portion of the site at the upstream end of the access road and the site's northern access road crossing, were sized in CulvertMaster to allow for conveyance of the channelized offsite flows. See **Appendix I** for CulvertMaster outputs.

5 WATER QUALITY AND LOW IMPACT DEVELOPMENT REQUIREMENTS

5.1 STORMWATER MITIGATION

5.1.1 STORMWATER TREATMENT

The proposed project will provide water quality utilizing proposed modular wetland system (MWS) units that will treat the required 85th percentile design storm volume. No infiltration is proposed due to low infiltration rates and the risk of affecting the existing stability of the proposed development.

5.1.2 STORMWATER MAINTENANCE

Stormwater facilities require routine maintenance to operate efficiently. It is recommended that facilities be inspected prior to the rainy season (fall) and after each runoff producing storm event. Sediment and debris shall be removed from the pre-treatment system to maintain the systems effectiveness. The MWS units shall be routinely inspected, and sediment/debris build-up removed to maintain efficient operation of the units.

5.2 HYDROLOGIC CONDITION OF CONCERN (HCOC)

The project is within the non-exempt Hydrologic Conditions of Concern (HCOC) areas. As previously mentioned, the SOHM software was used to verify that the proposed drainage systems meet HCOC requirements for up to the 10-year storm event, and the results are summarized below. As shown the project is compliant with the HCOC requirements and the basin is adequately sized to store the HCOC and 100-year volume. See the WQMP report for SOHM calculations.

5.3 CRITICAL COURSE SEDIMENT YIELD AREAS

The project is within limits of potential concern. Critical Couse Sediment Yield Areas (CCSYA) must be effectively bypassed through and/or around the proposed project site. Per South Orange County guidance, the 2-year, 24-hour runoff must maintain a discharge velocity of at least 3 fps. See the WQMP report for CCSYA supporting calculations.

6 CONCLUSION

Per the analysis, the project proposes no infiltration, but full treatment of all stormwater runoff by utilizing the proposed modular wetland system. Project runoff gravity flow into Oso Creek. The project is consistent with the allowable discharge compared to the existing condition and is not expected to cause a significant impact to downstream systems for storms up to the 100-year storm.

APPENDICES

APPENDIX A

NOAA ALTAS 14 PRECIPITATION ESTIMATES

NOAA Atlas 14, Volume 6, Version 2
Location name: San Juan Capistrano, California, USA*
Latitude: 33.5325°, Longitude: -117.6776°
Elevation: 210 ft**
* source: ESRI Maps
** source: USGS

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	**0.134** (0.113-0.161)	**0.184** (0.155-0.222)	**0.251** (0.210-0.304)	**0.307** (0.255-0.374)	**0.384** (0.308-0.485)	**0.445** (0.348-0.575)	**0.508** (0.387-0.674)	**0.575** (0.425-0.785)	**0.666** (0.471-0.952)	**0.740** (0.504-1.10)
10-min	**0.192** (0.162-0.231)	**0.264** (0.222-0.318)	**0.360** (0.302-0.435)	**0.440** (0.365-0.536)	**0.551** (0.441-0.696)	**0.638** (0.499-0.824)	**0.729** (0.555-0.966)	**0.823** (0.609-1.12)	**0.955** (0.676-1.36)	**1.06** (0.723-1.57)
15-min	**0.233** (0.196-0.280)	**0.320** (0.268-0.385)	**0.436** (0.365-0.526)	**0.532** (0.442-0.648)	**0.666** (0.533-0.841)	**0.772** (0.604-0.997)	**0.881** (0.671-1.17)	**0.996** (0.736-1.36)	**1.16** (0.817-1.65)	**1.28** (0.874-1.90)
30-min	**0.331** (0.278-0.398)	**0.454** (0.381-0.547)	**0.619** (0.518-0.748)	**0.757** (0.627-0.921)	**0.947** (0.758-1.20)	**1.10** (0.858-1.42)	**1.25** (0.954-1.66)	**1.42** (1.05-1.93)	**1.64** (1.16-2.34)	**1.82** (1.24-2.70)
60-min	**0.439** (0.369-0.528)	**0.603** (0.506-0.726)	**0.823** (0.689-0.993)	**1.00** (0.833-1.22)	**1.26** (1.01-1.59)	**1.46** (1.14-1.88)	**1.66** (1.27-2.20)	**1.88** (1.39-2.57)	**2.18** (1.54-3.11)	**2.42** (1.65-3.58)
2-hr	**0.625** (0.525-0.751)	**0.849** (0.713-1.02)	**1.15** (0.965-1.39)	**1.41** (1.17-1.72)	**1.77** (1.41-2.23)	**2.05** (1.61-2.65)	**2.35** (1.79-3.12)	**2.67** (1.98-3.65)	**3.12** (2.21-4.46)	**3.49** (2.38-5.17)
3-hr	**0.763** (0.641-0.918)	**1.03** (0.866-1.24)	**1.40** (1.17-1.68)	**1.70** (1.41-2.08)	**2.14** (1.71-2.70)	**2.49** (1.95-3.21)	**2.86** (2.18-3.78)	**3.25** (2.40-4.44)	**3.80** (2.69-5.43)	**4.26** (2.90-6.31)
6-hr	**1.06** (0.887-1.27)	**1.42** (1.19-1.70)	**1.91** (1.60-2.30)	**2.32** (1.93-2.83)	**2.91** (2.33-3.68)	**3.38** (2.65-4.37)	**3.88** (2.96-5.15)	**4.42** (3.27-6.03)	**5.17** (3.66-7.39)	**5.79** (3.94-8.57)
12-hr	**1.38** (1.16-1.66)	**1.86** (1.56-2.24)	**2.50** (2.09-3.02)	**3.04** (2.52-3.70)	**3.79** (3.03-4.79)	**4.39** (3.43-5.67)	**5.02** (3.82-6.65)	**5.68** (4.20-7.76)	**6.61** (4.67-9.43)	**7.35** (5.01-10.9)
24-hr	**1.80** (1.59-2.08)	**2.43** (2.14-2.81)	**3.27** (2.88-3.79)	**3.97** (3.47-4.64)	**4.96** (4.19-5.98)	**5.73** (4.75-7.06)	**6.54** (5.30-8.24)	**7.39** (5.82-9.56)	**8.57** (6.49-11.6)	**9.52** (6.97-13.3)
2-day	**2.22** (1.96-2.56)	**2.99** (2.64-3.46)	**4.04** (3.56-4.69)	**4.93** (4.30-5.76)	**6.18** (5.23-7.46)	**7.18** (5.95-8.84)	**8.23** (6.66-10.4)	**9.35** (7.37-12.1)	**10.9** (8.27-14.7)	**12.2** (8.94-17.0)
3-day	**2.43** (2.14-2.80)	**3.28** (2.89-3.79)	**4.45** (3.91-5.16)	**5.44** (4.75-6.36)	**6.86** (5.80-8.27)	**8.00** (6.63-9.84)	**9.20** (7.45-11.6)	**10.5** (8.28-13.6)	**12.3** (9.35-16.6)	**13.8** (10.1-19.3)
4-day	**2.61** (2.30-3.01)	**3.53** (3.12-4.08)	**4.80** (4.23-5.57)	**5.89** (5.14-6.88)	**7.44** (6.29-8.98)	**8.70** (7.21-10.7)	**10.0** (8.13-12.6)	**11.5** (9.04-14.9)	**13.5** (10.2-18.2)	**15.2** (11.1-21.2)
7-day	**2.98** (2.63-3.44)	**4.04** (3.56-4.67)	**5.51** (4.85-6.39)	**6.77** (5.91-7.91)	**8.59** (7.26-10.4)	**10.1** (8.34-12.4)	**11.6** (9.42-14.7)	**13.3** (10.5-17.3)	**15.8** (12.0-21.3)	**17.8** (13.0-24.8)
10-day	**3.22** (2.84-3.72)	**4.38** (3.87-5.07)	**5.99** (5.28-6.95)	**7.38** (6.44-8.63)	**9.38** (7.93-11.3)	**11.0** (9.13-13.6)	**12.8** (10.3-16.1)	**14.6** (11.5-19.0)	**17.4** (13.2-23.4)	**19.6** (14.4-27.3)
20-day	**3.86** (3.41-4.45)	**5.30** (4.68-6.13)	**7.32** (6.44-8.49)	**9.06** (7.91-10.6)	**11.6** (9.78-14.0)	**13.6** (11.3-16.8)	**15.8** (12.8-19.9)	**18.2** (14.4-23.6)	**21.7** (16.4-29.2)	**24.5** (18.0-34.1)
30-day	**4.56** (4.03-5.27)	**6.30** (5.55-7.28)	**8.72** (7.67-10.1)	**10.8** (9.43-12.6)	**13.8** (11.7-16.7)	**16.3** (13.5-20.0)	**18.9** (15.3-23.9)	**21.8** (17.2-28.2)	**26.0** (19.7-35.0)	**29.4** (21.5-40.9)
45-day	**5.42** (4.79-6.26)	**7.47** (6.59-8.64)	**10.3** (9.09-12.0)	**12.8** (11.2-15.0)	**16.4** (13.8-19.7)	**19.3** (16.0-23.7)	**22.4** (18.2-28.2)	**25.8** (20.3-33.4)	**30.7** (23.3-41.4)	**34.7** (25.5-48.4)
60-day	**6.29** (5.56-7.27)	**8.62** (7.60-9.97)	**11.9** (10.4-13.8)	**14.7** (12.8-17.1)	**18.7** (15.8-22.6)	**22.0** (18.3-27.1)	**25.6** (20.7-32.2)	**29.4** (23.2-38.1)	**35.0** (26.5-47.1)	**39.5** (29.0-55.1)

[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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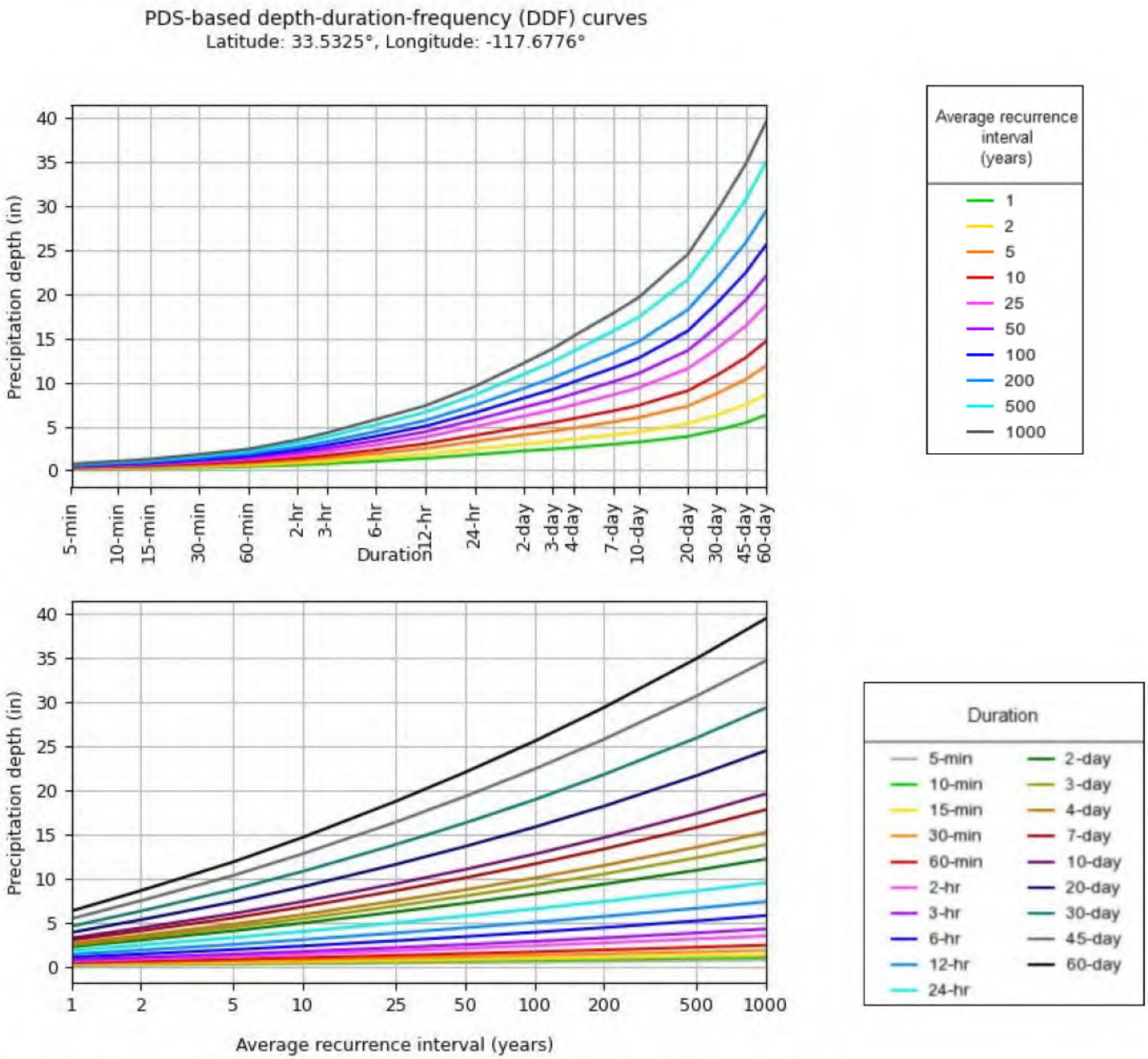
PF graphical



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NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.61 (1.36-1.93)	2.21 (1.86-2.66)	3.01 (2.52-3.65)	3.68 (3.06-4.49)	4.61 (3.70-5.82)	5.34 (4.18-6.90)	6.10 (4.64-8.09)	6.90 (5.10-9.42)	7.99 (5.65-11.4)	8.88 (6.05-13.2)
10-min	1.15 (0.972-1.39)	1.58 (1.33-1.91)	2.16 (1.81-2.61)	2.64 (2.19-3.22)	3.31 (2.65-4.18)	3.83 (2.99-4.94)	4.37 (3.33-5.80)	4.94 (3.65-6.75)	5.73 (4.06-8.18)	6.36 (4.34-9.43)
15-min	0.932 (0.784-1.12)	1.28 (1.07-1.54)	1.74 (1.46-2.10)	2.13 (1.77-2.59)	2.66 (2.13-3.36)	3.09 (2.42-3.99)	3.52 (2.68-4.67)	3.98 (2.94-5.44)	4.62 (3.27-6.60)	5.13 (3.50-7.60)
30-min	0.662 (0.556-0.796)	0.908 (0.762-1.09)	1.24 (1.04-1.50)	1.51 (1.25-1.84)	1.89 (1.52-2.39)	2.19 (1.72-2.83)	2.50 (1.91-3.32)	2.83 (2.09-3.87)	3.28 (2.32-4.69)	3.64 (2.48-5.40)
60-min	0.439 (0.369-0.528)	0.603 (0.506-0.726)	0.823 (0.689-0.993)	1.00 (0.833-1.22)	1.26 (1.01-1.59)	1.46 (1.14-1.88)	1.66 (1.27-2.20)	1.88 (1.39-2.57)	2.18 (1.54-3.11)	2.42 (1.65-3.58)
2-hr	0.312 (0.262-0.375)	0.424 (0.356-0.511)	0.576 (0.482-0.696)	0.704 (0.584-0.857)	0.883 (0.707-1.12)	1.03 (0.803-1.32)	1.18 (0.897-1.56)	1.34 (0.988-1.82)	1.56 (1.10-2.23)	1.74 (1.19-2.58)
3-hr	0.254 (0.213-0.305)	0.343 (0.288-0.413)	0.464 (0.388-0.561)	0.567 (0.470-0.690)	0.712 (0.569-0.899)	0.828 (0.648-1.07)	0.950 (0.724-1.26)	1.08 (0.799-1.48)	1.27 (0.896-1.81)	1.42 (0.966-2.10)
6-hr	0.176 (0.148-0.211)	0.236 (0.198-0.284)	0.318 (0.266-0.384)	0.388 (0.321-0.472)	0.486 (0.389-0.614)	0.565 (0.442-0.729)	0.648 (0.494-0.859)	0.737 (0.545-1.01)	0.863 (0.611-1.23)	0.966 (0.658-1.43)
12-hr	0.114 (0.096-0.138)	0.154 (0.129-0.185)	0.207 (0.173-0.250)	0.252 (0.209-0.306)	0.314 (0.251-0.397)	0.364 (0.285-0.470)	0.416 (0.317-0.551)	0.471 (0.348-0.643)	0.548 (0.387-0.783)	0.610 (0.415-0.903)
24-hr	0.075 (0.066-0.086)	0.101 (0.089-0.116)	0.136 (0.119-0.158)	0.165 (0.144-0.193)	0.206 (0.174-0.249)	0.238 (0.197-0.294)	0.272 (0.220-0.343)	0.307 (0.242-0.398)	0.357 (0.270-0.481)	0.396 (0.290-0.552)
2-day	0.046 (0.040-0.053)	0.062 (0.054-0.071)	0.084 (0.074-0.097)	0.102 (0.089-0.119)	0.128 (0.108-0.155)	0.149 (0.124-0.184)	0.171 (0.138-0.216)	0.194 (0.153-0.252)	0.227 (0.172-0.306)	0.254 (0.186-0.353)
3-day	0.033 (0.029-0.038)	0.045 (0.040-0.052)	0.061 (0.054-0.071)	0.075 (0.066-0.088)	0.095 (0.080-0.114)	0.111 (0.092-0.136)	0.127 (0.103-0.161)	0.145 (0.114-0.188)	0.171 (0.129-0.230)	0.192 (0.140-0.267)
4-day	0.027 (0.024-0.031)	0.036 (0.032-0.042)	0.050 (0.044-0.058)	0.061 (0.053-0.071)	0.077 (0.065-0.093)	0.090 (0.075-0.111)	0.104 (0.084-0.131)	0.119 (0.094-0.154)	0.140 (0.106-0.189)	0.158 (0.116-0.220)
7-day	0.017 (0.015-0.020)	0.024 (0.021-0.027)	0.032 (0.028-0.038)	0.040 (0.035-0.047)	0.051 (0.043-0.061)	0.059 (0.049-0.073)	0.069 (0.056-0.087)	0.079 (0.062-0.102)	0.094 (0.071-0.126)	0.106 (0.077-0.147)
10-day	0.013 (0.011-0.015)	0.018 (0.016-0.021)	0.024 (0.021-0.028)	0.030 (0.026-0.035)	0.039 (0.033-0.047)	0.045 (0.038-0.056)	0.053 (0.043-0.066)	0.061 (0.048-0.078)	0.072 (0.054-0.097)	0.081 (0.059-0.113)
20-day	0.008 (0.007-0.009)	0.011 (0.009-0.012)	0.015 (0.013-0.017)	0.018 (0.016-0.022)	0.024 (0.020-0.029)	0.028 (0.023-0.034)	0.032 (0.026-0.041)	0.037 (0.029-0.049)	0.045 (0.034-0.060)	0.051 (0.037-0.071)
30-day	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.012 (0.010-0.014)	0.014 (0.013-0.017)	0.019 (0.016-0.023)	0.022 (0.018-0.027)	0.026 (0.021-0.033)	0.030 (0.023-0.039)	0.036 (0.027-0.048)	0.040 (0.029-0.056)
45-day	0.005 (0.004-0.005)	0.006 (0.006-0.007)	0.009 (0.008-0.011)	0.011 (0.010-0.013)	0.015 (0.012-0.018)	0.017 (0.014-0.021)	0.020 (0.016-0.026)	0.023 (0.018-0.030)	0.028 (0.021-0.038)	0.032 (0.023-0.044)
60-day	0.004 (0.003-0.005)	0.005 (0.005-0.006)	0.008 (0.007-0.009)	0.010 (0.008-0.011)	0.012 (0.010-0.015)	0.015 (0.012-0.018)	0.017 (0.014-0.022)	0.020 (0.016-0.026)	0.024 (0.018-0.032)	0.027 (0.020-0.038)

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

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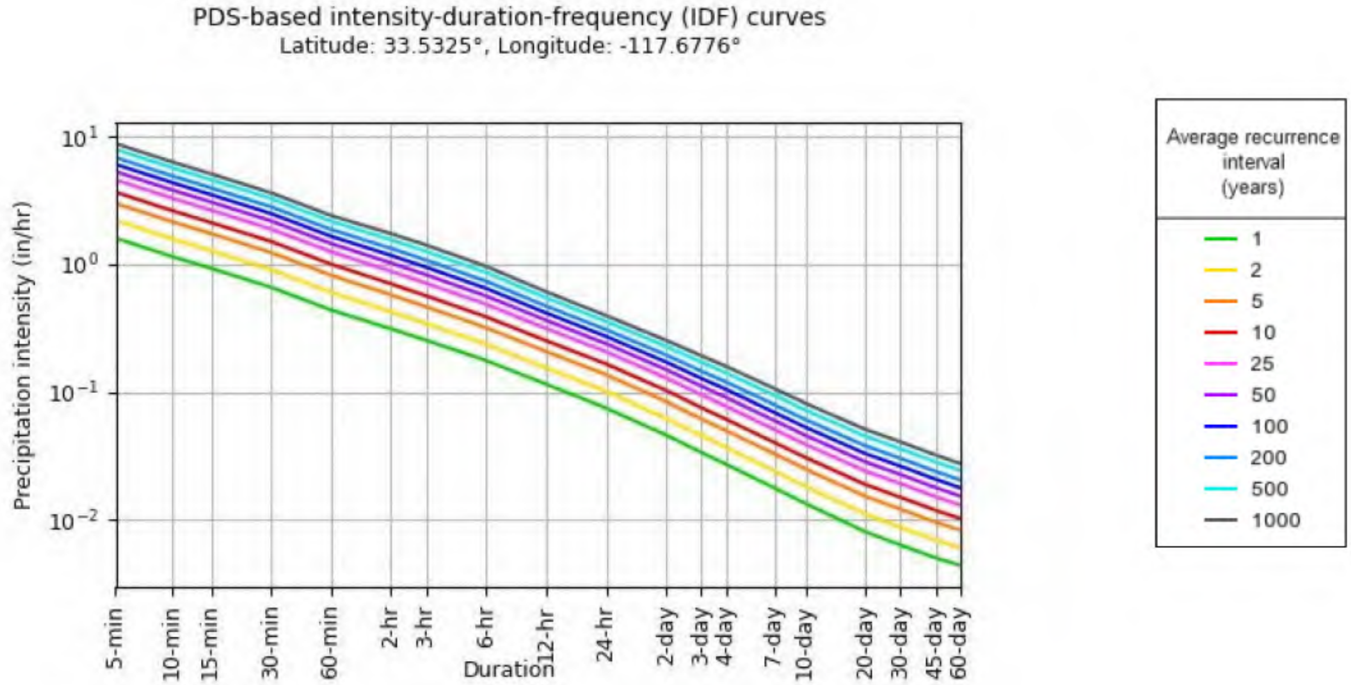
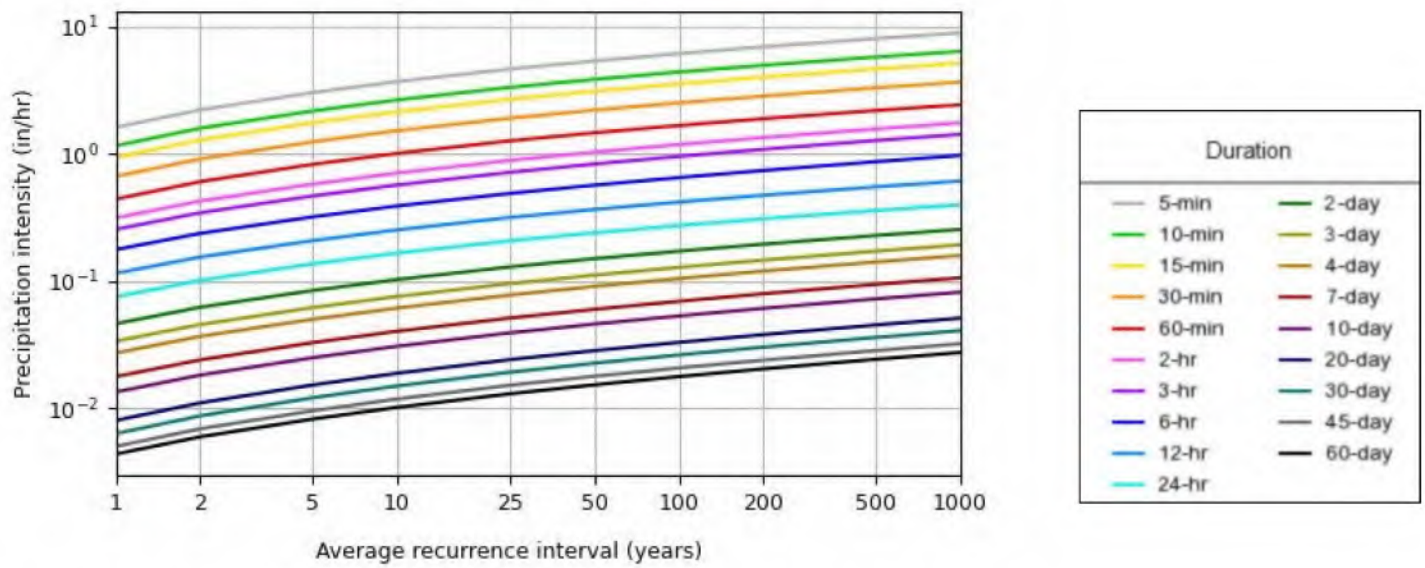
PF graphical





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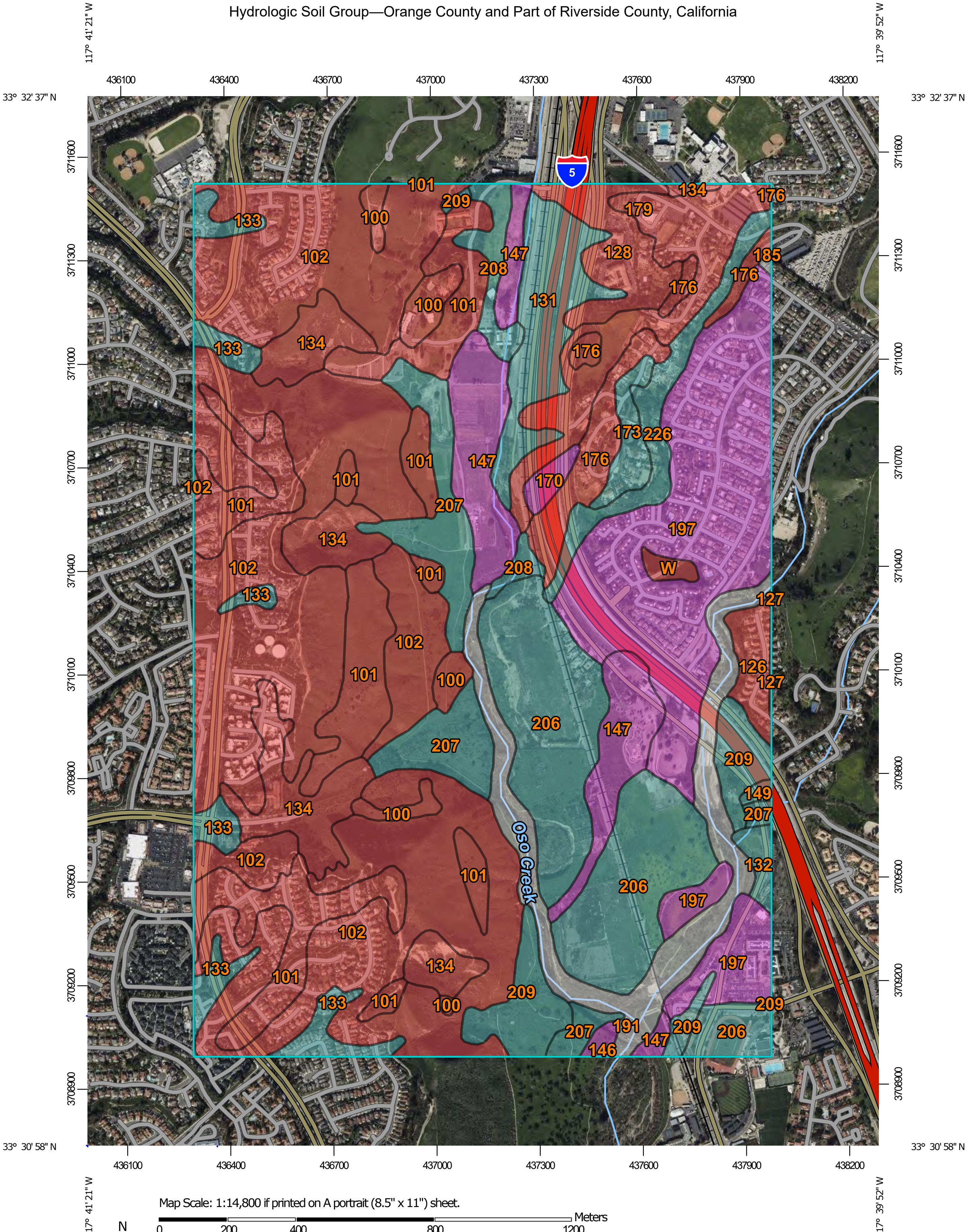
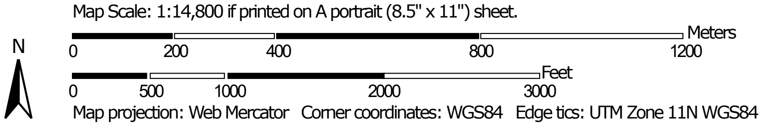
APPENDIX B

HYDROLOGIC SOIL TYPE CLASSIFICATION



Map Scale: 1:14,800 if printed on A portrait (8.5" x 11") sheet.



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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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:
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: Orange County and Part of Riverside County, California
Survey Area Data: Version 19, Sep 8, 2025

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

Date(s) aerial images were photographed: Jan 17, 2023—Feb 8, 2023

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	Alo clay, 9 to 15 percent slopes	D	15.0	1.4%
101	Alo clay, 15 to 30 percent slopes, dry	D	96.4	9.1%
102	Alo clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	D	301.0	28.5%
126	Bosanko clay, 9 to 15 percent slopes	D	9.1	0.9%
127	Bosanko clay, 15 to 30 percent slopes	D	0.4	0.0%
128	Bosanko clay, 30 to 50 percent slopes	D	20.2	1.9%
131	Botella loam, 2 to 9 percent slopes, warm MAAT, lower MAP, MLRA 19	C	30.3	2.9%
132	Botella clay loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	4.1	0.4%
133	Botella clay loam, 9 to 15 percent slopes	C	24.4	2.3%
134	Calleguas clay loam, 50 to 75 percent slopes, eroded	D	52.5	5.0%
146	Corralitos loamy sand	A	1.8	0.2%
147	Corralitos loamy sand, moderately fine substratum	A	50.5	4.8%
149	Cropley clay, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	1.1	0.1%
170	Modjeska gravelly loam, 9 to 15 percent slopes	A	3.6	0.3%
173	Myford sandy loam, 2 to 9 percent slopes	C	8.2	0.8%
176	Myford sandy loam, 15 to 30 percent slopes	D	22.9	2.2%
179	Myford sandy loam, thick surface, 2 to 9 percent slopes	D	38.1	3.6%
185	Pits		0.4	0.0%
191	Riverwash		47.7	4.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
197	Soboba gravelly loamy sand, 0 to 5 percent slopes	A	123.8	11.7%
206	Sorrento loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	101.3	9.6%
207	Sorrento loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	41.4	3.9%
208	Sorrento clay loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	11.8	1.1%
209	Sorrento clay loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	27.5	2.6%
226	Yorba cobbly sandy loam, 30 to 50 percent slopes	C	18.5	1.8%
W	Water	D	2.5	0.2%
Totals for Area of Interest			**1,054.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

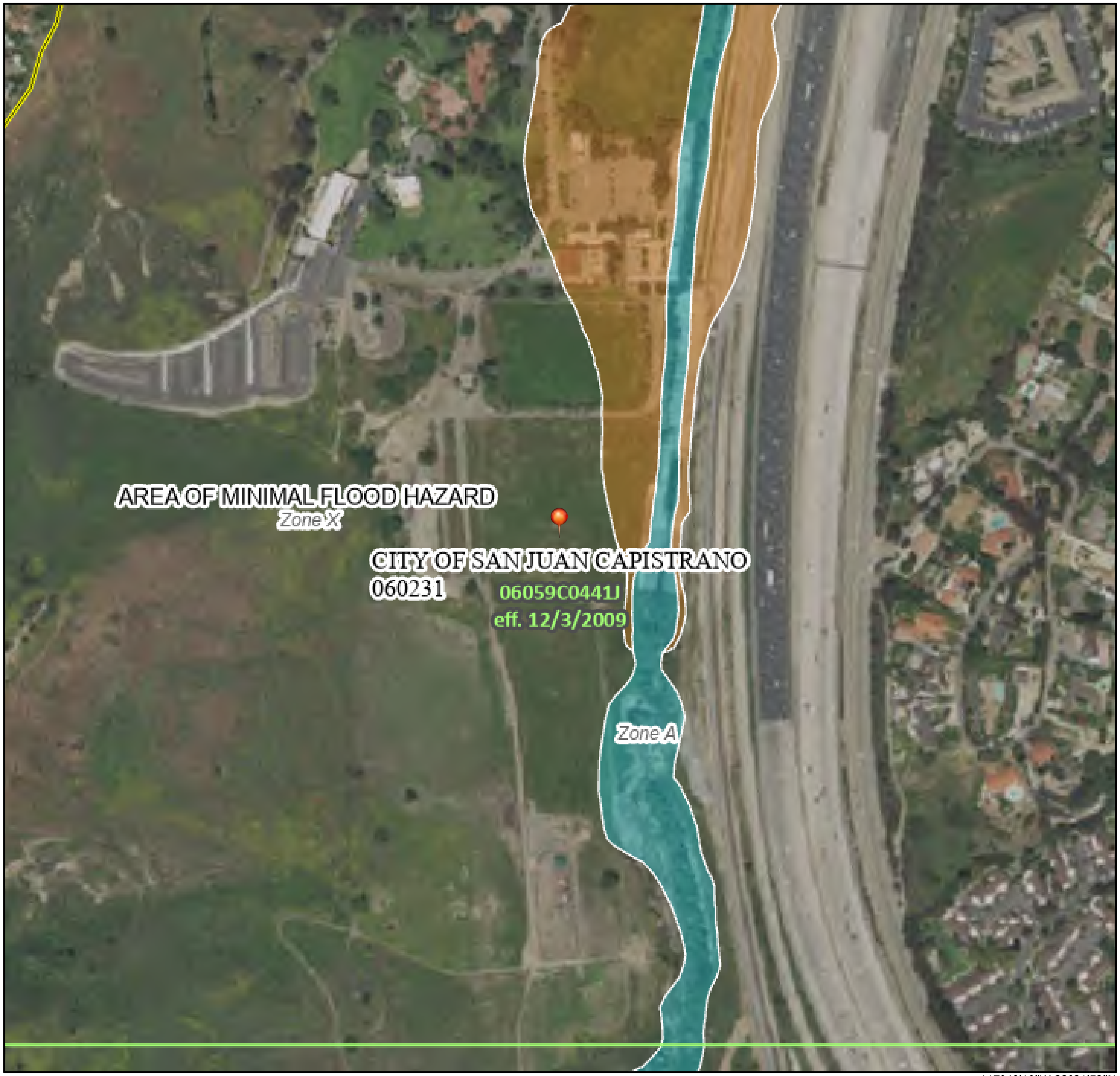
APPENDIX C

FEMA FIRMETTE

National Flood Hazard Layer FIRMette

FEMA

117°40'56"W 33°32'22"N



117°40'19"W 33°31'52"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

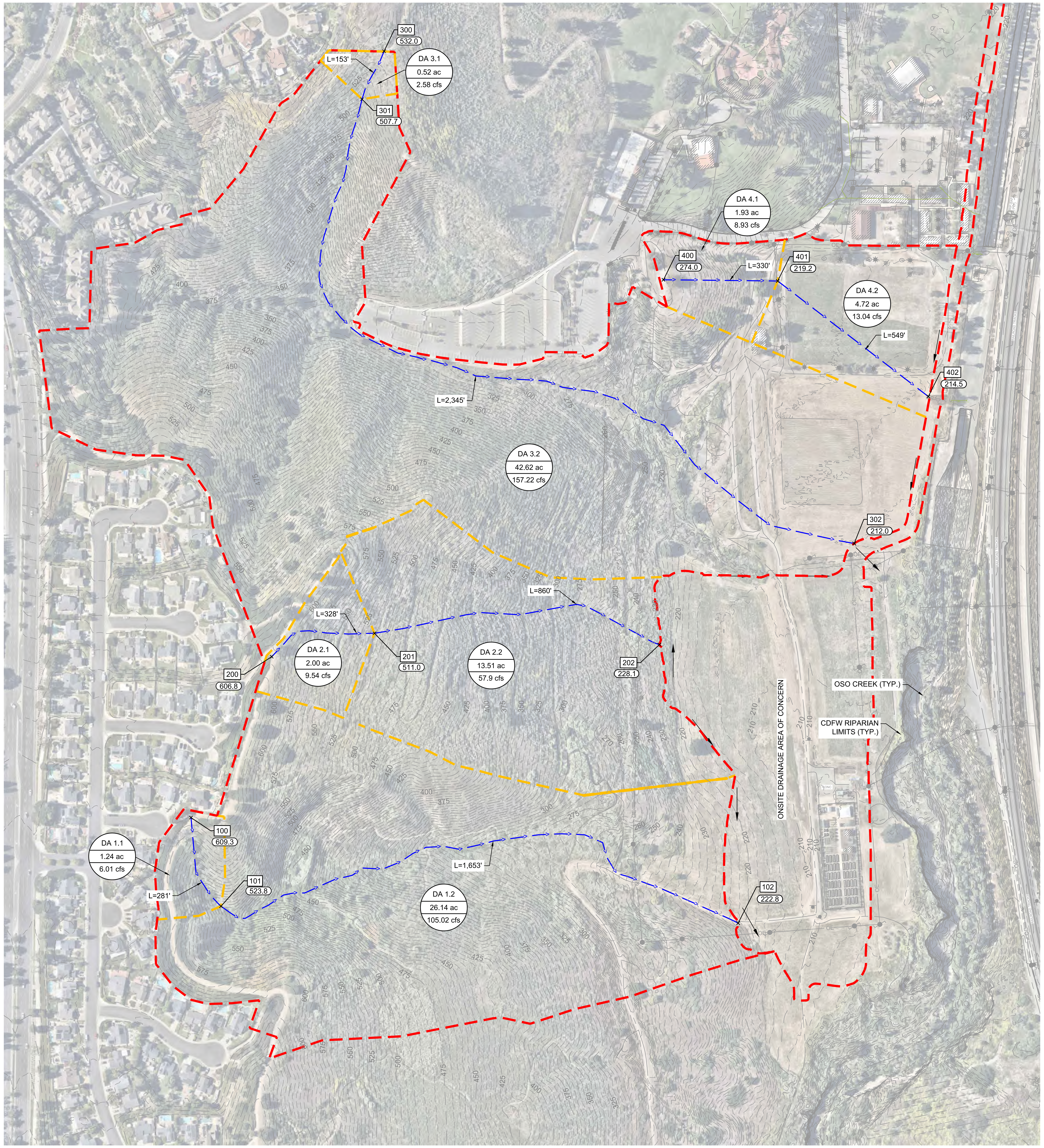
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/5/2025 at 4:38 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX D

DRAINAGE EXHIBITS



LEGEND

- DMA ID
- SUB-DMA ID
- XX.XX / X.XX ac — ACREAGE
- X.X cfs — 100-YR RUNOFF
- XXX — NODE DESIGNATION
- L=XXX' — FLOW PATH LENGTH (FEET)
- DRAINAGE SUB AREA
- DRAINAGE SUB BOUNDARY
- DRAINAGE BOUNDARY
- FLOW PATH
- XXX — EX MAJOR CONTOURS
- XXX — EX MINOR CONTOURS

EXISTING RATIONAL (OFFSITE)

DA ID	A (AC)	Q100 (CFS)	TC100 (MIN)
DA 1.1	1.24	6.01	8.54
DA 1.2	26.14	105.02	14.62
DA 2.1	2.00	9.54	9.16
DA 2.2	13.51	57.9	12.42
DA 3.1	0.52	2.58	7.63
DA 3.2	42.62	157.22	17.18
DA 4.1	1.93	8.93	10.28
DA 4.2	5.76	13.04	17.54
TOTAL	**93.72**	**360.24**	**-**

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

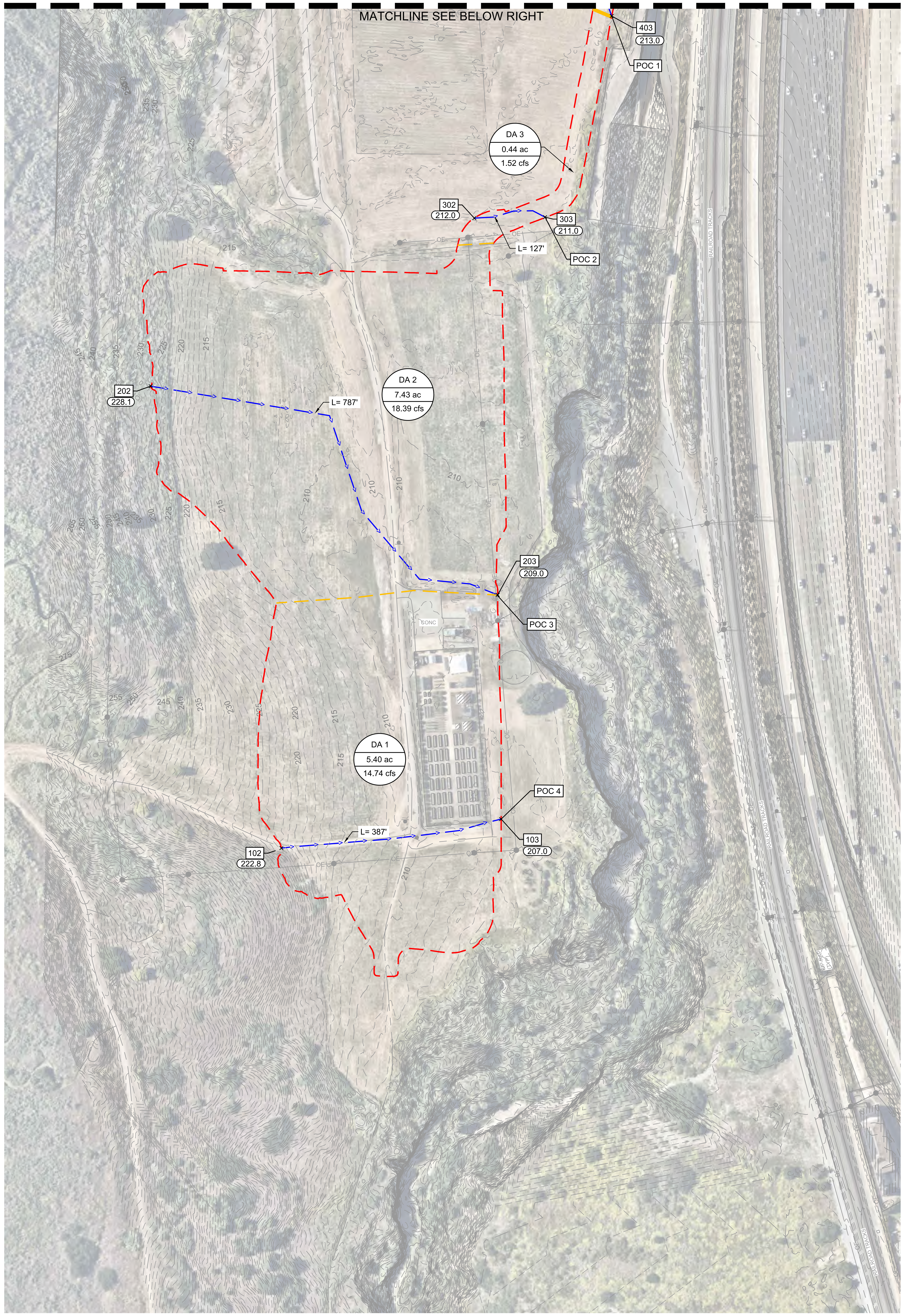
No.	REVISIONS	DATE	BY

Kimley»Horn
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NV 89119
702-862-3600
WWW.KIMLEY-HORN.COM

KHA PROJECT
DATE
SCALE AS SHOWN
DESIGNED BY
DRAWN BY
CHECKED BY

COMPASS BATTERY STORAGE PROJECT
CITY OF SAN JUAN CAPISTRANO, CA
EXISTING OFFSITE DRAINAGE EXHIBIT

SHEET NUMBER
1 OF 1



LEGEND

- DMA ID
- SUB-DMA ID
- XX.XX — ACREAGE: X.XX ac
- RUNOFF: X.X cfs
- XXX — NODE DESIGNATION
- L=XXX' — FLOW PATH LENGTH (FEET)
- POC XX — POINT OF COMPLIANCE
- DRAINAGE SUB BOUNDARY
- DRAINAGE BOUNDARY
- FLOW PATH
- XXX — EX MAJOR CONTOURS
- XXX — EX MINOR CONTOURS

EXISTING RATIONAL

DA ID	A (AC)	Q100 (CFS)	TC (MIN)
DA 1	5.40	14.74	16.20
DA 2	7.43	18.39	16.84
DA 3	0.44	1.52	18.06
DA 4	1.61	4.41	19.56
TOTAL	14.88	39.06	-

EXISTING POC

POC ID	A (AC)	Q100 (CFS)
POC 1	8.26	26.38
POC 2	43.58	159.80
POC 3	22.94	85.83
POC 4	32.78	125.77
TOTAL	107.58	397.78

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

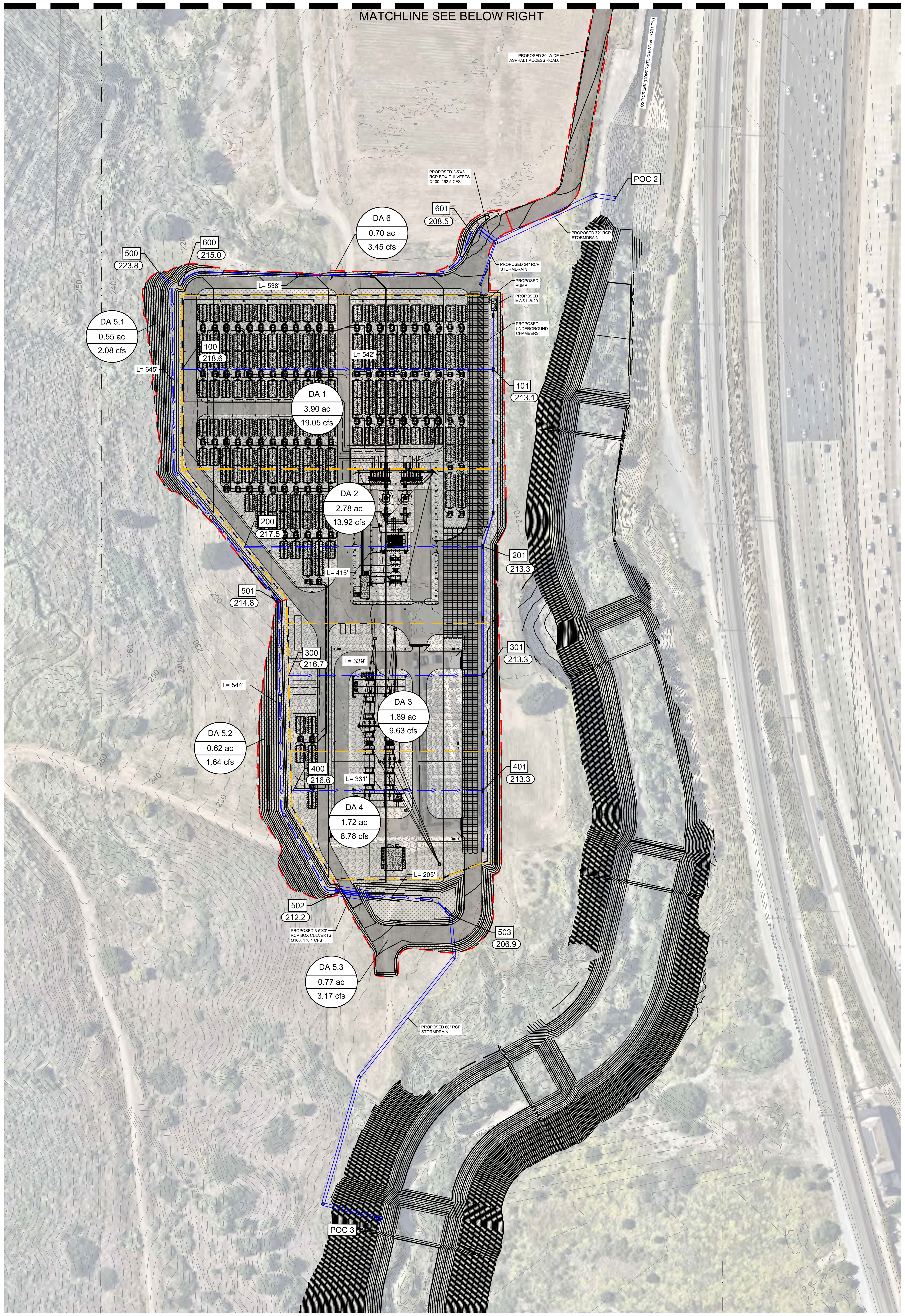
No. | REVISIONS | DATE | BY

Kimley»Horn
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NV 89119
702-862-3600
WWW.KIMLEY-HORN.COM

KHA PROJECT
DATE
SCALE AS SHOWN
DESIGNED BY
DRAWN BY
CHECKED BY

COMPASS BATTERY STORAGE PROJECT
CITY OF SAN JUAN CAPISTRANO, CA
EXISTING ONSITE DRAINAGE EXHIBIT

SHEET NUMBER
1 OF 1



LEGEND

- DMA ID
- SUB-DMA ID: XX.XX
- ACREAGE: X.XX ac
- RUNOFF: X.X cfs
- XXX — NODE DESIGNATION
- L=XXX' — FLOW PATH LENGTH (FEET)
- POC XX — POINT OF COMPLIANCE
- DRAINAGE SUB BOUNDARY
- DRAINAGE BOUNDARY
- FLOW PATH
- XXX — EX MAJOR CONTOURS
- XXX — EX MINOR CONTOURS

PROPOSED RATIONAL			
DA ID	A (AC)	Q100 (CFS)	TC (MIN)
DA 1	3.90	19.05	9.45
DA 2	2.78	13.92	8.49
DA 3	1.89	9.63	7.85
DA 4	1.72	8.78	7.78
DA 5.1	0.55	2.08	16.83
DA 5.2	0.62	1.64	25.21
DA 5.3	0.77	3.17	15.42
DA 6	0.70	3.45	9.09
DA 7	1.96	10.69	5.00
TOTAL	14.88	72.41	-

PROPOSED POC		
POC ID	A (AC)	Q100 (CFS)
POC 1	8.61	32.66
POC 2	54.13	162.53
POC 3	44.83	170.10
TOTAL	107.58	365.29

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

REVISIONS		
No.	DATE	BY

Kimley»Horn
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NV 89119
702-862-3600
WWW.KIMLEY-HORN.COM

KHA PROJECT
DATE
SCALE AS SHOWN
DESIGNED BY
DRAWN BY
CHECKED BY

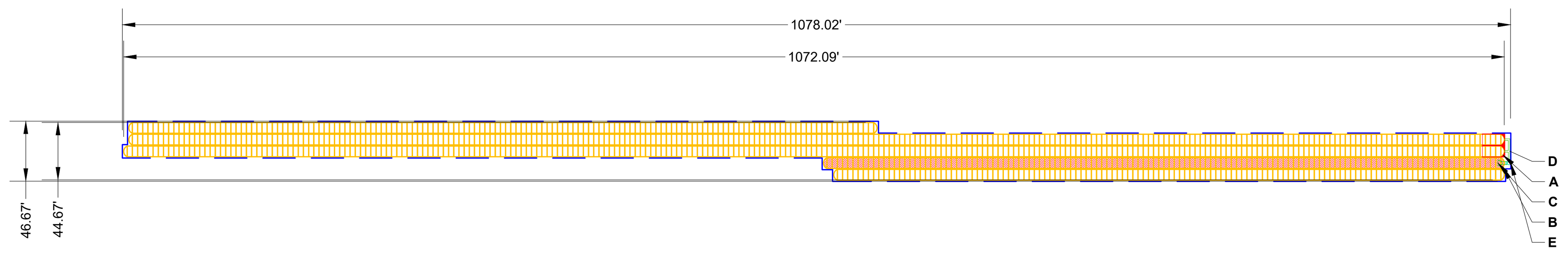
COMPASS BATTERY STORAGE PROJECT
CITY OF SAN JUAN CAPISTRANO, CA
PROPOSED DRAINAGE EXHIBIT

SHEET NUMBER
1 OF 1

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
930	STORMTECH MC-4500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
10	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
156308	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
		12" x 12" TOP MANIFOLD INVERT:	3.72
		24" ISOLATOR ROW PLUS INVERT:	0.94
35793	SYSTEM AREA (SF)	BOTTOM OF MC-4500 CHAMBER:	0.75
2249.4	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	12" TOP PARTIAL CUT END CAP, PART#: MC4500IEPP12T / TYP OF ALL 12" TOP CONNECTIONS	35.69"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	12" x 12" TOP MANIFOLD, ADS N-12	35.69"	
NYLOPLAST (INLET W/ ISO PLUS ROW)	E	30" DIAMETER (24.00" SUMP MIN)		5.0 CFS IN



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

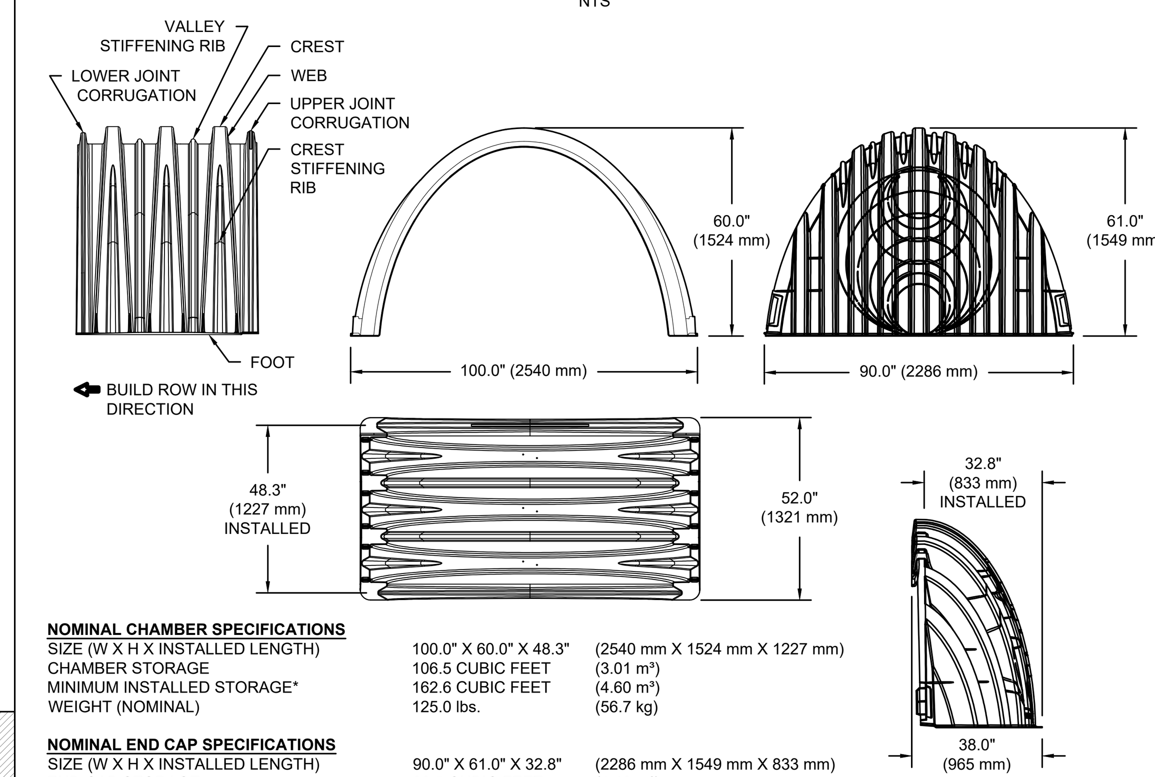
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION**: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

SPACE INTENTIONALLY LEFT BLANK

SPACE INTENTIONALLY LEFT BLANK

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

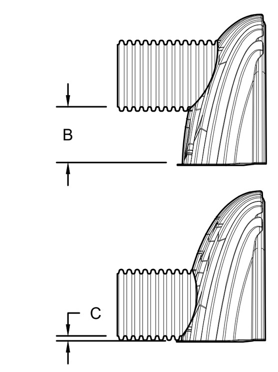
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

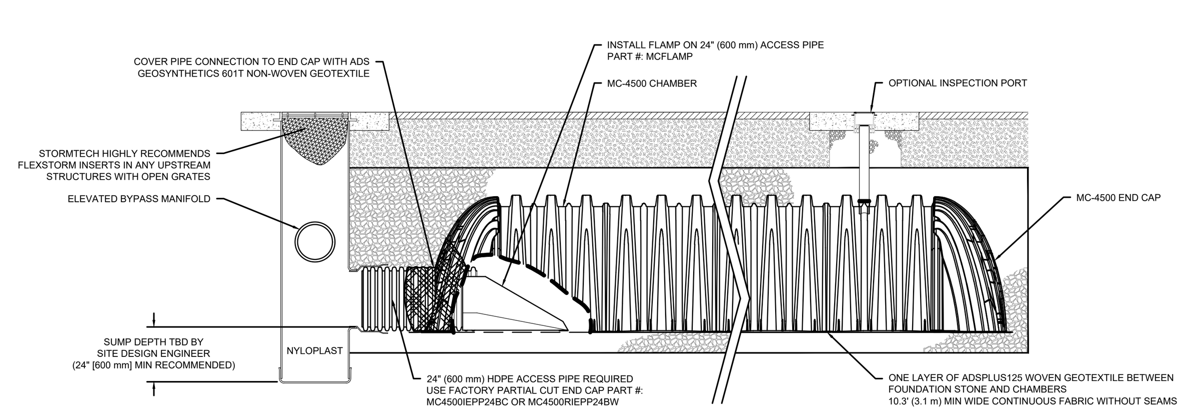
PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW			
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B		---	2.26" (57 mm)
MC4500IEPP24BW			
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-4500 TECHNICAL SPECIFICATION



MC-4500 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

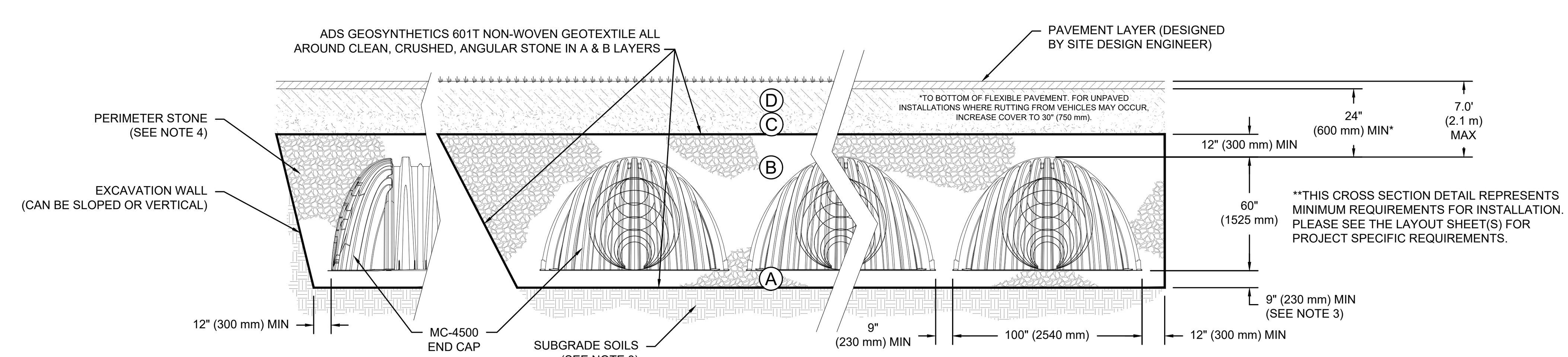
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-4500 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

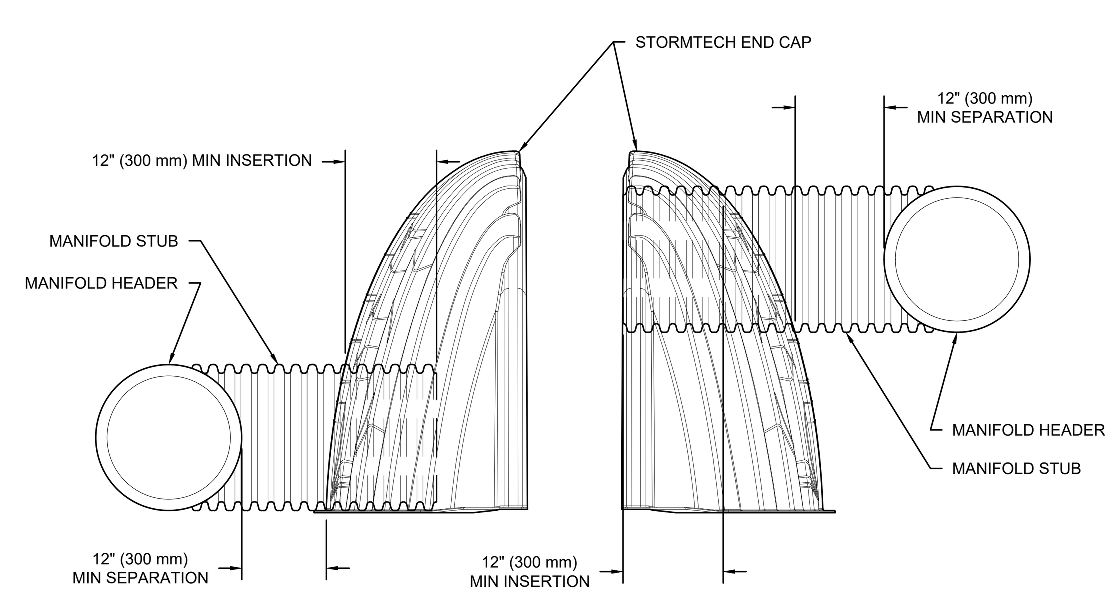
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3”.
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-4500 CROSS SECTION DETAIL

SPACE INTENTIONALLY LEFT BLANK

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

4 MC-SERIES END CAP INSERTION DETAIL

DATE: 11/20/2024
PROJECT #:
NOT TO SCALE
DRAWN: TZ
CHECKED: N/A
REV:

COMPASS BESS (SCENARIO 1)
SAN JUAN CAPISTRANO, CA, USA

StormTech® Chamber System
1-800-821-6710 | WWW.STORMTECH.COM
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APPENDIX E

EXISITING CONDITIONS HYDROLOGY AES RATIONAL METHOD RESULTS

Compass BESS - AES Inputs - Offsite Analysis											
Upstream Node	Downstream Node	Flow Type	AES Code	Upstream Elevation (ft)	Downstream Elevation (ft)	Length (ft)	Path Slope (%)	Land Use	Soil Type	Area (AC)	Drainage Area ID
100	101	Initial Subarea Sheetflow	2	609.30	523.80	281	30.43%	16	D	1.24	1.1
101	102	Channel Flow	5	523.80	222.80	1653	18.21%	16	C, D	26.14	1.2
102	102	Subarea Addition	8					16	C, D		1.2
200	201	Initial Subarea Sheetflow	2	606.80	511.00	328	29.21%	16	D	2.00	2.1
201	202	Channel Flow	5	511.00	226.50	860	33.08%	16	C, D	13.51	2.2
202	202	Subarea Addition	8					16	C, D		2.2
300	301	Initial Subarea Sheetflow	2	532.00	507.70	153	15.88%	16	D	0.52	3.1
301	302	Channel Flow	5	507.70	212.00	2345	12.61%	16	A, C, D	42.62	3.2
302	302	Subarea Addition	8					16	A, C, D		3.2
400	401	Initial Subarea Sheetflow	2	274.00	219.20	330	16.61%	16	D	1.93	4.1
401	402	Channel Flow	5	219.20	214.50	549	0.86%	16	A, C, D	4.72	4.2
402	402	Subarea Addition	8					16	A, C, D		4.2

Assumptions/Codes:

```
USER SPECIFIED STORM EVENT(YEAR) =  100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
*USER-DEFINED TABLED RAINFALL USED*
NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
 1)    5.00;  6.100
 2)   30.00;  2.500
 3)   60.00;  1.660
 4)  180.00;  0.950
 5)  360.00;  0.648
 6)  720.00;  0.416
*ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
   HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
   WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
O.  (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
==  =====  =========  =================  ======  ===== ====== ===== =======
 1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
  1. Relative Flow-Depth =  0.00 FEET
     as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
  2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

Channel Type: Good Earth
Channel Roughness Value: 0.03

Compass BESS - AES Inputs - Existing Onsite Analysis											
Upstream Node	**Downstream Node**	**Flow Type**	**AES Code**	**Upstream Elevation (ft)**	**Downstream Elevation (ft)**	**Length (ft)**	**Path Slope (%)**	**Land Use**	**Soil Type**	**Area (AC)**	**Drainage Area ID**
102	102	Specified Hydrology Info	7	Specified node info: Tc = 14.62 min., Q = 111.03 cfs, Tributary area = 27.38 ac							
102	103	Channel Flow	5	222.80	207.00	387	4.08%	16	A, C	5.40	1
103	103	Subarea Addition	8					16	A, C		1
202	202	Specified Hydrology Info	7	Specified node info: Tc = 12.42 min., Q = 67.44 cfs, Tributary area = 15.51 ac							
202	203	Channel Flow	5	228.10	209.00	787	2.43%	16	A, C, D	7.43	2
203	203	Subarea Addition	8					16	A, C, D		2
302	302	Specified Hydrology Info	7	Specified node info: Tc = 17.18 min., Q = 159.80 cfs, Tributary area = 43.14 ac							
302	303	Channel Flow	5	212.00	211.00	127	0.79%	16	A	0.44	3
303	303	Subarea Addition	8					16	A		3
402	402	Specified Hydrology Info	7	Specified node info: Tc = 19.56 min., Q = 21.97 cfs, Tributary area = 6.65 ac							
402	403	Channel Flow	5	215.30	213.00	75	3.07%	16	A, C	4.72	4
403	403	Subarea Addition	8					16	A, C		4

Assumptions/Codes:

```
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)    5.00;  6.100
   2)   30.00;  2.500
   3)   60.00;  1.660
   4)  180.00;  0.950
   5)  360.00;  0.648
   6)  720.00;  0.416
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)    (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

Channel Type: Good Earth
Channel Roughness Value: 0.03

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                           Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* COMPASS BESS                                                             *
* EXISTING 100-YR OFFSITE AREA ANALYSIS                                    *
* KIMLEY-HORN                                                              *
 **************************************************************************

  FILE NAME: O100.DAT
  TIME/DATE OF STUDY: 09:54 12/03/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)    5.00;  6.100
   2)   30.00;  2.500
   3)   60.00;  1.660
   4)  180.00;  0.950
   5)  360.00;  0.648
   6)  720.00;  0.416
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   281.00
  ELEVATION DATA: UPSTREAM(FEET) =    609.30  DOWNSTREAM(FEET) =    523.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.543
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.590
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        1.24      0.20     1.000    95    8.54
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      6.01
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      6.01

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    523.80  DOWNSTREAM(FEET) =    222.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1653.00   CHANNEL SLOPE =  0.1821
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.714
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       10.67      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        2.40      0.25     1.000    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      32.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.53
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   6.08
  Tc(MIN.) =   14.62
  SUBAREA AREA(ACRES) =    13.07       SUBAREA RUNOFF(CFS) =   52.99
```

```
  EFFECTIVE AREA(ACRES) =     14.31     AREA-AVERAGED Fm(INCH/HR) =   0.21
  AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       14.3         PEAK FLOW RATE(CFS) =      58.03

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   5.38
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1934.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.62
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.714
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       10.67      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        2.40      0.25     1.000    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.07      SUBAREA RUNOFF(CFS) =   52.99
  EFFECTIVE AREA(ACRES) =     27.38   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       27.4       PEAK FLOW RATE(CFS) =     111.03

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
  ELEVATION DATA: UPSTREAM(FEET) =    606.80  DOWNSTREAM(FEET) =    511.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.163
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.500
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        2.00      0.20     1.000    95    9.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      9.54
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =      9.54
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    511.00  DOWNSTREAM(FEET) =    226.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   860.00   CHANNEL SLOPE =  0.3309
  CHANNEL BASE(FEET) =   80.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.031
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        6.73      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.03      0.25     1.000    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      24.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.40
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   3.26
  Tc(MIN.) =   12.42
  SUBAREA AREA(ACRES) =     6.76       SUBAREA RUNOFF(CFS) =   29.39
  EFFECTIVE AREA(ACRES) =      8.76     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        8.8         PEAK FLOW RATE(CFS) =      38.09

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   5.34
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1188.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.42
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.031
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        6.73      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.02      0.25     1.000    91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    6.75      SUBAREA RUNOFF(CFS) =   29.35
  EFFECTIVE AREA(ACRES) =     15.51   AREA-AVERAGED Fm(INCH/HR) =  0.20
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       15.5       PEAK FLOW RATE(CFS) =      67.44

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   153.00
  ELEVATION DATA: UPSTREAM(FEET) =    532.00  DOWNSTREAM(FEET) =    507.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.630
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.721
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.52      0.20     1.000    95    7.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.58
  TOTAL AREA(ACRES) =      0.52   PEAK FLOW RATE(CFS) =      2.58

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    507.70  DOWNSTREAM(FEET) =    212.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2345.00   CHANNEL SLOPE =  0.1261
  CHANNEL BASE(FEET) =   66.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.347
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       15.63      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        3.15      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.53      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      42.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.09
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   9.55
  Tc(MIN.) =   17.18
```

```
  SUBAREA AREA(ACRES) =    21.31       SUBAREA RUNOFF(CFS) =   78.93
  EFFECTIVE AREA(ACRES) =     21.83     AREA-AVERAGED Fm(INCH/HR) =   0.23
  AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       21.8         PEAK FLOW RATE(CFS) =      80.87

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   5.09
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    2498.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   17.18
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.347
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       15.63      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        3.15      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.53      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   21.31      SUBAREA RUNOFF(CFS) =   78.93
  EFFECTIVE AREA(ACRES) =     43.14   AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       43.1       PEAK FLOW RATE(CFS) =     159.80

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    274.00  DOWNSTREAM(FEET) =    219.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.284
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.339
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        1.93      0.20     1.000    95   10.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
```

```
  SUBAREA RUNOFF(CFS) =      8.93
  TOTAL AREA(ACRES) =      1.93   PEAK FLOW RATE(CFS) =      8.93

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    219.20  DOWNSTREAM(FEET) =    214.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   549.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.003
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.05      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.17      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.15      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.39
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.99
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   9.28
  Tc(MIN.) =   19.56
  SUBAREA AREA(ACRES) =     2.37       SUBAREA RUNOFF(CFS) =    7.72
  EFFECTIVE AREA(ACRES) =      4.30     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       4.3        PEAK FLOW RATE(CFS) =      14.32

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     879.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   19.56
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.003
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.05      0.20     1.000    95
  NATURAL FAIR COVER
```

```
  "CHAPARRAL,BROADLEAF"      C        0.16      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.14      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.39
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    2.35      SUBAREA RUNOFF(CFS) =    7.65
  EFFECTIVE AREA(ACRES) =      6.65   AREA-AVERAGED Fm(INCH/HR) =  0.33
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =      21.97
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     19.56
  EFFECTIVE AREA(ACRES) =      6.65  AREA-AVERAGED Fm(INCH/HR)=  0.33
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      21.97
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* COMPASS BESS                                                             *
* EXISTING ONSITE ANALYSIS - 100-YEAR                                      *
* KIMLEY-HORN                                                              *
 **************************************************************************

  FILE NAME: 100YRE.DAT
  TIME/DATE OF STUDY: 11:37 12/03/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)    5.00;  6.100
   2)   30.00;  2.500
   3)   60.00;  1.660
   4)  180.00;  0.950
   5)  360.00;  0.648
   6)  720.00;  0.416
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
```

```
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   14.62   RAINFALL INTENSITY(INCH/HR) =  4.71
  EFFECTIVE AREA(ACRES) =    27.38
  TOTAL AREA(ACRES) =    27.38        PEAK FLOW RATE(CFS) =    111.03
  AREA-AVERAGED Fm(INCH/HR) =   0.21  AREA-AVERAGED Fp(INCH/HR) =   0.21
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    222.80  DOWNSTREAM(FEET) =    207.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   387.00   CHANNEL SLOPE =  0.0408
  CHANNEL BASE(FEET) =   25.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.487
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        1.87      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        0.84      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     116.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.08
  AVERAGE FLOW DEPTH(FEET) =   0.42   TRAVEL TIME(MIN.) =   1.58
  Tc(MIN.) =   16.20
  SUBAREA AREA(ACRES) =     2.71       SUBAREA RUNOFF(CFS) =   10.22
  EFFECTIVE AREA(ACRES) =     30.09     AREA-AVERAGED Fm(INCH/HR) =   0.22
  AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       30.1         PEAK FLOW RATE(CFS) =     115.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   4.10
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    103.00 =     387.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   16.20
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.487
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        1.86      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        0.83      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    2.69      SUBAREA RUNOFF(CFS) =   10.15
  EFFECTIVE AREA(ACRES) =     32.78   AREA-AVERAGED Fm(INCH/HR) =  0.22
  AREA-AVERAGED Fp(INCH/HR) =  0.22  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       32.8       PEAK FLOW RATE(CFS) =     125.77

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   12.42   RAINFALL INTENSITY(INCH/HR) =  5.03
  EFFECTIVE AREA(ACRES) =    15.51
  TOTAL AREA(ACRES) =    15.51        PEAK FLOW RATE(CFS) =     67.44
  AREA-AVERAGED Fm(INCH/HR) =   0.20  AREA-AVERAGED Fp(INCH/HR) =   0.20
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    228.10  DOWNSTREAM(FEET) =    209.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   787.00   CHANNEL SLOPE =  0.0243
  CHANNEL BASE(FEET) =   25.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.396
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.64      0.20     1.000    95
```

```
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        1.16      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        1.92      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      74.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.97
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   4.42
  Tc(MIN.) =   16.84
  SUBAREA AREA(ACRES) =     3.72       SUBAREA RUNOFF(CFS) =   13.65
  EFFECTIVE AREA(ACRES) =     19.23     AREA-AVERAGED Fm(INCH/HR) =   0.22
  AREA-AVERAGED Fp(INCH/HR) =   0.22  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       19.2         PEAK FLOW RATE(CFS) =      72.22

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   2.98
  LONGEST FLOWPATH FROM NODE    202.00 TO NODE    203.00 =    1174.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   16.84
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.396
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.64      0.20     1.000    95
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        1.16      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        1.91      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    3.71      SUBAREA RUNOFF(CFS) =   13.61
  EFFECTIVE AREA(ACRES) =     22.94   AREA-AVERAGED Fm(INCH/HR) =  0.24
  AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       22.9       PEAK FLOW RATE(CFS) =      85.83

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   17.18   RAINFALL INTENSITY(INCH/HR) =  4.35
  EFFECTIVE AREA(ACRES) =    43.14
  TOTAL AREA(ACRES) =    43.14        PEAK FLOW RATE(CFS) =    159.80
```

```
  AREA-AVERAGED Fm(INCH/HR) =   0.23  AREA-AVERAGED Fp(INCH/HR) =   0.23
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    212.00  DOWNSTREAM(FEET) =    211.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   127.00   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =   25.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.219
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        0.22      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     160.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.40
  AVERAGE FLOW DEPTH(FEET) =   0.70   TRAVEL TIME(MIN.) =   0.88
  Tc(MIN.) =   18.06
  SUBAREA AREA(ACRES) =     0.22       SUBAREA RUNOFF(CFS) =    0.76
  EFFECTIVE AREA(ACRES) =     43.36     AREA-AVERAGED Fm(INCH/HR) =   0.23
  AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       43.4         PEAK FLOW RATE(CFS) =     159.80
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.70   FLOW VELOCITY(FEET/SEC.) =   2.39
  LONGEST FLOWPATH FROM NODE    302.00 TO NODE    303.00 =    1301.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   18.06
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.219
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        0.22      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
```

```
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.76
  EFFECTIVE AREA(ACRES) =     43.58   AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       43.6       PEAK FLOW RATE(CFS) =     159.80
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   19.56   RAINFALL INTENSITY(INCH/HR) =  4.00
  EFFECTIVE AREA(ACRES) =     6.65
  TOTAL AREA(ACRES) =     6.65        PEAK FLOW RATE(CFS) =     21.97
  AREA-AVERAGED Fm(INCH/HR) =   0.39  AREA-AVERAGED Fp(INCH/HR) =   0.39
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    215.30  DOWNSTREAM(FEET) =    213.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.0307
  CHANNEL BASE(FEET) =   25.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.929
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.34      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        0.47      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      23.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.41
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   0.52
  Tc(MIN.) =   20.08
  SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    2.62
  EFFECTIVE AREA(ACRES) =      7.46     AREA-AVERAGED Fm(INCH/HR) =   0.38
  AREA-AVERAGED Fp(INCH/HR) =   0.38  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        7.5         PEAK FLOW RATE(CFS) =      23.80

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   2.37
```

```
  LONGEST FLOWPATH FROM NODE    402.00 TO NODE    403.00 =    1376.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   20.08
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.929
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.34      0.25     1.000    91
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        0.46      0.40     1.000    60
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.80      SUBAREA RUNOFF(CFS) =    2.59
  EFFECTIVE AREA(ACRES) =      8.26   AREA-AVERAGED Fm(INCH/HR) =  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.38  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        8.3       PEAK FLOW RATE(CFS) =      26.38
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.3  TC(MIN.) =     20.08
  EFFECTIVE AREA(ACRES) =      8.26  AREA-AVERAGED Fm(INCH/HR)=  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.38  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      26.38
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX F

PROPOSED CONDITIONS HYDROLOGY AES RATIONAL METHOD RESULTS

Compass BESS - AES Inputs - Proposed Onsite Analysis											
Upstream Node	**Downstream Node**	**Flow Type**	**AES Code**	**Upstream Elevation (ft)**	**Downstream Elevation (ft)**	**Length (ft)**	**Path Slope (%)**	**Land Use**	**Soil Type**	**Area (AC)**	**Drainage Area ID**
100	101	Initial Subarea Sheetflow	2	218.60	213.10	542	1.01%	Commercial	A, C, D	3.90	1
200	201	Initial Subarea Sheetflow	2	217.50	213.30	415	1.01%	Commercial	A, C, D	2.78	2
300	301	Initial Subarea Sheetflow	2	216.70	213.30	339	1.00%	Commercial	A, C	1.89	3
400	401	Initial Subarea Sheetflow	2	216.60	213.30	331	1.00%	Commercial	A, C	1.72	4
500	500	Specified Hydrology Info	7	Specified node info: Tc = 12.42 min., Q = 67.44 cfs, Tributary area = 15.51 ac							
500	501	Channel Flow	5	223.80	214.80	645	1.40%	Natural Good Cover "Grass"	C, D	0.55	5.1
501	502	Channel Flow	5	214.80	213.90	544	0.17%	Natural Good Cover "Grass"	C	0.62	5.2
502	502	Open Confluence	1								
502	502	Specified Hydrology Info	7	Specified node info: Tc = 14.62 min., Q = 111.03 cfs, Tributary area = 27.38 ac							
502	502	Close Confluence	1								
502	503	Channel Flow	5	213.90	206.90	205	3.41%	Commercial	A, C	0.77	5.3
600	601	Initial Subarea Sheetflow	2	215.00	208.50	538	1.21%	Commercial	A, C, D	0.70	6
601	601	Open Confluence	1								
601	601	Specified Hydrology Info	7	Specified node info: Tc = 17.18 min., Q = 159.80 cfs, Tributary area = 43.14 ac							
601	601	Close Confluence	1								
700	701	Initial Subarea Sheetflow	2	215.00	214.60	37	1.08%	Commercial	A, C	1.96	7

Assumptions/Codes:

```
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)    5.00;  6.100
   2)   30.00;  2.500
   3)   60.00;  1.660
   4)  180.00;  0.950
   5)  360.00;  0.648
   6)  720.00;  0.416
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
 1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                            Analysis prepared by:





 ************************** DESCRIPTION OF STUDY **************************
* COMPASS BESS                                                             *
* PROPOSED 100 YR                                                          *
* KIMLEY-HORN                                                              *
 **************************************************************************

  FILE NAME: 100YR.DAT
  TIME/DATE OF STUDY: 12:17 12/04/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  6
   1)    5.00;  6.100
   2)   30.00;  2.500
   3)   60.00;  1.660
   4)  180.00;  0.950
   5)  360.00;  0.648
   6)  720.00;  0.416
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
```

```
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   542.00
  ELEVATION DATA: UPSTREAM(FEET) =    218.60  DOWNSTREAM(FEET) =    213.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.445
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.460
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.51      0.20     0.100    91    9.44
  COMMERCIAL                 C       1.25      0.25     0.100    86    9.44
  COMMERCIAL                 A       2.14      0.40     0.100    52    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     19.05
  TOTAL AREA(ACRES) =      3.90   PEAK FLOW RATE(CFS) =     19.05

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   415.00
  ELEVATION DATA: UPSTREAM(FEET) =    217.50  DOWNSTREAM(FEET) =    213.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.493
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.597
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.18      0.20     0.100    91    8.49
  COMMERCIAL                 C       0.99      0.25     0.100    86    8.49
  COMMERCIAL                 A       1.61      0.40     0.100    52    8.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     13.92
  TOTAL AREA(ACRES) =      2.78   PEAK FLOW RATE(CFS) =     13.92
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   339.00
  ELEVATION DATA: UPSTREAM(FEET) =    216.70  DOWNSTREAM(FEET) =    213.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.847
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.690
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       1.19      0.25     0.100    86    7.85
  COMMERCIAL                 A       0.70      0.40     0.100    52    7.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      9.63
  TOTAL AREA(ACRES) =      1.89   PEAK FLOW RATE(CFS) =      9.63

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   331.00
  ELEVATION DATA: UPSTREAM(FEET) =    216.60  DOWNSTREAM(FEET) =    213.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.782
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.699
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       1.24      0.25     0.100    86    7.78
  COMMERCIAL                 A       0.48      0.40     0.100    52    7.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      8.78
  TOTAL AREA(ACRES) =      1.72   PEAK FLOW RATE(CFS) =      8.78

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
```

```
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   12.42   RAINFALL INTENSITY(INCH/HR) =  5.03
  EFFECTIVE AREA(ACRES) =    15.51
  TOTAL AREA(ACRES) =    15.51        PEAK FLOW RATE(CFS) =     67.44
  AREA-AVERAGED Fm(INCH/HR) =   0.20  AREA-AVERAGED Fp(INCH/HR) =   0.20
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    223.80  DOWNSTREAM(FEET) =    214.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   645.00   CHANNEL SLOPE =  0.0140
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.396
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                    D        0.52      0.20     1.000    94
  NATURAL GOOD COVER
  "GRASS"                    C        0.03      0.25     1.000    90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      68.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.44
  AVERAGE FLOW DEPTH(FEET) =   0.51   TRAVEL TIME(MIN.) =   4.41
  Tc(MIN.) =   16.83
  SUBAREA AREA(ACRES) =     0.55       SUBAREA RUNOFF(CFS) =    2.08
  EFFECTIVE AREA(ACRES) =     16.06     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       16.1         PEAK FLOW RATE(CFS) =     67.44
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =   2.42
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    501.00 =     976.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    214.80  DOWNSTREAM(FEET) =    213.90
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   544.00   CHANNEL SLOPE =  0.0017
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.189
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                    C        0.62      0.25     1.000    90
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      68.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.08
  AVERAGE FLOW DEPTH(FEET) =   0.77   TRAVEL TIME(MIN.) =   8.38
  Tc(MIN.) =   25.21
  SUBAREA AREA(ACRES) =     0.62       SUBAREA RUNOFF(CFS) =    1.64
  EFFECTIVE AREA(ACRES) =     16.68     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       16.7         PEAK FLOW RATE(CFS) =      67.44
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.77   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   25.21
  RAINFALL INTENSITY(INCH/HR) =   3.19
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      16.68
  TOTAL STREAM AREA(ACRES) =      16.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      67.44

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   14.62   RAINFALL INTENSITY(INCH/HR) =  4.71
  EFFECTIVE AREA(ACRES) =    27.38
  TOTAL AREA(ACRES) =    27.38        PEAK FLOW RATE(CFS) =    111.03
```

```
  AREA-AVERAGED Fm(INCH/HR) =   0.21  AREA-AVERAGED Fp(INCH/HR) =   0.21
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.62
  RAINFALL INTENSITY(INCH/HR) =   4.71
  AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      27.38
  TOTAL STREAM AREA(ACRES) =      27.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     111.03

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       67.44   25.21    3.189  0.20( 0.20) 1.00      16.7     500.00
      2      111.03   14.62    4.715  0.21( 0.21) 1.00      27.4     502.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      170.10   14.62    4.715  0.21( 0.21) 1.00      37.1     502.00
      2      140.87   25.21    3.189  0.21( 0.21) 1.00      44.1     500.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     170.10    Tc(MIN.) =    14.62
  EFFECTIVE AREA(ACRES) =      37.05   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       44.1
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    213.90  DOWNSTREAM(FEET) =    206.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0341
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.599
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.49      0.25     0.100    86
  COMMERCIAL                 A        0.28      0.40     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     171.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.26
  AVERAGE FLOW DEPTH(FEET) =   0.61   TRAVEL TIME(MIN.) =   0.80
  Tc(MIN.) =   15.42
  SUBAREA AREA(ACRES) =     0.77       SUBAREA RUNOFF(CFS) =    3.17
  EFFECTIVE AREA(ACRES) =     37.82     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   0.98
  TOTAL AREA(ACRES) =       44.8         PEAK FLOW RATE(CFS) =     170.10
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.61   FLOW VELOCITY(FEET/SEC.) =   4.22
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    503.00 =    1725.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   538.00
  ELEVATION DATA: UPSTREAM(FEET) =    215.00  DOWNSTREAM(FEET) =    208.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.094
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.510
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.42      0.40     0.100    52    9.09
  COMMERCIAL                 C        0.22      0.25     0.100    86    9.09
  COMMERCIAL                 D        0.06      0.20     0.100    91    9.09
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.45
  TOTAL AREA(ACRES) =      0.70   PEAK FLOW RATE(CFS) =      3.45

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

```
  FLOW PROCESS FROM NODE    601.00 TO NODE    601.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.09
  RAINFALL INTENSITY(INCH/HR) =   5.51
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.34
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.70
  TOTAL STREAM AREA(ACRES) =       0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.45

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    601.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   17.18   RAINFALL INTENSITY(INCH/HR) =  4.35
  EFFECTIVE AREA(ACRES) =    43.14
  TOTAL AREA(ACRES) =    43.14        PEAK FLOW RATE(CFS) =    159.80
  AREA-AVERAGED Fm(INCH/HR) =   0.23  AREA-AVERAGED Fp(INCH/HR) =   0.23
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    601.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.18
  RAINFALL INTENSITY(INCH/HR) =   4.35
  AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.23
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      43.14
  TOTAL STREAM AREA(ACRES) =      43.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     159.80

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.45    9.09    5.510  0.34( 0.03) 0.10       0.7     600.00
```

```
    2      159.80   17.18    4.346  0.23( 0.23) 1.00      43.1     601.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1      111.97    9.09    5.510  0.23( 0.22) 0.97      23.5     600.00
      2      162.52   17.18    4.346  0.23( 0.23) 0.99      43.8     601.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     162.52    Tc(MIN.) =    17.18
  EFFECTIVE AREA(ACRES) =      43.84   AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.99
  TOTAL AREA(ACRES) =       43.8
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    601.00 =     538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    37.00
  ELEVATION DATA: UPSTREAM(FEET) =    215.00  DOWNSTREAM(FEET) =    214.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.100
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.20      0.25     0.100    86    5.00
  COMMERCIAL                 A        1.76      0.40     0.100    52    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.69
  TOTAL AREA(ACRES) =      1.96   PEAK FLOW RATE(CFS) =     10.69
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      1.96  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.38  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      10.69
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX G

AES UNIT HYDROGRAPGH RESULTS

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____________________________________________________________________________
****************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
         (C) Copyright 1989-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                            Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  COMPASS BESS
  PROPOSED 100-YR
  KIMLEY-HORN
----------------------------------------------------------------------------
=================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     6.54 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         10.29        0.00       75.(AMC II)     0.315       0.964

    TOTAL AREA (Acres) =     10.29
                                   _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.000
                                            _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.036
=================================================================

    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.02
    TOTAL CATCHMENT AREA(ACRES) =   10.29
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.000
    LOW LOSS FRACTION = 0.036
    TIME OF CONCENTRATION(MIN.) =  7.78
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.51
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  1.25
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.66
```

```
      3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.86
      6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.88
     24-HOUR   POINT RAINFALL VALUE(INCHES) =  6.54

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     5.67
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =    -0.06

****************************************************************************
  TIME     VOLUME       Q     0.       15.0      30.0      45.0      60.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.05      0.0023      1.08  Q         .         .         .         .
  0.18      0.0138      1.08  Q         .         .         .         .
  0.31      0.0254      1.08  Q         .         .         .         .
  0.44      0.0370      1.09  Q         .         .         .         .
  0.57      0.0487      1.10  Q         .         .         .         .
  0.70      0.0605      1.10  Q         .         .         .         .
  0.83      0.0723      1.11  Q         .         .         .         .
  0.96      0.0842      1.11  Q         .         .         .         .
  1.09      0.0961      1.12  Q         .         .         .         .
  1.22      0.1081      1.12  Q         .         .         .         .
  1.35      0.1202      1.13  Q         .         .         .         .
  1.48      0.1324      1.14  Q         .         .         .         .
  1.61      0.1446      1.14  Q         .         .         .         .
  1.74      0.1568      1.15  Q         .         .         .         .
  1.87      0.1692      1.16  Q         .         .         .         .
  2.00      0.1816      1.16  Q         .         .         .         .
  2.13      0.1941      1.17  Q         .         .         .         .
  2.26      0.2067      1.17  Q         .         .         .         .
  2.38      0.2193      1.18  Q         .         .         .         .
  2.51      0.2320      1.19  Q         .         .         .         .
  2.64      0.2448      1.20  Q         .         .         .         .
  2.77      0.2577      1.20  Q         .         .         .         .
  2.90      0.2706      1.21  Q         .         .         .         .
  3.03      0.2836      1.22  Q         .         .         .         .
  3.16      0.2967      1.23  Q         .         .         .         .
  3.29      0.3099      1.23  Q         .         .         .         .
  3.42      0.3232      1.24  Q         .         .         .         .
  3.55      0.3365      1.25  Q         .         .         .         .
  3.68      0.3500      1.26  Q         .         .         .         .
  3.81      0.3635      1.26  Q         .         .         .         .
  3.94      0.3771      1.28  Q         .         .         .         .
  4.07      0.3908      1.28  Q         .         .         .         .
  4.20      0.4046      1.29  Q         .         .         .         .
  4.33      0.4185      1.30  Q         .         .         .         .
  4.46      0.4325      1.31  Q         .         .         .         .
  4.59      0.4466      1.32  Q         .         .         .         .
  4.72      0.4607      1.33  Q         .         .         .         .
```

4.85	0.4750	1.34	Q	.	.	.	.
4.98	0.4894	1.35	Q	.	.	.	.
5.11	0.5039	1.36	Q	.	.	.	.
5.24	0.5185	1.37	Q	.	.	.	.
5.37	0.5332	1.38	Q	.	.	.	.
5.50	0.5480	1.39	Q	.	.	.	.
5.63	0.5630	1.40	Q	.	.	.	.
5.76	0.5780	1.41	Q	.	.	.	.
5.89	0.5932	1.42	Q	.	.	.	.
6.02	0.6085	1.43	Q	.	.	.	.
6.15	0.6239	1.44	Q	.	.	.	.
6.27	0.6394	1.46	Q	.	.	.	.
6.40	0.6551	1.47	Q	.	.	.	.
6.53	0.6709	1.48	Q	.	.	.	.
6.66	0.6868	1.49	Q	.	.	.	.
6.79	0.7029	1.51	.Q	.	.	.	.
6.92	0.7191	1.52	.Q	.	.	.	.
7.05	0.7354	1.53	.Q	.	.	.	.
7.18	0.7519	1.54	.Q	.	.	.	.
7.31	0.7686	1.56	.Q	.	.	.	.
7.44	0.7854	1.57	.Q	.	.	.	.
7.57	0.8023	1.59	.Q	.	.	.	.
7.70	0.8195	1.60	.Q	.	.	.	.
7.83	0.8367	1.62	.Q	.	.	.	.
7.96	0.8542	1.63	.Q	.	.	.	.
8.09	0.8718	1.66	.Q	.	.	.	.
8.22	0.8896	1.67	.Q	.	.	.	.
8.35	0.9076	1.69	.Q	.	.	.	.
8.48	0.9258	1.70	.Q	.	.	.	.
8.61	0.9442	1.73	.Q	.	.	.	.
8.74	0.9627	1.74	.Q	.	.	.	.
8.87	0.9815	1.77	.Q	.	.	.	.
9.00	1.0005	1.78	.Q	.	.	.	.
9.13	1.0197	1.81	.Q	.	.	.	.
9.26	1.0391	1.82	.Q	.	.	.	.
9.39	1.0588	1.85	.Q	.	.	.	.
9.52	1.0787	1.86	.Q	.	.	.	.
9.65	1.0988	1.90	.Q	.	.	.	.
9.78	1.1192	1.91	.Q	.	.	.	.
9.91	1.1399	1.94	.Q	.	.	.	.
10.04	1.1608	1.96	.Q	.	.	.	.
10.16	1.1820	2.00	.Q	.	.	.	.
10.29	1.2035	2.02	.Q	.	.	.	.
10.42	1.2253	2.05	.Q	.	.	.	.
10.55	1.2474	2.07	.Q	.	.	.	.
10.68	1.2699	2.11	.Q	.	.	.	.
10.81	1.2926	2.14	.Q	.	.	.	.
10.94	1.3158	2.18	.Q	.	.	.	.
11.07	1.3393	2.20	.Q	.	.	.	.
11.20	1.3631	2.25	.Q	.	.	.	.

```
11.33      1.3874      2.28  .Q        .         .         .         .
11.46      1.4121      2.33  .Q        .         .         .         .
11.59      1.4372      2.36  .Q        .         .         .         .
11.72      1.4628      2.41  .Q        .         .         .         .
11.85      1.4888      2.45  .Q        .         .         .         .
11.98      1.5153      2.51  .Q        .         .         .         .
12.11      1.5430      2.66  .Q        .         .         .         .
12.24      1.5736      3.05  . Q       .         .         .         .
12.37      1.6065      3.08  . Q       .         .         .         .
12.50      1.6400      3.17  . Q       .         .         .         .
12.63      1.6741      3.21  . Q       .         .         .         .
12.76      1.7090      3.30  . Q       .         .         .         .
12.89      1.7447      3.35  . Q       .         .         .         .
13.02      1.7812      3.46  . Q       .         .         .         .
13.15      1.8185      3.51  . Q       .         .         .         .
13.28      1.8568      3.63  . Q       .         .         .         .
13.41      1.8960      3.70  . Q       .         .         .         .
13.54      1.9364      3.83  . Q       .         .         .         .
13.67      1.9779      3.91  . Q       .         .         .         .
13.80      2.0206      4.07  . Q       .         .         .         .
13.93      2.0647      4.16  . Q       .         .         .         .
14.05      2.1108      4.43  . Q       .         .         .         .
14.18      2.1614      5.01  .  Q      .         .         .         .
14.31      2.2164      5.25  .  Q      .         .         .         .
14.44      2.2734      5.39  .  Q      .         .         .         .
14.57      2.3328      5.69  .  Q      .         .         .         .
14.70      2.3947      5.86  .  Q      .         .         .         .
14.83      2.4597      6.26  .   Q     .         .         .         .
14.96      2.5280      6.49  .   Q     .         .         .         .
15.09      2.6004      7.04  .   Q     .         .         .         .
15.22      2.6776      7.37  .   Q     .         .         .         .
15.35      2.7610      8.20  .    Q    .         .         .         .
15.48      2.8460      7.67  .    Q    .         .         .         .
15.61      2.9337      8.70  .    Q    .         .         .         .
15.74      3.0328      9.80  .     Q   .         .         .         .
15.87      3.1729     16.35  .         Q         .         .         .
16.00      3.3746     21.30  .         .   Q     .         .         .
16.13      3.7640     51.38  .         .         .         .   Q     .
16.26      4.1114     13.44  .       Q .         .         .         .
16.39      4.2256      7.88  .    Q    .         .         .         .
16.52      4.3093      7.75  .    Q    .         .         .         .
16.65      4.3870      6.75  .   Q     .         .         .         .
16.78      4.4556      6.05  .   Q     .         .         .         .
16.91      4.5176      5.53  .  Q      .         .         .         .
17.04      4.5748      5.13  .  Q      .         .         .         .
17.17      4.6251      4.25  . Q       .         .         .         .
17.30      4.6692      3.99  . Q       .         .         .         .
17.43      4.7107      3.76  . Q       .         .         .         .
17.56      4.7500      3.57  . Q       .         .         .         .
17.69      4.7874      3.40  . Q       .         .         .         .
```

17.82	4.8231	3.26	. Q	.	.	.	.
17.94	4.8573	3.13	. Q	.	.	.	.
18.07	4.8901	3.01	. Q	.	.	.	.
18.20	4.9195	2.48	.Q	.	.	.	.
18.33	4.9456	2.39	.Q	.	.	.	.
18.46	4.9707	2.30	.Q	.	.	.	.
18.59	4.9950	2.23	.Q	.	.	.	.
18.72	5.0185	2.16	.Q	.	.	.	.
18.85	5.0412	2.09	.Q	.	.	.	.
18.98	5.0634	2.03	.Q	.	.	.	.
19.11	5.0849	1.98	.Q	.	.	.	.
19.24	5.1058	1.93	.Q	.	.	.	.
19.37	5.1262	1.88	.Q	.	.	.	.
19.50	5.1461	1.83	.Q	.	.	.	.
19.63	5.1655	1.79	.Q	.	.	.	.
19.76	5.1845	1.75	.Q	.	.	.	.
19.89	5.2031	1.71	.Q	.	.	.	.
20.02	5.2213	1.68	.Q	.	.	.	.
20.15	5.2391	1.64	.Q	.	.	.	.
20.28	5.2565	1.61	.Q	.	.	.	.
20.41	5.2737	1.58	.Q	.	.	.	.
20.54	5.2905	1.55	.Q	.	.	.	.
20.67	5.3069	1.53	.Q	.	.	.	.
20.80	5.3232	1.50	Q	.	.	.	.
20.93	5.3391	1.47	Q	.	.	.	.
21.06	5.3548	1.45	Q	.	.	.	.
21.19	5.3702	1.43	Q	.	.	.	.
21.32	5.3853	1.40	Q	.	.	.	.
21.45	5.4003	1.38	Q	.	.	.	.
21.58	5.4150	1.36	Q	.	.	.	.
21.71	5.4295	1.34	Q	.	.	.	.
21.83	5.4438	1.32	Q	.	.	.	.
21.96	5.4578	1.31	Q	.	.	.	.
22.09	5.4717	1.29	Q	.	.	.	.
22.22	5.4854	1.27	Q	.	.	.	.
22.35	5.4990	1.25	Q	.	.	.	.
22.48	5.5123	1.24	Q	.	.	.	.
22.61	5.5255	1.22	Q	.	.	.	.
22.74	5.5385	1.21	Q	.	.	.	.
22.87	5.5514	1.19	Q	.	.	.	.
23.00	5.5641	1.18	Q	.	.	.	.
23.13	5.5767	1.17	Q	.	.	.	.
23.26	5.5891	1.15	Q	.	.	.	.
23.39	5.6014	1.14	Q	.	.	.	.
23.52	5.6135	1.13	Q	.	.	.	.
23.65	5.6255	1.11	Q	.	.	.	.
23.78	5.6374	1.10	Q	.	.	.	.
23.91	5.6492	1.09	Q	.	.	.	.
24.04	5.6608	1.08	Q	.	.	.	.
24.17	5.6666	0.00	Q	.	.	.	.

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%	1447.1
10%	163.4
20%	31.1
30%	23.3
40%	15.6
50%	7.8
60%	7.8
70%	7.8
80%	7.8
90%	7.8

APPENDIX H

PONDPACK CALCULATIONS

Project:

☑ Include Perimeter Stone in Calculations

☑ Click for Stage Area Data

☐ Click to Invert Stage Area Data

Click Here for Metric

Chamber Model -	MC-4500	
Units -	Imperial	
Number of Chambers -	930	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	100.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	9	in
Area of system -	35793	sf Min. Area - 34340 sf min. area

StormTech MC-4500 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System *(cubic feet)*	Elevation *(feet)*
81	0.00	0.00	0.00	0.00	1193.09	1193.09	156308.38	106.75
80	0.00	0.00	0.00	0.00	1193.09	1193.09	155115.29	106.67
79	0.00	0.00	0.00	0.00	1193.09	1193.09	153922.20	106.58
78	0.00	0.00	0.00	0.00	1193.09	1193.09	152729.11	106.50
77	0.00	0.00	0.00	0.00	1193.09	1193.09	151536.02	106.42
76	0.00	0.00	0.00	0.00	1193.09	1193.09	150342.92	106.33
75	0.00	0.00	0.00	0.00	1193.09	1193.09	149149.83	106.25
74	0.00	0.00	0.00	0.00	1193.09	1193.09	147956.74	106.17
73	0.00	0.00	0.00	0.00	1193.09	1193.09	146763.65	106.08
72	0.00	0.00	0.00	0.00	1193.09	1193.09	145570.56	106.00
71	0.00	0.00	0.00	0.00	1193.09	1193.09	144377.47	105.92
70	0.00	0.00	0.00	0.00	1193.09	1193.09	143184.37	105.83
69	0.04	0.01	38.10	0.13	1177.80	1216.03	141991.28	105.75
68	0.12	0.03	107.97	0.34	1149.77	1258.08	140775.26	105.67
67	0.16	0.05	153.20	0.52	1131.60	1285.32	139517.18	105.58
66	0.21	0.07	194.11	0.66	1115.18	1309.96	138231.85	105.50
65	0.27	0.08	249.56	0.83	1092.94	1343.33	136921.90	105.42
64	0.45	0.11	421.10	1.05	1024.23	1446.38	135578.57	105.33
63	0.67	0.13	618.69	1.32	945.09	1565.10	134132.19	105.25
62	0.80	0.16	743.08	1.61	895.21	1639.91	132567.09	105.17
61	0.91	0.19	844.56	1.89	854.51	1700.96	130927.18	105.08
60	1.00	0.22	932.70	2.19	819.14	1754.02	129226.22	105.00
59	1.09	0.25	1011.22	2.47	787.62	1801.31	127472.20	104.92
58	1.16	0.28	1082.04	2.75	759.18	1843.97	125670.89	104.83
57	1.23	0.30	1147.63	3.02	732.83	1883.48	123826.93	104.75
56	1.30	0.33	1208.70	3.28	708.30	1920.28	121943.45	104.67
55	1.36	0.35	1265.76	3.55	685.37	1954.67	120023.17	104.58
54	1.42	0.38	1319.40	3.84	663.79	1987.04	118068.50	104.50
53	1.47	0.41	1370.19	4.09	643.38	2017.66	116081.46	104.42
52	1.53	0.44	1418.39	4.41	623.97	2046.77	114063.80	104.33
51	1.57	0.47	1464.28	4.69	605.51	2074.47	112017.02	104.25
50	1.62	0.50	1507.89	4.95	587.95	2100.80	109942.55	104.17
49	1.67	0.52	1549.59	5.21	571.17	2125.97	107841.76	104.08
48	1.71	0.54	1589.47	5.44	555.12	2150.04	105715.79	104.00
47	1.75	0.57	1627.58	5.67	539.79	2173.04	103565.74	103.92
46	1.79	0.59	1664.05	5.89	525.12	2195.05	101392.70	103.83
45	1.83	0.61	1699.29	6.10	510.94	2216.33	99197.65	103.75
44	1.86	0.63	1733.00	6.32	497.36	2236.68	96981.33	103.67
43	1.90	0.64	1765.44	6.43	484.34	2256.22	94744.64	103.58
42	1.93	0.68	1796.61	6.77	471.74	2275.12	92488.43	103.50
41	1.96	0.70	1826.60	7.00	459.65	2293.25	90213.31	103.42
40	2.00	0.72	1855.46	7.22	448.02	2310.70	87920.06	103.33
39	2.03	0.74	1883.26	7.44	436.81	2327.51	85609.36	103.25
38	2.05	0.76	1910.02	7.64	426.03	2343.69	83281.85	103.17
37	2.08	0.79	1935.79	7.86	415.63	2359.28	80938.16	103.08
36	2.11	0.80	1960.51	8.03	405.68	2374.21	78578.88	103.00
35	2.13	0.82	1984.48	8.20	396.02	2388.70	76204.66	102.92
34	2.16	0.84	2007.57	8.39	386.71	2402.66	73815.96	102.83
33	2.18	0.85	2029.76	8.51	377.78	2416.06	71413.30	102.75
32	2.21	0.86	2051.14	8.60	369.20	2428.93	68997.24	102.67
31	2.23	0.89	2071.72	8.89	360.85	2441.46	66568.31	102.58
30	2.25	0.90	2091.45	9.04	352.90	2453.39	64126.85	102.50
29	2.27	0.92	2110.49	9.17	345.23	2464.89	61673.47	102.42
28	2.29	0.92	2128.76	9.20	337.91	2475.87	59208.57	102.33
27	2.31	0.94	2146.30	9.43	330.80	2486.53	56732.71	102.25
26	2.33	0.96	2163.13	9.56	324.01	2496.71	54246.18	102.17
25	2.34	0.97	2179.26	9.69	317.51	2506.46	51749.47	102.08
24	2.36	0.98	2194.71	9.81	311.28	2515.81	49243.00	102.00
23	2.38	0.97	2209.49	9.71	305.41	2524.61	46727.20	101.92
22	2.39	1.00	2223.61	10.03	299.63	2533.28	44202.58	101.83
21	2.41	1.01	2237.08	10.11	294.22	2541.41	41669.31	101.75
20	2.42	1.02	2249.91	10.20	289.05	2549.16	39127.90	101.67
19	2.43	1.03	2262.12	10.30	284.12	2556.54	36578.74	101.58
18	2.44	1.04	2273.70	10.39	279.46	2563.54	34022.20	101.50
17	2.46	1.05	2284.67	10.46	275.04	2570.17	31458.65	101.42
16	2.47	1.05	2295.04	10.54	270.86	2576.44	28888.48	101.33
15	2.48	1.05	2304.80	10.50	266.97	2582.28	26312.04	101.25
14	2.49	1.06	2314.08	10.57	263.23	2587.88	23729.77	101.17
13	2.50	1.08	2322.85	10.75	259.65	2593.25	21141.89	101.08
12	2.51	1.08	2331.05	10.83	256.34	2598.22	18548.64	101.00
11	2.51	1.09	2338.69	10.88	253.26	2602.83	15950.42	100.92
10	2.53	1.11	2350.04	11.06	248.65	2609.76	13347.58	100.83

Stage Area Data

Depth (feet)	Elevation (feet)	Area (ft²)	Area (acres)
0.00	100.00	14317.10	0.3287
0.08	100.08	14317.10	0.3287
0.17	100.17	14317.10	0.3287
0.25	100.25	14317.10	0.3287
0.33	100.33	14317.10	0.3287
0.42	100.42	14317.10	0.3287
0.50	100.50	14317.10	0.3287
0.58	100.58	14317.10	0.3287
0.67	100.67	14317.10	0.3287
0.75	100.75	14317.10	0.3287
0.83	100.83	31317.08	0.7189
0.92	100.92	31234.01	0.7170
1.00	101.00	31178.64	0.7158
1.08	101.08	31119.05	0.7144
1.17	101.17	31054.53	0.7129
1.25	101.25	30987.31	0.7114
1.33	101.33	30917.26	0.7098
1.42	101.42	30842.07	0.7080
1.50	101.50	30762.52	0.7062
1.58	101.58	30678.51	0.7043
1.67	101.67	30589.93	0.7022
1.75	101.75	30496.88	0.7001
1.83	101.83	30399.32	0.6979
1.92	101.92	30295.35	0.6955
2.00	102.00	30189.70	0.6931
2.08	102.08	30077.55	0.6905
2.17	102.17	29960.50	0.6878
2.25	102.25	29838.40	0.6850
2.33	102.33	29710.39	0.6821
2.42	102.42	29578.70	0.6790
2.50	102.50	29440.63	0.6759
2.58	102.58	29297.50	0.6726
2.67	102.67	29147.18	0.6691
2.75	102.75	28992.69	0.6656
2.83	102.83	28831.97	0.6619
2.92	102.92	28664.38	0.6580
3.00	103.00	28490.58	0.6541
3.08	103.08	28311.37	0.6499
3.17	103.17	28124.30	0.6456
3.25	103.25	27930.10	0.6412
3.33	103.33	27728.42	0.6366
3.42	103.42	27518.98	0.6317
3.50	103.50	27301.45	0.6268
3.58	103.58	27074.58	0.6215
3.67	103.67	26840.21	0.6162
3.75	103.75	26595.92	0.6106
3.83	103.83	26340.60	0.6047
3.92	103.92	26076.49	0.5986
4.00	104.00	25800.50	0.5923
4.08	104.08	25511.65	0.5857
4.17	104.17	25209.57	0.5787
4.25	104.25	24893.64	0.5715
4.33	104.33	24561.26	0.5638
4.42	104.42	24211.96	0.5558
4.50	104.50	23844.44	0.5474
4.58	104.58	23456.07	0.5385
4.67	104.67	23043.33	0.5290
4.75	104.75	22601.77	0.5189
4.83	104.83	22127.60	0.5080
4.92	104.92	21615.66	0.4962
5.00	105.00	21048.28	0.4832
5.08	105.08	20411.50	0.4686
5.17	105.17	19678.90	0.4518
5.25	105.25	18781.22	0.4312
5.33	105.33	17356.57	0.3985
5.42	105.42	16119.92	0.3701
5.50	105.50	15719.47	0.3609
5.58	105.58	15423.89	0.3541
5.67	105.67	15096.93	0.3466
5.75	105.75	14592.32	0.3350
5.83	105.83	14317.10	0.3287
5.92	105.92	14317.10	0.3287

NOTE: If the software program being us
Volume data, it is recommended to use t
from this spreadsheet. Software progra
interpolation to take stage area data and
data. Due to rounding differences over t
provided in this spreadsheet, the accura
could be off as much as 1%. It is recomm
check the software estimated volume an
volume listed in this spreadsheet to ensu
acceptable levels.

Project Summary

Title	COMPASS BESS
Engineer	
Company	
Date	11/8/2024

Notes

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Subsection: User Notifications

User Notifications

Message Id	-1
Scenario	100-YR
Element Type	Scenario
Element Id	33
Label	100-YR
Time	(N/A)
Message	The output increment (0.050 hours) is not an equal interval of the simulation duration (24.180 hours). The actual simulation duration is 24.150 hours.
Source	Precalculation
Message Id	40
Scenario	Base
Element Type	Pond
Element Id	17
Label	BMP1
Time	(N/A)
Message	Mass balance for routing volumes vary by more than 0.5 %. (2.0 % of Inflow Volume))
Source	Warning

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
SITE	100-YR	0	247,366.000	16.120	51.38
SITE	Base	0	458,662.000	16.500	37.63

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
O-1	100-YR	0	2.000	24.150	0.00
O-1	Base	0	0.000	0.000	0.00

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BMP1 (IN)	100-YR	0	247,009.000	16.100	46.75	(N/A)	(N/A)
BMP1 (OUT)	100-YR	0	2.000	24.150	0.00	100.00	247,008.000
BMP1 (IN)	Base	0	676,465.000	16.500	37.63	(N/A)	(N/A)
BMP1 (OUT)	Base	0	0.000	0.000	0.00	0.00	662,583.000

Peak Discharge	51.38 ft³/s
Time to Peak	16.120 hours
Hydrograph Volume	247,366.080 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.130 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	1.08	1.08	1.08	1.09	1.10
0.650	1.10	1.11	1.11	1.12	1.12
1.300	1.13	1.14	1.14	1.15	1.16
1.950	1.16	1.17	1.17	1.18	1.19
2.600	1.20	1.20	1.21	1.22	1.23
3.250	1.23	1.24	1.25	1.26	1.26
3.900	1.28	1.28	1.29	1.30	1.31
4.550	1.32	1.33	1.34	1.35	1.36
5.200	1.37	1.38	1.39	1.40	1.41
5.850	1.42	1.43	1.44	1.46	1.47
6.500	1.48	1.49	1.51	1.52	1.53
7.150	1.54	1.56	1.57	1.59	1.60
7.800	1.62	1.63	1.66	1.67	1.69
8.450	1.70	1.73	1.74	1.77	1.78
9.100	1.81	1.82	1.85	1.86	1.90
9.750	1.91	1.94	1.96	2.00	2.02
10.400	2.05	2.07	2.11	2.14	2.18
11.050	2.20	2.25	2.28	2.33	2.36
11.700	2.41	2.45	2.51	2.66	3.05
12.350	3.08	3.17	3.21	3.30	3.35
13.000	3.46	3.51	3.63	3.70	3.83
13.650	3.91	4.07	4.16	4.43	5.01
14.300	5.25	5.39	5.69	5.86	6.26
14.950	6.49	7.04	7.37	8.20	7.67
15.600	8.70	9.80	16.35	21.30	51.38
16.250	13.44	7.88	7.75	6.75	6.05
16.900	5.53	5.13	4.25	3.99	3.76
17.550	3.57	3.40	3.26	3.13	3.01
18.200	2.48	2.39	2.30	2.23	2.16
18.850	2.09	2.03	1.98	1.93	1.88
19.500	1.83	1.79	1.75	1.71	1.68
20.150	1.64	1.61	1.58	1.55	1.53
20.800	1.50	1.47	1.45	1.43	1.40
21.450	1.38	1.36	1.34	1.32	1.31
22.100	1.29	1.27	1.25	1.24	1.22
22.750	1.21	1.19	1.18	1.17	1.15
23.400	1.14	1.13	1.11	1.10	1.09
24.050	1.08	0.00	(N/A)	(N/A)	(N/A)

Peak Discharge	51.38 ft³/s
Time to Peak	16.120 hours
Hydrograph Volume	247,366.080 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.130 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	1.08	1.08	1.08	1.09	1.10
0.650	1.10	1.11	1.11	1.12	1.12
1.300	1.13	1.14	1.14	1.15	1.16
1.950	1.16	1.17	1.17	1.18	1.19
2.600	1.20	1.20	1.21	1.22	1.23
3.250	1.23	1.24	1.25	1.26	1.26
3.900	1.28	1.28	1.29	1.30	1.31
4.550	1.32	1.33	1.34	1.35	1.36
5.200	1.37	1.38	1.39	1.40	1.41
5.850	1.42	1.43	1.44	1.46	1.47
6.500	1.48	1.49	1.51	1.52	1.53
7.150	1.54	1.56	1.57	1.59	1.60
7.800	1.62	1.63	1.66	1.67	1.69
8.450	1.70	1.73	1.74	1.77	1.78
9.100	1.81	1.82	1.85	1.86	1.90
9.750	1.91	1.94	1.96	2.00	2.02
10.400	2.05	2.07	2.11	2.14	2.18
11.050	2.20	2.25	2.28	2.33	2.36
11.700	2.41	2.45	2.51	2.66	3.05
12.350	3.08	3.17	3.21	3.30	3.35
13.000	3.46	3.51	3.63	3.70	3.83
13.650	3.91	4.07	4.16	4.43	5.01
14.300	5.25	5.39	5.69	5.86	6.26
14.950	6.49	7.04	7.37	8.20	7.67
15.600	8.70	9.80	16.35	21.30	51.38
16.250	13.44	7.88	7.75	6.75	6.05
16.900	5.53	5.13	4.25	3.99	3.76
17.550	3.57	3.40	3.26	3.13	3.01
18.200	2.48	2.39	2.30	2.23	2.16
18.850	2.09	2.03	1.98	1.93	1.88
19.500	1.83	1.79	1.75	1.71	1.68
20.150	1.64	1.61	1.58	1.55	1.53
20.800	1.50	1.47	1.45	1.43	1.40
21.450	1.38	1.36	1.34	1.32	1.31
22.100	1.29	1.27	1.25	1.24	1.22
22.750	1.21	1.19	1.18	1.17	1.15
23.400	1.14	1.13	1.11	1.10	1.09
24.050	1.08	0.00	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	BMP1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	1.544	24.150	0.00
Flow (In)	O-1	1.544	24.150	0.00

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	BMP1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Outlet-1	0.000	0.000	0.00
Flow (In)	O-1	0.000	0.000	0.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	0.00	0.00	0.00	0.00	0.00
0.250	0.00	0.00	0.00	0.00	0.00
0.500	0.00	0.00	0.00	0.00	0.00
0.750	0.00	0.00	0.00	0.00	0.00
1.000	0.00	0.00	0.00	0.00	0.00
1.250	0.00	0.00	0.00	0.00	0.00
1.500	0.00	0.00	0.00	0.00	0.00
1.750	0.00	0.00	0.00	0.00	0.00
2.000	0.00	0.00	0.00	0.00	0.00
2.250	0.00	0.00	0.00	0.00	0.00
2.500	0.00	0.00	0.00	0.00	0.00
2.750	0.00	0.00	0.00	0.00	0.00
3.000	0.00	0.00	0.00	0.00	0.00
3.250	0.00	0.00	0.00	0.00	0.00
3.500	0.00	0.00	0.00	0.00	0.00
3.750	0.00	0.00	0.00	0.00	0.00
4.000	0.00	0.00	0.00	0.00	0.00
4.250	0.00	0.00	0.00	0.00	0.00
4.500	0.00	0.00	0.00	0.00	0.00
4.750	0.00	0.00	0.00	0.00	0.00
5.000	0.00	0.00	0.00	0.00	0.00
5.250	0.00	0.00	0.00	0.00	0.00
5.500	0.00	0.00	0.00	0.00	0.00
5.750	0.00	0.00	0.00	0.00	0.00
6.000	0.00	0.00	0.00	0.00	0.00
6.250	0.00	0.00	0.00	0.00	0.00
6.500	0.00	0.00	0.00	0.00	0.00
6.750	0.00	0.00	0.00	0.00	0.00
7.000	0.00	0.00	0.00	0.00	0.00
7.250	0.00	0.00	0.00	0.00	0.00
7.500	0.00	0.00	0.00	0.00	0.00
7.750	0.00	0.00	0.00	0.00	0.00
8.000	0.00	0.00	0.00	0.00	0.00
8.250	0.00	0.00	0.00	0.00	0.00
8.500	0.00	0.00	0.00	0.00	0.00
8.750	0.00	0.00	0.00	0.00	0.00
9.000	0.00	0.00	0.00	0.00	0.00
9.250	0.00	0.00	0.00	0.00	0.00
9.500	0.00	0.00	0.00	0.00	0.00
9.750	0.00	0.00	0.00	0.00	0.00
10.000	0.00	0.00	0.00	0.00	0.00
10.250	0.00	0.00	0.00	0.00	0.00
10.500	0.00	0.00	0.00	0.00	0.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.750	0.00	0.00	0.00	0.00	0.00
11.000	0.00	0.00	0.00	0.00	0.00
11.250	0.00	0.00	0.00	0.00	0.00
11.500	0.00	0.00	0.00	0.00	0.00
11.750	0.00	0.00	0.00	0.00	0.00
12.000	0.00	0.00	0.00	0.00	0.00
12.250	0.00	0.00	0.00	0.00	0.00
12.500	0.00	0.00	0.00	0.00	0.00
12.750	0.00	0.00	0.00	0.00	0.00
13.000	0.00	0.00	0.00	0.00	0.00
13.250	0.00	0.00	0.00	0.00	0.00
13.500	0.00	0.00	0.00	0.00	0.00
13.750	0.00	0.00	0.00	0.00	0.00
14.000	0.00	0.00	0.00	0.00	0.00
14.250	0.00	0.00	0.00	0.00	0.00
14.500	0.00	0.00	0.00	0.00	0.00
14.750	0.00	0.00	0.00	0.00	0.00
15.000	0.00	0.00	0.00	0.00	0.00
15.250	0.00	0.00	0.00	0.00	0.00
15.500	0.00	0.00	0.00	0.00	0.00
15.750	0.00	0.00	0.00	0.00	0.00
16.000	0.00	0.00	0.00	0.00	0.00
16.250	0.00	0.00	0.00	0.00	0.00
16.500	0.00	0.00	0.00	0.00	0.00
16.750	0.00	0.00	0.00	0.00	0.00
17.000	0.00	0.00	0.00	0.00	0.00
17.250	0.00	0.00	0.00	0.00	0.00
17.500	0.00	0.00	0.00	0.00	0.00
17.750	0.00	0.00	0.00	0.00	0.00
18.000	0.00	0.00	0.00	0.00	0.00
18.250	0.00	0.00	0.00	0.00	0.00
18.500	0.00	0.00	0.00	0.00	0.00
18.750	0.00	0.00	0.00	0.00	0.00
19.000	0.00	0.00	0.00	0.00	0.00
19.250	0.00	0.00	0.00	0.00	0.00
19.500	0.00	0.00	0.00	0.00	0.00
19.750	0.00	0.00	0.00	0.00	0.00
20.000	0.00	0.00	0.00	0.00	0.00
20.250	0.00	0.00	0.00	0.00	0.00
20.500	0.00	0.00	0.00	0.00	0.00
20.750	0.00	0.00	0.00	0.00	0.00
21.000	0.00	0.00	0.00	0.00	0.00
21.250	0.00	0.00	0.00	0.00	0.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
21.500	0.00	0.00	0.00	0.00	0.00
21.750	0.00	0.00	0.00	0.00	0.00
22.000	0.00	0.00	0.00	0.00	0.00
22.250	0.00	0.00	0.00	0.00	0.00
22.500	0.00	0.00	0.00	0.00	0.00
22.750	0.00	0.00	0.00	0.00	0.00
23.000	0.00	0.00	0.00	0.00	0.00
23.250	0.00	0.00	0.00	0.00	0.00
23.500	0.00	0.00	0.00	0.00	0.00
23.750	0.00	0.00	0.00	0.00	0.00
24.000	0.00	0.00	0.00	0.00	0.00
24.250	0.00	0.00	0.00	0.00	0.00
24.500	0.00	0.00	0.00	0.00	0.00
24.750	0.00	0.00	0.00	0.00	0.00
25.000	0.00	0.00	0.00	0.00	0.00
25.250	0.00	0.00	0.00	0.00	0.00
25.500	0.00	0.00	0.00	0.00	0.00
25.750	0.00	0.00	0.00	0.00	0.00
26.000	0.00	0.00	0.00	0.00	0.00
26.250	0.00	0.00	0.00	0.00	0.00
26.500	0.00	0.00	0.00	0.00	0.00
26.750	0.00	0.00	0.00	0.00	0.00
27.000	0.00	0.00	0.00	0.00	0.00
27.250	0.00	0.00	0.00	0.00	0.00
27.500	0.00	0.00	0.00	0.00	0.00
27.750	0.00	0.00	0.00	0.00	0.00
28.000	0.00	0.00	0.00	0.00	0.00
28.250	0.00	0.00	0.00	0.00	0.00
28.500	0.00	0.00	0.00	0.00	0.00
28.750	0.00	0.00	0.00	0.00	0.00
29.000	0.00	0.00	0.00	0.00	0.00
29.250	0.00	0.00	0.00	0.00	0.00
29.500	0.00	0.00	0.00	0.00	0.00
29.750	0.00	0.00	0.00	0.00	0.00
30.000	0.00	0.00	0.00	0.00	0.00
30.250	0.00	0.00	0.00	0.00	0.00
30.500	0.00	0.00	0.00	0.00	0.00
30.750	0.00	0.00	0.00	0.00	0.00
31.000	0.00	0.00	0.00	0.00	0.00
31.250	0.00	0.00	0.00	0.00	0.00
31.500	0.00	0.00	0.00	0.00	0.00
31.750	0.00	0.00	0.00	0.00	0.00
32.000	0.00	0.00	0.00	0.00	0.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
32.250	0.00	0.00	0.00	0.00	0.00
32.500	0.00	0.00	0.00	0.00	0.00
32.750	0.00	0.00	0.00	0.00	0.00
33.000	0.00	0.00	0.00	0.00	0.00
33.250	0.00	0.00	0.00	0.00	0.00
33.500	0.00	0.00	0.00	0.00	0.00
33.750	0.00	0.00	0.00	0.00	0.00
34.000	0.00	0.00	0.00	0.00	0.00
34.250	0.00	0.00	0.00	0.00	0.00
34.500	0.00	0.00	0.00	0.00	0.00
34.750	0.00	0.00	0.00	0.00	0.00
35.000	0.00	0.00	0.00	0.00	0.00
35.250	0.00	0.00	0.00	0.00	0.00
35.500	0.00	0.00	0.00	0.00	0.00
35.750	0.00	0.00	0.00	0.00	0.00
36.000	0.00	0.00	0.00	0.00	0.00
36.250	0.00	0.00	0.00	0.00	0.00
36.500	0.00	0.00	0.00	0.00	0.00
36.750	0.00	0.00	0.00	0.00	0.00
37.000	0.00	0.00	0.00	0.00	0.00
37.250	0.00	0.00	0.00	0.00	0.00
37.500	0.00	0.00	0.00	0.00	0.00
37.750	0.00	0.00	0.00	0.00	0.00
38.000	0.00	0.00	0.00	0.00	0.00
38.250	0.00	0.00	0.00	0.00	0.00
38.500	0.00	0.00	0.00	0.00	0.00
38.750	0.00	0.00	0.00	0.00	0.00
39.000	0.00	0.00	0.00	0.00	0.00
39.250	0.00	0.00	0.00	0.00	0.00
39.500	0.00	0.00	0.00	0.00	0.00
39.750	0.00	0.00	0.00	0.00	0.00
40.000	0.00	0.00	0.00	0.00	0.00
40.250	0.00	0.00	0.00	0.00	0.00
40.500	0.00	0.00	0.00	0.00	0.00
40.750	0.00	0.00	0.00	0.00	0.00
41.000	0.00	0.00	0.00	0.00	0.00
41.250	0.00	0.00	0.00	0.00	0.00
41.500	0.00	0.00	0.00	0.00	0.00
41.750	0.00	0.00	0.00	0.00	0.00
42.000	0.00	0.00	0.00	0.00	0.00
42.250	0.00	0.00	0.00	0.00	0.00
42.500	0.00	0.00	0.00	0.00	0.00
42.750	0.00	0.00	0.00	0.00	0.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
43.000	0.00	0.00	0.00	0.00	0.00
43.250	0.00	0.00	0.00	0.00	0.00
43.500	0.00	0.00	0.00	0.00	0.00
43.750	0.00	0.00	0.00	0.00	0.00
44.000	0.00	0.00	0.00	0.00	0.00
44.250	0.00	0.00	0.00	0.00	0.00
44.500	0.00	0.00	0.00	0.00	0.00
44.750	0.00	0.00	0.00	0.00	0.00
45.000	0.00	0.00	0.00	0.00	0.00
45.250	0.00	0.00	0.00	0.00	0.00
45.500	0.00	0.00	0.00	0.00	0.00
45.750	0.00	0.00	0.00	0.00	0.00
46.000	0.00	0.00	0.00	0.00	0.00
46.250	0.00	0.00	0.00	0.00	0.00
46.500	0.00	0.00	0.00	0.00	0.00
46.750	0.00	0.00	0.00	0.00	0.00
47.000	0.00	0.00	0.00	0.00	0.00
47.250	0.00	0.00	0.00	0.00	0.00
47.500	0.00	0.00	0.00	0.00	0.00
47.750	0.00	0.00	0.00	0.00	0.00
48.000	0.00	(N/A)	(N/A)	(N/A)	(N/A)

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	100.00	100.00	100.00	100.00	100.00
0.250	100.00	100.00	100.00	100.00	100.00
0.500	100.00	100.00	100.00	100.00	100.00
0.750	100.00	100.00	100.00	100.00	100.00
1.000	100.00	100.00	100.00	100.00	100.00
1.250	100.00	100.00	100.00	100.00	100.00
1.500	100.00	100.00	100.00	100.00	100.00
1.750	100.00	100.00	100.00	100.00	100.00
2.000	100.00	100.00	100.00	100.00	100.00
2.250	100.00	100.00	100.00	100.00	100.00
2.500	100.00	100.00	100.00	100.00	100.00
2.750	100.00	100.00	100.00	100.00	100.00
3.000	100.00	100.00	100.00	100.00	100.00
3.250	100.00	100.00	100.00	100.00	100.00
3.500	100.00	100.00	100.00	100.00	100.00
3.750	100.00	100.00	100.00	100.00	100.00
4.000	100.00	100.00	100.00	100.00	100.00
4.250	100.00	100.00	100.00	100.00	100.00
4.500	100.00	100.00	100.00	100.00	100.00
4.750	100.00	100.00	100.00	100.00	100.00
5.000	100.00	100.00	100.00	100.00	100.00
5.250	100.00	100.00	100.00	100.00	100.00
5.500	100.00	100.00	100.00	100.00	100.00
5.750	100.00	100.00	100.00	100.00	100.00
6.000	100.00	100.00	100.00	100.00	100.00
6.250	100.00	100.00	100.00	100.00	100.00
6.500	100.00	100.00	100.00	100.00	100.00
6.750	100.00	100.00	100.00	100.00	100.00
7.000	100.00	100.00	100.00	100.00	100.00
7.250	100.00	100.00	100.00	100.00	100.00
7.500	100.00	100.00	100.00	100.00	100.00
7.750	100.00	100.00	100.00	100.00	100.00
8.000	100.00	100.00	100.00	100.00	100.00
8.250	100.00	100.00	100.00	100.00	100.00
8.500	100.00	100.00	100.00	100.00	100.00
8.750	100.00	100.00	100.00	100.00	100.00
9.000	100.00	100.00	100.00	100.00	100.00
9.250	100.00	100.00	100.00	100.00	100.00
9.500	100.00	100.00	100.00	100.00	100.00
9.750	100.00	100.00	100.00	100.00	100.00
10.000	100.00	100.00	100.00	100.00	100.00
10.250	100.00	100.00	100.00	100.00	100.00
10.500	100.00	100.00	100.00	100.00	100.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.750	100.00	100.00	100.00	100.00	100.00
11.000	100.00	100.00	100.00	100.00	100.00
11.250	100.00	100.00	100.00	100.00	100.00
11.500	100.00	100.00	100.00	100.00	100.00
11.750	100.00	100.00	100.00	100.00	100.00
12.000	100.00	100.00	100.00	100.00	100.00
12.250	100.00	100.00	100.00	100.00	100.00
12.500	100.00	100.00	100.00	100.00	100.00
12.750	100.00	100.00	100.00	100.00	100.00
13.000	100.00	100.00	100.00	100.00	100.00
13.250	100.00	100.00	100.00	100.00	100.00
13.500	100.00	100.00	100.00	100.00	100.00
13.750	100.00	100.00	100.00	100.00	100.00
14.000	100.00	100.00	100.00	100.00	100.00
14.250	100.00	100.00	100.00	100.00	100.00
14.500	100.00	100.00	100.00	100.00	100.00
14.750	100.00	100.00	100.00	100.00	100.00
15.000	100.00	100.00	100.00	100.00	100.00
15.250	100.00	100.00	100.00	100.00	100.00
15.500	100.00	100.00	100.00	100.00	100.00
15.750	100.00	100.00	100.00	100.00	100.00
16.000	100.00	100.00	100.00	100.00	100.00
16.250	100.00	100.00	100.00	100.00	100.00
16.500	100.00	100.00	100.00	100.00	100.00
16.750	100.00	100.00	100.00	100.00	100.00
17.000	100.00	100.00	100.00	100.00	100.00
17.250	100.00	100.00	100.00	100.00	100.00
17.500	100.00	100.00	100.00	100.00	100.00
17.750	100.00	100.00	100.00	100.00	100.00
18.000	100.00	100.00	100.00	100.00	100.00
18.250	100.00	100.00	100.00	100.00	100.00
18.500	100.00	100.00	100.00	100.00	100.00
18.750	100.00	100.00	100.00	100.00	100.00
19.000	100.00	100.00	100.00	100.00	100.00
19.250	100.00	100.00	100.00	100.00	100.00
19.500	100.00	100.00	100.00	100.00	100.00
19.750	100.00	100.00	100.00	100.00	100.00
20.000	100.00	100.00	100.00	100.00	100.00
20.250	100.00	100.00	100.00	100.00	100.00
20.500	100.00	100.00	100.00	100.00	100.00
20.750	100.00	100.00	100.00	100.00	100.00
21.000	100.00	100.00	100.00	100.00	100.00
21.250	100.00	100.00	100.00	100.00	100.00

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
21.500	100.00	100.00	100.00	100.00	100.00
21.750	100.00	100.00	100.00	100.00	100.00
22.000	100.00	100.00	100.00	100.00	100.00
22.250	100.00	100.00	100.00	100.00	100.00
22.500	100.00	100.00	100.00	100.00	100.00
22.750	100.00	100.00	100.00	100.00	100.00
23.000	100.00	100.00	100.00	100.00	100.00
23.250	100.00	100.00	100.00	100.00	100.00
23.500	100.00	100.00	100.00	100.00	100.00
23.750	100.00	100.00	100.00	100.00	100.00
24.000	100.00	100.00	100.00	100.00	(N/A)

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	0.000	0.000
5.250	0.000	0.000	0.000	0.000	0.000
5.500	0.000	0.000	0.000	0.000	0.000
5.750	0.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000	0.000
6.250	0.000	0.000	0.000	0.000	0.000
6.500	0.000	0.000	0.000	0.000	0.000
6.750	0.000	0.000	0.000	0.000	0.000
7.000	0.000	0.000	0.000	0.000	0.000
7.250	0.000	0.000	0.000	71,102.000	71,697.000
7.500	72,294.000	72,893.000	73,494.000	74,096.000	74,701.000
7.750	75,307.000	75,915.000	76,525.000	77,137.000	77,751.000
8.000	78,368.000	78,986.000	79,606.000	80,228.000	80,852.000
8.250	81,478.000	82,105.000	82,734.000	83,366.000	84,000.000
8.500	84,636.000	85,274.000	85,914.000	86,557.000	87,203.000
8.750	87,851.000	88,501.000	89,154.000	89,808.000	90,465.000
9.000	91,124.000	91,785.000	92,448.000	93,114.000	93,783.000
9.250	94,454.000	95,128.000	95,804.000	96,483.000	97,165.000
9.500	97,850.000	98,538.000	99,228.000	99,920.000	100,615.000
9.750	101,313.000	102,013.000	102,716.000	103,423.000	104,133.000
10.000	104,845.000	105,562.000	106,281.000	107,003.000	107,729.000
10.250	108,458.000	109,190.000	109,925.000	110,663.000	111,405.000
10.500	112,149.000	112,898.000	113,649.000	114,404.000	115,163.000

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.750	115,925.000	116,691.000	117,461.000	118,234.000	119,012.000
11.000	119,793.000	120,578.000	121,367.000	122,161.000	122,957.000
11.250	123,758.000	124,563.000	125,373.000	126,187.000	127,006.000
11.500	127,829.000	128,657.000	129,490.000	130,327.000	131,169.000
11.750	132,015.000	132,866.000	133,723.000	134,584.000	135,452.000
12.000	136,324.000	137,207.000	138,107.000	139,022.000	139,954.000
12.250	140,902.000	141,871.000	142,865.000	143,885.000	144,930.000
12.500	146,001.000	147,088.000	148,184.000	149,289.000	150,402.000
12.750	151,523.000	152,653.000	153,789.000	154,933.000	156,085.000
13.000	157,244.000	158,411.000	159,586.000	160,770.000	161,962.000
13.250	163,163.000	164,373.000	165,592.000	166,821.000	168,059.000
13.500	169,307.000	170,565.000	171,834.000	173,113.000	174,403.000
13.750	175,703.000	177,015.000	178,339.000	179,677.000	181,027.000
14.000	182,390.000	183,766.000	185,157.000	186,562.000	187,982.000
14.250	189,416.000	190,866.000	192,334.000	193,820.000	195,323.000
14.500	196,844.000	198,384.000	199,945.000	201,528.000	203,132.000
14.750	204,757.000	206,406.000	208,082.000	209,786.000	211,516.000
15.000	213,274.000	215,063.000	216,888.000	218,749.000	220,645.000
15.250	222,577.000	224,537.000	226,521.000	228,527.000	230,556.000
15.500	232,607.000	234,680.000	236,772.000	238,885.000	241,018.000
15.750	243,171.000	245,444.000	247,936.000	250,647.000	253,577.000
16.000	256,726.000	260,282.000	264,431.000	269,175.000	274,511.000
16.250	280,442.000	286,710.000	293,061.000	299,495.000	306,011.000
16.500	312,610.000	318,829.000	324,208.000	328,747.000	332,444.000
16.750	335,301.000	337,672.000	339,913.000	342,023.000	344,002.000
17.000	345,851.000	347,610.000	349,320.000	350,981.000	352,593.000
17.250	354,155.000	355,677.000	357,165.000	358,621.000	360,043.000
17.500	361,432.000	362,792.000	364,129.000	365,442.000	366,732.000
17.750	367,998.000	369,243.000	370,470.000	371,679.000	372,870.000
18.000	374,043.000	375,195.000	376,321.000	377,422.000	378,499.000
18.250	379,550.000	380,573.000	381,565.000	382,527.000	383,457.000
18.500	384,356.000	385,233.000	386,099.000	386,954.000	387,796.000
18.750	388,627.000	389,448.000	390,261.000	391,065.000	391,860.000
19.000	392,647.000	393,427.000	394,198.000	394,963.000	395,720.000
19.250	396,469.000	397,212.000	397,948.000	398,678.000	399,401.000
19.500	400,119.000	400,830.000	401,535.000	402,235.000	402,929.000
19.750	403,618.000	404,301.000	404,979.000	405,652.000	406,319.000
20.000	406,981.000	407,638.000	408,290.000	408,938.000	409,581.000
20.250	410,220.000	410,854.000	411,485.000	412,111.000	412,734.000
20.500	413,353.000	413,968.000	414,579.000	415,186.000	415,790.000
20.750	416,389.000	416,985.000	417,577.000	418,166.000	418,751.000
21.000	419,333.000	419,911.000	420,486.000	421,058.000	421,627.000
21.250	422,192.000	422,755.000	423,315.000	423,872.000	424,426.000

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
21.500	424,977.000	425,525.000	426,071.000	426,614.000	427,154.000
21.750	427,691.000	428,225.000	428,757.000	429,287.000	429,814.000
22.000	430,339.000	430,861.000	431,380.000	431,898.000	432,412.000
22.250	432,925.000	433,435.000	433,942.000	434,448.000	434,952.000
22.500	435,453.000	435,953.000	436,450.000	436,945.000	437,438.000
22.750	437,929.000	438,418.000	438,904.000	439,389.000	439,871.000
23.000	440,352.000	440,830.000	441,307.000	441,781.000	442,254.000
23.250	442,726.000	443,195.000	443,663.000	444,129.000	444,593.000
23.500	445,056.000	445,516.000	445,975.000	446,433.000	446,888.000
23.750	447,342.000	447,794.000	448,244.000	448,692.000	449,139.000
24.000	449,583.000	450,027.000	450,471.000	450,915.000	451,359.000
24.250	451,803.000	452,247.000	452,691.000	453,135.000	453,579.000
24.500	454,023.000	454,467.000	454,911.000	455,354.000	455,798.000
24.750	456,242.000	456,686.000	457,130.000	457,574.000	458,018.000
25.000	458,462.000	458,906.000	459,350.000	459,794.000	460,238.000
25.250	460,681.000	461,125.000	461,569.000	462,013.000	462,457.000
25.500	462,901.000	463,345.000	463,789.000	464,233.000	464,677.000
25.750	465,121.000	465,564.000	466,008.000	466,452.000	466,896.000
26.000	467,340.000	467,784.000	468,228.000	468,672.000	469,116.000
26.250	469,560.000	470,003.000	470,447.000	470,891.000	471,335.000
26.500	471,779.000	472,223.000	472,667.000	473,111.000	473,555.000
26.750	473,999.000	474,442.000	474,886.000	475,330.000	475,774.000
27.000	476,218.000	476,662.000	477,106.000	477,550.000	477,994.000
27.250	478,437.000	478,881.000	479,325.000	479,769.000	480,213.000
27.500	480,657.000	481,101.000	481,545.000	481,988.000	482,432.000
27.750	482,876.000	483,320.000	483,764.000	484,208.000	484,652.000
28.000	485,096.000	485,539.000	485,983.000	486,427.000	486,871.000
28.250	487,315.000	487,759.000	488,203.000	488,647.000	489,090.000
28.500	489,534.000	489,978.000	490,422.000	490,866.000	491,310.000
28.750	491,754.000	492,197.000	492,641.000	493,085.000	493,529.000
29.000	493,973.000	494,417.000	494,861.000	495,304.000	495,748.000
29.250	496,192.000	496,636.000	497,080.000	497,524.000	497,968.000
29.500	498,411.000	498,855.000	499,299.000	499,743.000	500,187.000
29.750	500,631.000	501,074.000	501,518.000	501,962.000	502,406.000
30.000	502,850.000	503,294.000	503,738.000	504,181.000	504,625.000
30.250	505,069.000	505,513.000	505,957.000	506,401.000	506,844.000
30.500	507,288.000	507,732.000	508,176.000	508,620.000	509,064.000
30.750	509,507.000	509,951.000	510,395.000	510,839.000	511,283.000
31.000	511,727.000	512,170.000	512,614.000	513,058.000	513,502.000
31.250	513,946.000	514,389.000	514,833.000	515,277.000	515,721.000
31.500	516,165.000	516,609.000	517,052.000	517,496.000	517,940.000
31.750	518,384.000	518,828.000	519,271.000	519,715.000	520,159.000
32.000	520,603.000	521,047.000	521,491.000	521,934.000	522,378.000

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
32.250	522,822.000	523,266.000	523,710.000	524,153.000	524,597.000
32.500	525,041.000	525,485.000	525,929.000	526,372.000	526,816.000
32.750	527,260.000	527,704.000	528,148.000	528,591.000	529,035.000
33.000	529,479.000	529,923.000	530,367.000	530,810.000	531,254.000
33.250	531,698.000	532,142.000	532,586.000	533,029.000	533,473.000
33.500	533,917.000	534,361.000	534,804.000	535,248.000	535,692.000
33.750	536,136.000	536,580.000	537,023.000	537,467.000	537,911.000
34.000	538,355.000	538,798.000	539,242.000	539,686.000	540,130.000
34.250	540,574.000	541,017.000	541,461.000	541,905.000	542,349.000
34.500	542,792.000	543,236.000	543,680.000	544,124.000	544,568.000
34.750	545,011.000	545,455.000	545,899.000	546,343.000	546,786.000
35.000	547,230.000	547,674.000	548,118.000	548,561.000	549,005.000
35.250	549,449.000	549,893.000	550,336.000	550,780.000	551,224.000
35.500	551,668.000	552,112.000	552,555.000	552,999.000	553,443.000
35.750	553,887.000	554,330.000	554,774.000	555,218.000	555,662.000
36.000	556,105.000	556,549.000	556,993.000	557,437.000	557,880.000
36.250	558,324.000	558,768.000	559,212.000	559,655.000	560,099.000
36.500	560,543.000	560,987.000	561,430.000	561,874.000	562,318.000
36.750	562,761.000	563,205.000	563,649.000	564,093.000	564,536.000
37.000	564,980.000	565,424.000	565,868.000	566,311.000	566,755.000
37.250	567,199.000	567,643.000	568,086.000	568,530.000	568,974.000
37.500	569,417.000	569,861.000	570,305.000	570,749.000	571,192.000
37.750	571,636.000	572,080.000	572,524.000	572,967.000	573,411.000
38.000	573,855.000	574,298.000	574,742.000	575,186.000	575,630.000
38.250	576,073.000	576,517.000	576,961.000	577,404.000	577,848.000
38.500	578,292.000	578,736.000	579,179.000	579,623.000	580,067.000
38.750	580,510.000	580,954.000	581,398.000	581,842.000	582,285.000
39.000	582,729.000	583,173.000	583,616.000	584,060.000	584,504.000
39.250	584,947.000	585,391.000	585,835.000	586,279.000	586,722.000
39.500	587,166.000	587,610.000	588,053.000	588,497.000	588,941.000
39.750	589,384.000	589,828.000	590,272.000	590,715.000	591,159.000
40.000	591,603.000	592,047.000	592,490.000	592,934.000	593,378.000
40.250	593,821.000	594,265.000	594,709.000	595,152.000	595,596.000
40.500	596,040.000	596,483.000	596,927.000	597,371.000	597,814.000
40.750	598,258.000	598,702.000	599,145.000	599,589.000	600,033.000
41.000	600,476.000	600,920.000	601,364.000	601,807.000	602,251.000
41.250	602,695.000	603,139.000	603,582.000	604,026.000	604,470.000
41.500	604,913.000	605,357.000	605,801.000	606,244.000	606,688.000
41.750	607,131.000	607,575.000	608,019.000	608,462.000	608,906.000
42.000	609,350.000	609,793.000	610,237.000	610,681.000	611,124.000
42.250	611,568.000	612,012.000	612,455.000	612,899.000	613,343.000
42.500	613,786.000	614,230.000	614,674.000	615,117.000	615,561.000
42.750	616,005.000	616,448.000	616,892.000	617,336.000	617,779.000

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
43.000	618,223.000	618,666.000	619,110.000	619,554.000	619,997.000
43.250	620,441.000	620,885.000	621,328.000	621,772.000	622,216.000
43.500	622,659.000	623,103.000	623,546.000	623,990.000	624,434.000
43.750	624,877.000	625,321.000	625,765.000	626,208.000	626,652.000
44.000	627,096.000	627,539.000	627,983.000	628,426.000	628,870.000
44.250	629,314.000	629,757.000	630,201.000	630,645.000	631,088.000
44.500	631,532.000	631,975.000	632,419.000	632,863.000	633,306.000
44.750	633,750.000	634,193.000	634,637.000	635,081.000	635,524.000
45.000	635,968.000	636,412.000	636,855.000	637,299.000	637,742.000
45.250	638,186.000	638,630.000	639,073.000	639,517.000	639,960.000
45.500	640,404.000	640,848.000	641,291.000	641,735.000	642,178.000
45.750	642,622.000	643,066.000	643,509.000	643,953.000	644,396.000
46.000	644,840.000	645,284.000	645,727.000	646,171.000	646,614.000
46.250	647,058.000	647,502.000	647,945.000	648,389.000	648,832.000
46.500	649,276.000	649,720.000	650,163.000	650,607.000	651,050.000
46.750	651,494.000	651,937.000	652,381.000	652,825.000	653,268.000
47.000	653,712.000	654,155.000	654,599.000	655,043.000	655,486.000
47.250	655,930.000	656,373.000	656,817.000	657,260.000	657,704.000
47.500	658,148.000	658,591.000	659,035.000	659,478.000	659,922.000
47.750	660,365.000	660,809.000	661,253.000	661,696.000	662,140.000
48.000	662,583.000	(N/A)	(N/A)	(N/A)	(N/A)

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.000	0.000	0.000	0.000
2.750	0.000	0.000	0.000	0.000	0.000
3.000	0.000	0.000	0.000	0.000	0.000
3.250	0.000	0.000	0.000	0.000	0.000
3.500	0.000	0.000	0.000	0.000	0.000
3.750	0.000	0.000	0.000	0.000	0.000
4.000	0.000	0.000	0.000	0.000	0.000
4.250	0.000	0.000	0.000	0.000	0.000
4.500	0.000	0.000	0.000	0.000	0.000
4.750	0.000	0.000	0.000	0.000	0.000
5.000	0.000	0.000	0.000	0.000	0.000
5.250	0.000	0.000	0.000	0.000	0.000
5.500	0.000	0.000	0.000	0.000	0.000
5.750	0.000	0.000	0.000	0.000	0.000
6.000	0.000	0.000	0.000	0.000	0.000
6.250	0.000	0.000	0.000	0.000	0.000
6.500	0.000	0.000	0.000	0.000	0.000
6.750	0.000	0.000	0.000	0.000	0.000
7.000	0.000	0.000	0.000	0.000	0.000
7.250	0.000	0.000	0.000	0.000	0.000
7.500	0.000	0.000	0.000	0.000	0.000
7.750	0.000	0.000	0.000	0.000	0.000
8.000	0.000	0.000	0.000	0.000	0.000
8.250	0.000	0.000	0.000	0.000	0.000
8.500	0.000	0.000	0.000	0.000	0.000
8.750	0.000	0.000	0.000	0.000	0.000
9.000	0.000	0.000	0.000	0.000	0.000
9.250	0.000	0.000	0.000	0.000	0.000
9.500	0.000	0.000	0.000	0.000	0.000
9.750	0.000	0.000	0.000	0.000	0.000
10.000	0.000	0.000	0.000	0.000	0.000
10.250	0.000	0.000	0.000	0.000	0.000
10.500	0.000	0.000	0.000	0.000	0.000

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.750	0.000	0.000	0.000	0.000	0.000
11.000	0.000	0.000	0.000	0.000	0.000
11.250	0.000	0.000	0.000	0.000	0.000
11.500	0.000	62,500.000	62,925.000	63,354.000	63,786.000
11.750	64,221.000	64,659.000	65,100.000	65,545.000	65,994.000
12.000	66,449.000	66,915.000	67,392.000	67,890.000	68,414.000
12.250	68,958.000	69,510.000	70,063.000	70,621.000	71,184.000
12.500	71,754.000	72,327.000	72,903.000	73,483.000	74,069.000
12.750	74,660.000	75,257.000	75,857.000	76,461.000	77,073.000
13.000	77,692.000	78,316.000	78,944.000	79,577.000	80,216.000
13.250	80,863.000	81,518.000	82,178.000	82,843.000	83,515.000
13.500	84,196.000	84,885.000	85,581.000	86,282.000	86,991.000
13.750	87,712.000	88,442.000	89,180.000	89,925.000	90,681.000
14.000	91,454.000	92,248.000	93,073.000	93,939.000	94,837.000
14.250	95,758.000	96,694.000	97,644.000	98,604.000	99,575.000
14.500	100,564.000	101,574.000	102,600.000	103,640.000	104,693.000
14.750	105,767.000	106,869.000	107,995.000	109,139.000	110,299.000
15.000	111,487.000	112,712.000	113,972.000	115,260.000	116,571.000
15.250	117,918.000	119,319.000	120,769.000	122,219.000	123,633.000
15.500	125,042.000	126,501.000	128,031.000	129,635.000	131,316.000
15.750	133,147.000	135,319.000	137,945.000	140,980.000	144,368.000
16.000	148,273.000	153,565.000	160,939.000	168,983.000	175,342.000
16.250	179,075.000	181,302.000	183,143.000	184,676.000	186,086.000
16.500	187,487.000	188,855.000	190,160.000	191,398.000	192,579.000
16.750	193,712.000	194,800.000	195,849.000	196,862.000	197,844.000
17.000	198,798.000	199,717.000	200,586.000	201,394.000	202,157.000
17.250	202,899.000	203,623.000	204,330.000	205,021.000	205,697.000
17.500	206,359.000	207,009.000	207,645.000	208,270.000	208,884.000
17.750	209,487.000	210,081.000	210,665.000	211,240.000	211,806.000
18.000	212,364.000	212,913.000	213,445.000	213,947.000	214,412.000
18.250	214,855.000	215,292.000	215,723.000	216,147.000	216,566.000
18.500	216,978.000	217,386.000	217,789.000	218,187.000	218,580.000
18.750	218,968.000	219,352.000	219,730.000	220,105.000	220,474.000
19.000	220,840.000	221,203.000	221,562.000	221,917.000	222,269.000
19.250	222,617.000	222,962.000	223,304.000	223,642.000	223,976.000
19.500	224,307.000	224,635.000	224,961.000	225,283.000	225,603.000
19.750	225,920.000	226,234.000	226,545.000	226,854.000	227,160.000
20.000	227,465.000	227,767.000	228,066.000	228,363.000	228,657.000
20.250	228,949.000	229,239.000	229,527.000	229,813.000	230,096.000
20.500	230,378.000	230,658.000	230,936.000	231,212.000	231,487.000
20.750	231,761.000	232,032.000	232,300.000	232,567.000	232,832.000
21.000	233,096.000	233,358.000	233,618.000	233,877.000	234,135.000
21.250	234,391.000	234,645.000	234,897.000	235,147.000	235,396.000

Subsection: Time vs. Volume
Label: BMP1

Scenario: 100-YR

Time vs. Volume (ft³)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
21.500	235,644.000	235,890.000	236,135.000	236,379.000	236,621.000
21.750	236,862.000	237,101.000	237,339.000	237,576.000	237,813.000
22.000	238,048.000	238,283.000	238,516.000	238,747.000	238,977.000
22.250	239,206.000	239,433.000	239,659.000	239,884.000	240,108.000
22.500	240,332.000	240,554.000	240,775.000	240,994.000	241,213.000
22.750	241,431.000	241,648.000	241,864.000	242,078.000	242,292.000
23.000	242,505.000	242,717.000	242,929.000	243,139.000	243,349.000
23.250	243,557.000	243,764.000	243,971.000	244,176.000	244,381.000
23.500	244,585.000	244,788.000	244,991.000	245,191.000	245,391.000
23.750	245,590.000	245,788.000	245,986.000	246,182.000	246,378.000
24.000	246,574.000	246,769.000	246,926.000	247,008.000	(N/A)

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft³)	Volume (Total) (ft³)
100.00	0.0	14,317.100	0.000	0.000	0.000
100.08	0.0	14,317.100	42,951.300	49,892,230.000	49,892,230.000
100.17	0.0	14,317.100	42,951.300	56,128,759.000	106,020,989.000
100.25	0.0	14,317.100	42,951.300	49,892,230.000	155,913,219.000
100.33	0.0	14,317.100	42,951.300	49,892,230.000	205,805,449.000
100.42	0.0	14,317.100	42,951.300	56,128,759.000	261,934,208.000
100.50	0.0	14,317.100	42,951.300	49,892,230.000	311,826,438.000
100.58	0.0	14,317.100	42,951.300	49,892,230.000	361,718,668.000
100.67	0.0	14,317.100	42,951.300	56,128,759.000	417,847,427.000
100.75	0.0	14,317.100	42,951.300	49,892,230.000	467,739,657.000
100.83	0.0	31,317.080	66,808.924	77,605,246.000	545,344,903.000
100.92	0.0	31,234.010	93,826.607	122,612,611.000	667,957,513.000
101.00	0.0	31,178.640	93,618.963	108,747,787.000	776,705,301.000
101.08	0.0	31,119.050	93,446.521	108,547,479.000	885,252,779.000
101.17	0.0	31,054.530	93,260.353	121,872,630.000	1,007,125,409.000
101.25	0.0	30,987.310	93,062.742	108,101,681.000	1,115,227,090.000
101.33	0.0	30,917.260	92,856.835	107,862,500.000	1,223,089,589.000
101.42	0.0	30,842.070	92,638.972	121,060,609.000	1,344,150,198.000
101.50	0.0	30,762.520	92,406.859	107,339,808.000	1,451,490,006.000
101.58	0.0	30,678.510	92,161.516	107,054,817.000	1,558,544,823.000
101.67	0.0	30,589.930	91,902.628	120,098,354.000	1,678,643,178.000
101.75	0.0	30,496.880	91,630.180	106,437,617.000	1,785,080,794.000
101.83	0.0	30,399.320	91,344.261	106,105,494.000	1,891,186,288.000
101.92	0.0	30,295.350	91,041.960	118,973,634.000	2,010,159,922.000
102.00	0.0	30,189.700	90,727.529	105,389,098.000	2,115,549,019.000
102.08	0.0	30,077.550	90,400.823	105,009,596.000	2,220,558,615.000
102.17	0.0	29,960.500	90,057.018	117,686,511.000	2,338,245,126.000
102.25	0.0	29,838.400	89,698.288	104,193,531.000	2,442,438,657.000
102.33	0.0	29,710.390	89,323.116	103,757,732.000	2,546,196,389.000
102.42	0.0	29,578.700	88,933.562	116,218,379.000	2,662,414,768.000
102.50	0.0	29,440.630	88,528.914	102,835,187.000	2,765,249,955.000

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft³)	Volume (Total) (ft³)
102.58	0.0	29,297.500	88,107.108	102,345,216.000	2,867,595,171.000
102.67	0.0	29,147.180	87,666.923	114,563,135.000	2,982,158,307.000
102.75	0.0	28,992.690	87,209.702	101,302,790.000	3,083,461,097.000
102.83	0.0	28,831.970	86,736.878	100,753,558.000	3,184,214,655.000
102.92	0.0	28,664.380	86,244.403	112,704,186.000	3,296,918,841.000
103.00	0.0	28,490.580	85,732.308	99,586,649.000	3,396,505,489.000
103.08	0.0	28,311.370	85,202.784	98,971,554.000	3,495,477,043.000
103.17	0.0	28,124.300	84,653.350	110,624,998.000	3,606,102,041.000
103.25	0.0	27,930.100	84,081.432	97,668,991.000	3,703,771,032.000
103.33	0.0	27,728.420	83,487.597	96,979,193.000	3,800,750,225.000
103.42	0.0	27,518.980	82,870.902	108,295,694.000	3,909,045,919.000
103.50	0.0	27,301.450	82,230.429	95,518,867.000	4,004,564,786.000
103.58	0.0	27,074.580	81,563.808	94,744,520.000	4,099,309,306.000
103.67	0.0	26,840.210	80,871.930	105,683,439.000	4,204,992,744.000
103.75	0.0	26,595.920	80,153.916	93,106,789.000	4,298,099,533.000
103.83	0.0	26,340.600	79,404.472	92,236,235.000	4,390,335,768.000
103.92	0.0	26,076.490	78,625.302	102,747,545.000	4,493,083,313.000
104.00	0.0	25,800.500	77,815.118	90,390,041.000	4,583,473,354.000
104.08	0.0	25,511.650	76,967.818	89,405,818.000	4,672,879,172.000
104.17	0.0	25,209.570	76,081.380	99,423,148.000	4,772,302,319.000
104.25	0.0	24,893.640	75,154.317	87,299,255.000	4,859,601,574.000
104.33	0.0	24,561.260	74,181.792	86,169,569.000	4,945,771,143.000
104.42	0.0	24,211.960	73,159.205	95,604,449.000	5,041,375,592.000
104.50	0.0	23,844.440	72,083.897	83,732,655.000	5,125,108,247.000

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft³)	Volume (Total) (ft³)
104.58	0.0	23,456.070	70,949.968	82,415,483.000	5,207,523,729.000
104.67	0.0	23,043.330	69,748.184	91,146,927.000	5,298,670,656.000
104.75	0.0	22,601.770	68,466.582	79,530,782.000	5,378,201,438.000
104.83	0.0	22,127.600	67,092.798	77,934,995.000	5,456,136,433.000
104.92	0.0	21,615.660	65,613.392	85,743,581.000	5,541,880,014.000
105.00	0.0	21,048.280	63,994.024	74,335,458.000	5,616,215,471.000
105.08	0.0	20,411.500	62,187.225	72,236,680.000	5,688,452,152.000
105.17	0.0	19,678.900	60,132.253	78,580,828.000	5,767,032,980.000
105.25	0.0	18,781.220	57,684.941	67,006,828.000	5,834,039,808.000
105.33	0.0	17,356.570	54,192.639	62,950,169.000	5,896,989,977.000
105.42	0.0	16,119.920	50,203.310	65,605,686.000	5,962,595,663.000
105.50	0.0	15,719.470	47,757.826	55,475,490.000	6,018,071,153.000
105.58	0.0	15,423.890	46,714.339	54,263,376.000	6,072,334,529.000
105.67	0.0	15,096.930	45,780.354	59,825,767.000	6,132,160,296.000
105.75	0.0	14,592.320	44,531.731	51,728,058.000	6,183,888,354.000
105.83	0.0	14,317.100	43,363.475	50,371,013.000	6,234,259,367.000
105.92	0.0	14,317.100	42,951.300	56,128,759.000	6,290,388,126.000
106.00	0.0	14,317.100	42,951.300	49,892,230.000	6,340,280,356.000
106.08	0.0	14,317.100	42,951.300	49,892,230.000	6,390,172,586.000
106.17	0.0	14,317.100	42,951.300	56,128,759.000	6,446,301,345.000
106.25	0.0	14,317.100	42,951.300	49,892,230.000	6,496,193,575.000
106.33	0.0	14,317.100	42,951.300	49,892,230.000	6,546,085,805.000
106.42	0.0	14,317.100	42,951.300	56,128,759.000	6,602,214,564.000
106.50	0.0	14,317.100	42,951.300	49,892,230.000	6,652,106,794.000

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft³)	Volume (Total) (ft³)
106.58	0.0	14,317.100	42,951.300	49,892,230.000	6,701,999,024.000
106.67	0.0	14,317.100	42,951.300	56,128,759.000	6,758,127,783.000
106.75	0.0	14,317.100	42,951.300	49,892,230.000	6,808,020,013.000

Pond Volume Equations

*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft³)
100.00	14,000.000
100.08	14,000.000
100.17	14,000.000
100.25	14,000.000
100.33	14,000.000
100.42	14,000.000
100.50	14,000.000
100.58	14,000.000
100.67	14,000.000
100.75	14,000.000
100.83	30,936.250
100.92	30,854.230
101.00	30,799.170
101.08	30,740.010
101.17	30,676.560
101.25	30,609.700
101.33	30,539.450
101.42	30,464.700
101.50	30,385.590
101.58	30,302.070
101.67	30,214.060
101.75	30,121.540
101.83	30,024.440
101.92	29,922.310
102.00	29,816.080
102.08	29,704.650
102.17	29,588.310
102.25	29,466.960
102.33	29,340.300
102.42	29,208.760
102.50	29,071.450
102.58	28,929.170
102.67	28,780.570
102.75	28,626.550
102.83	28,466.580
102.92	28,300.050
103.00	28,127.240
103.08	27,949.020
103.17	27,763.170
103.25	27,570.160
103.33	27,369.710
103.42	27,161.570
103.50	26,945.340
103.58	26,720.440
103.67	26,486.700

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft³)
103.75	26,243.680
103.83	25,989.600
103.92	25,726.750
104.00	25,452.040
104.08	25,164.560
104.17	24,863.950
104.25	24,549.530
104.33	24,218.760
104.42	23,871.290
104.50	23,505.240
104.58	23,118.550
104.67	22,707.370
104.75	22,267.280
104.83	21,794.640
104.92	21,284.340
105.00	20,718.600
105.08	20,083.530
105.17	19,352.530
105.25	18,456.490
105.33	17,033.400
105.42	15,798.030
105.50	15,398.570
105.58	15,103.810
105.67	14,777.870
105.75	14,274.470
105.83	14,000.000
105.92	14,000.000
106.00	14,000.000
106.08	14,000.000
106.17	14,000.000
106.25	14,000.000
106.33	14,000.000
106.42	14,000.000
106.50	14,000.000
106.58	14,000.000
106.67	14,000.000
106.75	14,000.000

Requested Pond Water Surface Elevations	
Minimum (Headwater)	100.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	106.75 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Rectangular Weir	Weir - 1	Forward	TW	104.60	106.75
Stand Pipe	Riser - 1	Forward	TW	105.75	106.75
Orifice-Circular	Orifice - 1	Forward	TW	100.00	106.75
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	100.00 ft
Orifice Diameter	1.8 in
Orifice Coefficient	0.600

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	104.60 ft
Weir Length	0.95 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	105.75 ft
Diameter	54.0 in
Orifice Area	15.9 ft²
Orifice Coefficient	0.600
Weir Length	14.14 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	True

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Convergence Tolerances

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Composite Rating Curve | Scenario: 100-YR
Label: Composite Outlet Structure - 1

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
100.00	0.00	(N/A)	0.00	None Contributing
100.50	0.05	(N/A)	0.00	Orifice - 1
101.00	0.08	(N/A)	0.00	Orifice - 1
101.50	0.10	(N/A)	0.00	Orifice - 1
102.00	0.11	(N/A)	0.00	Orifice - 1
102.50	0.13	(N/A)	0.00	Orifice - 1
103.00	0.14	(N/A)	0.00	Orifice - 1
103.50	0.15	(N/A)	0.00	Orifice - 1
104.00	0.16	(N/A)	0.00	Orifice - 1
104.50	0.17	(N/A)	0.00	Orifice - 1
104.60	0.17	(N/A)	0.00	Weir - 1 + Orifice - 1
105.00	0.90	(N/A)	0.00	Weir - 1 + Orifice - 1
105.50	2.62	(N/A)	0.00	Weir - 1 + Orifice - 1
105.75	3.71	(N/A)	0.00	Weir - 1 + Riser - 1 + Orifice - 1
106.00	10.22	(N/A)	0.00	Weir - 1 + Riser - 1 + Orifice - 1
106.50	35.21	(N/A)	0.00	Weir - 1 + Riser - 1 + Orifice - 1
106.75	51.60	(N/A)	0.00	Weir - 1 + Riser - 1 + Orifice - 1

Requested Pond Water Surface Elevations	
Minimum (Headwater)	100.08 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	105.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1A	Forward	TW	3.50	10.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	6.00 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1A (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
0.00	0.00	(N/A)	0.00
0.50	0.00	(N/A)	0.00
1.00	0.00	(N/A)	0.00
1.50	0.00	(N/A)	0.00
2.00	0.00	(N/A)	0.00
2.50	0.00	(N/A)	0.00
3.00	0.00	(N/A)	0.00
3.50	0.00	(N/A)	0.00
4.00	1.16	(N/A)	0.00
4.50	4.33	(N/A)	0.00
5.00	9.01	(N/A)	0.00
5.50	15.12	(N/A)	0.00
6.00	18.52	(N/A)	0.00
6.50	21.38	(N/A)	0.00
7.00	23.91	(N/A)	0.00
7.50	26.19	(N/A)	0.00
8.00	28.29	(N/A)	0.00
8.50	30.24	(N/A)	0.00
9.00	32.08	(N/A)	0.00
9.50	33.81	(N/A)	0.00
10.00	35.46	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
CRIT.DEPTH CONTROL Vh= .129ft Dcr= .371ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .270ft Dcr= .731ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .429ft Dcr= 1.071ft CRIT.DEPTH Hev= .00ft

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1A (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H =1.00
H =1.50
H =2.00
H =2.50
H =3.00
H =3.50
H =4.00
H =4.50
H =5.00
H =5.50

Subsection: Composite Rating Curve Scenario: Base
Label: <deleted>

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
0.00	0.00	(N/A)	0.00
0.50	0.00	(N/A)	0.00
1.00	0.00	(N/A)	0.00
1.50	0.00	(N/A)	0.00
2.00	0.00	(N/A)	0.00
2.50	0.00	(N/A)	0.00
3.00	0.00	(N/A)	0.00
3.50	0.00	(N/A)	0.00
4.00	1.16	(N/A)	0.00
4.50	4.33	(N/A)	0.00
5.00	9.01	(N/A)	0.00
5.50	15.12	(N/A)	0.00
6.00	18.52	(N/A)	0.00
6.50	21.38	(N/A)	0.00
7.00	23.91	(N/A)	0.00
7.50	26.19	(N/A)	0.00
8.00	28.29	(N/A)	0.00
8.50	30.24	(N/A)	0.00
9.00	32.08	(N/A)	0.00
9.50	33.81	(N/A)	0.00
10.00	35.46	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A
Orifice - 1A

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	100.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
100.00	0.00	0.000	14,317.100	0.00	0.00	0.00
100.50	0.05	311,826,438.105	14,317.100	0.00	0.05	3,464,738.25
101.00	0.08	776,705,300.575	31,178.640	0.00	0.08	8,630,058.97
101.50	0.10	1,451,490,006.108	30,762.520	0.00	0.10	16,127,666.83
102.00	0.11	2,115,549,019.448	30,189.700	0.00	0.11	23,506,100.33
102.50	0.13	2,765,249,954.712	29,440.630	0.00	0.13	30,724,999.62
103.00	0.14	3,396,505,489.421	28,490.580	0.00	0.14	37,738,950.02
103.50	0.15	4,004,564,785.718	27,301.450	0.00	0.15	44,495,164.43
104.00	0.16	4,583,473,353.680	25,800.500	0.00	0.16	50,927,481.87
104.50	0.17	5,125,108,246.810	23,844.440	0.00	0.17	56,945,647.36
104.60	0.17	5,227,918,553.330	23,364.033	0.00	0.17	58,087,984.10
105.00	0.90	5,616,215,471.349	21,048.280	0.00	0.90	62,402,395.03
105.50	2.62	6,018,071,153.090	15,719.470	0.00	2.62	66,867,459.88
105.75	3.71	6,183,888,354.339	14,592.320	0.00	3.71	68,709,874.31
106.00	10.22	6,340,280,355.820	14,317.100	0.00	10.22	70,447,569.73
106.50	35.21	6,652,106,793.926	14,317.100	0.00	35.21	73,912,332.93
106.75	51.60	6,808,020,012.979	14,317.100	0.00	51.60	75,644,718.41

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	3.46 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.00	0.00	0.000	0.000	0.00	0.00	0.00
0.50	0.00	362,244,964.550	0.000	3.46	3.46	4,024,947.51
1.00	0.00	724,489,929.101	0.000	3.46	3.46	8,049,891.56
1.50	0.00	1,248,987,183.689	0.000	3.46	3.46	13,877,638.83
2.00	0.00	1,898,815,271.852	0.000	3.46	3.46	21,097,950.93
2.50	0.00	2,620,521,716.917	0.000	3.46	3.46	29,116,911.43
3.00	0.00	3,392,417,994.613	0.000	3.46	3.46	37,693,536.73
3.50	0.00	4,200,381,952.762	0.000	3.46	3.46	46,670,914.05
4.00	1.16	5,033,567,151.228	0.000	3.46	4.62	55,928,528.52
4.50	4.33	5,882,834,701.896	0.000	3.46	7.79	65,364,837.81
5.00	9.01	6,739,951,764.663	0.000	3.46	12.47	74,888,365.41
5.50	15.12	7,597,068,827.429	0.000	3.46	18.58	84,411,894.44
6.00	18.52	8,446,336,378.097	0.000	3.46	21.98	93,848,203.96
6.50	21.38	9,279,521,576.563	0.000	3.46	24.84	103,105,820.14
7.00	23.91	10,087,481,178.712	0.000	3.46	27.37	112,083,151.58
7.50	26.19	10,859,381,812.409	0.000	3.46	29.65	120,659,827.57

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
8.00	28.29	11,581,088,257.474	0.000	3.46	31.75	128,678,790.16
8.50	30.24	12,230,916,345.637	0.000	3.46	33.70	135,899,104.21
9.00	32.08	12,755,413,600.225	0.000	3.46	35.54	141,726,853.32
9.50	33.81	13,117,658,564.776	0.000	3.46	37.27	145,751,799.10
10.00	35.46	13,479,903,529.326	0.000	3.46	38.92	149,776,744.80

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	100.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	46.75 ft³/s	Time to Peak (Flow, In)	16.100 hours
Flow (Peak Outlet)	0.00 ft³/s	Time to Peak (Flow, Outlet)	24.150 hours

Elevation (Water Surface, Peak)	100.00 ft
Volume (Peak)	247,007.885 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	247,009.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	2.000 ft³
Volume (Retained)	247,008.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	3.46 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	37.63 ft³/s	Time to Peak (Flow, In)	16.500 hours
Infiltration (Peak)	0.01 ft³/s	Time to Peak (Infiltration)	48.000 hours
Flow (Peak Outlet)	0.00 ft³/s	Time to Peak (Flow, Outlet)	0.000 hours

Elevation (Water Surface, Peak)	0.00 ft
Volume (Peak)	662,583.289 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	676,465.000 ft³
Volume (Total Infiltration)	631.000 ft³
Volume (Total Outlet Outflow)	0.000 ft³
Volume (Retained)	662,582.000 ft³
Volume (Unrouted)	-13,252.000 ft³
Error (Mass Balance)	2.0 %

Peak Discharge	0.01 ft³/s
Time to Peak	48.000 hours
Hydrograph Volume	613.169 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.200	0.00	0.00	0.00	0.00	0.00
10.450	0.00	0.00	0.00	0.00	0.00
10.700	0.00	0.00	0.00	0.00	0.00
10.950	0.00	0.00	0.00	0.00	0.00
11.200	0.00	0.00	0.00	0.00	0.00
11.450	0.00	0.00	0.00	0.00	0.00
11.700	0.00	0.00	0.00	0.00	0.00
11.950	0.00	0.00	0.00	0.00	0.00
12.200	0.00	0.00	0.00	0.00	0.00
12.450	0.00	0.00	0.00	0.00	0.00
12.700	0.00	0.00	0.00	0.00	0.00
12.950	0.00	0.00	0.00	0.00	0.00
13.200	0.00	0.00	0.00	0.00	0.00
13.450	0.00	0.00	0.00	0.00	0.00
13.700	0.00	0.00	0.00	0.00	0.00
13.950	0.00	0.00	0.00	0.00	0.00
14.200	0.00	0.00	0.00	0.00	0.00
14.450	0.00	0.00	0.00	0.00	0.00
14.700	0.00	0.00	0.00	0.00	0.00
14.950	0.00	0.00	0.00	0.00	0.00
15.200	0.00	0.00	0.00	0.00	0.00
15.450	0.00	0.00	0.00	0.00	0.00
15.700	0.00	0.00	0.00	0.00	0.00
15.950	0.00	0.00	0.00	0.00	0.00
16.200	0.00	0.00	0.00	0.00	0.00
16.450	0.00	0.00	0.00	0.00	0.00
16.700	0.00	0.00	0.00	0.00	0.00
16.950	0.00	0.00	0.00	0.00	0.00
17.200	0.00	0.00	0.00	0.00	0.00
17.450	0.00	0.00	0.00	0.00	0.00
17.700	0.00	0.00	0.00	0.00	0.00
17.950	0.00	0.00	0.00	0.00	0.00
18.200	0.00	0.00	0.00	0.00	0.00
18.450	0.00	0.00	0.00	0.00	0.00
18.700	0.00	0.00	0.00	0.00	0.00
18.950	0.00	0.00	0.00	0.00	0.00
19.200	0.00	0.00	0.00	0.00	0.00
19.450	0.00	0.00	0.00	0.00	0.00
19.700	0.00	0.00	0.00	0.00	0.00

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
19.950	0.00	0.00	0.00	0.00	0.00
20.200	0.00	0.00	0.00	0.00	0.00
20.450	0.00	0.00	0.00	0.00	0.00
20.700	0.00	0.00	0.00	0.00	0.00
20.950	0.00	0.00	0.00	0.00	0.00
21.200	0.00	0.00	0.00	0.00	0.00
21.450	0.00	0.00	0.00	0.00	0.00
21.700	0.00	0.00	0.00	0.00	0.00
21.950	0.00	0.00	0.00	0.00	0.00
22.200	0.00	0.00	0.00	0.00	0.00
22.450	0.00	0.00	0.00	0.00	0.00
22.700	0.00	0.00	0.00	0.00	0.00
22.950	0.00	0.00	0.00	0.00	0.00
23.200	0.00	0.00	0.00	0.00	0.00
23.450	0.00	0.00	0.00	0.00	0.00
23.700	0.00	0.00	0.00	0.00	0.00
23.950	0.00	0.00	0.00	0.00	0.00
24.200	0.00	0.00	0.00	0.00	0.00
24.450	0.00	0.00	0.00	0.00	0.00
24.700	0.00	0.00	0.00	0.00	0.00
24.950	0.00	0.00	0.00	0.00	0.00
25.200	0.00	0.00	0.00	0.00	0.00
25.450	0.00	0.00	0.00	0.00	0.00
25.700	0.00	0.00	0.00	0.00	0.00
25.950	0.00	0.00	0.00	0.00	0.00
26.200	0.00	0.00	0.00	0.00	0.00
26.450	0.00	0.00	0.00	0.00	0.00
26.700	0.00	0.00	0.00	0.00	0.00
26.950	0.00	0.00	0.00	0.00	0.00
27.200	0.00	0.00	0.00	0.00	0.00
27.450	0.00	0.00	0.00	0.00	0.00
27.700	0.00	0.00	0.00	0.00	0.00
27.950	0.00	0.00	0.00	0.00	0.00
28.200	0.00	0.00	0.00	0.00	0.00
28.450	0.00	0.00	0.00	0.00	0.00
28.700	0.00	0.00	0.00	0.00	0.00
28.950	0.00	0.00	0.00	0.00	0.00
29.200	0.00	0.00	0.00	0.00	0.00
29.450	0.00	0.00	0.00	0.00	0.00
29.700	0.00	0.00	0.00	0.00	0.00
29.950	0.00	0.00	0.00	0.00	0.00
30.200	0.00	0.00	0.00	0.00	0.00
30.450	0.00	0.00	0.00	0.00	0.00
30.700	0.00	0.00	0.00	0.00	0.00

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.950	0.00	0.00	0.00	0.00	0.00
31.200	0.01	0.01	0.01	0.01	0.01
31.450	0.01	0.01	0.01	0.01	0.01
31.700	0.01	0.01	0.01	0.01	0.01
31.950	0.01	0.01	0.01	0.01	0.01
32.200	0.01	0.01	0.01	0.01	0.01
32.450	0.01	0.01	0.01	0.01	0.01
32.700	0.01	0.01	0.01	0.01	0.01
32.950	0.01	0.01	0.01	0.01	0.01
33.200	0.01	0.01	0.01	0.01	0.01
33.450	0.01	0.01	0.01	0.01	0.01
33.700	0.01	0.01	0.01	0.01	0.01
33.950	0.01	0.01	0.01	0.01	0.01
34.200	0.01	0.01	0.01	0.01	0.01
34.450	0.01	0.01	0.01	0.01	0.01
34.700	0.01	0.01	0.01	0.01	0.01
34.950	0.01	0.01	0.01	0.01	0.01
35.200	0.01	0.01	0.01	0.01	0.01
35.450	0.01	0.01	0.01	0.01	0.01
35.700	0.01	0.01	0.01	0.01	0.01
35.950	0.01	0.01	0.01	0.01	0.01
36.200	0.01	0.01	0.01	0.01	0.01
36.450	0.01	0.01	0.01	0.01	0.01
36.700	0.01	0.01	0.01	0.01	0.01
36.950	0.01	0.01	0.01	0.01	0.01
37.200	0.01	0.01	0.01	0.01	0.01
37.450	0.01	0.01	0.01	0.01	0.01
37.700	0.01	0.01	0.01	0.01	0.01
37.950	0.01	0.01	0.01	0.01	0.01
38.200	0.01	0.01	0.01	0.01	0.01
38.450	0.01	0.01	0.01	0.01	0.01
38.700	0.01	0.01	0.01	0.01	0.01
38.950	0.01	0.01	0.01	0.01	0.01
39.200	0.01	0.01	0.01	0.01	0.01
39.450	0.01	0.01	0.01	0.01	0.01
39.700	0.01	0.01	0.01	0.01	0.01
39.950	0.01	0.01	0.01	0.01	0.01
40.200	0.01	0.01	0.01	0.01	0.01
40.450	0.01	0.01	0.01	0.01	0.01
40.700	0.01	0.01	0.01	0.01	0.01
40.950	0.01	0.01	0.01	0.01	0.01
41.200	0.01	0.01	0.01	0.01	0.01
41.450	0.01	0.01	0.01	0.01	0.01
41.700	0.01	0.01	0.01	0.01	0.01

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
41.950	0.01	0.01	0.01	0.01	0.01
42.200	0.01	0.01	0.01	0.01	0.01
42.450	0.01	0.01	0.01	0.01	0.01
42.700	0.01	0.01	0.01	0.01	0.01
42.950	0.01	0.01	0.01	0.01	0.01
43.200	0.01	0.01	0.01	0.01	0.01
43.450	0.01	0.01	0.01	0.01	0.01
43.700	0.01	0.01	0.01	0.01	0.01
43.950	0.01	0.01	0.01	0.01	0.01
44.200	0.01	0.01	0.01	0.01	0.01
44.450	0.01	0.01	0.01	0.01	0.01
44.700	0.01	0.01	0.01	0.01	0.01
44.950	0.01	0.01	0.01	0.01	0.01
45.200	0.01	0.01	0.01	0.01	0.01
45.450	0.01	0.01	0.01	0.01	0.01
45.700	0.01	0.01	0.01	0.01	0.01
45.950	0.01	0.01	0.01	0.01	0.01
46.200	0.01	0.01	0.01	0.01	0.01
46.450	0.01	0.01	0.01	0.01	0.01
46.700	0.01	0.01	0.01	0.01	0.01
46.950	0.01	0.01	0.01	0.01	0.01
47.200	0.01	0.01	0.01	0.01	0.01
47.450	0.01	0.01	0.01	0.01	0.01
47.700	0.01	0.01	0.01	0.01	0.01
47.950	0.01	0.01	(N/A)	(N/A)	(N/A)

Peak Discharge	0.00 ft³/s
Time to Peak	24.150 hours
Hydrograph Volume	0.000 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	0.00	(N/A)	(N/A)	(N/A)

Peak Discharge	0.00 ft³/s
Time to Peak	15.950 hours
Hydrograph Volume	0.000 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	0.00	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	SITE

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SITE	247,366.080	16.120	51.38
Flow (In)	BMP1	247,009.431	16.100	46.75

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	SITE

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	SITE	458,662.500	16.500	37.63
Flow (In)	BMP1	676,465.200	16.500	37.63

Subsection: Diverted Hydrograph Scenario: 100-YR
Label: Outlet-1

Peak Discharge	0.00 ft³/s
Time to Peak	24.150 hours
Hydrograph Volume	0.000 ft³

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.000	0.00	0.00	(N/A)	(N/A)	(N/A)

Subsection: Diverted Hydrograph Scenario: Base
Label: Outlet-1

Peak Discharge	0.00 ft³/s
Time to Peak	15.950 hours
Hydrograph Volume	0.000 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	0.00	(N/A)	(N/A)	(N/A)

Index

APPENDIX I

HYDRAULIC CALULATIONS

```
T1 COMPASS BESS                                                                          0
T2 PROPOSED NORTH STORM DRAIN TO OSO CREEK
T3 KIMLEY-HORN
SO   1000.000 195.613  1                                  201.613
R    1035.000 195.788  1      .013                                          .000 -35.000 1
R    1210.000 202.770  1      .013                                          .000    .000 1
JX   1213.000 202.770  1  2   .013  162.520           207.990           64.0      -45.000
R    1288.500 203.106  3      .013                                          .000 -20.000 1
R    1302.500 203.350  3      .013                                          .000    .000 0
SH   1302.500 203.350  3                                  203.350
CD   1  4   1    .000   6.000     .000  .000  .000   .00
CD   2  3   1    .500   3.000    8.500  .000  .000   .00
CD   3  4   1    .000   2.000     .000  .000  .000   .00
Q              0.010   .0
```

```
                              Program Package Serial Number: 7545
                                         WATER SURFACE PROFILE LISTING                    Date:12- 5-2025  Time: 8:15:38
                        COMPASS BESS
                         PROPOSED NORTH STORM DRAIN TO OSO CREEK
                          KIMLEY-HORN
************************************************************************************************************************** ********
         | Invert  |  Depth |  Water   |    Q     |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
 Station |  Elev   |  (FT)  |  Elev    |  (CFS)   | (FPS)   Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
        -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    -|
 L/Elem  |Ch Slope |        |          |          |        SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1000.000  195.613   6.000   201.613    162.53    5.75     .51   202.13     .00    3.47      .00    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   21.212    .0050                                      .0015      .03     6.00     .00    3.15    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1021.212  195.719   6.000   201.719    162.53    5.75     .51   202.23     .00    3.47      .00    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   13.788    .0050                                      .0014      .02     6.00     .00    3.15    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1035.000  195.788   5.948   201.736    162.53    5.76     .51   202.25     .00    3.47     1.11    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
    2.154    .0399                                      .0013      .00     5.95     .20    1.78    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1037.154  195.874   5.861   201.735    162.53    5.78     .52   202.25     .00    3.47     1.80    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
HYDRAULIC JUMP
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1037.154  195.874   1.938   197.812    162.53   20.57    6.57   204.38     .00    3.47     5.61    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   40.252    .0399                                      .0271     1.09     1.94    3.06    1.78    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1077.406  197.480   2.006   199.486    162.53   19.62    5.98   205.46     .00    3.47     5.66    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   29.260    .0399                                      .0238      .70     2.01    2.86    1.78    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1106.665  198.647   2.077   200.724    162.53   18.70    5.43   206.16     .00    3.47     5.71    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   22.009    .0399                                      .0208      .46     2.08    2.67    1.78    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1128.674  199.525   2.151   201.676    162.53   17.83    4.94   206.61     .00    3.47     5.75    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   17.185    .0399                                      .0183      .31     2.15    2.50    1.78    .013      .00   .00  PIPE
         |         |        |         |         |              |         |       |        |        |       |       |      |
 1145.859  200.211   2.228   202.439    162.53   17.00    4.49   206.93     .00    3.47     5.80    6.000    .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-      -|-    -|-       -|-     -|-      -|-      -|-     -|-     -|-    |-
   13.735    .0399                                      .0160      .22     2.23    2.33    1.78    .013      .00   .00  PIPE
```

Program Package Serial Number: 7545

WATER SURFACE PROFILE LISTING Date:12- 5-2025 Time: 8:15:38

COMPASS BESS

PROPOSED NORTH STORM DRAIN TO OSO CREEK

KIMLEY-HORN

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1159.594	200.759	2.308	203.067	162.53	16.21	4.08	207.15	.00	3.47	5.84	6.000	.000	.00	1 .0
11.102	.0399					.0140	.16	2.31	2.18	1.78	.013	.00	.00	PIPE
1170.696	201.202	2.392	203.594	162.53	15.46	3.71	207.30	.00	3.47	5.88	6.000	.000	.00	1 .0
9.078	.0399					.0123	.11	2.39	2.04	1.78	.013	.00	.00	PIPE
1179.774	201.564	2.479	204.043	162.53	14.74	3.37	207.42	.00	3.47	5.91	6.000	.000	.00	1 .0
7.450	.0399					.0108	.08	2.48	1.90	1.78	.013	.00	.00	PIPE
1187.224	201.861	2.569	204.430	162.53	14.05	3.07	207.50	.00	3.47	5.94	6.000	.000	.00	1 .0
6.046	.0399					.0095	.06	2.57	1.77	1.78	.013	.00	.00	PIPE
1193.270	202.103	2.664	204.767	162.53	13.40	2.79	207.55	.00	3.47	5.96	6.000	.000	.00	1 .0
4.895	.0399					.0084	.04	2.66	1.66	1.78	.013	.00	.00	PIPE
1198.165	202.298	2.763	205.061	162.53	12.77	2.53	207.60	.00	3.47	5.98	6.000	.000	.00	1 .0
3.882	.0399					.0073	.03	2.76	1.54	1.78	.013	.00	.00	PIPE
1202.047	202.453	2.867	205.320	162.53	12.18	2.30	207.62	.00	3.47	5.99	6.000	.000	.00	1 .0
3.004	.0399					.0065	.02	2.87	1.44	1.78	.013	.00	.00	PIPE
1205.051	202.573	2.976	205.549	162.53	11.61	2.09	207.64	.00	3.47	6.00	6.000	.000	.00	1 .0
2.233	.0399					.0057	.01	2.98	1.34	1.78	.013	.00	.00	PIPE
1207.284	202.662	3.090	205.752	162.53	11.07	1.90	207.66	.00	3.47	6.00	6.000	.000	.00	1 .0
1.551	.0399					.0050	.01	3.09	1.25	1.78	.013	.00	.00	PIPE

WATER SURFACE PROFILE LISTING   Date:12- 5-2025 Time: 8:15:38

COMPASS BESS

PROPOSED NORTH STORM DRAIN TO OSO CREEK

KIMLEY-HORN

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1208.835	202.724	3.209	205.933	162.53	10.56	1.73	207.66	.00	3.47	5.99	6.000	.000	.00	1 .0
.884	.0399					.0044	.00	3.21	1.16	1.78	.013	.00	.00	PIPE
1209.718	202.759	3.335	206.094	162.53	10.07	1.57	207.67	.00	3.47	5.96	6.000	.000	.00	1 .0
.282	.0399					.0039	.00	3.34	1.08	1.78	.013	.00	.00	PIPE
1210.000	202.770	3.469	206.239	162.53	9.59	1.43	207.67	6.00	3.47	5.93	6.000	.000	.00	1 .0
JUNCT STR	.0000					.0018	.01	6.00	1.00		.013	.00	.00	PIPE
1213.000	202.770	5.649	208.419	.01	.00	.00	208.42	.00	.03	.00	2.000	.000	.00	1 .0
75.500	.0045					.0000	.00	5.65	.00	.04	.013	.00	.00	PIPE
1288.500	203.106	5.313	208.419	.01	.00	.00	208.42	.00	.03	.00	2.000	.000	.00	1 .0
14.000	.0174					.0000	.00	5.31	.00	.03	.013	.00	.00	PIPE
1302.500	203.350	5.069	208.419	.01	.00	.00	208.42	.00	.03	.00	2.000	.000	.00	1 .0

```
T1 COMPASS BESS                                                              0
T2 PROPOSED SOUTH STORM DRAIN TO OSO CREEK
T3 KIMLEY-HORN
SO   1000.000 195.780  1                           200.780
R    1040.000 195.980  1      .013                                  .000  90.000 0
R    1271.000 197.270  1      .013                                  .000  23.000 1
R    1538.000 198.600  1      .013                                  .000 -44.000 1
R    1613.000 206.200  1      .013                                  .000    .000 0
SH   1613.000 206.790  1                           206.790
CD   1  4   0    .000   5.000     .000  .000  .000   .00
Q           170.100   .0
```

Program Package Serial Number: 7545

WATER SURFACE PROFILE LISTING Date:12- 4-2025 Time: 9:52:32

COMPASS BESS
PROPOSED SOUTH STORM DRAIN TO OSO CREEK
KIMLEY-HORN

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	195.780	5.000	200.780	170.10	8.66	1.17	201.95	.00	3.74	.00	5.000	.000	.00	0 .0
40.000	.0050					.0043	.17	5.00	.00	3.79	.013	.00	.00	PIPE
1040.000	195.980	5.317	201.297	170.10	8.66	1.17	202.46	.00	3.74	.00	5.000	.000	.00	0 .0
231.000	.0056					.0043	.99	5.32	.00	3.62	.013	.00	.00	PIPE
1271.000	197.270	5.159	202.429	170.10	8.66	1.17	203.59	.00	3.74	.00	5.000	.000	.00	0 .0
51.599	.0050					.0043	.22	5.16	.00	3.80	.013	.00	.00	PIPE
1322.599	197.527	5.163	202.690	170.10	8.66	1.17	203.86	.00	3.74	.00	5.000	.000	.00	0 .0
HYDRAULIC JUMP														
1322.599	197.527	2.612	200.139	170.10	16.39	4.17	204.31	.00	3.74	5.00	5.000	.000	.00	0 .0
13.544	.0050					.0151	.20	2.61	2.00	3.80	.013	.00	.00	PIPE
1336.143	197.595	2.571	200.166	170.10	16.72	4.34	204.51	.00	3.74	5.00	5.000	.000	.00	0 .0
29.266	.0050					.0166	.48	2.57	2.07	3.80	.013	.00	.00	PIPE
1365.409	197.740	2.476	200.216	170.10	17.54	4.77	204.99	.00	3.74	5.00	5.000	.000	.00	0 .0
28.008	.0050					.0188	.53	2.48	2.22	3.80	.013	.00	.00	PIPE
1393.417	197.880	2.386	200.266	170.10	18.39	5.25	205.52	.00	3.74	4.99	5.000	.000	.00	0 .0
26.719	.0050					.0214	.57	2.39	2.38	3.80	.013	.00	.00	PIPE
1420.137	198.013	2.299	200.312	170.10	19.29	5.78	206.09	.00	3.74	4.98	5.000	.000	.00	0 .0
25.641	.0050					.0243	.62	2.30	2.56	3.80	.013	.00	.00	PIPE

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                                   WATER SURFACE PROFILE LISTING                    Date:12- 4-2025  Time: 9:52:32
                  COMPASS BESS
                    PROPOSED SOUTH STORM DRAIN TO OSO CREEK
                      KIMLEY-HORN
************************************************************************************************************************************ ********
          | Invert  |  Depth |  Water   |    Q     |  Vel    Vel  |  Energy | Super  |Critical|Flow Top|Height/|Base Wt|       |No Wth
 Station  |  Elev   |  (FT)  |  Elev    |  (CFS)   | (FPS)   Head |  Grd.El.|  Elev  | Depth  | Width  |Dia.-FT|or I.D.|  ZL   |Prs/Pip
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     -|
 L/Elem   |Ch Slope |        |          |          |         SF Ave|   HF    |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR   |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|***** |*******
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1445.777   198.141    2.217   200.358    170.10   20.23    6.36   206.71      .00     3.74     4.97    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
   24.529    .0050                                          .0277      .68     2.22     2.74     3.80    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1470.306   198.263    2.138   200.401    170.10   21.22    6.99   207.39      .00     3.74     4.95    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
   23.498    .0050                                          .0315      .74     2.14     2.94     3.80    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1493.804   198.380    2.062   200.442    170.10   22.25    7.69   208.13      .00     3.74     4.92    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
   22.560    .0050                                          .0359      .81     2.06     3.15     3.80    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1516.364   198.492    1.990   200.482    170.10   23.34    8.46   208.94      .00     3.74     4.89    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
   21.636    .0050                                          .0409      .88     1.99     3.37     3.80    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1538.000   198.600    1.921   200.521    170.10   24.48    9.30   209.83      .00     3.74     4.86    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    2.031    .1034                                          .0431      .09     1.92     3.61     1.53    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1540.032   198.810    1.931   200.741    170.10   24.29    9.17   209.91      .00     3.74     4.87    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
   12.045    .1034                                          .0400      .48     1.93     3.57     1.53    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1552.077   200.056    2.001   202.057    170.10   23.16    8.33   210.39      .00     3.74     4.90    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
   10.027    .1034                                          .0351      .35     2.00     3.33     1.53    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1562.104   201.092    2.074   203.166    170.10   22.09    7.57   210.74      .00     3.74     4.93    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    8.444    .1034                                          .0309      .26     2.07     3.11     1.53    .013      .00   .00  PIPE
          |         |        |          |          |               |         |        |        |        |       |       |       |
 1570.548   201.965    2.150   204.116    170.10   21.06    6.89   211.00      .00     3.74     4.95    5.000    .000   .00   0   .0
         -|-       -|-      -|-        -|-        -|-      -|-    -|-       -|-      -|-      -|-      -|-     -|-     -|-     |-
    7.156    .1034                                          .0271      .19     2.15     2.91     1.53    .013      .00   .00  PIPE
```

COMPASS BESS
PROPOSED SOUTH STORM DRAIN TO OSO CREEK
KIMLEY-HORN

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1577.705	202.705	2.230	204.936	170.10	20.08	6.26	211.20	.00	3.74	4.97	5.000	.000	.00	0 .0
6.109	.1034					.0238	.15	2.23	2.71	1.53	.013	.00	.00	PIPE
1583.813	203.337	2.313	205.650	170.10	19.14	5.69	211.34	.00	3.74	4.99	5.000	.000	.00	0 .0
5.220	.1034					.0210	.11	2.31	2.53	1.53	.013	.00	.00	PIPE
1589.033	203.877	2.400	206.277	170.10	18.25	5.17	211.45	.00	3.74	5.00	5.000	.000	.00	0 .0
4.465	.1034					.0184	.08	2.40	2.36	1.53	.013	.00	.00	PIPE
1593.498	204.339	2.491	206.830	170.10	17.40	4.70	211.53	.00	3.74	5.00	5.000	.000	.00	0 .0
3.815	.1034					.0162	.06	2.49	2.19	1.53	.013	.00	.00	PIPE
1597.313	204.733	2.586	207.319	170.10	16.59	4.28	211.59	.00	3.74	5.00	5.000	.000	.00	0 .0
3.240	.1034					.0143	.05	2.59	2.04	1.53	.013	.00	.00	PIPE
1600.553	205.068	2.686	207.754	170.10	15.82	3.89	211.64	.00	3.74	4.99	5.000	.000	.00	0 .0
2.725	.1034					.0126	.03	2.69	1.90	1.53	.013	.00	.00	PIPE
1603.278	205.350	2.792	208.142	170.10	15.09	3.53	211.68	.00	3.74	4.97	5.000	.000	.00	0 .0
2.279	.1034					.0111	.03	2.79	1.76	1.53	.013	.00	.00	PIPE
1605.557	205.585	2.903	208.489	170.10	14.38	3.21	211.70	.00	3.74	4.93	5.000	.000	.00	0 .0
1.860	.1034					.0099	.02	2.90	1.64	1.53	.013	.00	.00	PIPE
1607.417	205.778	3.021	208.799	170.10	13.71	2.92	211.72	.00	3.74	4.89	5.000	.000	.00	0 .0
1.494	.1034					.0087	.01	3.02	1.52	1.53	.013	.00	.00	PIPE

WATER SURFACE PROFILE LISTING Date:12- 4-2025 Time: 9:52:32

COMPASS BESS
PROPOSED SOUTH STORM DRAIN TO OSO CREEK
KIMLEY-HORN

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1608.912	205.932	3.145	209.077	170.10	13.08	2.65	211.73	.00	3.74	4.83	5.000	.000	.00	0 .0
1.133	.1034					.0077	.01	3.15	1.40	1.53	.013	.00	.00	PIPE
1610.044	206.049	3.278	209.328	170.10	12.47	2.41	211.74	.00	3.74	4.75	5.000	.000	.00	0 .0
.812	.1034					.0069	.01	3.28	1.30	1.53	.013	.00	.00	PIPE
1610.857	206.133	3.419	209.553	170.10	11.89	2.19	211.75	.00	3.74	4.65	5.000	.000	.00	0 .0
.488	.1034					.0061	.00	3.42	1.19	1.53	.013	.00	.00	PIPE
1611.345	206.184	3.571	209.755	170.10	11.33	1.99	211.75	.00	3.74	4.52	5.000	.000	.00	0 .0
.155	.1034					.0055	.00	3.57	1.10	1.53	.013	.00	.00	PIPE
1611.500	206.200	3.738	209.938	170.10	10.80	1.81	211.75	.00	3.74	4.34	5.000	.000	.00	0 .0

Trapezoidal Grass Channel - (DA 5.1)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.500 %
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	5.00 ft
Discharge	67.44 cfs

Results	
Normal Depth	21.0 in
Flow Area	17.9 ft²
Wetted Perimeter	16.1 ft
Hydraulic Radius	13.4 in
Top Width	15.49 ft
Critical Depth	16.3 in
Critical Slope	1.401 %
Velocity	3.77 ft/s
Velocity Head	0.22 ft
Specific Energy	1.97 ft
Froude Number	0.618
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	21.0 in
Critical Depth	16.3 in
Channel Slope	0.500 %
Critical Slope	1.401 %

Trapezoidal Grass Channel - (DA 5.2)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	0.500 %
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	5.00 ft
Discharge	170.10 cfs

Results

Normal Depth	32.4 in
Flow Area	35.4 ft²
Wetted Perimeter	22.1 ft
Hydraulic Radius	19.2 in
Top Width	21.22 ft
Critical Depth	26.3 in
Critical Slope	1.235 %
Velocity	4.80 ft/s
Velocity Head	0.36 ft
Specific Energy	3.06 ft
Froude Number	0.655
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	32.4 in
Critical Depth	26.3 in
Channel Slope	0.500 %
Critical Slope	1.235 %

Culvert Calculator Report
DA 5.2

Solve For: Section Size

Culvert Summary

Allowable HW Elevation	215.00	ft	Headwater Depth/Height	0.85	
Computed Headwater Eleva	214.79	ft	Discharge	170.10	cfs
Inlet Control HW Elev.	214.75	ft	Tailwater Elevation	212.00	ft
Outlet Control HW Elev.	214.79	ft	Control Type	Entrance Control	

Grades

Upstream Invert	212.25	ft	Downstream Invert	209.75	ft
Length	60.00	ft	Constructed Slope	0.041667	ft/ft

Hydraulic Profile

Profile	CompositeS1S2		Depth, Downstream	2.25	ft
Slope Type	Steep		Normal Depth	0.72	ft
Flow Regime	N/A		Critical Depth	1.59	ft
Velocity Downstream	5.04	ft/s	Critical Slope	0.004066	ft/ft

Section

Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	5.00	ft
Section Size	5 x 3 ft		Rise	3.00	ft
Number Sections	3				

Outlet Control Properties

Outlet Control HW Elev.	214.79	ft	Upstream Velocity Head	0.79	ft
Ke	0.20		Entrance Loss	0.16	ft

Inlet Control Properties

Inlet Control HW Elev.	214.75	ft	Flow Control	N/A	
Inlet Type	90° headwall w 45° bevels		Area Full	45.0	ft²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

Culvert Calculator Report
DA 6

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	212.00 ft	Headwater Depth/Height	1.08
Computed Headwater Eleva	211.73 ft	Discharge	162.50 cfs
Inlet Control HW Elev.	211.68 ft	Tailwater Elevation	209.00 ft
Outlet Control HW Elev.	211.73 ft	Control Type	Entrance Control

Grades

Upstream Invert	208.50 ft	Downstream Invert	208.00 ft
Length	35.00 ft	Constructed Slope	0.014286 ft/ft

Hydraulic Profile

Profile	S2	Depth, Downstream	1.54 ft
Slope Type	Steep	Normal Depth	1.31 ft
Flow Regime	Supercritical	Critical Depth	2.02 ft
Velocity Downstream	10.54 ft/s	Critical Slope	0.004289 ft/ft

Section

Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	5 x 3 ft	Rise	3.00 ft
Number Sections	2		

Outlet Control Properties

Outlet Control HW Elev.	211.73 ft	Upstream Velocity Head	1.01 ft
Ke	0.20	Entrance Loss	0.20 ft

Inlet Control Properties

Inlet Control HW Elev.	211.68 ft	Flow Control	N/A
Inlet Type	90° headwall w 45° bevels	Area Full	30.0 ft²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

APPENDIX J

GEOTECHNICAL REPORT
(provided separately)

Appendix 4.15B

Water Quality Management Plan

Water Quality Management Plan (WQMP)

Project Name:

COMPASS BATTERY STORAGE PROJECT

Prepared for:

Broad Reach Power Company

39343 Camino Capistrano

San Juan Capistrano, California 92675

Prepared by:

Kimely-Horn and Associates, Inc.

Engineer: Ashley Teani

27290 Madison Ave, Suite 300

Temecula, CA 92590

(951) 888-8978

Engineer's Seal

Prepared on:

12/05/2025

Project Owner's Certification			
Permit/Application No.		Grading Permit No.	
Tract/Parcel Map No.		Building Permit No.	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			637-082-71

This Water Quality Management Plan (WQMP) has been prepared for Broad Reach Power Company by Kimley-Horn and Associates, Inc (Kimely-Horn). The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the San Diego Region (South Orange County). Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Compass Energy Storage LLC			
Title	Senior Vice President and Secretary		
Company	Broad Reach Power Company		
Address	333 Clay Street, Suite 2800, Houston, TX 77002		
Email	jalvord@broadreachpower.com		
Telephone #	(240) 893-2738		
Signature		Date	

Contents

Page No.

Section 1 Discretionary Permit(s) and Water Quality Conditions

Project Infomation			
Permit/Application No.		Site Address or Tract/Parcel Map No.	29343 Camino Capistrano, San Juan Capistrano, CA 92675
Additional Information/ Comments:	N/A		
Water Quality Conditions			
Water Quality Conditions from prior approvals or applicable watershed-based plans	N/A		

Section 2 Project Description

2.1 General Description

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td>Site Location</td><td colspan="4">The proposed development is bound by Saddleback Church to the north, Interstate 5 to the east, Oso Creek to the south, and steep hills to the west. Address for the site is 29343 Camino Capistrano, San Juan Capistrano, CA 92675.</td></tr>
<tr><td>Project Area (ft²):
647,999</td><td colspan="3">Number of Dwelling Units: 0</td><td>SIC Code: 3691 & 5063</td></tr>
<tr><td>Narrative Project Description:</td><td colspan="4">The proposed Compass Battery Storage Project is approximately 14.88 Acres and will include battery storage units and associated equipment with concrete pads, access roads, and proposed drainage structures. Run-on from adjacent hills is expected and will be collected and diverted around the site. Under existing conditions, some vegetation, impervious surfaces, gravel, and dirt roads are present.

The site is comprised of soil types A, C, and D. The western half of the site is primarily soil types C and D, and the eastern half of the site is primarily soil type A per the NRCS Web Soil Survey soil data tool. The site does not propose to store any waste or outdoor materials. The site is located within the San Juan watershed and located west of lower Oso Creek.

The proposed development is classified as a priority project since it creates over 10,000 sf of impervious surfacing.</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious (Grass and Dirt)</td><td colspan="2">Impervious (Gravel & Concrete/Asphalt)</td></tr>
<tr><td>Area
(acres or sq ft)</td><td>Percentage</td><td>Area
(acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>14.41 AC/627,428 SF</td><td>96.84%</td><td>0.47 AC/20,571 SF (Gravel)</td><td>3.16%</td></tr>
<tr><td>Post-Project Conditions</td><td>2.39 AC/
104,140 SF</td><td>16.07%</td><td>5.01 AC/
218,319 SF (Gravel)

7.47 AC/
325,540 SF (Concrete/Asphalt)</td><td>83.93 %</td></tr>
</table>

2.2 Post Development Drainage Characteristics

Under the proposed conditions, existing drain patterns will remain. Runoff flows from west to east and stormwater will be collected via proposed inlets and conveyed into the proposed subsurface basin. This basin will not infiltrate but detain the stormwater before discharging to the channelized portion of Oso creek and continues downstream. Expected Run-on, generated from adjacent hills, will be intercepted and rerouted around the site via level spreaders and diversion as previously aforementioned.

2.3 Property Ownership/Management

Maintenance of BMP facilities will be the responsibility of the property owner:

Broad Reach Power Company

39343 Camino Capistrano

San Juan Capistrano, California 92675

Once constructed, it is our understanding that the substation will be transferred to SDG&E which SDG&E will then be the party responsible for inspections/maintenance of BMP facilities. Until ownership is transferred, Broad Reach Power Company will be required to oversee BMP facilities and maintenance. No association to be formed for long-term maintenance.

Section 3 Site & Watershed Characterization

3.1 Site Conditions

3.1.1 Existing Site Conditions

- The site is composed of 14.88 Acres and contains some vegetation, impervious surfaces, gravel, and dirt roads.
- The project site is located in an area with a hydrologic condition of concerns. Therefore, the project site will be restricted to discharging up to 110% of the pre-development (natural) peak flow for up to a 10-year storm event.
- There are no environmentally sensitive areas onsite.
- The site Receives run-on from the hills located to the west of the site.
- Based on the Geotechnical Evaluation Report prepared by LGC Geotechnical, Inc. and Section 4.2.2.1 of the Technical Guidance Document (TGD), low infiltration rates and the risk of infiltration affecting the existing stability of the proposed development, onsite infiltration is not feasible.
- The existing topography generally drains from the west to east toward Oso Creek.

Existing Land Uses				
Land Use Description	Total Area	Impervious Area	Pervious Area	Imperviousness
Open Space	14.88 AC/647,999 SF	0.47 AC/20,571 SF	14.41 AC/627,428 SF	3.16%
Total	14.88 AC	0.47 AC	14.41 AC	3.16%

3.1.2 Infiltration-Related Characteristics

3.1.2.1 Hydrogeologic Conditions

According to the Geotechnical Evaluation Report prepared by LGC Geotechnical, Inc., dated April 4th, 2024, groundwater was encountered at depths ranging from approximately 31 feet to 41 feet below the existing grade, with historic high groundwater estimated at 5 feet below grade. Based on this information groundwater is not expected to be a constraint.

3.1.2.2 Soil and Geologic Infiltration Characteristics

Using the NRCS GIS Web Soil Survey soil data, it was determined that the hydrologic soil group classification for the area is a mixture of soil types A, C, and D. The western half of the site is primarily soil types C and D and the eastern half of the site is primarily soil type A. Soil type A soils are defined to have high infiltration rates (low runoff potential), Soil type C having slow infiltration rates, and Soil type D typically have very slow infiltration rates (high runoff potential) when thoroughly wet. Based on the Geotechnical Evaluation Report prepared by LGC Geotechnical, Inc., infiltration is not favorable.

3.1.2.3 Geotechnical Conditions

As mentioned in the Geotechnical Evaluation Report prepared by LGC Geotechnical, Inc., the site consists of compacted fill over fine-grained soils that have low permeability. Due to the nature of the site and as stated in the geotechnical report "any infiltration system would have to prevent the lateral migration of the infiltrated water which could decrease the existing stability of the proposed development" (LGC Geotechnical, 2024), infiltration is not favored.

3.1.2.4 Summary of Infiltration Opportunities and Constraints of Existing Site

Due to low infiltration rates and the risk of affecting the existing stability of the proposed development, onsite infiltration is not feasible. Refer to the Geotechnical report (Attachment E) for more information.

3.2 Proposed Site Development Activities

3.2.1 Overview of Site Development Activities

The project development includes battery storage units and associated equipment with concrete pads, access roads, and proposed drainage structures. The site will routinely be occupied during periodic maintenance activities only. Similar to existing conditions, the post-development project site will discharge into Oso Creek and maintain existing flow patterns from west to east.

3.2.2 Project Attributes Influencing Stormwater Management

• During operation there will be no waste generated on site and there will be minimum traffic to the area; except to maintain the underground detention basin and landscaping. There will be no discharge to any environmentally sensitive features.

• The proposed land surfacing of the site will consist of impervious concrete pads for batteries, paved internal roads, as well as gravel access roads and gravel surfacing in the substation area. Surrounding the site will be a 20-foot vegetative buffer.

• The site will maintain the existing drainage pattern by discharging into Oso Creek.

•Run-on is expected from the western portion of the site. Stormwater from the steep hills will be intercepted and rerouted around the site. Onsite runoff will be detained within the underground basin and treated downstream before entering Oso Creek.

•Lithium-ion batteries, inverters, medium-voltage (MV) transformers, a switchyard, a collector substation, and other associated equipment to interconnect into the SDG&E Trabuco to Capistrano 138 kV transmission line (Point of Interconnection) will be installed. Equipment will be located in non-habitable enclosures.

• The Project will be connected to the SDG&E electric transmission system. Electric energy will be transferred from the existing power grid to the Project batteries for storage and from the Project batteries to the power grid when additional electricity is needed.

• The land cover will be commercial and contain both impervious and pervious areas. See the table below for a summary of the land use ratios.

Proposed Land Uses					
Land Use Description	Total Area	Impervious Area	Pervious Area	Gravel (40% impervious)	Imperviousness
Commercial	14.88 AC/647,999 SF	7.47 AC/325,540 SF	2.39 AC/104,140 SF	5.01 AC/ 218,319 SF	64%
Total	14.88 AC	7.47 AC	2.39 AC	5.01 AC	64%

3.2.3 Effects on Infiltration and Harvest and Use Feasibility

As discussed in section 3.1.2.4, infiltration is not feasible due to low infiltration rates and the risk of affecting the existing stability of the proposed development. Harvest and use was not proposed due to site constraints and lack of demand. Necessary flows will be treated via biofiltration before discharging into Oso Creek.

3.3 Receiving Waterbodies

Oso Creek is a major tributary within the San Juan Creek Watershed of South Orange County, California. The Oso Creek drainage ultimately discharges to Arroyo Trabuco, then to San Juan Creek, which outlets to the Pacific Ocean. See the table below for a summary of the receiving waterbodies and the 303(d) listed impairments and TMDLs. The project does not discharge to any environmentally sensitive areas.

Receiving Waterbodies		
Receiving Waters	303(d) Listed Impairments	Applicable TMDLs
Oso Creek (lower)	Nitrogen, Phosphorus, Selenium, Toxicity	Toxicity (Ceriodaphnia dubia & Selenastrum algae)
Arroyo Trabuco	Benthic Community Effects, Indicator Bacteria, Malathion, Nitrogen, Phosphorus, Toxicity	Indicator Bacteria (Enterococcus & fecal coliform)
San Juan Creek	Benthic Community Effects, Indicator Bacteria, Nitrogen, Oxygen Dissolved, PCBs (Polychlorinated biphenyls), Phosphorus, Selenium, Toxicity	Benthic Community Effects (Agriculture, contaminated sediments, hydromodification, illicit connections/illegal hookups/dry weather flows, removal of riparian vegetation)
Pacific Ocean	N/A	N/A

3.4 Stormwater Pollutants or Conditions of Concern

Pollutants or Conditions of Concern				
Pollutant	Expected from Proposed Land Uses/Activities (Yes or No)	Receiving Waterbody Impaired (Yes or No)	Priority Pollutant from WQIP or other Water Quality Condition? (Yes or No)	**Pollutant of Concern (Primary, Other, or No)**
Suspended-Solids	Yes	No	No	No
Nutrients	Yes	No	No	No
Heavy Metals	No	No	No	No
Bacteria/Virus/Pathogens	No	Yes	Yes	Primary
Pesticides	Yes	No	No	No
Oil and Grease	Yes	No	No	No
Toxic Organic Compounds	Yes	Yes	No	No
Trash and Debris	Yes	No	No	No
Dry Weather Runoff	No	No	Yes	Primary

3.5 Hydrologic Conditions of Concern

Does a hydrologic condition of concern exist for this project?

☐ No – An HCOC does not exist for this receiving water because

- ☐ Project discharges directly to a protected conveyance (bed and bank are concrete lined the entire way from the point(s) of discharge to a receiving lake, reservoir, embayment, or the Ocean
- ☐ Project discharges directly to storm drains which discharge directly to a reservoir, lake, embayment, ocean or protected conveyance (as described above)
- ☐ The project discharges to an area identified in the WMAA as exempt from hydromodification concerns

☒ Yes – An HCOC does exist for this receiving water because none of the above are applicable.

3.6 Critical Coarse Sediment Yield Areas

As Shown in the Potential Coarse Sediment maps provided in Appendix N.8 of the TGD, the site is located within the limits of potential concern. Per the guidance provided from the adjacent jurisdiction, the County of San Diego BMP Design Manual, for investigating Critical Coarse Sediment Yield Areas (CCSYAs), the project proposes to bypass CCSYAs around the project site. Proposed swales surrounding the site will convey sediment from offsite hillslopes to the downstream waters (Oso Creek) while maintaining a velocity from the 2-year, 24-hour event greater than three feet per second.

See Attachment I for calculations.

Section 4 Site Plan and Drainage Plan

4.1 Drainage Management Area Delineation

The Site is divided into 2 Drainage Management Areas (DMA): DMA 1 and 2. DMA 1 is composed of the onsite area(s) in which flows are routed to the proposed subsurface basin. DMA 2 considers the disturbed area in which flows are routed to the proposed vegetated earthen channels and diverted around the site. Refer to the WQMP exhibit for additional information.

4.2 Overall Site Design BMPs

Minimize Impervious Area – Landscaping will be provided, and impervious areas will be minimized to where necessary.

Maximize Natural Infiltration Capacity – As aforementioned, infiltration is not feasible for this development due to poor infiltration rates and soil-causing perched water conditions.

Preserve Existing Drainage Patterns and Time of Concentration – Time of concentrations will increase as a result of the proposed storm drain infrastructure. The proposed drainage pattern (west to east) will be maintained as in existing conditions. Additionally, proposed conditions will discharge to Oso Creek as in existing conditions.

Disconnect Impervious Areas – Disconnected impervious areas will not be used for onsite access. Convenient access for emergencies and maintenance is required. Vegetative buffers are proposed which will add additional pervious areas.

Protect Existing Vegetation and Sensitive Areas – N/A. There are no sensitive areas within the project site.

Revegetate Disturbed Areas – The project will include native and/or drought-tolerant landscaping to the maximum extent practicable.

Soil Stockpiling and Site Generated Organics – Soil stockpiling is not expected to occur during regular site activities, but if stockpiling is necessary, then proper stockpiling storage and reapplication of disturbed topsoil is recommended. Proper stockpiling generally includes protecting the stockpile to prevent excessive compaction and covering the stockpile to prevent significant erosion and leaching of nutrients. The site will only be occupied during regular maintenance activities.

Firescaping - Plants will be selected to minimize the risks of fire. Vegetation will be selected in accordance with the zone of the battery storage area.

Water Efficient Landscaping - The project will include native and/or drought-tolerant landscaping to the maximum extent practicable.

Slopes and Channel Buffers – Vegetative buffer and diversion channels will be installed, and slopes will be stabilized to reduce the risk of erosion of slopes.

4.3 DMA Characteristics and Site Design BMPs

4.3.1 DMA 1

DMA 1 includes the area(s) in which runoff is conveyed to proposed catch basins and the subsurface basin. This area is approximately 12.87 Acres and is composed of class 2 aggregate base and asphalt. This DMA is considered to be 74% impervious. This area will not infiltrate as it is infeasible as discussed in the geotechnical report.

4.3.2 DMA 2

DMA 2 includes the area(s) in which runoff is conveyed to earthen channels. This area is approximately 2.01 Acres and is composed of landscaping. This DMA is considered to be 100% pervious and self-treating.

4.3.3 DMA Summary

Drainage Management Areas				
DMA (Number/Description)	Total Area (acres)	Imperviousness (%)	Infiltration Feasibility Category (Full, Partial, or No Infiltration)	Hydrologic Source Controls Used
DMA 1	12.87	74	No Infiltration	Subsurface Basin
DMA 2	2.01	0	Partial Infiltration	Earthen Channel

4.4 Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	Name	Check One		Reason Source Control is Not Applicable
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed development will not generate waste subject to Title 22 CCR compliance.
N6	Local Industrial Permit Compliance	☐	☒	Industrial facility not proposed.
N7	Spill Contingency Plan	☐	☒	No hazardous materials onsite.
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks for hazardous waste are proposed for the project.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous waste will be present onsite.
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☐	☒	Battery Storage area will be uninhabited.
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks proposed.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☐	☒	Minimum Traffic is expected.
N16	Retail Gasoline Outlets	☐	☒	No gasoline will be sold onsite.

The following is a description of how each non-structural source control BMP will be implemented:

N1 Education for Property Owners, Tenants and Occupants - Educational materials will be provided to employees/maintenance crew by owner/developer to inform them of their actions and potential impacts on downstream water quality. Materials include those described in Section 7 of this WQMP and any updates to educational materials.

N2 Activity Restrictions - Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measures.

N3 Common Area Landscape Management - Maintenance activities for landscape areas shall be consistent with City's and manufacturer's guidelines for fertilizer and/or pesticide usage consistent with Management Guidelines for Use of Fertilizers (DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement and shall be consistent with the City's Landscape Ordinance. Stockpiled materials during maintenance activities, if necessary, shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled.

N4 BMP Maintenance - The Owner shall be responsible for implementation of each applicable non-structural, structural and LID BMPs as well as scheduling inspection and maintenance cleaning of all applicable structural BMP facilities. The Owner shall be responsible for inspection and maintenance activities in landscape areas.

N10 Uniform Fire Code Implementation - Compliance with Article 80 of the Uniform Fire Code is enforced by the fire protection agency.

N12 Employee Training - All employees, contractors and subcontractors shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.

N14 Common Area Catch Basin Inspection - As required by the Technical Guidance Document (TGD), at least 80 percent of drainage facilities shall be inspected, cleaned and maintained on an annual basis with 100 percent of the facilities included in a two-year period. Cleaning should take place in later summer/early fall prior to the start of the rainy season. Drainage facilities include catch basins, detention basins, and the project's LID BMPs. Records should be kept documenting the annual maintenance.

Structural Source Control BMPs

Identifier	Name	Check One		Reason Source Control is Not Applicable
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas are proposed onsite. All material will be hauled offsite.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	No trash and waste storage areas proposed onsite.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	No dock areas proposed onsite.
S7	Maintenance bays	☐	☒	No maintenance bays proposed onsite
S8	Vehicle wash areas	☐	☒	No vehicle was areas proposed onsite.
S9	Outdoor processing areas	☐	☒	No outdoor processing areas are proposed onsite.
S10	Equipment wash areas	☐	☒	No equipment wash areas are proposed onsite.
S11	Fueling areas	☐	☒	No fueling areas are proposed onsite.
S12	Hillside landscaping	☒	☐	
S13	Wash water control for food preparation areas	☐	☒	No food preparation areas are proposed onsite.
S14	Community car wash racks	☐	☒	No community car wash racks are proposed onsite.

The following is a description of how each non-structural source control BMP will be implemented:

S1 Provide storm drain stenciling/signage – "No dumping" signs/stencils to be placed near proposed onsite grate inlets to prevent excessive pollutants from entering the storm drain infrastructure and creek.

S4 Efficient Irrigation Systems and Landscape Design - Native or drought tolerant landscaping will be used to minimize runoff of excess irrigation water.

S5 Protect slopes and channels and provide energy dissipation – Landscaping will be provided near the earthen channels to help hinder erosion.

S12 Hillside Landscaping - Landscaping will be provided near the earthen channels to help hinder erosion.

Section 5 Low Impact Development BMPs

5.1 LID BMPs in DMA 1

- Infiltration is not feasible per Geotechnical Study.
- Harvest and use is not feasible due to insufficient demand.
- Detention basin will be used to mitigate peak flows and comply with hydromodification requirements prior to discharging runoff offsite.
- Biofiltration units will be used to meet treatment demands.

5.1.1 Hydrologic Source Controls for DMA 1

Hydraulic source controls will not be utilized for this project. A subsurface basin and MWS unit are proposed to detain and treat onsite stormwater.

5.1.2 Structural LID BMP for DMA 1

The project proposes a proprietary biotreatment unit (MWS), BMP #1, to treat the required design volume generated. A modular wetland system (MWS) DMAs capable of pollutant removal of total suspended solids (TSS), heavy metals, nutrients, and hydrocarbons through physical, chemical, and biological filtration processes. The MWS is designed as a high capacity model to sufficiently treat the proposed DCV. Flows entering onsite grate inlets will be routed to the MWS prior to the detention systems, with flows exceeding treatment capacity bypassing via an internal weir. Portions of the proposed areas, such as the north and south access road segments, could not be feasibly captured by onsite BMPs due to grading constraints. As a result, proposed LID BMP #1 will be upsized accordingly to offset such areas.

Additionally, a subsurface detention basin is proposed to mitigate the flow rate required for LID conformance and hydromodification requirements. The basin is composed of several chambers within a perimeter stone envelope. The chambers are wrapped in a non-woven geotextile and have a layer of stone under the chambers.

The sizing calculations along with the worksheets are shown in Attachment G, and the table below summarizes the requirements for each DMA.

Structural LID BMPs					
DMA	Total Area (Acres)	Imperviousness (%)	Runoff Coefficient	DCV (CF)	Proposed BMP Model
1	12.87	74	0.70	26,980	MWS-L-8-24

5.2 LID BMPs in DMA 2

DMA 2 is considered as fully self-treating and will not require treatment of collected stormwater. This area will collect offsite run-on and divert around the site.

Section 6 Hydromodification BMPs

6.1 Points of Compliance

For analyzing HCOCs, the project identified the point of compliance at the outlet of DMA 1 where the project site eventually discharges flow into Oso Creek. Compliance is verified at the connection point to ensure that the project complies on an overall basis.

6.2 Pre-Development (Natural) Conditions

Under existing conditions, some vegetation, impervious surfaces, gravel, and dirt roads are present. The site is relatively flat comprised of several soil types including A, C, and D. The western half of the site is primarily soil types C and D, and the eastern half of the site is primarily soil type A per the NRCS GIS Web Soil Survey soil data tool. The existing topography generally drains from the west to east toward Oso Creek.

6.3 Post-Development Conditions and Hydromodification BMPs

Hydrologic Conditions of Concern are present in the waterbodies downstream of the site. Therefore, the project is required to comply with the South Orange County hydromodification requirements which involve mitigating peak flows from 10% of the 2-year event to the 10-year event to within 10% of the existing conditions using a continuous simulation model. The South Orange County Hydrology Model (SOHM) was used to size the hydromodification BMPs and outlet structures. See Attachment I for the post development exhibit. The site will be mostly flat and impervious with portions and will utilize a detention system for hydromodification and flow mitigation purposes. The proposed MWS unit will treat runoff prior to the detention system, and mitigated flows are then routed towards the POC. To mitigate flows, an outlet structure with an orifice and weir will limit the flow rate connecting to the proposed storm drain system infrastructure, and the placement and sizing of the orifice and weir were run through SOHM to verify compliance with Hydromodification requirements. For a general schematic of the detention system, see the exhibit in Attachment I.

6.4 Measures for Avoidance of Critical Coarse Sediment Yield Areas

As mentioned in section 3.6, the Potential Corse Sediment maps provided in Appendix N.8 of the TGD demonstrate that the site is located within the limits of potential concern. Proposed swales and drainage systems, along with site grading, will effectively bypass the 2-year, 24-hour storm event around the project site while maintain a peak velocity of greater than 3 feet per second. Refer to Attachment I for calculations.

6.5 Hydrologic Modeling and Hydromodification Compliance

SOHM hydromodification models were developed for pre-development and post-development conditions. Since only DMA 1 will be modified from existing conditions, the pre-development conditions were divided into one basin to represent DMA 1. The land cover chosen is Open Brush with different soil types including A, C, and D. Similarly, for post-development conditions, DMA 1 is also modeled and divided into one basin. The basin is defined as impervious, and the basin connects to MC-4500 StormTech chambers (BMP #2) to represent the upstream detention system. StormTech chamber properties including stage storage information are derived from the SOHM software. The basin connects to a POC and contains a riser with a flow control orifice and weir. The POC is analyzed in the SOHM model to verify HCOC compliance. In the proposed conditions, the detention system will be connected to a MWS unit. However, since the detention system will control flow rates leaving the project site, only the detention system was analyzed in the SOHM model.

The tables below summarize the land use inputs, and for more information, refer to the SOHM report in Attachment I.

Pre-Development Land Use Inputs					
DMA	Total Area (AC)	Impervious Area (AC)	Open Brush (Type A) (AC)	Open Brush (Type C) (AC)	Open Brush (Type D) (AC)
1	12.87	0.47	6.23	5.45	0.72
2	2.01	N/A	0.54	0.91	0.56
Total	14.88	0.47	6.77	6.36	1.28

Post-Development Land Use Inputs						
DMA	Total Area (AC)	Impervious Area (AC)	Open Brush (Type A) (AC)	Open Brush (Type C) (AC)	Open Brush (Type D) (AC)	Gravel (AC)
1	12.87	7.47	0.12	0.26	N/A	5.01
2	2.01	N/A	0.54	0.91	0.56	N/A
Total	14.88	7.47	0.66	1.17	0.56	5.01

Section 7 Educational Materials Index

Educational Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	☐	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☒
Household Tips	☐	Compliance BMPs for Mobile Businesses	☐
Proper Disposal of Household Hazardous Waste	☐	Other Material	Check If Attached
Recycle at Your Local Used Oil Collection Center (North County)	☐		
Recycle at Your Local Used Oil Collection Center (Central County)	☐	Modular Wetlands Fact Sheet	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐	StormTech MC-4500 Manual Fact Sheet	☒
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☐		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☐		☐
Tips for Pet Care	☐		☐
Tips for Projects Using Paint	☐		☐

Attachment A: Educational Materials

Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: **www.swrcb.ca.gov/stormwater/industrial.html**

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

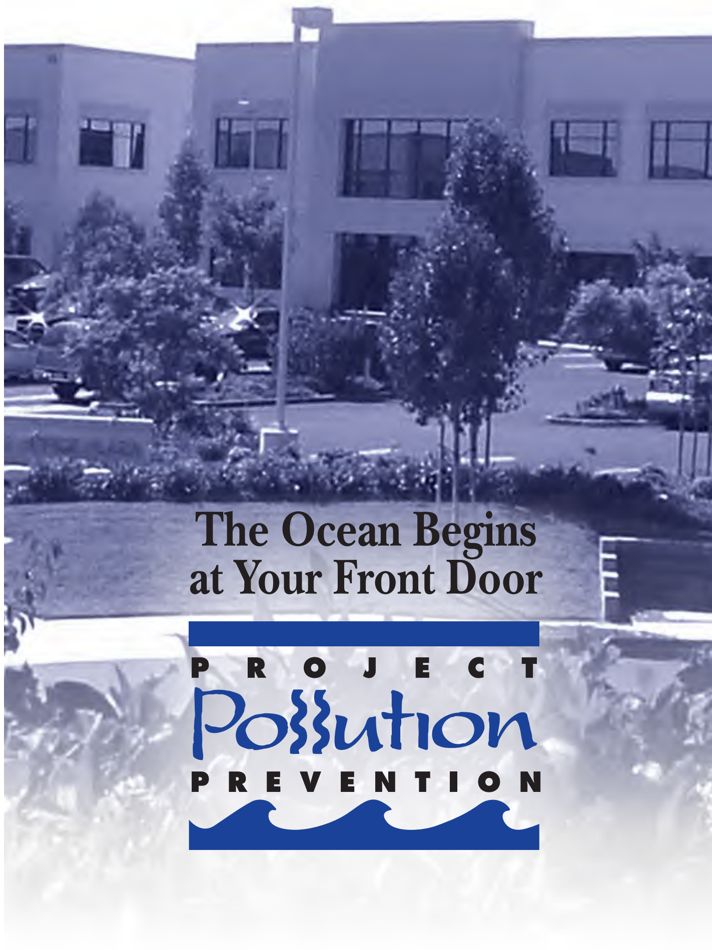
For emergencies, dial 911.

RECYCLE USED OIL

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.
- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

NEVER DISPOSE OF ANYTHING IN THE STORM DRAIN.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION

Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program

24 Hour Water Pollution Reporting Hotline

1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health

(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between $500–$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board

Santa Ana Region (951) 782-4130

San Diego Region (858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services

(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters **shall immediately notify the Office of Emergency Services.**
- Any person who fails to provide the notice required by this section is **guilty of a misdemeanor** and shall be punished by a fine (less than $20,000) and/or imprisonment for not more than one year.

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Sewage Spill

Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities

Orange County Sanitation District

Health Care Agency Environmental Health

PROJECT POLLUTION PREVENTION

www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.

Overflowing cleanout pipe located on private property

You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

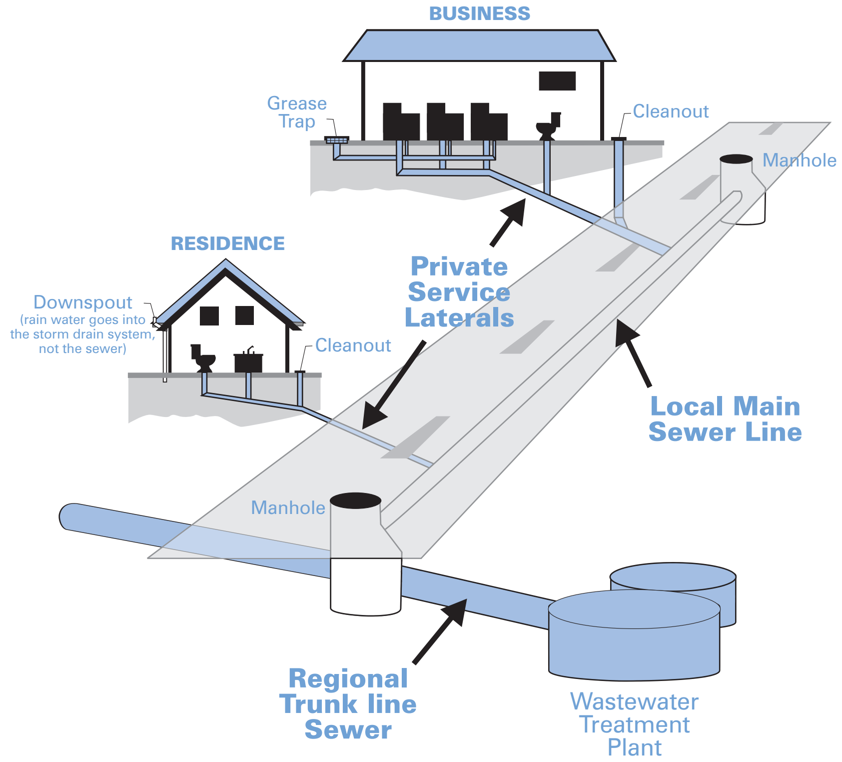
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

If You See a Sewage Spill Occurring, Notify Your City Sewer/Public Works Department or Public Sewer District IMMEDIATELY!

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

1 Never put grease down garbage disposals, drains or toilets.

2 Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.

3 Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.

Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

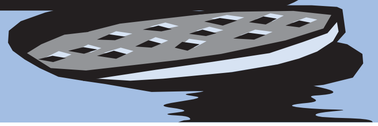
- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—** Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—** Responsible for protecting State waters.
- **Orange County Stormwater Program—** Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.



Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

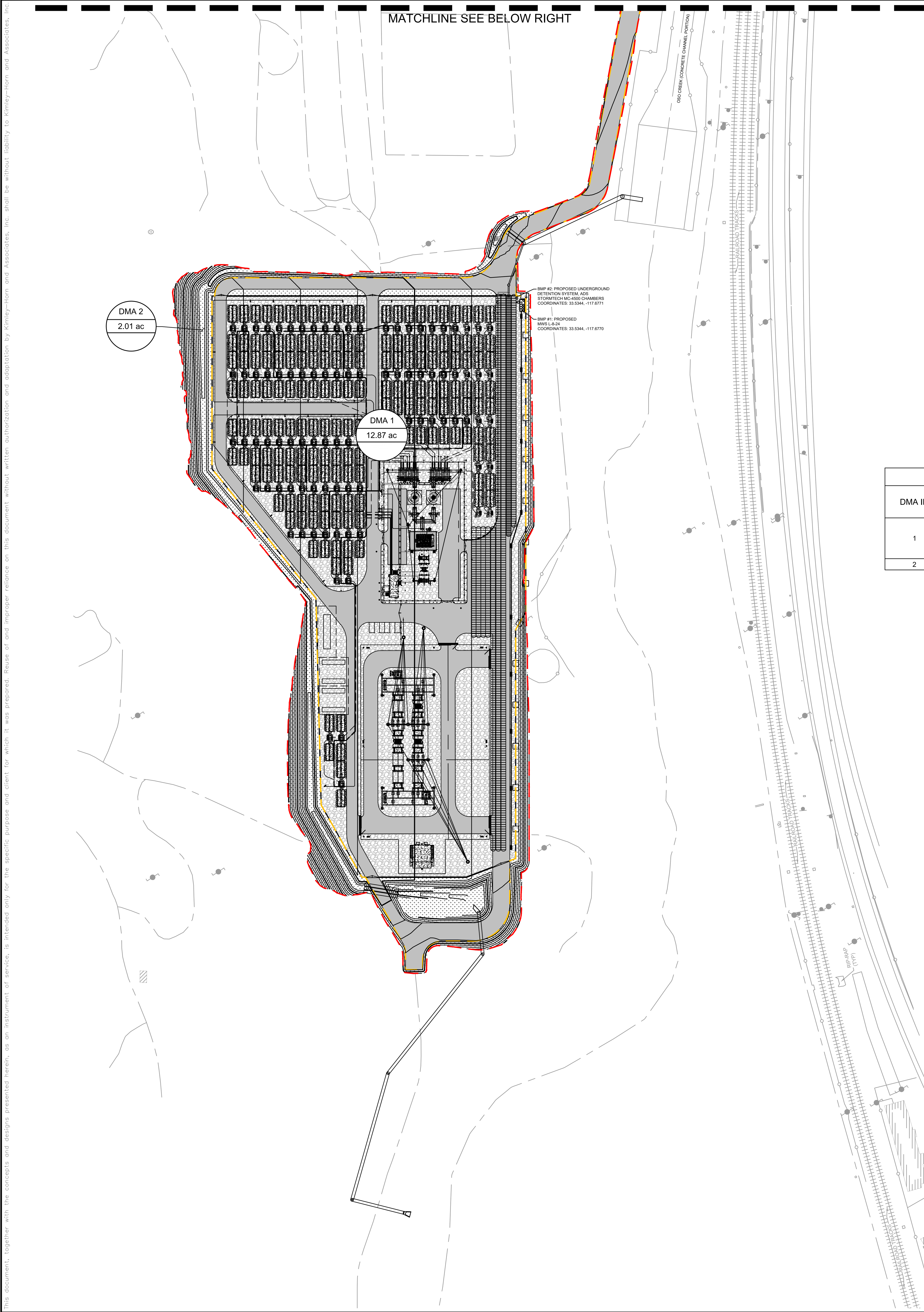
Other Agencies

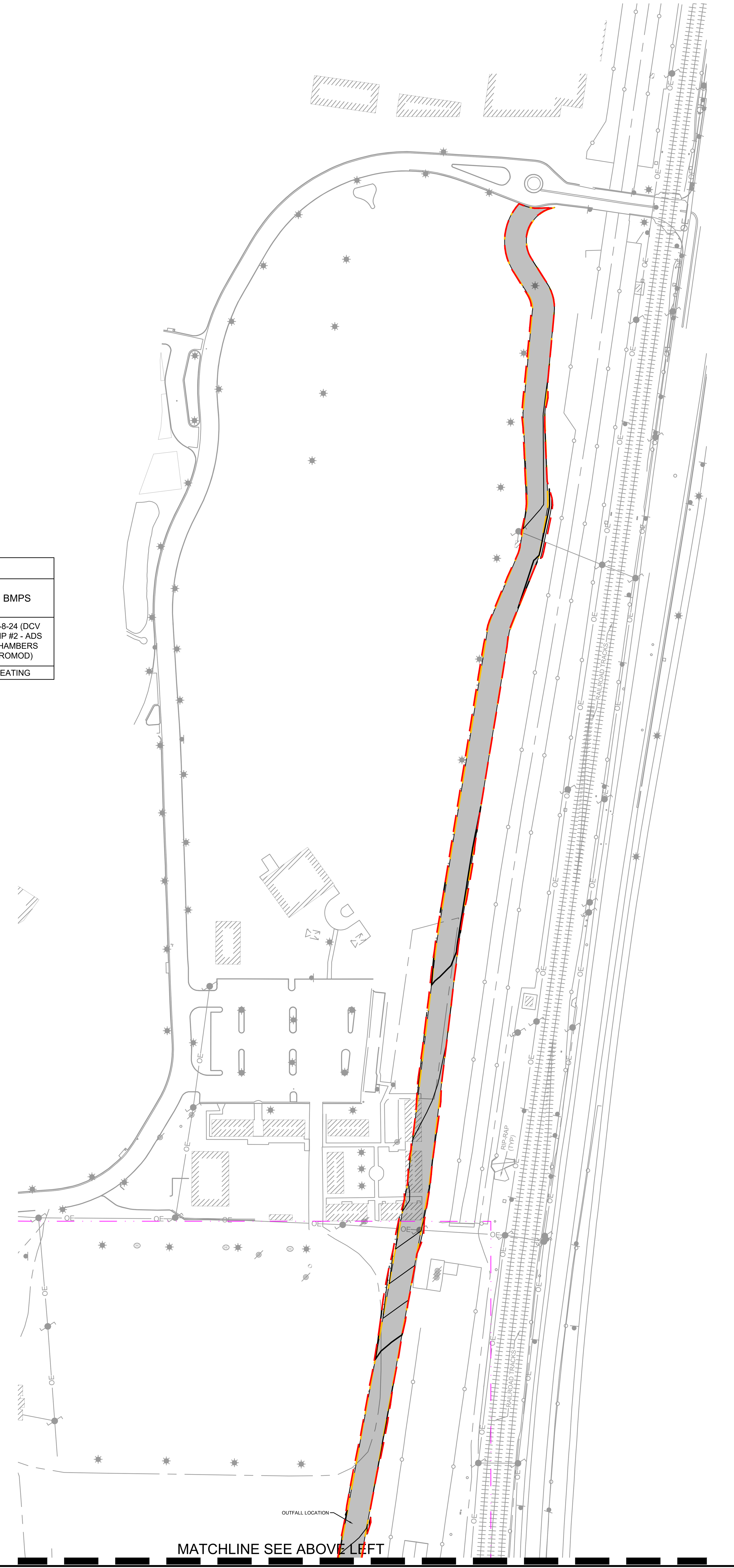
Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550

Attachment B: Operations and Maintenance Plan

TO BE INCLUDED IN FINAL SUBMITTAL

Attachment C: WQMP Site Plan





WQMP SUMMARY TABLE

DMA ID	AREA (AC)	IMPERVIOUS %	DCV REQUIRED (CF)	PROPOSED BMPS
1	12.87	74	26,980	BMP #1 - MWS-L-8-24 (DCV TREATMENT) BMP #2 - ADS STORMTECH CHAMBERS MC-4500 (HYDROMOD)
2	2.01	0	-	N/A - SELF TREATING

LEGEND

DMA ID
XX.XX — SUB-DMA ID
X.XX ac — ACREAGE
X.X cfs — RUNOFF
XXX — NODE DESIGNATION
L=XXX' — FLOW PATH LENGTH (FEET)
DRAINAGE SUB AREA
DRAINAGE SUB BOUNDARY
DRAINAGE BOUNDARY
FLOW PATH
XXX — EX MAJOR CONTOURS
XXX — EX MINOR CONTOURS

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

No.	REVISIONS	DATE	BY

Kimley»Horn
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NV 89119
702-862-3600
WWW.KIMLEY-HORN.COM

KHA PROJECT
DATE
SCALE AS SHOWN
DESIGNED BY
DRAWN BY
CHECKED BY

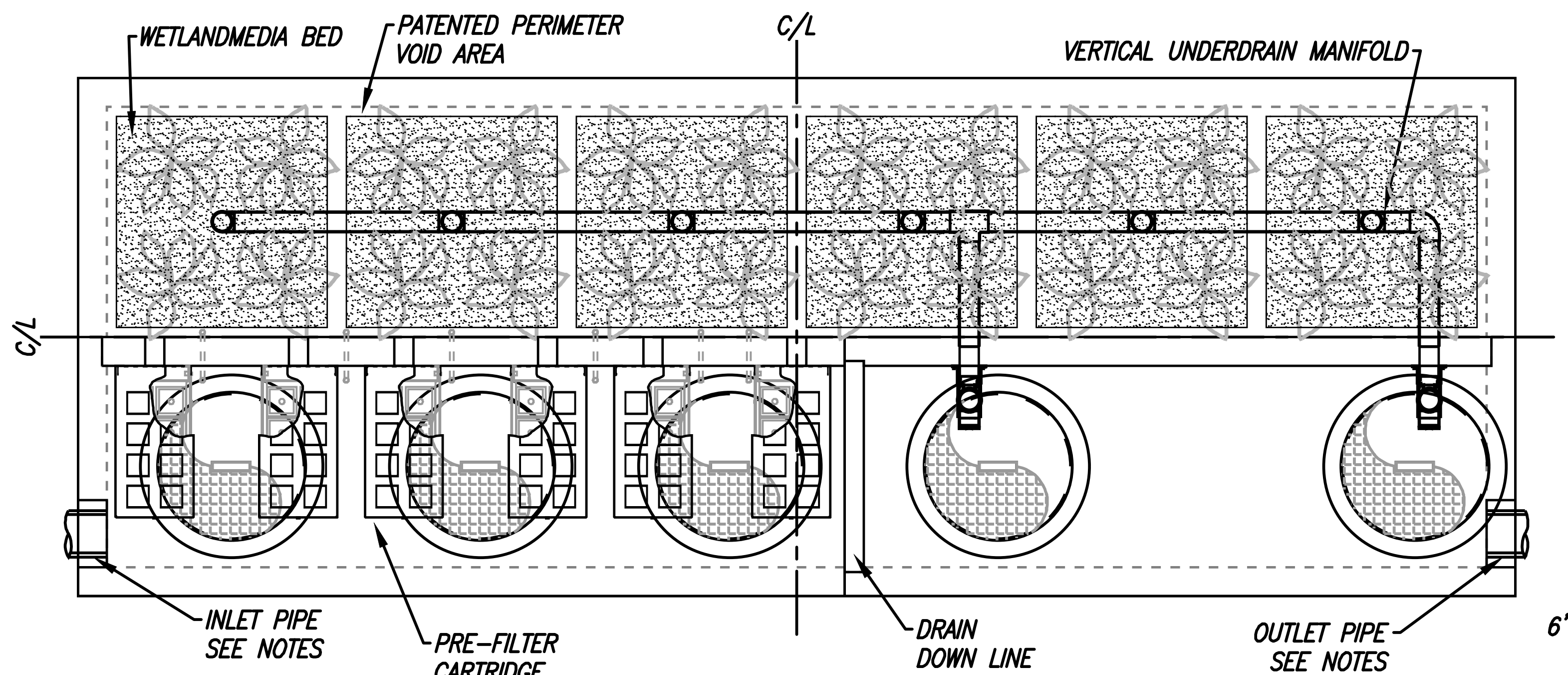
COMPASS BATTERY STORAGE PROJECT
CITY OF SAN JUAN CAPISTRANO, CA
WQMP EXHIBIT

SHEET NUMBER
1 OF 1

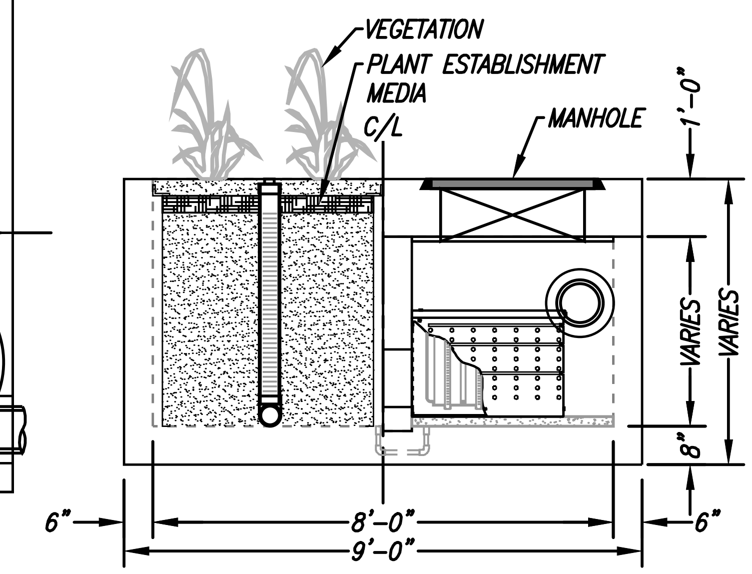
SITE SPECIFIC DATA

PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)			
0.693			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

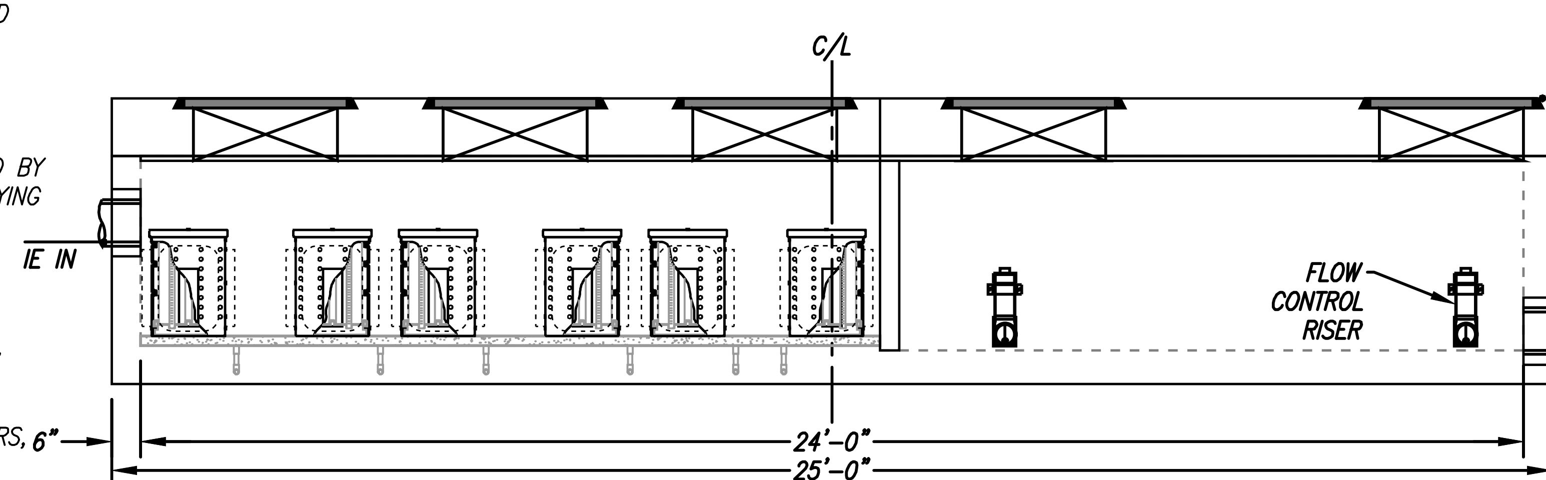
UPDATED DETAIL WITH CORRECT LAYOUT AND INVERTS TO BE PROVIDED IN FINAL SUBMITTAL

INSTALLATION NOTES

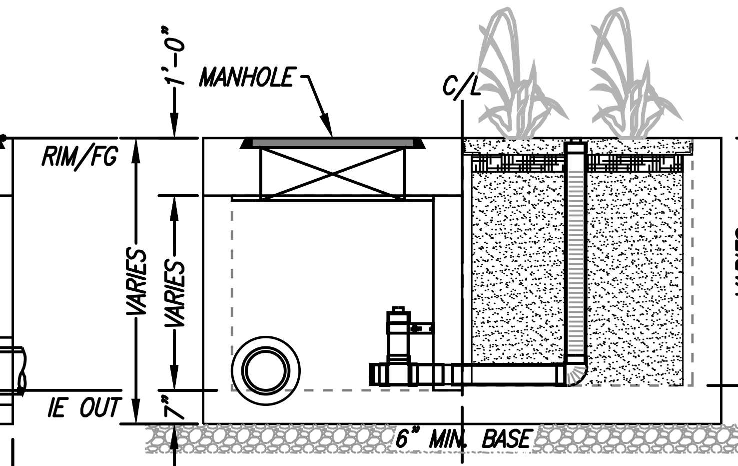
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT CONTECH.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.693
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

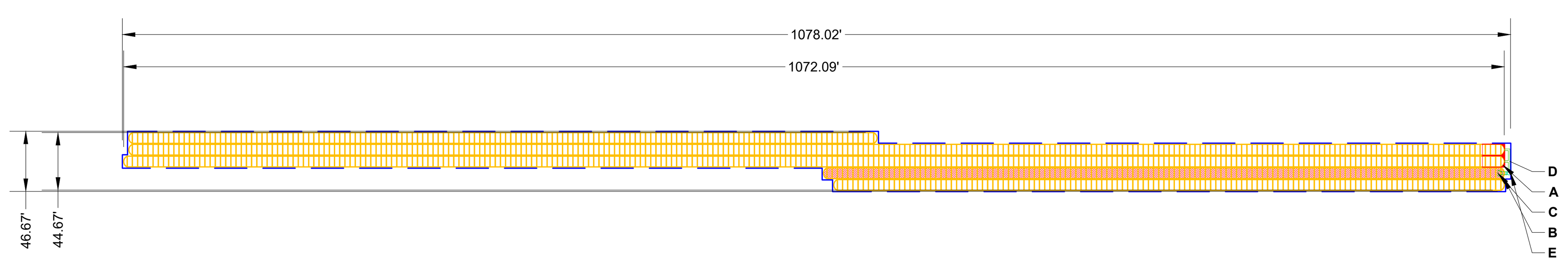
CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
930	STORMTECH MC-4500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
10	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
156308	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-4500 CHAMBER:	5.75
		12" x 12" TOP MANIFOLD INVERT:	3.72
		24" ISOLATOR ROW PLUS INVERT:	0.94
35793	SYSTEM AREA (SF)	BOTTOM OF MC-4500 CHAMBER:	0.75
2249.4	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	12" TOP PARTIAL CUT END CAP, PART#: MC4500IEPP12T / TYP OF ALL 12" TOP CONNECTIONS	35.69"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	12" x 12" TOP MANIFOLD, ADS N-12	35.69"	
NYLOPLAST (INLET W/ ISO PLUS ROW)	E	30" DIAMETER (24.00" SUMP MIN)		5.0 CFS IN



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION**: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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MC-4500 TECHNICAL SPECIFICATION

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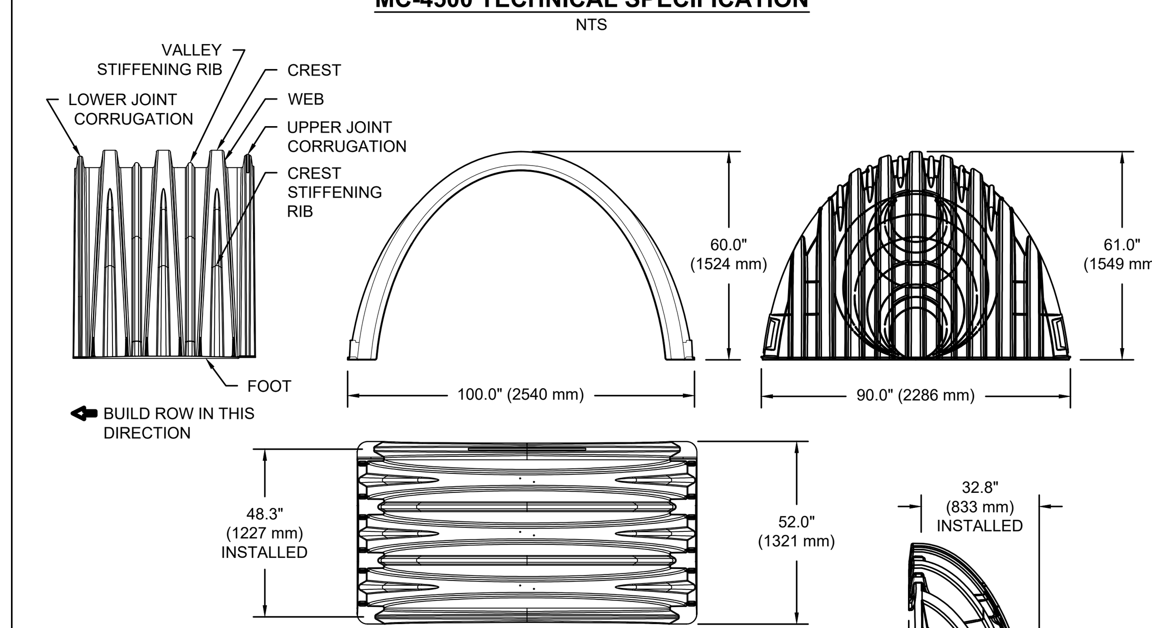
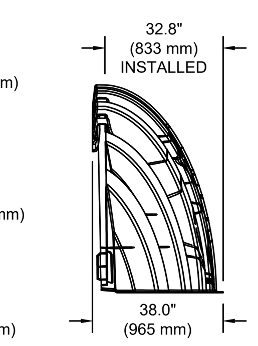




NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

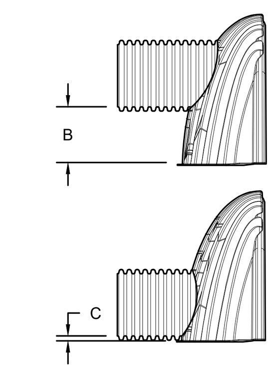
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

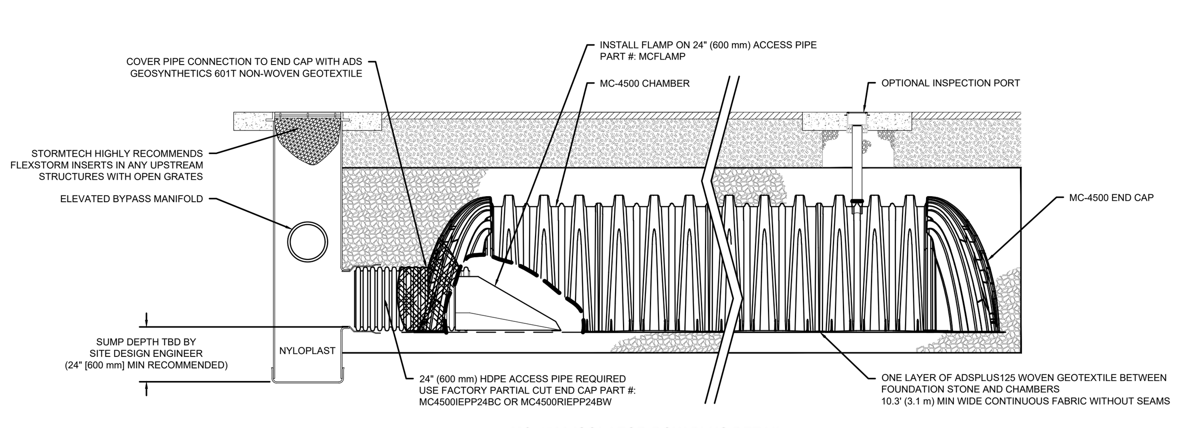
PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW			
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B		---	2.26" (57 mm)
MC4500IEPP24BW			
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-4500 TECHNICAL SPECIFICATION



MC-4500 ISOLATOR ROW PLUS DETAIL

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INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

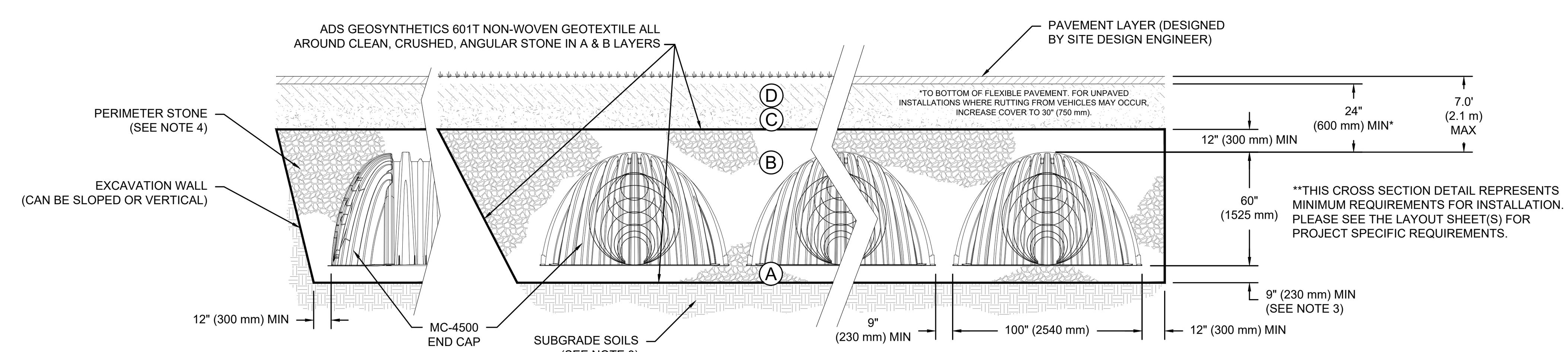
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-4500 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-4500 CROSS SECTION DETAIL

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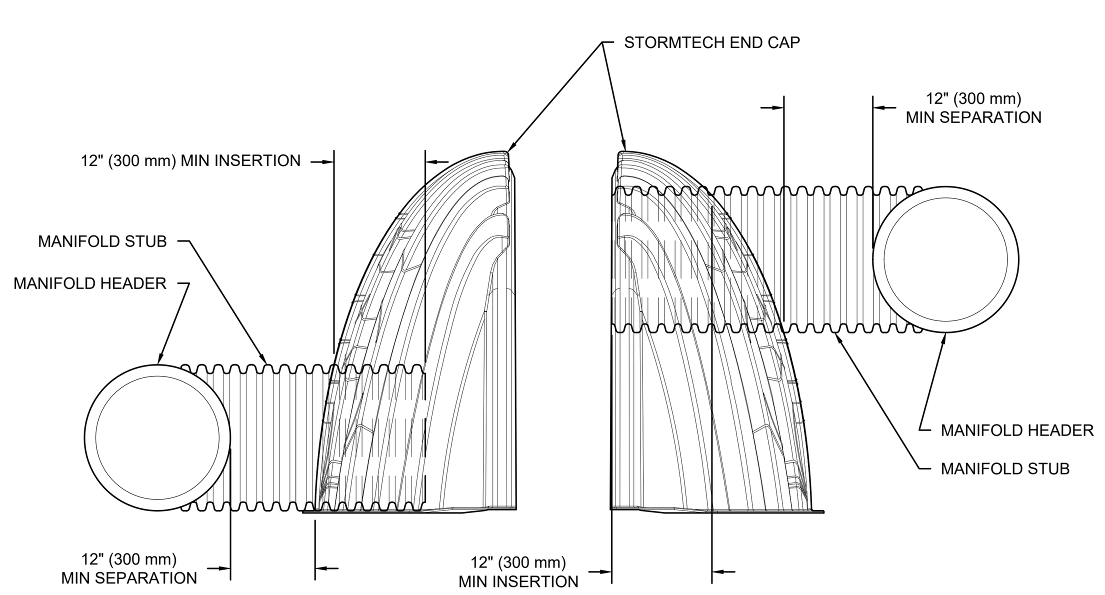
MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

4 MC-SERIES END CAP INSERTION DETAIL

DATE: 11/20/2024 | PROJECT #: | NOT TO SCALE
DRAWN: TZ | CHECKED: N/A | REV:

COMPASS BESS (SCENARIO 1)

SAN JUAN CAPISTRANO, CA, USA

StormTech® Chamber System
1-800-821-6710 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

Attachment D: Supporting Documents

OC Stormwater Program Land Development Tool

Guidance

Delineate

Export

Legend

2014/2016 All Assessed Waters

2014/2016 Impaired Waters (303(d) - listed)

Regional Subbasins

Rainfall 85th Percentile

Soil

South OC Potential Coarse Sediment Area (June 2018)

Infiltration Constraints

Exempted Hydrologic Condition of Concern (HCOC) areas

Designation

- Engineered Channels/Large River - Exempt
- Non-Engineered Channels - Not Exempt

Depth to First Groundwater (1980)

Groundwater Contaminent Plumes

Soil Susceptibility to Rill and Sheet Erosion (K Factor)

Liquefaction

Landslides

Land Use

Principal Aquifer Elevation

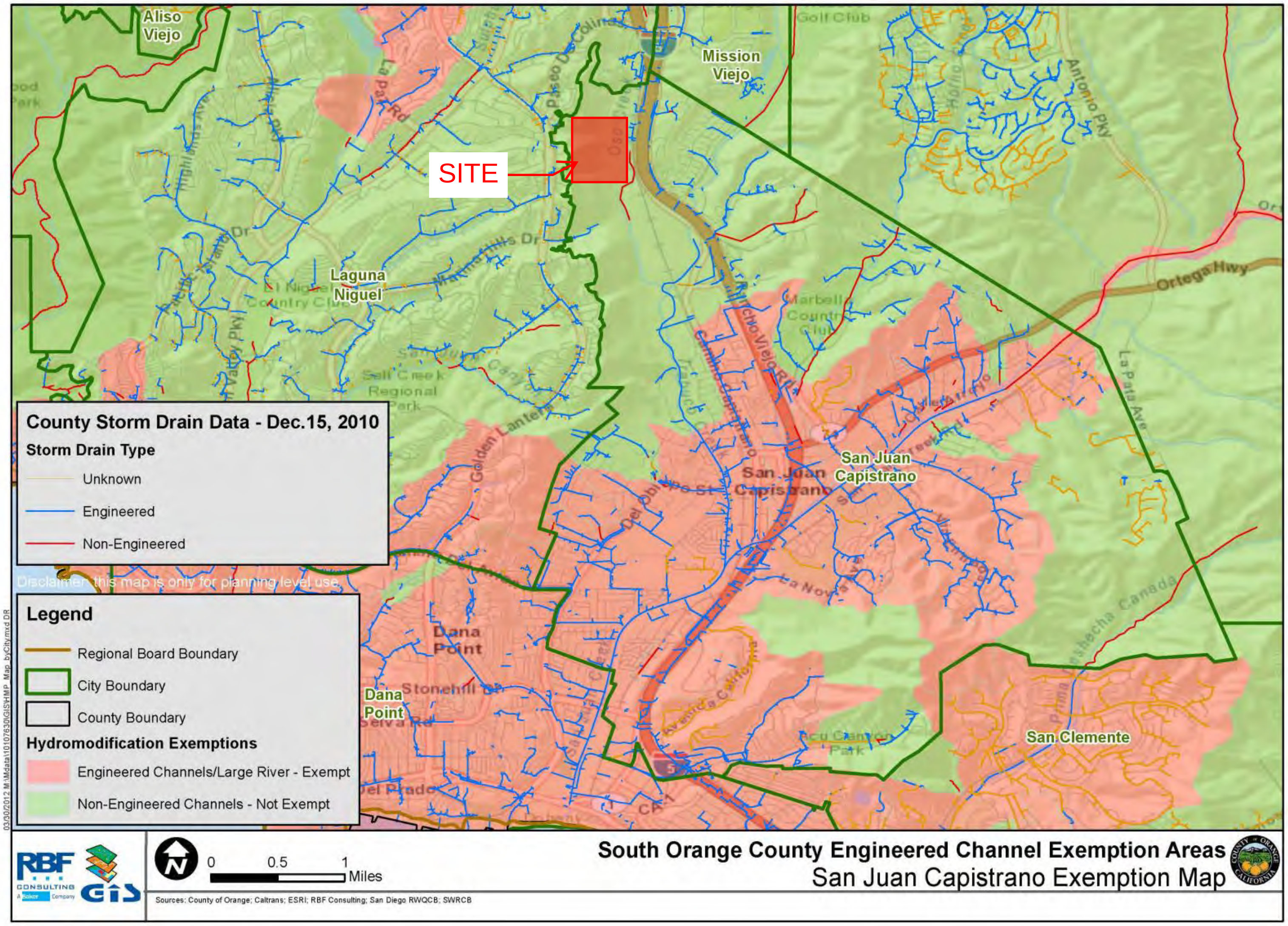
Legend

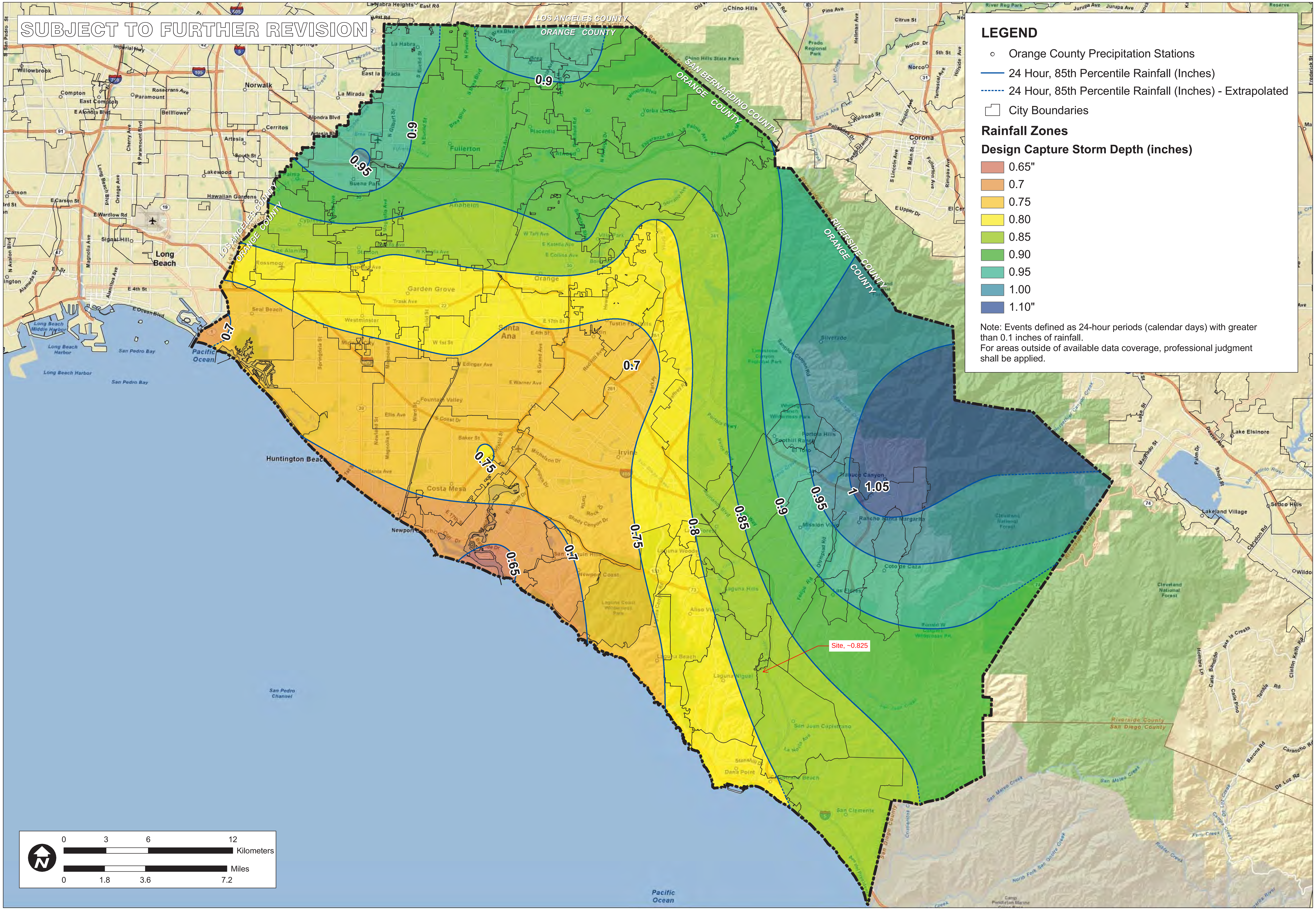
Features

Collapse

Maxar | OC Survey | Water Quality Assessment Unit, Division of Water Quality, California State Water Resources Control B... Powered by Esri

Figure F-11: San Juan Capistrano Exemption Map





P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasibility_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

TITLE: RAINFALL ZONES

JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE

XVI-1

Attachment E: Geotechnical Report (provided separately)

Attachment F: Grading Plans

FINAL SET TO BE INCLUDED IN FINAL SUBMITTAL

Attachment G: Worksheets

E.3.1.3 Worksheet for Using the Simple Method to Size Full Infiltration BMPs

DMA 1

Worksheet 5: Simple Design Capture Volume Sizing Method for Full Infiltration BMPs

Part 1: Calculate the DCV				
1	Enter design capture storm depth, *d* (inches)	d=	0.825	inches
2a	Enter the combined effect of provided HSCs, d_{HSC} (inches) (based on Worksheet 4) including any other upstream BMPs	d_{HSC}=	N/A	inches
2b	Calculate the remainder of the design capture storm depth, $d_{remainder} = d - d_{HSC}$	$d_{remainder}$=	N/A	inches
3a	Enter DMA area tributary to BMP(s), *A* (acres) excluding any self-retaining areas	A=	12.87	acres
3b	Enter DMA Imperviousness, imp (unitless) after removal of self-retaining areas	imp=	0.74	
3c	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.70	
3d	Calculate runoff volume, *DCV = (C x* $d_{remainder}$ *x A x 43560 x (1/12)) (See* ***Section E.2.2****)*	DCV=	26,980	cu-ft
Part 2: Design BMP and Calculate Effective Storage Depth and Footprint				
4	Enter total effective storage depth (sum of values below)	$D_{total\_effective}$		inches
4a	Ponding storage depth	D_{pond}		inches
4b	Media effective storage depth (depth * 0.2)	$D_{media\_effective}$		inches
4c	Gravel effective storage (depth * 0.4)	$D_{gravel\_effective}$		inches
5	Determine required effective footprint: $A_{BMP} = DCV / (D_{Total}$ *12 inches/ft) If sides are sloped, measure A_{BMP} at the mid ponding depth of the BMP.	A_{BMP}=		sq-ft
Part 3: Check Drawdown Time				
6a	Calculate design infiltration rate, $K_{design} = K_{observed} / S_{total}$ (See Worksheet 3 and **Appendix D**)	K_{design}=		in/hr
6b	Calculate drawdown time ($D_{total\_effective} / K_{design}$) (must be less than or equal to 48 hours).	$T_{drawdown}$=		hours
6c	If using Method 2 for drawdown (**Section E.2.5**) which accounts for sidewall infiltration, insert result and attach relevant calculations below.	$T_{drawdown}$=		hours
Part 4: *Check Minimum Infiltrating Surface Area for Premature Clogging*				
7a	Calculate BMP infiltrating surface area as percent of tributary impervious area ($A_{infiltrating}$/(A * imp * 43560 sq-ft/ac)			%
7b	Calculate minimum infiltrating surface area required for BMP to avoid premature clogging (**Section E.4.1**)			%

Attachment H: BMP Fact Sheets

MC-4500 Design Manual

StormTech® Chamber Systems for Stormwater Management

ADS
StormTech™

9.0 Inspection and Maintenance

9.1 Isolator Row Plus Inspection
Regular inspection and maintenance are essential to assure a properly functioning stormwater system. Inspection is easily accomplished through the manhole or optional inspection ports of an Isolator Row PLUS. Please follow local and OSHA rules for a confined space entry.

Inspection ports can allow inspection to be accomplished completely from the surface without the need for a con- fined space entry. Inspection ports provide visual access to the system with the use of a flashlight. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding 3” (76 mm), cleanout is required.

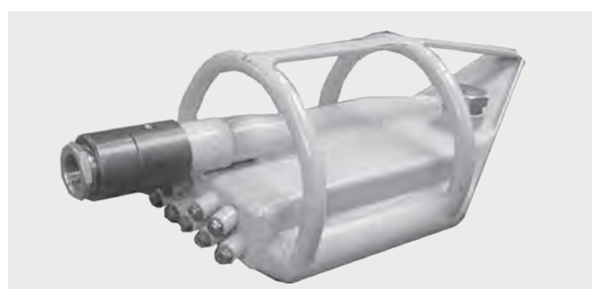
A StormTech Isolator Row PLUS should initially be inspected immediately after completion of the site’s construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter any stormwater system. Inspection and maintenance, if necessary, should be performed prior to passing responsibility over to the site’s owner. Once in normal service, a StormTech Isolator Row PLUS should be inspected bi-annually until an understanding of the sites characteristics is developed. The site’s maintenance manager can then revise the inspection schedule based on experience or local requirements.

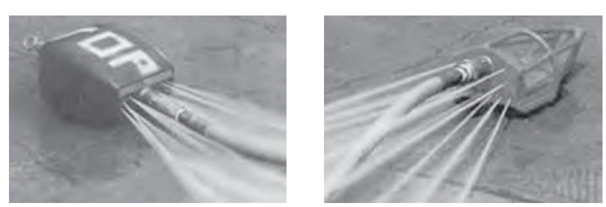
9.2 Isolator Row Plus Maintenance
JetVac maintenance is recommended if sediment has been collected to an average depth of 3” (76 mm) inside the Isolator Row PLUS. More frequent maintenance may be required to maintain minimum flow rates through the Isolator Row PLUS. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row PLUS while scouring and suspending sediments. As the nozzle is retrieved, a wave of suspended sediments is flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/ JetVac combi- nation vehicles. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” (1143 mm) are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. The JetVac process shall only be performed on StormTech Rows that have ADS PLUS fabric over the foundation stone.

A FLAMP (flared end ramp) is attached to the inlet pipe on the inside of the chamber end cap to provide a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning, and to guide cleaning and inspection equipment back into the inlet pipe when complete.

FLAMP (Flared End Ramp)

A typical JetVac truck
(This is not a StormTech product.)





Examples of culvert cleaning nozzles appropriate for Isolator Row PLUS maintenance. (These are not StormTech products).

A Family of Products and Services for the Stormwater Industry:

MC-3500 and MC-7200 Chambers and End Caps

SC-160LP, SC-310 and SC-740 Chambers & End Caps

DC-780 Chambers and End Caps

Fabricated End Caps

Fabricated Manifold Fittings

Patented Isolator Row PLUS for Maintenance and Water Quality

Chamber Separation Spacers

In-House System Layout Assistance

On-Site Educational Seminars

Worldwide Technical Sales Group

Centralized Product Applications Department

Research and Development Team

Technical Literature, O&M Manuals and Detailed CAD drawings all downloadable via our Website

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CONTECH ENGINEERED SOLUTIONS

Modular Wetlands® Linear Operations & Maintenance Manual

MODULAR WETLANDS

MODULAR WETLANDS LINEAR
OPERATION & MAINTENANCE MANUAL

TABLE OF CONTENTS

OVERVIEW

This operation and maintenance (O&M) manual is for the Modular Wetlands Linear Biofilter (MWL). Please read the instructions and equipment lists closely prior to starting. It is important to follow all necessary safety procedures associated with state and local regulations. Please contact Contech for more information on pre-authorized third-party service providers who can provide inspection and maintenance services in your area. For a list of service providers in your area, please visit www.conteches.com/maintenance.

WARNING

Confined space entry may be required. Contractor to obtain all equipment and training to meet applicable local and OSHA regulations regarding confined space entry. It is the Contractor's or entry personnel's responsibility to always proceed safely.

SAFETY NOTICE & PERSONAL SAFETY EQUIPMENT

Job site safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s), and Service Provider(s). OSHA and Canadian OSH, Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Service Provider's responsibility and outside the scope of Contech Engineered Solutions.

Safety Boots

Gloves

Hard Hat

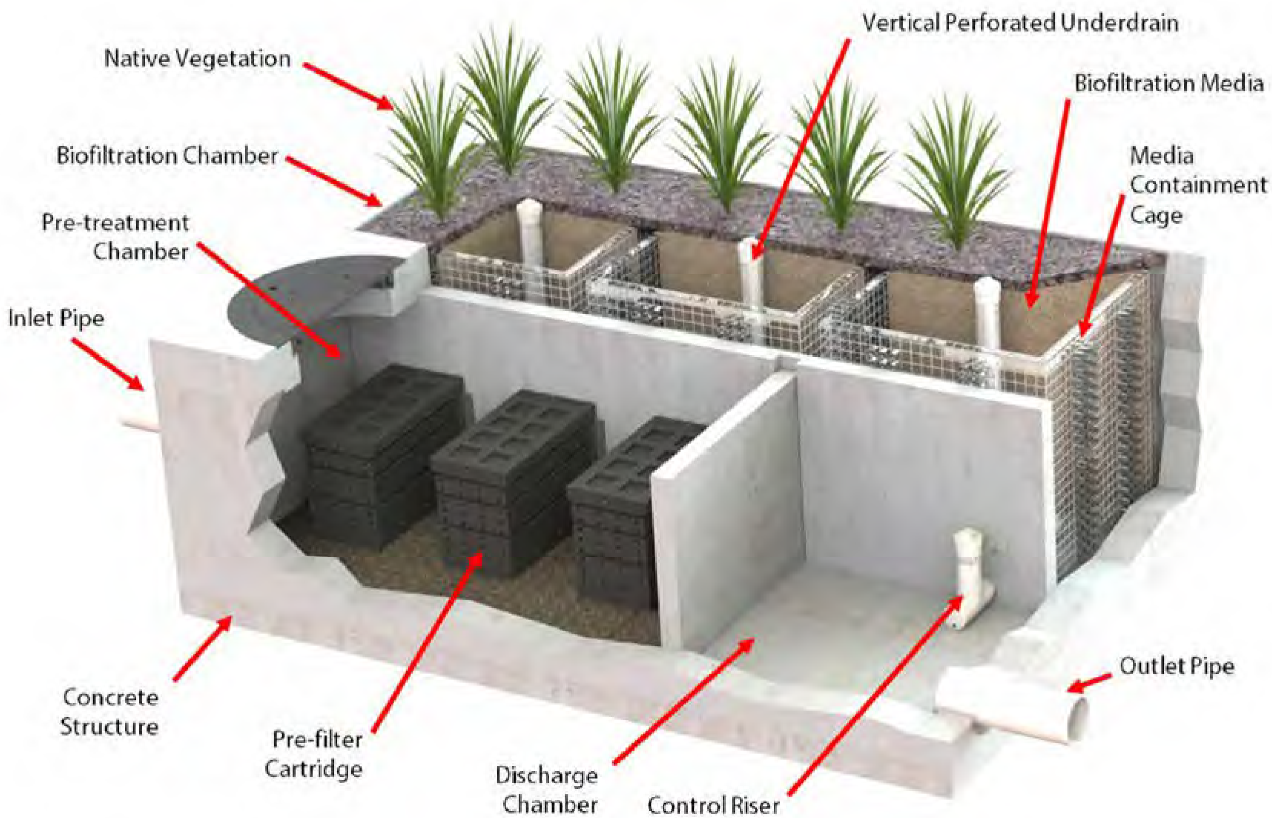
Eye Protection

Maintenance and Protection
of Traffic Plan

MODULAR WETLANDS LINEAR COMPONENTS LIST

The MWL system comes in multiple sizes and configurations, including side by side or end to end layouts, both as open planters or underground systems. See shop drawings (plans) for project specific details.

The standard MWL system is comprised of the following components:



INSPECTION SUMMARY & EQUIPMENT LIST

Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site-specific loading conditions. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided.

- Inspect pre-treatment, biofiltration, and discharge chambers an average of once every six to twelve months. Varies based on site specific and local conditions.
- Average inspection time is approximately 15 minutes. Always ensure appropriate safety protocol and procedures are followed.

The following is a list of equipment required to allow for simple and effective inspection of the MWL:

Modular Wetlands Linear Inspection Form

Flashlight

Tape Measure

Access Cover Hook

Ratchet
& 7/16" Socket
(if required for older pre-filter cartridges that have two bolts holding the lids on)

INSPECTION & MAINTENANCE NOTES

1. Following maintenance and/or inspection, it is recommended that the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics, and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the biofiltration chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

INSPECTION PROCESS

1. Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
2. Observe the inside of the system through the access covers. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all chambers.
3. Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
4. Through observation and/or digital photographs, estimate the amount of trash, debris accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick, estimate the amount of sediment in this chamber. Record this depth on the inspection form.
5. Through visual observation, inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediment on the cartridges, any build-up on the tops of the cartridges, or clogging of the holes. Record this information on the inspection form. The pre-filter cartridges can be further inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber - see notes previous notes regarding confined space entry). Record the color of the material. New material is a light green color. As the media becomes clogged, it will turn darker in color, eventually becoming dark brown or black. The closer to black the media is the higher percentage that the media is exhausted and in need of replacement.

6. The biofiltration chamber is generally maintenance-free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection form and indicate through visual observation or digital photographs if trimming of the vegetation is required.

7. The discharge chamber houses the control riser (if applicable), drain down filter (only in California - older models), and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating condition and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the pre-filter cartridge as mentioned above.

8. Finalize the inspection report for analysis by the maintenance manager to determine if maintenance is required.

MAINTENANCE INDICATORS

Based upon the observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet and/or outlet pipes.
- Excessive accumulation of floatables in the pre-treatment chamber in which the length and width of the chamber is fully impacted more than 18".
- Excessive accumulation of sediment in the pre-treatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. When media is more than 85% clogged, replacement is required. The darker the BioMediaGREEN, the more clogged it is and in need of replacement.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models).
- Overgrown vegetation.

MAINTENANCE SUMMARY & EQUIPMENT LIST

The time has come to maintain your MWL. All necessary pre-maintenance steps must be carried out before maintenance occurs. Once traffic control has been set up per local and state regulations and access covers have been safely opened, the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition, the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and maintenance equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.
    - o A gas meter should be used to detect the presence of any hazardous gases prior to entering the system. If hazardous gases are present, do not enter the vault. Following appropriate confined space procedures, take steps such as utilizing a venting system to address the hazard. Once it is determined to be safe, enter the system utilizing appropriate entry equipment such as a ladder and tripod with harness.

The following is a list of equipment required for maintenance of the MWL:

Modular Wetlands Linear Maintenance Form

Flashlight

Access Cover Hook

Ratchet
& 7/16" Socket
(if required for older pre-filter cartridges that have two bolts holding the lids on)

Vacuum Assisted Truck with Pressure Washer

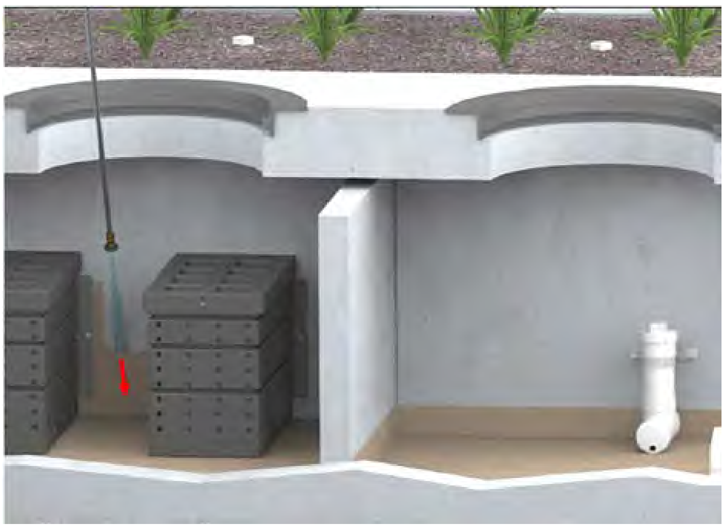
Replacement BioMediaGREEN
(If Required)

(order BioMediaGREEN from Contech's Maintenance Team members at https://www.conteches.com/maintenance)

MAINTENANCE INSTRUCTIONS

1. ACCESS COVER REMOVAL

Upon determining that the vault is safe for entry, remove all access cover(s) and position the vacuum truck accordingly.



2. PRESSURE WASH SYSTEM CHAMBERS

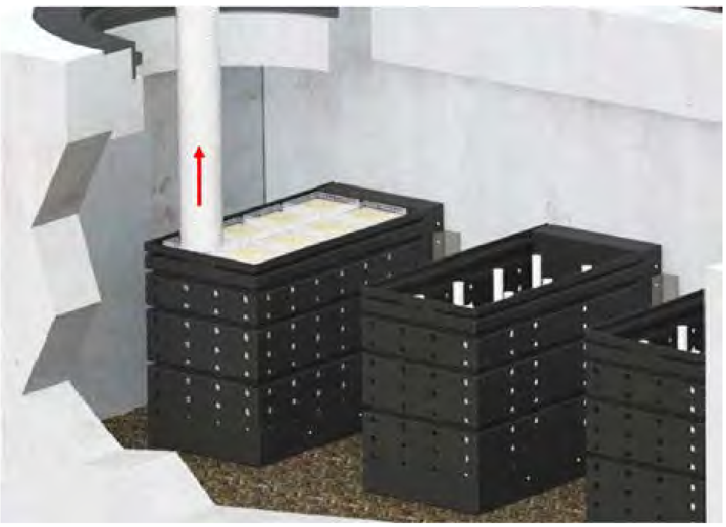
With the pressure washer, spray down pollutants accumulated on the walls and floors of the pre-treatment and discharge chambers. Then wash any accumulated sediment from the pre-filter cartridge(s).

3. VACUUM SYSTEM CHAMBERS

Vacuum out pre-treatment and discharge chambers and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the pre-treatment floor until the pervious pavers are visible and clean. (**MWL systems outside of California may or may not have pervious pavers on the floor in the pre-treatment chamber)** If pre-filter cartridges require media replacement, proceed to **Step 4.** If not, replace the access cover(s) and proceed to **Step 7**.

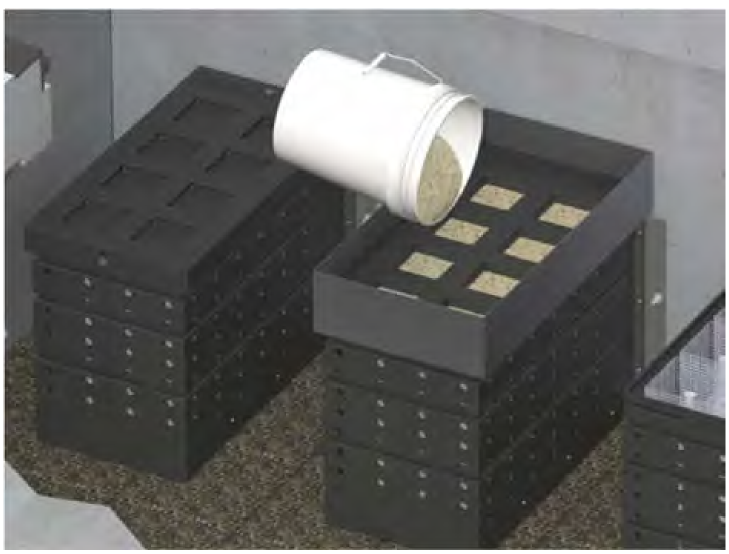
4. PRE-FILTER CARTRIDGE LID REMOVAL

After successfully cleaning out the pre-treatment chamber, enter the chamber and remove the lid(s) from the pre-filter cartridge(s) by removing the two thumb screws. (Older pre-filter cartridges have two bolts holding the lids on that require a 7/16" socket to remove)



5. VACUUM EXISTING PRE-FILTER MEDIA

Utilize the vacuum truck hose or hose extension to remove the filter media from each of the individual media cages. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and its media cages. Remove cleaned media cages and place to the side. Once removed, the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.



6. PRE-FILTER MEDIA REPLACEMENT

Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. The easiest way to fill the media cages is to utilize a refilling tray that can also be sourced from the manufacturer. Place the refilling tray on top of the cartridge and fill with new bulk media shaking it down into the cages. Using your hands, lightly compact the media into each filter cage. Once the cages are full (each cartridge will hold five heaping 5gal buckets of bulk media), remove the refilling tray and replace the cartridge top, ensuring fasteners are properly tightened.

7. MAINTAINING VEGETATION

In general, the biofiltration chamber is maintenance-free with the exception of maintaining the vegetation. The MWL utilizes vegetation similar to surrounding landscape areas, therefore, trim vegetation to match surrounding vegetation. If any plants have died, replace them with new ones.

8. INSPECT UNDERDRAIN SYSTEM

Each vertical under drain on the biofiltration chamber has a removable threaded cap that can be taken off to check for any blockages or root growth. Once removed, a jetting attachment to the pressure washer can be used to clean out the under drain and orifice riser if needed.

9. REPLACE ACCESS COVERS

Once maintenance is complete, replace all access cover(s)

REPLACING BIOFILTRATION MEDIA IF REQUIRED

As with all biofilter systems, at some point the biofiltration media will need to be replaced, either due to physical clogging or sorptive exhaustion (for dissolved pollutants) of the media ion exchange capacity (to remove dissolved metals and phosphorous). The general life of this media is 10 to 20 years based on site specific conditions and pollutant loading, so replacing the biofiltration media should not be a common occurrence. In the event that the biofiltration media requires replacement, contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new biofiltration media. The quantity of media needed can be determined by providing the model number and unit depth. Media will be provided in super sacks for easy installation. Each sack will weigh between 1,000 and 2,000 lbs. Biofiltration media replacement can be done following the steps below:

1. VACUUM EXISTING BIOFILTRATION MEDIA

Remove the mulch and vegetation to access the biofiltration media, and then position the vacuum truck accordingly. Utilize the vacuum truck to vacuum out all the media. Once all media is removed, use the pressure washer to spray down all the netting and underdrain systems on the inside of the media containment cage. Vacuum out any remaining debris after spraying down netting. Inspect the netting for any damage or holes. If the netting is damaged, it can be repaired or replaced with guidance by the manufacturer.

2. INSTALLING NEW BIOFILTRATION MEDIA

Ensure that the chamber is fully cleaned prior to installation of new media into the media containment cage(s). Media will be provided in super sacks for easy installation. A lifting apparatus (forklift, backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Add media in lifts to ensure that the riser pipes remain vertical. Be sure to only fill the media cage(s) up to the same level as the old media.

3. REPLANT VEGETATION

Once the media has been replaced, replant the vegetation and cover biofiltration chamber with approved mulch (if applicable). If the existing vegetation is not being reused, and new vegetation is being planted, you will need to acquire new plant establishment media that will be installed just below the mulch layer at each plant location. (see plan drawings for details). Contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new plant establishment media.

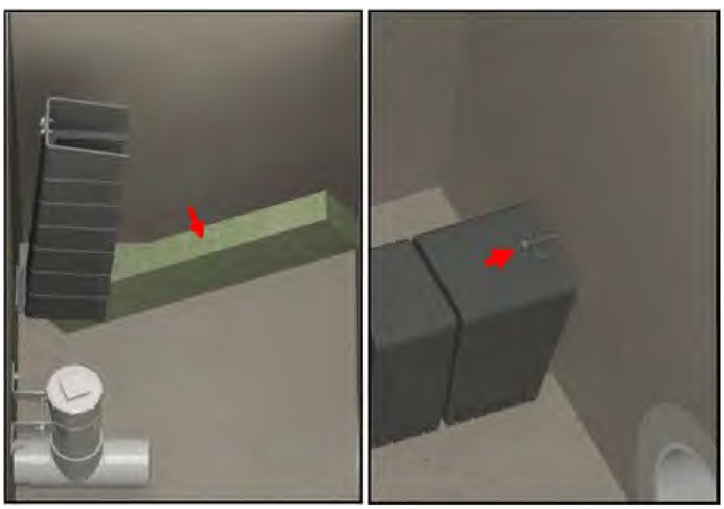
REPLACING DRAIN DOWN FILTER MEDIA (ONLY ON OLDER CALIFORNIA MODELS)

NOTE: The drain down filter is only found on units installed in California prior to 2023

If during inspection it was determined that the drain down filter media requires replacement, contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new media.

1. **REMOVE EXISTING DRAIN DOWN MEDIA**

Pull knob back to unlock the locking mechanism and lift the drain down filter housing to remove the used BioMediaGREEN filter block.



2. **INSTALL NEW DRAIN DOWN MEDIA**

Ensure that the chamber and housing are fully cleaned prior to installation of new media, and then insert the new BioMediaGREEN filter block. The media filter block should fit snugly between the chamber walls and be centered under the filter housing. Lower the housing over the filter block and secure the locking mechanism.

NOTES

CONTECH ENGINEERED SOLUTIONS

Inspection Report
Modular Wetlands Linear

Project Name ______________________________

Project Address ______________________________
(city) (Zip Code)

Owner / Management Company ______________________________

Contact ______________________ Phone ( ) –

Inspector Name ______________________ Date ____/____/______ Time __________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ______________________ Additional Notes ______________________

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): __________ Size (22', 14' or etc.): __________

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: ______________________________

CONTECH® ENGINEERED SOLUTIONS

Cleaning and Maintenance Report
Modular Wetlands Linear

Project Name ______________________________

Project Address ______________________________ (city) (Zip Code)

Owner / Management Company ______________________________

Contact ______________________ Phone ( ) –

Inspector Name ______________________ Date ___/___/_____ Time _________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ______________________ Additional Notes ______________________

For Office Use Only
(Reviewed By)
(Date) Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

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SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

ModWetLinear OM Manual 03/24

Attachment I: Stage Storage & SOHM Report

SOHM

PROJECT REPORT

General Model Information

Project Name:	COMPASS BESS SOHM
Site Name:	COMPASS BESS
Site Address:	
City:	SAN JUAN CAPISTRANO
Report Date:	12/4/2025
Gage:	Laguna Beach
Data Start:	10/01/1949
Data End:	09/30/2006
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/05/25

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

EXISTING

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A,Open Brush,Mod	6.23
C,Open Brush,Mod	5.92
D,Open Brush,Mod	0.72
Pervious Total	12.87
Impervious Land Use	acre
Impervious Total	0
Basin Total	12.87

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

PROPOSED

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A,Open Brush,Mod	0.12
C,Open Brush,Mod	0.26
D,Gravel,Flat(0-5%)	5.01
Pervious Total	5.39
Impervious Land Use	acre
Impervious,Flat(0-5)	7.47
Impervious Total	7.47
Basin Total	12.86

Element Flows To:

Surface	Interflow	Groundwater
StormTech 3	StormTech 3	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech 3

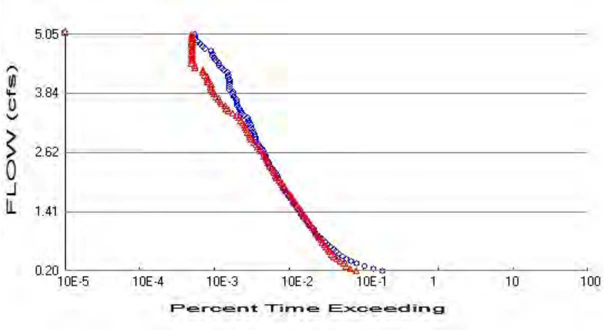
Chamber Model: 4500
Dimensions
Max Row Length: 750
Number of Chambers: 930
Number of Endcaps: 10
Top Stone Depth: 12
Bottom Stone Depth: 9
Discharge Structure
Riser Height: 5.75 ft.
Riser Diameter: 54 in.
Notch Type: Rectangular
Notch Width: 0.950 ft.
Notch Height: 1.150 ft.
Orifice 1 Diameter: 1.75 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

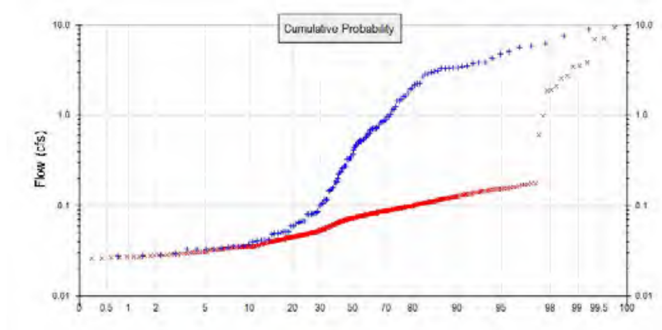
StormTech Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.788	0.000	0.000	0.000
0.0833	0.788	0.026	0.024	0.000
0.1667	0.788	0.052	0.033	0.000
0.2500	0.788	0.078	0.041	0.000
0.3333	0.788	0.105	0.048	0.000
0.4167	0.788	0.131	0.053	0.000
0.5000	0.788	0.157	0.058	0.000
0.5833	0.788	0.183	0.063	0.000
0.6667	0.788	0.210	0.067	0.000
0.7500	0.788	0.236	0.072	0.000
0.8333	0.788	0.295	0.075	0.000
0.9167	0.788	0.353	0.079	0.000
1.0000	0.788	0.412	0.083	0.000
1.0833	0.788	0.470	0.086	0.000
1.1667	0.788	0.529	0.089	0.000
1.2500	0.788	0.587	0.092	0.000
1.3333	0.788	0.645	0.096	0.000
1.4167	0.788	0.703	0.098	0.000
1.5000	0.788	0.760	0.101	0.000
1.5833	0.788	0.818	0.104	0.000
1.6667	0.788	0.875	0.107	0.000
1.7500	0.788	0.932	0.109	0.000
1.8333	0.788	0.989	0.112	0.000
1.9167	0.788	1.046	0.115	0.000
2.0000	0.788	1.103	0.117	0.000
2.0833	0.788	1.159	0.120	0.000
2.1667	0.788	1.215	0.122	0.000
2.2500	0.788	1.271	0.124	0.000
2.3333	0.788	1.327	0.126	0.000
2.4167	0.788	1.383	0.129	0.000
2.5000	0.788	1.438	0.131	0.000
2.5833	0.788	1.493	0.133	0.000
2.6667	0.788	1.547	0.135	0.000

2.7500	0.788	1.602	0.137	0.000
2.8333	0.788	1.656	0.139	0.000
2.9167	0.788	1.709	0.141	0.000
3.0000	0.788	1.763	0.143	0.000
3.0833	0.788	1.816	0.145	0.000
3.1667	0.788	1.868	0.147	0.000
3.2500	0.788	1.921	0.149	0.000
3.3333	0.788	1.973	0.151	0.000
3.4167	0.788	2.024	0.153	0.000
3.5000	0.788	2.075	0.155	0.000
3.5833	0.788	2.126	0.157	0.000
3.6667	0.788	2.176	0.159	0.000
3.7500	0.788	2.226	0.160	0.000
3.8333	0.788	2.275	0.162	0.000
3.9167	0.788	2.324	0.164	0.000
4.0000	0.788	2.372	0.166	0.000
4.0833	0.788	2.420	0.167	0.000
4.1667	0.788	2.467	0.169	0.000
4.2500	0.788	2.513	0.171	0.000
4.3333	0.788	2.559	0.173	0.000
4.4167	0.788	2.604	0.174	0.000
4.5000	0.788	2.649	0.176	0.000
4.5833	0.788	2.693	0.177	0.000
4.6667	0.788	2.736	0.234	0.000
4.7500	0.788	2.778	0.364	0.000
4.8333	0.788	2.819	0.539	0.000
4.9167	0.788	2.859	0.748	0.000
5.0000	0.788	2.898	0.986	0.000
5.0833	0.788	2.936	1.250	0.000
5.1667	0.788	2.973	1.538	0.000
5.2500	0.788	3.008	1.848	0.000
5.3333	0.788	3.040	2.178	0.000
5.4167	0.788	3.069	2.528	0.000
5.5000	0.788	3.098	2.895	0.000
5.5833	0.788	3.127	3.281	0.000
5.6667	0.788	3.154	3.682	0.000
5.7500	0.788	3.181	4.100	0.000
5.8333	0.788	3.208	5.250	0.000
5.9167	0.788	3.234	7.350	0.000
6.0000	0.788	3.260	10.06	0.000
6.0833	0.788	3.286	13.26	0.000
6.1667	0.788	3.313	16.88	0.000
6.2500	0.788	3.339	20.85	0.000
6.3333	0.788	3.365	25.12	0.000
6.4167	0.788	3.392	29.62	0.000
6.5000	0.788	3.418	34.33	0.000
6.5833	0.788	3.444	39.17	0.000
6.6667	0.788	3.470	44.09	0.000
6.7500	0.788	3.497	49.05	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 12.87
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 5.39
Total Impervious Area: 7.47

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.954947
5 year	3.544602
10 year	5.053681
25 year	6.555829

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.150057
5 year	1.118135
10 year	3.394758
25 year	7.060854

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1955	3570	1593	44	Pass
0.2446	2690	1317	48	Pass
0.2936	2047	1181	57	Pass
0.3427	1601	1071	66	Pass
0.3918	1350	963	71	Pass
0.4409	1171	874	74	Pass
0.4899	1049	802	76	Pass
0.5390	937	739	78	Pass
0.5881	854	700	81	Pass
0.6371	783	667	85	Pass
0.6862	721	633	87	Pass
0.7353	665	597	89	Pass
0.7844	611	563	92	Pass
0.8334	556	539	96	Pass
0.8825	516	502	97	Pass
0.9316	482	483	100	Pass
0.9807	449	455	101	Pass
1.0297	432	436	100	Pass
1.0788	407	414	101	Pass
1.1279	377	400	106	Pass
1.1769	361	376	104	Pass
1.2260	341	357	104	Pass
1.2751	314	338	107	Pass
1.3242	300	321	107	Pass
1.3732	284	307	108	Pass
1.4223	273	292	106	Pass
1.4714	258	275	106	Pass
1.5205	242	261	107	Pass
1.5695	230	250	108	Pass
1.6186	223	240	107	Pass
1.6677	214	226	105	Pass
1.7167	200	218	109	Pass
1.7658	193	204	105	Pass
1.8149	181	190	104	Pass
1.8640	174	181	104	Pass
1.9130	166	169	101	Pass
1.9621	161	164	101	Pass
2.0112	151	158	104	Pass
2.0603	147	149	101	Pass
2.1093	143	137	95	Pass
2.1584	139	131	94	Pass
2.2075	130	126	96	Pass
2.2565	123	123	100	Pass
2.3056	118	118	100	Pass
2.3547	110	113	102	Pass
2.4038	107	105	98	Pass
2.4528	102	102	100	Pass
2.5019	98	100	102	Pass
2.5510	98	95	96	Pass
2.6001	93	92	98	Pass
2.6491	89	85	95	Pass
2.6982	86	81	94	Pass
2.7473	81	76	93	Pass

2.7963	78	73	93	Pass
2.8454	73	68	93	Pass
2.8945	71	62	87	Pass
2.9436	70	60	85	Pass
2.9926	69	59	85	Pass
3.0417	67	56	83	Pass
3.0908	63	54	85	Pass
3.1399	61	52	85	Pass
3.1889	61	51	83	Pass
3.2380	59	48	81	Pass
3.2871	57	46	80	Pass
3.3361	55	42	76	Pass
3.3852	50	40	80	Pass
3.4343	47	35	74	Pass
3.4834	45	31	68	Pass
3.5324	43	29	67	Pass
3.5815	41	28	68	Pass
3.6306	40	25	62	Pass
3.6796	40	24	60	Pass
3.7287	39	23	58	Pass
3.7778	37	21	56	Pass
3.8269	35	20	57	Pass
3.8759	35	19	54	Pass
3.9250	32	18	56	Pass
3.9741	32	18	56	Pass
4.0232	32	18	56	Pass
4.0722	32	16	50	Pass
4.1213	32	16	50	Pass
4.1704	31	16	51	Pass
4.2194	31	15	48	Pass
4.2685	30	14	46	Pass
4.3176	27	14	51	Pass
4.3667	25	11	44	Pass
4.4157	23	11	47	Pass
4.4648	23	10	43	Pass
4.5139	21	10	47	Pass
4.5630	20	10	50	Pass
4.6120	19	10	52	Pass
4.6611	19	10	52	Pass
4.7102	18	10	55	Pass
4.7592	15	10	66	Pass
4.8083	14	10	71	Pass
4.8574	13	10	76	Pass
4.9065	12	10	83	Pass
4.9555	11	10	90	Pass
5.0046	11	10	90	Pass
5.0537	11	10	90	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

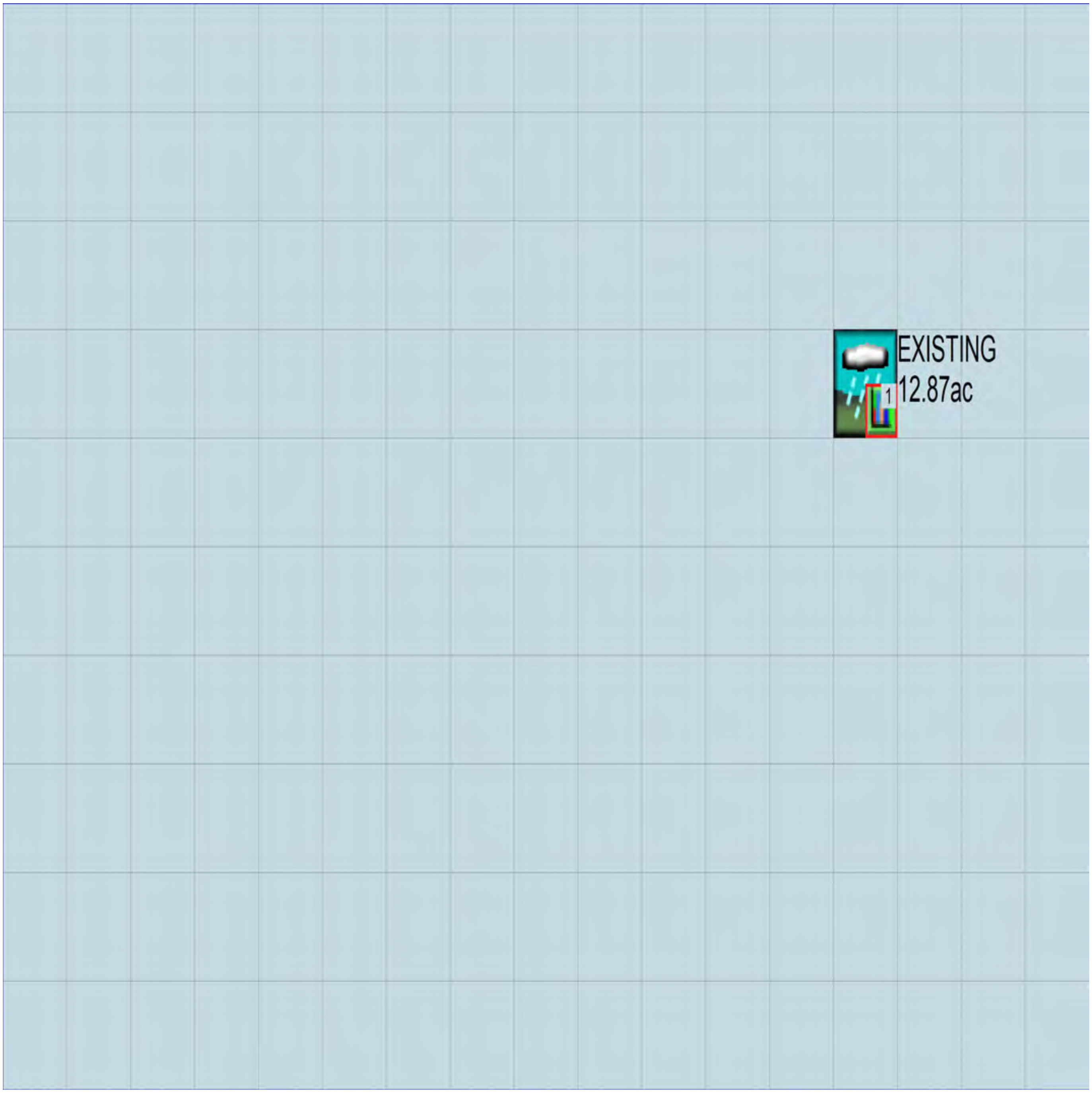
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2006 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   COMPASS BESS SOHM.wdm
MESSU      25   MitCOMPASS BESS SOHM.MES
           27   MitCOMPASS BESS SOHM.L61
           28   MitCOMPASS BESS SOHM.L62
           30   POCCOMPASS BESS SOHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       6
      PERLND      30
      PERLND      45
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        StormTech  3                MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    6     A,Open Brush,Mod        1    1    1    1   27    0
   30     C,Open Brush,Mod        1    1    1    1   27    0
   45     D,Gravel,Flat(0-5%)     1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    6         0    0    1    0    0    0    0    0    0    0    0    0
   30         0    0    1    0    0    0    0    0    0    0    0    0
```

```
  45          0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    6         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   30         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    6         0    0    0    1    0    0    0    0    1    0    0
   30         0    0    0    1    0    0    0    0    1    0    0
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    6              0       4.8      0.07       350       0.1       0.8     0.955
   30              0       4.5      0.04       350       0.1       0.8     0.955
   45              0       2.3      0.02       400      0.05       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    6             40        35         2         2         0      0.03         0
   30             40        35         3         2         0      0.03         0
   45             40        35         4         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    6              0      0.65      0.25       3.2      0.45         0
   30              0      0.65      0.25       1.2      0.45         0
   45              0       0.6       0.2      0.65       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    6       0.4  0.4  0.4  0.5 0.55 0.55 0.55 0.55 0.55 0.55 0.45  0.4
   30       0.4  0.4  0.4  0.5 0.55 0.55 0.55 0.55 0.55 0.55 0.45  0.4
   45       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    6      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
   30      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    6              0         0     0.065         0      0.96       0.3      0.01
   30              0         0     0.065         0       0.9       0.3      0.01
   45              0         0      0.06         0      0.46       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
```

```
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    1     Impervious,Flat(0-5)    1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
PROPOSED***
PERLND   6                        0.12     RCHRES   1      2
PERLND   6                        0.12     RCHRES   1      3
PERLND  30                        0.26     RCHRES   1      2
PERLND  30                        0.26     RCHRES   1      3
PERLND  45                        5.01     RCHRES   1      2
PERLND  45                        5.01     RCHRES   1      3
IMPLND   1                        7.47     RCHRES   1      5

******Routing******
PERLND   6                        0.12     COPY     1     12
PERLND  30                        0.26     COPY     1     12
PERLND  45                        5.01     COPY     1     12
IMPLND   1                        7.47     COPY     1     15
PERLND   6                        0.12     COPY     1     13
PERLND  30                        0.26     COPY     1     13
PERLND  45                        5.01     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
```

```
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     StormTech  3           1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.14       0.0       4.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   81    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.787980  0.000000  0.000000
  0.083333  0.787980  0.026288  0.023991
  0.166667  0.787980  0.052575  0.033928
  0.250000  0.787980  0.078769  0.041553
  0.333333  0.787980  0.105065  0.047982
  0.416667  0.787980  0.131333  0.053645
  0.500000  0.787980  0.157598  0.058765
  0.583333  0.787980  0.183866  0.063474
  0.666667  0.787980  0.210131  0.067856
  0.750000  0.787980  0.236399  0.071972
  0.833333  0.787980  0.295192  0.075865
  0.916667  0.787980  0.353797  0.079568
```

1.000000	0.787980	0.412311	0.083106
1.083333	0.787980	0.470708	0.086500
1.166667	0.787980	0.528988	0.089765
1.250000	0.787980	0.587136	0.092916
1.333333	0.787980	0.645150	0.095963
1.416667	0.787980	0.703018	0.098916
1.500000	0.787980	0.760735	0.101784
1.583333	0.787980	0.818289	0.104573
1.666667	0.787980	0.875675	0.107290
1.750000	0.787980	0.932881	0.109940
1.833333	0.787980	0.989900	0.112527
1.916667	0.787980	1.046724	0.115056
2.000000	0.787980	1.103343	0.117530
2.083333	0.787980	1.159745	0.119954
2.166667	0.787980	1.215925	0.122329
2.250000	0.787980	1.271871	0.124660
2.333333	0.787980	1.327575	0.126947
2.416667	0.787980	1.383024	0.129194
2.500000	0.787980	1.438208	0.131403
2.583333	0.787980	1.493118	0.133575
2.666667	0.787980	1.547743	0.135712
2.750000	0.787980	1.602072	0.137816
2.833333	0.787980	1.656092	0.139889
2.916667	0.787980	1.709792	0.141931
3.000000	0.787980	1.763160	0.143945
3.083333	0.787980	1.816185	0.145930
3.166667	0.787980	1.868853	0.147889
3.250000	0.787980	1.921148	0.149822
3.333333	0.787980	1.973061	0.151731
3.416667	0.787980	2.024571	0.153616
3.500000	0.787980	2.075666	0.155478
3.583333	0.787980	2.126330	0.157318
3.666667	0.787980	2.176544	0.159137
3.750000	0.787980	2.226292	0.160935
3.833333	0.787980	2.275552	0.162713
3.916667	0.787980	2.324305	0.164472
4.000000	0.787980	2.372531	0.166213
4.083333	0.787980	2.420205	0.167935
4.166667	0.787980	2.467302	0.169640
4.250000	0.787980	2.513794	0.171328
4.333333	0.787980	2.559652	0.173000
4.416667	0.787980	2.604842	0.174655
4.500000	0.787980	2.649329	0.176295
4.583333	0.787980	2.693074	0.177920
4.666667	0.787980	2.736030	0.233985
4.750000	0.787980	2.778141	0.364909
4.833333	0.787980	2.819345	0.539269
4.916667	0.787980	2.859569	0.748007
5.000000	0.787980	2.898708	0.986141
5.083333	0.787980	2.936631	1.250385
5.166667	0.787980	2.973151	1.538361
5.250000	0.787980	3.007955	1.848243
5.333333	0.787980	3.040033	2.178570
5.416667	0.787980	3.069746	2.528141
5.500000	0.787980	3.098692	2.895945
5.583333	0.787980	3.127072	3.281116
5.666667	0.787980	3.154826	3.682898
5.750000	0.787980	3.181618	4.100629
5.833333	0.787980	3.208153	5.250778
5.916667	0.787980	3.234440	7.350127
6.000000	0.787980	3.260634	10.06425
6.083333	0.787980	3.286931	13.26930
6.166667	0.787980	3.313197	16.88680
6.250000	0.787980	3.339464	20.85532
6.333333	0.787980	3.365730	25.12025
6.416667	0.787980	3.391997	29.62931
6.500000	0.787980	3.418263	34.33036
6.583333	0.787980	3.444529	39.17047
6.666667	0.787980	3.470796	44.09570

END FTABLE 1

```
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1005 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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Attachment J: 2-Year Calculations - PCCSYA

2-YEAR AES ANALYSIS RUN FOR OFFSITE AND PROPOSED ONSITE SWALE AREAS TO DETERMINE THE FINAL VELOCITIES OF BYPASSED FLOW FOR PCCYSA

FLOWS ARE SHOWN TO BE GREATER THAN 3 FT/SEC WITHIN SWALES

REFER TO DRAINAGE REPORT FOR VELOCITIES EXITING PROPOSED STORM DRAIN INFRASTRUCTURE

```
 ************************** DESCRIPTION OF STUDY **************************
* COMPASS BESS                                                              *
* OFFSITE 2-YEAR ANALYSIS                                                   *
* KIMLEY-HORN                                                               *
 **************************************************************************

  FILE NAME: O2.DAT
  TIME/DATE OF STUDY: 15:31 12/04/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  2.210
   2)   30.00;  0.908
   3)   60.00;  0.603
   4)  180.00;  0.343
   5)  360.00;  0.236
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   281.00
  ELEVATION DATA: UPSTREAM(FEET) =    609.30  DOWNSTREAM(FEET) =    523.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.543
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.025
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        1.24      0.20     1.000    64    8.54
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.04
  TOTAL AREA(ACRES) =      1.24   PEAK FLOW RATE(CFS) =      2.04

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    523.80  DOWNSTREAM(FEET) =    222.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1653.00   CHANNEL SLOPE =  0.1821
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       10.67      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        2.40      0.25     1.000    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.16
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   8.71
  Tc(MIN.) =   17.25
  SUBAREA AREA(ACRES) =    13.07       SUBAREA RUNOFF(CFS) =   16.03
  EFFECTIVE AREA(ACRES) =     14.31     AREA-AVERAGED Fm(INCH/HR) =   0.21
```

```
  AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       14.3         PEAK FLOW RATE(CFS) =      17.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.73
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1934.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   17.25
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       10.67      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        2.40      0.25     1.000    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.07      SUBAREA RUNOFF(CFS) =   16.03
  EFFECTIVE AREA(ACRES) =     27.38   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       27.4       PEAK FLOW RATE(CFS) =      33.59

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
  ELEVATION DATA: UPSTREAM(FEET) =    606.80  DOWNSTREAM(FEET) =    511.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.163
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.993
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        2.00      0.20     1.000    64    9.16
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.23
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =      3.23

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

```
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    511.00  DOWNSTREAM(FEET) =    226.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   860.00   CHANNEL SLOPE =  0.3309
  CHANNEL BASE(FEET) =   80.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.731
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        6.73      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.03      0.25     1.000    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.85
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   5.04
  Tc(MIN.) =   14.20
  SUBAREA AREA(ACRES) =     6.76       SUBAREA RUNOFF(CFS) =    9.31
  EFFECTIVE AREA(ACRES) =      8.76     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        8.8         PEAK FLOW RATE(CFS) =      12.07

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   3.34
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1188.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   14.20
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.731
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        6.73      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.02      0.25     1.000    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    6.75      SUBAREA RUNOFF(CFS) =    9.30
  EFFECTIVE AREA(ACRES) =     15.51   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
```

```
  TOTAL AREA(ACRES) =       15.5       PEAK FLOW RATE(CFS) =      21.37

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   153.00
  ELEVATION DATA: UPSTREAM(FEET) =    532.00  DOWNSTREAM(FEET) =    507.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.630
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.073
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.52      0.20     1.000    64    7.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.88
  TOTAL AREA(ACRES) =      0.52   PEAK FLOW RATE(CFS) =      0.88

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    507.70  DOWNSTREAM(FEET) =    212.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2345.00   CHANNEL SLOPE =  0.1261
  CHANNEL BASE(FEET) =   66.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.310
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       15.63      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        3.15      0.25     1.000    57
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.53      0.40     1.000    23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.67
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =  14.66
  Tc(MIN.) =   22.29
  SUBAREA AREA(ACRES) =    21.31       SUBAREA RUNOFF(CFS) =   20.69
```

```
  EFFECTIVE AREA(ACRES) =     21.83     AREA-AVERAGED Fm(INCH/HR) =   0.23
  AREA-AVERAGED Fp(INCH/HR) =   0.23  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       21.8         PEAK FLOW RATE(CFS) =      21.20

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   3.20
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    2498.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   22.29
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.310
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D       15.63      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        3.15      0.25     1.000    57
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.53      0.40     1.000    23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   21.31      SUBAREA RUNOFF(CFS) =   20.69
  EFFECTIVE AREA(ACRES) =     43.14   AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       43.1       PEAK FLOW RATE(CFS) =      41.89

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    274.00  DOWNSTREAM(FEET) =    219.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.284
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.935
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        1.93      0.20     1.000    64   10.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.01
```

```
  TOTAL AREA(ACRES) =      1.93   PEAK FLOW RATE(CFS) =      3.01

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    219.20  DOWNSTREAM(FEET) =    214.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   549.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.219
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.05      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.17      0.25     1.000    57
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A        2.15      0.40     1.000    23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.39
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.96
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.67
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =  13.74
  Tc(MIN.) =   24.02
  SUBAREA AREA(ACRES) =     2.37       SUBAREA RUNOFF(CFS) =    1.78
  EFFECTIVE AREA(ACRES) =      4.30     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       4.3         PEAK FLOW RATE(CFS) =       3.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.60
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     879.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   24.02
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.219
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      D        0.05      0.20     1.000    64
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      C        0.16      0.25     1.000    57
```

```
  NATURAL FAIR COVER
  "CHAPARRAL,BROADLEAF"      A       2.14      0.40     1.000    23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.39
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    2.35      SUBAREA RUNOFF(CFS) =    1.76
  EFFECTIVE AREA(ACRES) =      6.65   AREA-AVERAGED Fm(INCH/HR) =  0.33
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       6.7       PEAK FLOW RATE(CFS) =      5.31
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     24.02
  EFFECTIVE AREA(ACRES) =      6.65  AREA-AVERAGED Fm(INCH/HR)=  0.33
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       5.31
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* COMPASS BESS                                                             *
* PROPOSED 2-YEAR ANALYSIS                                                 *
* KIMLEY-HORN                                                              *
 **************************************************************************

  FILE NAME: PR2YR.DAT
  TIME/DATE OF STUDY: 15:42 12/04/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  2.210
   2)   30.00;  0.908
   3)   60.00;  0.603
   4)  180.00;  0.343
   5)  360.00;  0.236
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   542.00
  ELEVATION DATA: UPSTREAM(FEET) =    218.60  DOWNSTREAM(FEET) =    213.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.445
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.979
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.51      0.20     0.100    57    9.44
  COMMERCIAL                 C       1.25      0.25     0.100    50    9.44
  COMMERCIAL                 A       2.14      0.40     0.100    17    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      6.83
  TOTAL AREA(ACRES) =      3.90   PEAK FLOW RATE(CFS) =      6.83

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   415.00
  ELEVATION DATA: UPSTREAM(FEET) =    217.50  DOWNSTREAM(FEET) =    213.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.493
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.028
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D       0.18      0.20     0.100    57    8.49
  COMMERCIAL                 C       0.99      0.25     0.100    50    8.49
  COMMERCIAL                 A       1.61      0.40     0.100    17    8.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.99
  TOTAL AREA(ACRES) =      2.78   PEAK FLOW RATE(CFS) =      4.99

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   339.00
  ELEVATION DATA: UPSTREAM(FEET) =    216.70  DOWNSTREAM(FEET) =    213.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.847
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.062
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       1.19      0.25     0.100    50    7.85
  COMMERCIAL                 A       0.70      0.40     0.100    17    7.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.46
  TOTAL AREA(ACRES) =      1.89   PEAK FLOW RATE(CFS) =      3.46

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   331.00
  ELEVATION DATA: UPSTREAM(FEET) =    216.60  DOWNSTREAM(FEET) =    213.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.782
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.065
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C       1.24      0.25     0.100    50    7.78
  COMMERCIAL                 A       0.48      0.40     0.100    17    7.78
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.15
  TOTAL AREA(ACRES) =      1.72   PEAK FLOW RATE(CFS) =      3.15

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    500.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   14.20   RAINFALL INTENSITY(INCH/HR) =  1.73
  EFFECTIVE AREA(ACRES) =    15.51
  TOTAL AREA(ACRES) =    15.51        PEAK FLOW RATE(CFS) =     21.37
```

```
  AREA-AVERAGED Fm(INCH/HR) =   0.20  AREA-AVERAGED Fp(INCH/HR) =   0.20
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    223.80  DOWNSTREAM(FEET) =    214.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   645.00   CHANNEL SLOPE =  0.0140
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.422
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                    D        0.52      0.20     1.000    63
  NATURAL GOOD COVER
  "GRASS"                    C        0.03      0.25     1.000    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.67
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.81
  AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =   5.93
  Tc(MIN.) =   20.13
  SUBAREA AREA(ACRES) =     0.55       SUBAREA RUNOFF(CFS) =    0.60
  EFFECTIVE AREA(ACRES) =     16.06     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       16.1         PEAK FLOW RATE(CFS) =      21.37
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   1.79
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    501.00 =     976.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    214.80  DOWNSTREAM(FEET) =    213.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   544.00   CHANNEL SLOPE =  0.0017
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.896
  SUBAREA LOSS RATE DATA(AMC  I ):
```

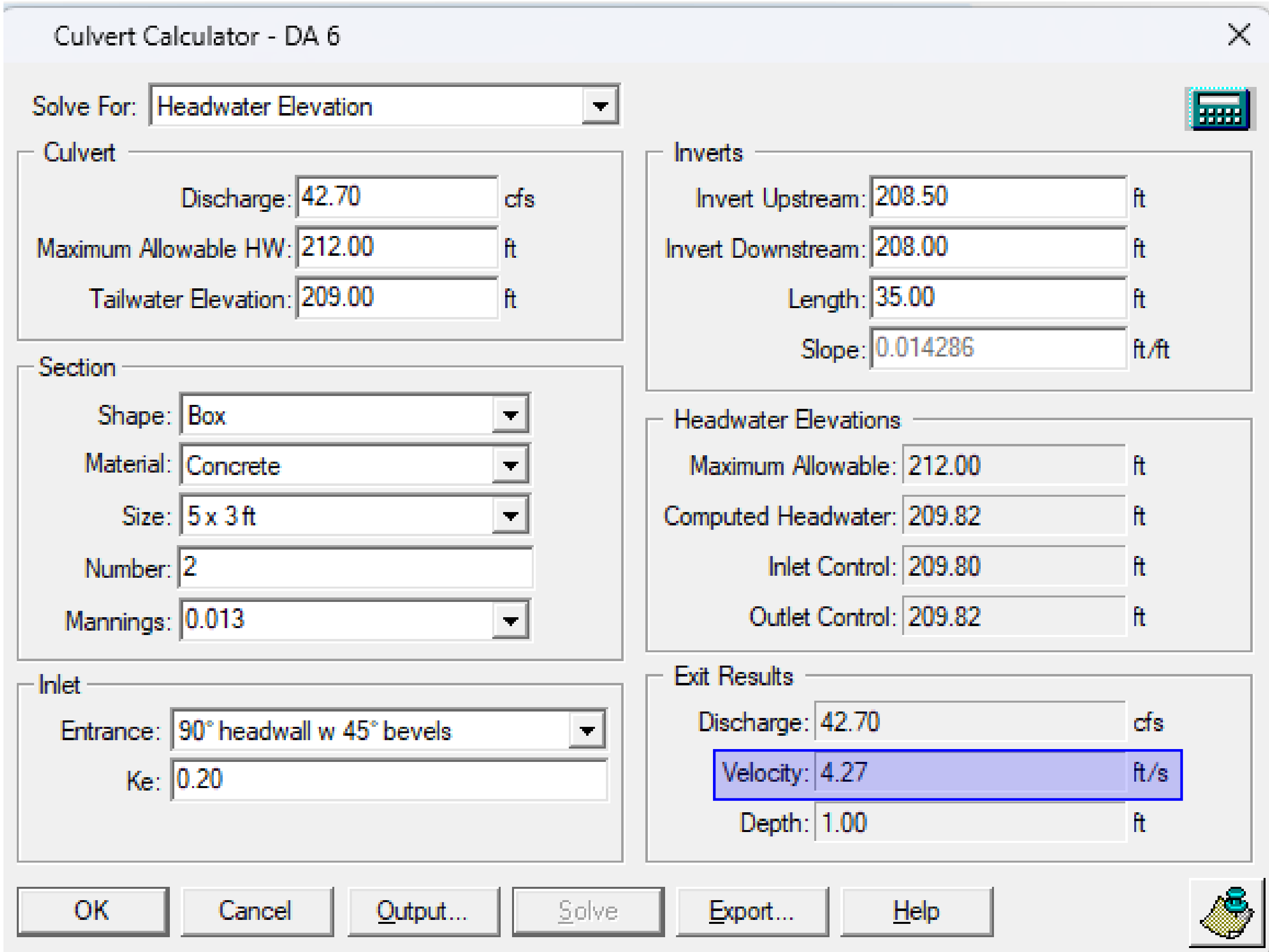
```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL GOOD COVER
  "GRASS"                    C        0.62      0.25     1.000    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.82
  AVERAGE FLOW DEPTH(FEET) =   0.49   TRAVEL TIME(MIN.) =  11.08
  Tc(MIN.) =   31.21
  SUBAREA AREA(ACRES) =     0.62       SUBAREA RUNOFF(CFS) =    0.36
  EFFECTIVE AREA(ACRES) =     16.68     AREA-AVERAGED Fm(INCH/HR) =   0.20
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       16.7         PEAK FLOW RATE(CFS) =      21.37
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   31.21
  RAINFALL INTENSITY(INCH/HR) =   0.90
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      16.68
  TOTAL STREAM AREA(ACRES) =      16.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.37

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   17.25   RAINFALL INTENSITY(INCH/HR) =  1.57
  EFFECTIVE AREA(ACRES) =    27.38
  TOTAL AREA(ACRES) =    27.38        PEAK FLOW RATE(CFS) =     33.59
  AREA-AVERAGED Fm(INCH/HR) =   0.21  AREA-AVERAGED Fp(INCH/HR) =   0.21
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

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

```
  FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.25
  RAINFALL INTENSITY(INCH/HR) =   1.57
  AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      27.38
  TOTAL STREAM AREA(ACRES) =      27.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      33.59

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       21.37   31.21    0.896  0.20( 0.20) 1.00      16.7     500.00
      2       33.59   17.25    1.572  0.21( 0.21) 1.00      27.4     502.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       54.96   17.25    1.572  0.21( 0.21) 1.00      36.6     502.00
      2       38.28   31.21    0.896  0.21( 0.21) 1.00      44.1     500.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      54.96    Tc(MIN.) =    17.25
  EFFECTIVE AREA(ACRES) =      36.60   AREA-AVERAGED Fm(INCH/HR) =  0.21
  AREA-AVERAGED Fp(INCH/HR) =  0.21  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       44.1
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =    1520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    502.00 TO NODE    503.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    213.90  DOWNSTREAM(FEET) =    206.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   205.00   CHANNEL SLOPE =  0.0341
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.517
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                C       0.49      0.25     0.100    50
 COMMERCIAL                A       0.28      0.40     0.100    17
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      55.47
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.23
 AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   1.06
 Tc(MIN.) =   18.31
 SUBAREA AREA(ACRES) =     0.77       SUBAREA RUNOFF(CFS) =    1.03
 EFFECTIVE AREA(ACRES) =     37.37     AREA-AVERAGED Fm(INCH/HR) =   0.20
 AREA-AVERAGED Fp(INCH/HR) =   0.21  AREA-AVERAGED Ap =   0.98
 TOTAL AREA(ACRES) =       44.8         PEAK FLOW RATE(CFS) =      54.96
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   3.20
 LONGEST FLOWPATH FROM NODE    500.00 TO NODE    503.00 =    1725.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   538.00
 ELEVATION DATA: UPSTREAM(FEET) =    215.00  DOWNSTREAM(FEET) =    208.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.094
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.997
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                A       0.42      0.40     0.100    17    9.09
 COMMERCIAL                C       0.22      0.25     0.100    50    9.09
 COMMERCIAL                D       0.06      0.20     0.100    57    9.09
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.24
 TOTAL AREA(ACRES) =      0.70   PEAK FLOW RATE(CFS) =      1.24

****************************************************************************
 FLOW PROCESS FROM NODE    601.00 TO NODE    601.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.09
 RAINFALL INTENSITY(INCH/HR) =   2.00
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.34
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.70
  TOTAL STREAM AREA(ACRES) =       0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.24

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    601.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =   22.29   RAINFALL INTENSITY(INCH/HR) =  1.31
  EFFECTIVE AREA(ACRES) =    43.14
  TOTAL AREA(ACRES) =    43.14        PEAK FLOW RATE(CFS) =     41.89
  AREA-AVERAGED Fm(INCH/HR) =   0.23  AREA-AVERAGED Fp(INCH/HR) =   0.23
  AREA-AVERAGED Ap =  1.00
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
         CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    601.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   22.29
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.23
  AREA-AVERAGED Fp(INCH/HR) =  0.23
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      43.14
  TOTAL STREAM AREA(ACRES) =      43.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      41.89

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.24    9.09    1.997  0.34( 0.03) 0.10       0.7     600.00
      2       41.89   22.29    1.310  0.23( 0.23) 1.00      43.1     601.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       29.21    9.09    1.997  0.23( 0.22) 0.97      18.3     600.00
```

```
     2        42.69    22.29    1.310  0.23( 0.23) 0.99      43.8     601.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      42.69    Tc(MIN.) =    22.29
 EFFECTIVE AREA(ACRES) =      43.84   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  0.99
 TOTAL AREA(ACRES) =       43.8
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    601.00 =     538.00 FEET.

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



Appendix 4.15C

Oso Creek Hydraulic Study

TORY R. WALKER
ENGINEERING

PRELIMINARY HYDRAULIC REPORT

for

Oso Creek Stabilization

City of San Juan Capistrano, California

Prepared for:

ENGIE North America Flexible Generation & Retail

8001 Arista Place, Suite 350

Broomfield, CO 80021

SEPTEMBER 2025

Prepared by;

Tory R. Walker, PE

R.C.E. 45005

REGISTERED PROFESSIONAL ENGINEER
TORY R WALKER
No. 45005
Exp. 3-31-2026
CIVIL
STATE OF CALIFORNIA

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1. PURPOSE AND SCOPE

The Oso Creek Stabilization Project involves the repair and rehabilitation of approximately 2,600 linear feet of the Oso Creek channel, which we will refer to in this report as the "study reach". The study reach is located to the east of the Saddleback Church Rancho Capistrano property and west of the I-5 San Diego Freeway and the Southern California Regional Rail Authority (SCRRA) rail line within the city of San Juan Capistrano, California, as shown in **Figure 1** and **Figure 2**.

Over time, the creek has experienced significant vertical scour, horizontal migration, bank instability, and native and non-native vegetation overgrowth. The purpose of this study is to prepare a restoration design for the creek that will stabilize the channel, prevent future bank failure and channel migration, and will enhance native vegetation growth. This preliminary hydraulic report is therefore prepared to support a 30-percent design of a creek restoration plan using the Nationwide Permit 27 (NWP 27) process.

The proposed creek channel restoration begins at the vegetated open channel at the outfall of an existing double box culvert and ends approximately 2,600-feet downstream. The channel flows from north to south and confluences downstream with Trabuco Creek, a tributary of San Juan Creek, which flows into the Pacific Ocean.

The proposed creek channel design incorporates a series of instream stabilization structures consisting of natural rock; native vegetation will be added at the 60-percent design, but the sizing and placement of the natural rock as designed herein will ensure the stability of the restored creek channel without the subsequent reinforcing of the creek channel by that native vegetation.

The primary instream stabilization structures used for this creek restoration will be low-head drop structures consisting of rock weirs and ramps followed by pools/stilling basins. These rock structures will be spaced approximately every 300 feet between flatter channel sections to reduce flow velocities to less than erosive. This restoration design approach will thus, not only stabilize the creek channel, but facilitate the establishment of native vegetation (habitat) in both the channel bed and the 3:1 side slopes.

Another important design feature will be elevating this highly degraded section of Oso Creek; this will allow reestablishment of a hyporheic zone in the creek channel bed. Taken together, these design features will stabilize the channel, reducing the risk of ongoing vertical and horizontal scour and bank collapse, and will provide habitat and water quality improvements.

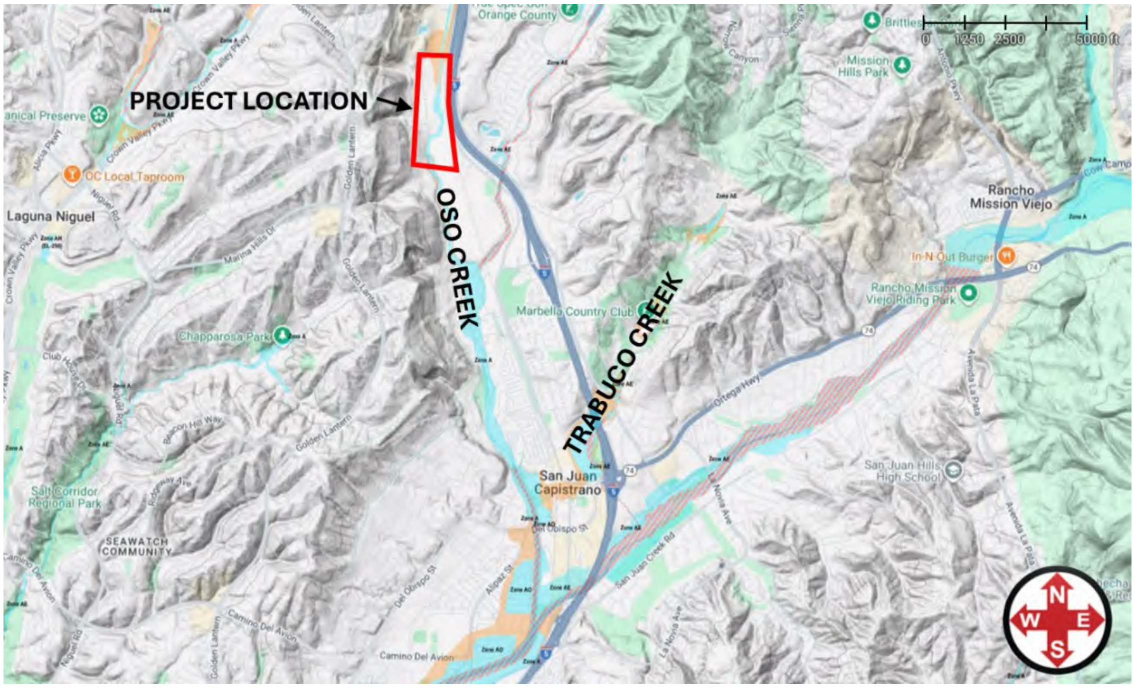

Figure 1 | Vicinity Map Overview

Figure 2 | Project Location

1.1. NATIONWIDE PERMIT 27

To qualify under the Nationwide Permit (NWP) 27, a creek restoration project must follow these principles:

Authorized Activities

- Remove accumulated sediments and stream barriers
- Restore stream meanders, riffle-pool complexes, and any in-stream habitat structures
- Modify stream beds and banks to improve flow and habitat
- Install current deflectors and small water control structures
- Reestablish native vegetation and submerged aquatic plants

- Remove invasive vegetation
- Restore wetland hydrology by removing structures and reshaping ditches

Ecological Requirements

- Use only native plant species
- Design restoration to resemble a natural reference habitat
- Ensure net ecological benefits—no conversions between habitat types (e.g., stream to wetland)

Prohibited Actions

- Stream channelization[1]
- Conversion of tidal waters or wetlands to other aquatic uses
- Use of unsuitable materials (e.g., trash, debris, asphalt)

Each of these items was used to guide the proposed channel restoration design.

2. TOPOGRAPHIC DATA

Topographic survey for the north portion of the project site was prepared by Dudek on September 3, 2024. The survey is on the NAD 83 California State Plane Zone 6 coordinate system and uses vertical datum NAVD 88.

The south portion of the project site utilizes Captiva topographic data from March 3, 2021. The survey uses horizontal datum NAD 83 California State Plane Zone 6 coordinate system and uses vertical datum NAVD 88.

As-built drawings were used to identify the inverts and sizing for the existing double box culvert and downstream concrete and rock channel. These plans are on vertical datum NGVD 29. According to the NGS Coordinate Conversion calculator, the conversion between NAVD 88 and NGVD 29 is 2.2-feet.

[1] The US Army Corps of Engineers (USACE) defines stream channelization as the manipulation of a stream channel to increase the rate of water flow. Manipulation may include deepening, widening, straightening, armoring, or other activities that change the stream cross-section or other aspects of stream channel geometry to increase the rate of water flow through the stream channel. The proposed design does not include any of these activities.

3. HYDROLOGIC DATA

The FEMA 2019 Flood Insurance Study (FIS) shows a 100-year peak flow rate of 6,080 cfs. However, this study has elected to use the peak flow rate provided by Orange County Public Works (OCPW). According to OCPW, the 100-year peak flow rate at the downstream end of the concrete lined channel is 6,500 cubic feet per second (cfs) per the as-built Oso Creek Channel Facility No. L03 plans (Drawing No. L03-101-1A). This is supported by Rivertech's May 1987 report, *Oso Creek Channel Facility No. L03 Hydrology Study,* which determined that the 100-year flow rate to be 6,500 cfs near the downstream end of the study reach. Other peak flow rates were estimated from the 100-year flow rate; the 5-, 10-, 25-, 50-year Oso Creek flow rates were taken from PACE's January 2020 report, *Lower San Juan Creek and Trabuco Creek Invert Stabilization Master Plan.*

We estimated the 2-year flow rate from NOAA Atlas 14 by multiplying the 2-year, 24-hour rainfall intensity by the same ratio between the 10-year flow rate and the 10-year, 24-hour rainfall intensity.

Table 1 | Oso Creek Flow Rates

Storm Event	Flow Rate (CFS)
2-Year	2,178
10-Year	3,558
100-Year	6,500

4. HISTORIC AND EXISTING CONDITION OF OSO CREEK

Over the last 50 years, development within the Oso Creek watershed has increased significantly, decreasing the amount of sediment produced from within the watershed. With the increase in development came traditional means of flood control in the form of concrete channels and storm drain structures. The double box culvert was built in 1984 along with a series of concrete open channels upstream. This addition of the box culvert and concrete lined channels has increased flow velocities, erosion, and scour within the creek channel. We compared the existing Oso Creek study reach topography with topography from the USGS 7.5 minute topographic map from 1949. A profile of both sets of topography along the Oso Creek channel invert are shown in **Figure 3**. This shows that over the past 76 years the channel invert over the study reach has degraded by between 20 and 30 feet.

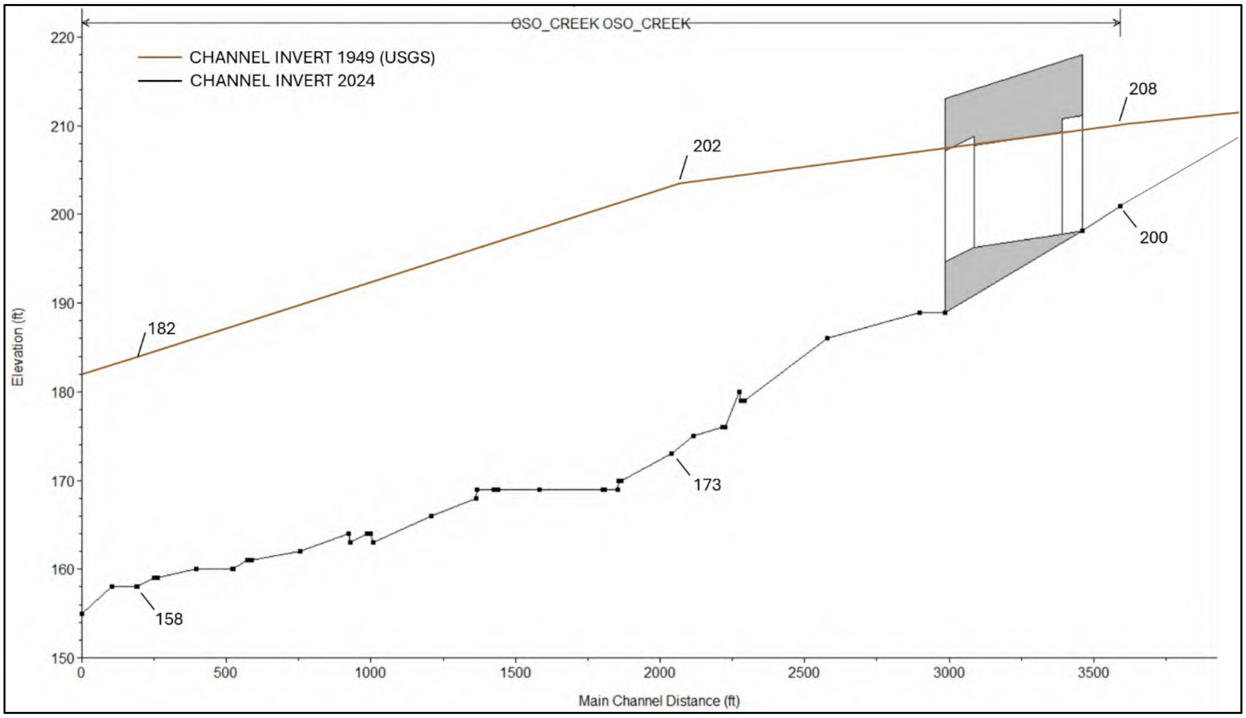

Figure 3 | Channel Profile 1949 vs. 2024 Comparison

Tory R. Walker Engineering (TRWE) conducted a site visit on August 21st, 2025 to assess the current physical characteristics of Oso Creek along the study reach. The existing double box culvert at the upstream end of the project site outlets to a rip rap-lined open channel (see **Figure 4**). The channel then transitions to a densely vegetated open channel lined with the same size rip rap scattered along the banks, which appears to be stable (see **Figure 5** and **Figure 6**). The creek then transitions to a natural channel without rock lining, at which point severe vertical and horizontal erosion begins and continues downstream.

According to the existing topography, the channel has flatter stretches with an average longitudinal slope of approximately 1-percent, and some short but steep stretches where the slope is as high as 20-percent.

Figure 4 | Rip Rap Lined Open Channel at Existing RCB Outfall

Figure 5 | Rip Rap Channel Transitions to Vegetated Channel with Rip Rap

Figure 6 | Stable Vegetated Open Channel with Rip Rap Downstream of Culvert Outfall

At this point (approximately 700-feet downstream of the existing double RCB outfall) the channel has eroded downward into a clay layer. Both native and non-native vegetation are overgrown in various areas, causing re-direction of flows away from the channel thalweg (see **Figure 7**, which was taken within Oso Creek looking upstream). Existing native and non-native vegetation are overgrown along the eastern bank, directing flows toward the western bank, which has recently collapsed.

No deposition of rocks or sediment was seen except for in areas where a scour hole might have occurred, or where a debris dam currently exists, allowing sediment to settle.

Along the western top of bank, deep cracks were observed in the soil near the edge of the creek top of bank (see **Figure 8**).

With time, these surface cracks are expected to deepen, eventually causing more bank failure. The channel at this location and continuing downstream is no longer protected by rock and is unstable and lacks proper bank vegetation in some areas. It is therefore susceptible to the high velocities that cause bank failure and horizontal migration as it continues downstream.

Figure 7 | Oso Creek Existing Condition

Figure 8 | Surface Cracks Along Channel Banks

Plants such as Giant Reed (arundo donax) and willows were observed along the channel. Their shallow and compact roots force the water away towards the west bank, stabilizing the soil beneath them but also diverting flows to the opposite channel bank (see **Figure 9**). Riprap has been placed along the east side of the corridor along the railroad just south of the culvert outfall. This rip rap has somewhat stabilized the eastern slope of the channel along the railroad, leaving the western bank more vulnerable to ongoing collapse.

Additionally, mature plants such as palms were found to be trapping debris that moved through the channel and had formed debris dams (see **Figure 10**). These overgrown plants form natural dams and barriers that re-direct high velocity flows around them and toward the banks, creating new flow paths as the water looks for a path around the blockage.

Figure 9 | Willow Roots Inside Channel

Figure 10 | Palm Tree Debris Dam in Center of Channel Bottom

The team observed clay soils along the channel bottom and along the lower banks throughout the visited channel reach. These soils are highly erosive and experience erosion at the exposed toes of slope throughout the channel. As the toe erodes, the foundation of the slope is compromised, leading to bank collapse. Undercutting and collapse of the channel banks can be seen in **Figure 11.** This photo was taken toward the downstream end of the project reach and shows the lack of rock and deposited sediment in both the channel banks and bottom.

Dry weather flows were observed during the site visit and were estimated to be approximately 1 cfs. These flows are considered a baseflow, as they occur year-round due to various sources throughout the watershed. This baseflow was clear and did not contain sediment (see **Figure 12**).

Figure 11 | Undercutting and Bank Collapse of Clay Soils

Figure 12 | Dry Weather Flows

In summary, the Oso Creek channel exhibits widespread instability as a combined result of the high velocities, unmanaged vegetation, and soils. Lateral migration and vertical scour will continue until the stream channel is rehabilitated. The channel is not expected to achieve a natural state of equilibrium for a very long time.

5. SEDIMENT TRANSPORT ANALYSIS

A sediment transport analysis was considered for the channel but ultimately not conducted due to the conditions observed during the site visit. Through sampling and observation, the channel bed was determined to be composed of clay and largely free of sediment deposition; the channel displayed very limited deposition in small, localized areas of vegetated overgrowth and debris dams, where localized velocities would be low. In addition, the upstream section of the creek is concrete-lined and fed from urban runoff, meaning the water entering the channel at the upstream of the project site is devoid of sediment load. The existing double box culvert at the upstream portion of the study reach is preceded by an upstream network of concrete open channels. This combination of concrete-lined channels and culverts reduces sediment in runoff. Runoff is therefore “hungry” when entering the natural stream section and will look for sediment to pick up.

During our site visit, we saw no natural deposition of rock or sediment. The only sediment deposition that was seen within the study reach was within scour holes or where vegetation overgrowth blocked flows, allowing sediment to settle. Therefore, it was determined that a sediment transport analysis would not be useful in predicting future changes within this stretch of the channel, because there is no sediment being deposited withing the study reach.

The sieve analyses performed on the sediment samples confirmed the field observation that the channel bed was composed of clay and shows that the lower banks contain mostly clay. Locations where the sediment samples were taken can be viewed in **Figure 13**. Results of the sieve analysis are summarized in **Table 2,** and the gradation results are located in **Attachment 1**.

Figure 13 | Soil Sample Locations

Table 2 | USCS Soil Sample Classifications

Sample	USCS Classification
1	Dark Brown CL (Clay)
2	Light Gray SM (Silty Sand)- **Bank Sample**
3	Dark Gray SM/SC (Silty Sand/Clayey Sand)
4	Dark Brown CL (Clay)
5	Gray SC/CL (Clayey Sand/Clay)

6. HYDRAULIC ANALYSIS

6.1. Existing Condition

A hydraulic model of the study reach was prepared using the USACE river hydraulic analysis software HEC-RAS (version 6.4.1). Cross sections were drawn using the existing topographic survey, and the model was run with a mixed-flow regime to account for either subcritical or supercritical flow. The upstream and downstream boundary conditions were set to normal depth, and Manning's roughness coefficients were determined based on the geometry and physical characteristics of the channel as well as the vegetation observed during the August 2025 site visit.

The existing condition model results show the existing condition average velocities and flow depths along the channel. These values were then used to determine the most appropriate locations for the berms, drop structures, and stilling basins along the channel. The existing condition HEC-RAS results are available in **Attachment 4**.

6.2. Proposed Condition

There were several goals with the proposed channel rehabilitation design. Every design consideration took into account the requirements within the NWP 27 discussed in Chapter 1. With this in mind, the first goal was to reduce flow velocities in order to prevent further long-term channel scour and provide the channel banks with long-term stability. The second goal was to promote stable slopes that would allow the growth of native vegetation in the channel and along the banks. The third goal was to ensure that this rehabilitation design would be mostly self-sustaining once vegetation establishes.

A summary of the proposed design includes the following:

1. Channel base width of 80 feet.
2. Western side slope is graded at 3:1 (H:V) up to 10 feet (above the 100-year water surface elevation).
3. The upper portion of the western slope will be graded at 2:1 (H:V) until it meets the top of bank elevation. This will require cut or fill, depending on location.
4. The slopes will be planted with native vegetation, including woody vegetation.
5. The eastern slope at the north (upstream) portion of the restoration reach will remain since it appears stable and is lined with rip rap.

6. The eastern slope along the lower (southerly) portion of the channel will be graded at 3:1 and 2:1 and also replanted with native vegetation.
7. Six instream rock stabilization structures are proposed at between 300 to 400 feet apart (see **Figure 14**). Each drop structure begins with a 2-foot berm, followed by a 3:1 slope, and ending with a pool/stilling basin (see **Figure 15**, **Figure 16**, and **Figure 17**).

The purpose of the rock structures is to dissipate energy and allow for a flatter longitudinal slope of the creek channel in between each structure to approximately 0.5%. The 2-foot rock berm further reduces velocities as flows approach each rock structure. Velocities increase as the flows cascade over the steeper rock. Therefore, the pool/stilling basin provides a depth and a length to absorb the hydraulic jump and reduce velocities before flows exit the pool and continue down the creek.

The bottom width of the creek channel will be 80 feet wide. This width will ensure reduced flow depths, which in turn reduces velocities. Also, the western bank will be graded at a 3:1 side slope to a height of 10 feet. The slope will then be graded at a 2:1 slope until it meets the existing top of bank elevation. The 3:1 side slopes are stable enough to withstand the 100-year flow and are also the recommended slope for planting and establishing native vegetation, which will be planted throughout the rehabilitation area slopes. Vegetation will also be planted along the 2:1 side slopes. These slopes will not be in contact with the 100-year creek flows.

The proposed rehabilitated creek channel has been designed to comply with the ecological requirements of the NWP 27 including, using only native plant species, designing restoration to resemble a natural reference habitat, and ensuring net ecological benefits with no conversions between habitat types.

The proposed condition hydraulic model was created by adding cross sections for the berms, drop structures, and stilling basins, which were placed roughly every 400 feet along the channel at the 0.5% slope. The hydraulic model assumes a channel bottom width of 80 feet, 3:1 side slopes from the toe of slope transitioning into 2:1 side slopes at a height of 10 feet for the entire length of the rehabilitated creek section. The proposed rock structures and grading will begin downstream at Cross Section 1. The grading will include some cut and fill to construct the first two stabilization structures, as the grading fill elevates the channel invert. After the first two structures, the grading will include mostly fill as the structures and channel invert are elevated above the existing (eroded) channel invert. The grading ties in upstream where the vegetated rip rap channel ends (see **Figure 14**).

The Manning's roughness coefficients were adjusted along the rehabilitated portion of the channel to reflect the large natural rock that would be placed along each drop structure and areas of bare graded soil before vegetation establishes. HEC-RAS results are in **Attachment 4**.

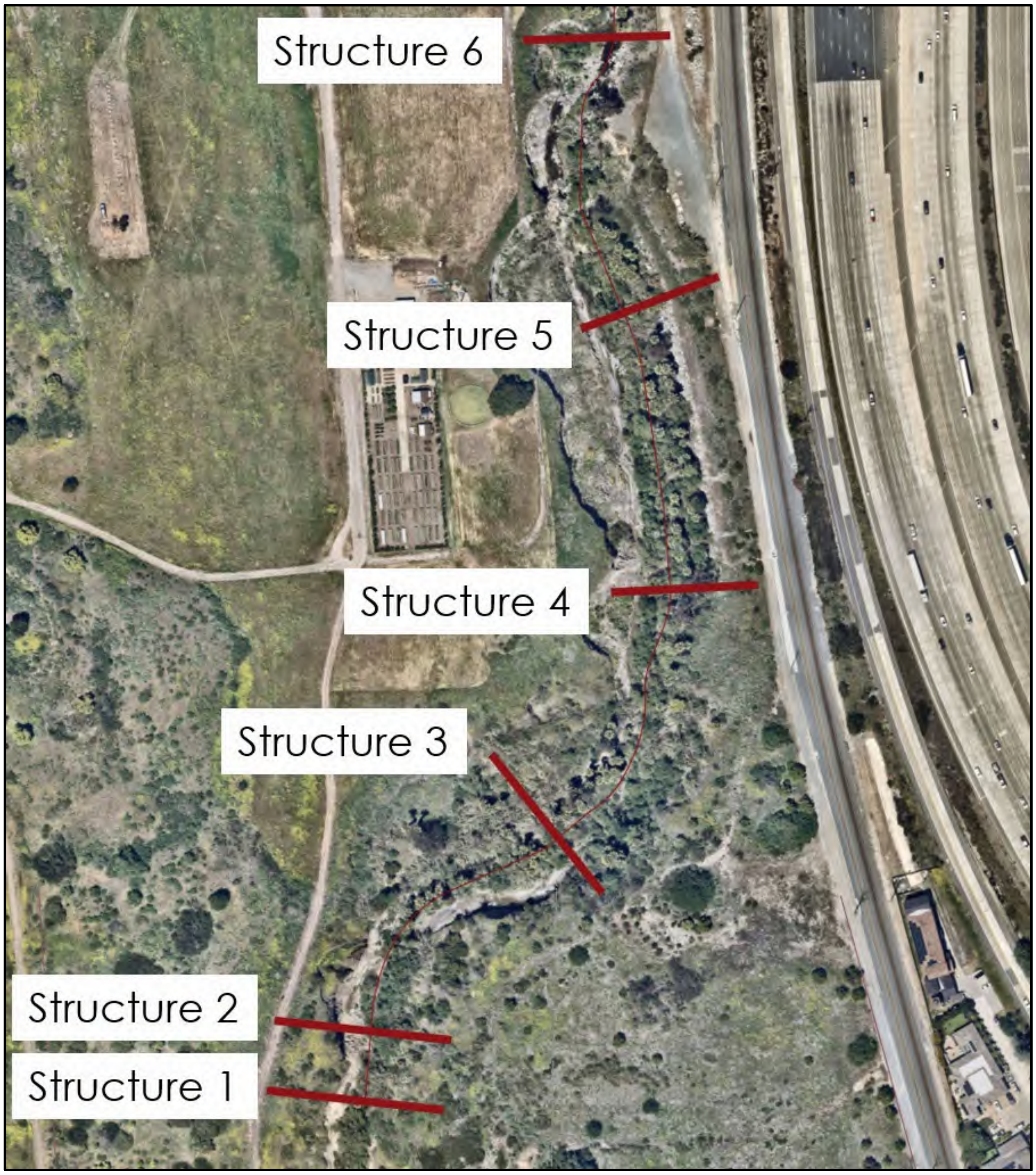

Figure 14 | Drop Structure Locations

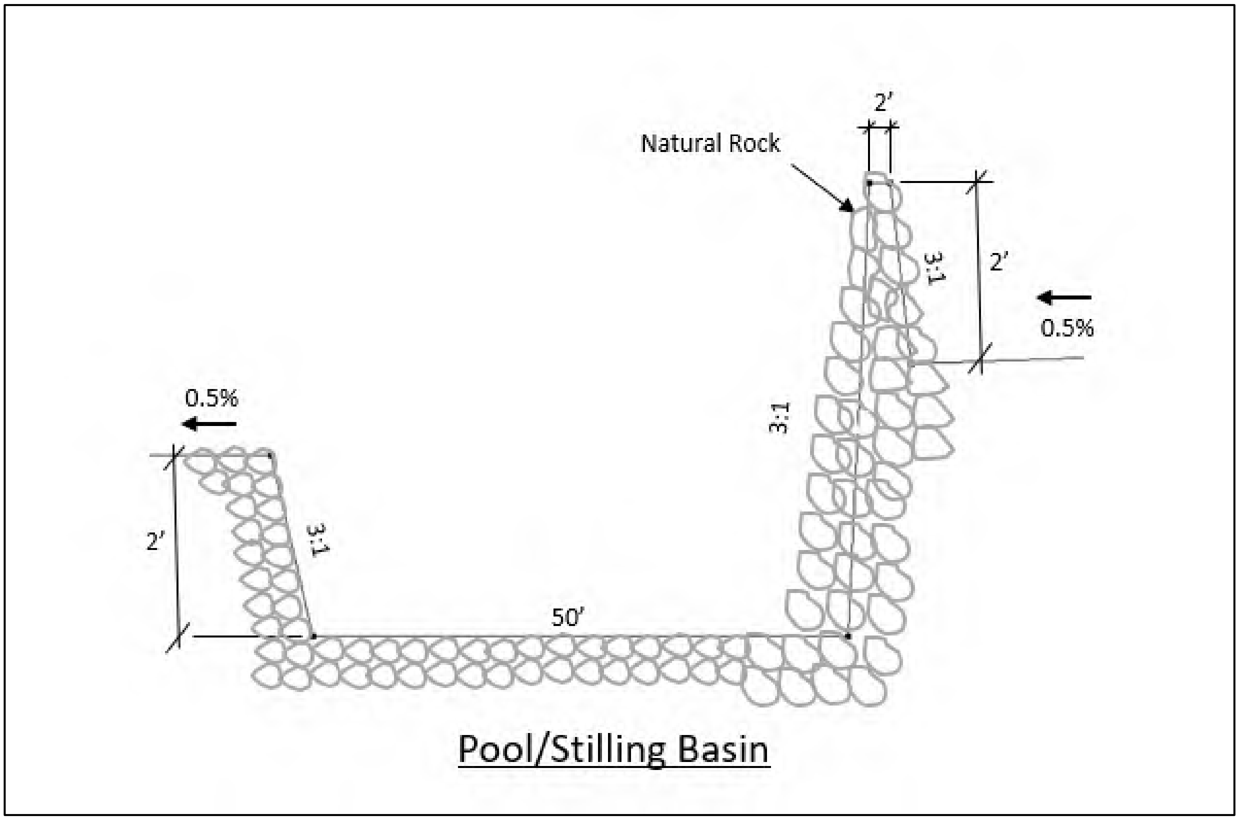

Figure 15 | Typical Rock Stabilization Structure Profile View, Looking West

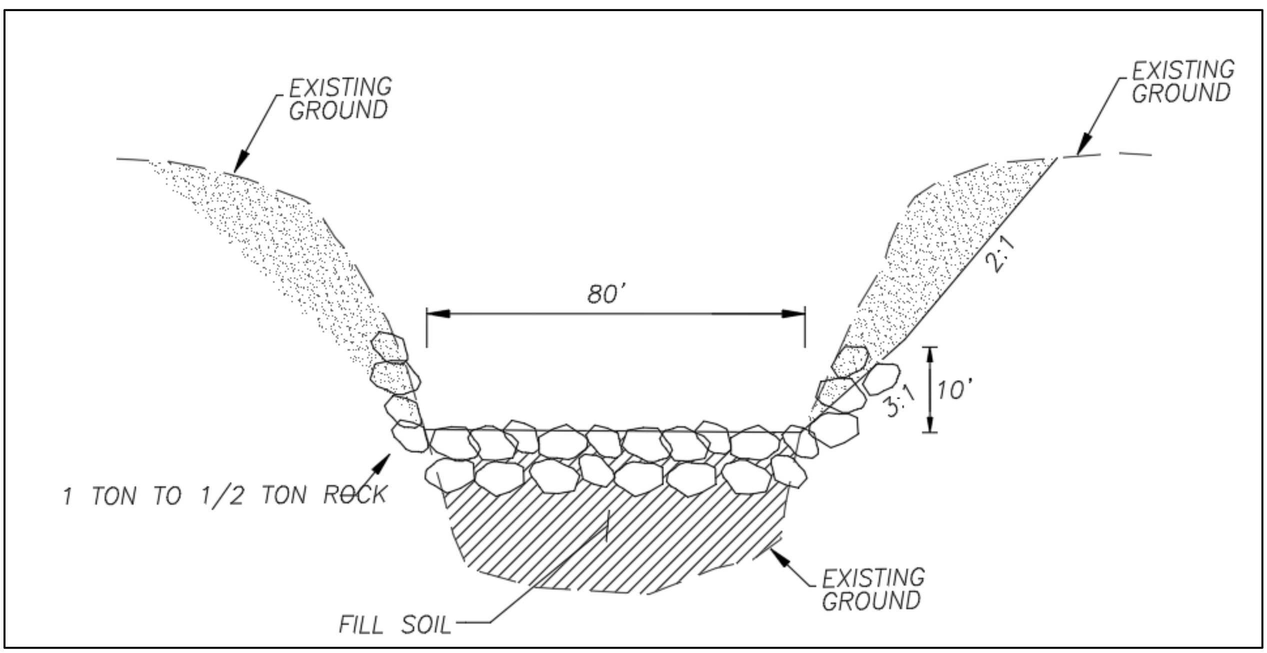

Figure 16| Typical Rock Stabilization Structure Cross Section, Looking Downstream

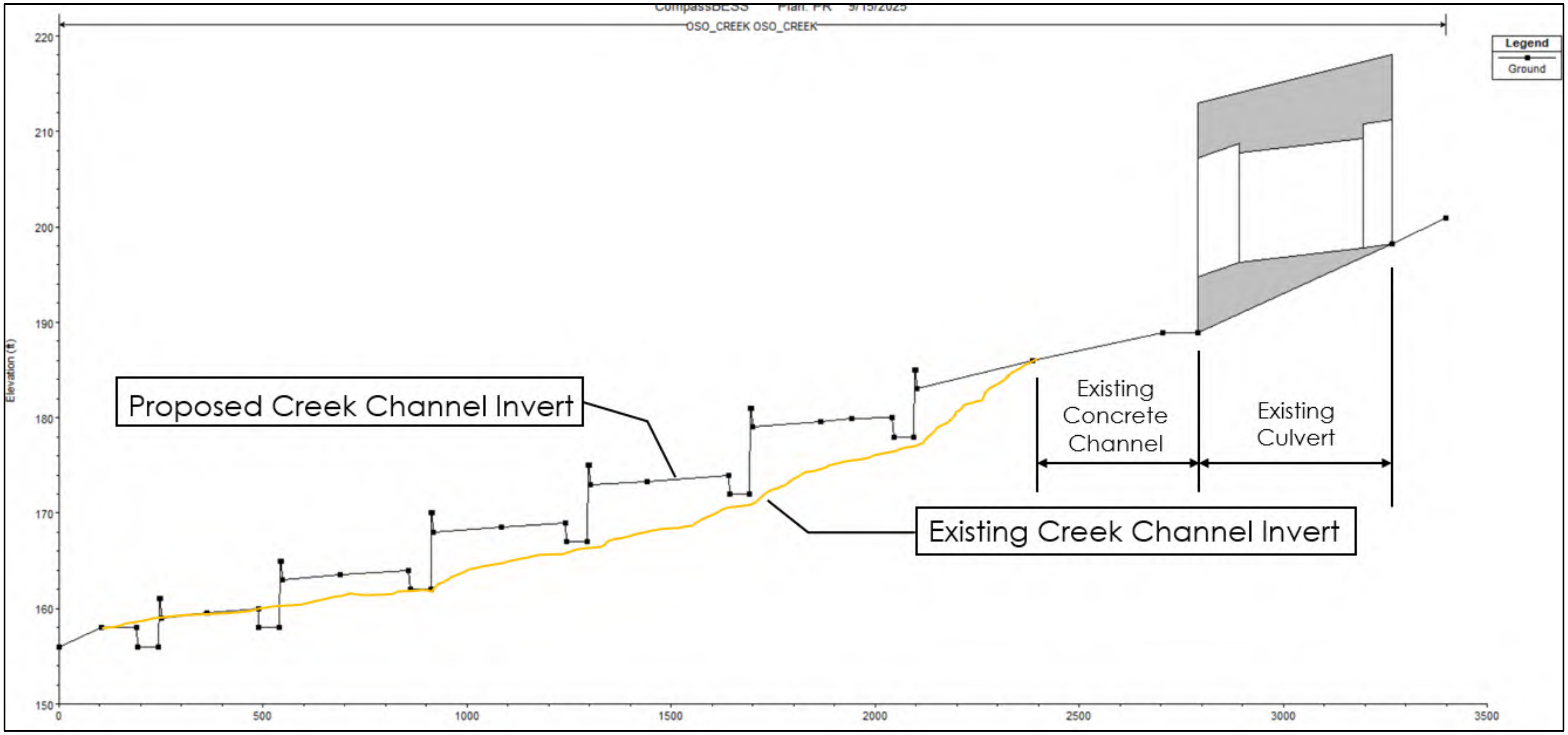

Figure 17 | Existing Vs. Proposed Channel Profile

7. RESULTS

The comparisons between the existing and proposed creek channel velocities can be seen in the tables below; the velocities for all three modeled storm events are significantly reduced in the proposed condition when compared with the existing condition.

The 2, 10, and 100-year proposed condition average velocities are reduced compared to the existing condition average velocities. The complete proposed condition results are located in **Attachment 4**. **Table 3** compares velocities for all three storm events between existing and proposed conditions. This table shows that the proposed design reduces the 2-year velocities between 60% and 70%, the 10-year velocities by 50% to 60%, and the 100-year by approximately 30%. Proposed condition results are found in **Attachment 4**.

Table 3 | Existing and Proposed Channel Average Velocities (ft/s)

	Average Channel Velocity (ft/s) at Top of Study Reach XS 44		Average Channel Velocity (ft/s) at Middle of Study Reach XS 23		Average Channel Velocity (ft/s) at End of Study Reach XS 1	
	EX	PR	EX	PR	EX	PR
2-Year	17.65	4.24	10.63	5.09	9.03	5.41
10-Year	19.39	5.54	12.10	6.26	11.11	6.56
100-Year	21.42	7.50	14.15	7.95	12.15	8.18

The 100-year proposed average velocities range between 5 to 8-ft/s and the average shear stress is approximately 1 lb/sf along the unlined portions of channel before vegetation establishes. The maximum flow depth along the channel is 9 feet. This shows that the proposed channel should remain stable during a 100-year storm and the 100-year flow depth will remain below the 3:1 side slope maximum depth of 10-feet. Once vegetation establishes over the proposed area of improvements it will further stabilize the channel.

For this preliminary study, the pool/stilling basin lengths were modeled in HEC-RAS. During final design, these lengths will be calculated using USACE stilling basin design calculations.

Preliminary rock sizing for the drop structures was calculated in accordance with the Orange County Flood Control District Design Manual. Rock sizing was based on 100-year velocities. Rock sizes were calculated using a factor of safety of 2 and the resulting diameter was rounded up to the nearest foot. Results can be seen in **Table 4** below and calculations are in **Attachment 5**.

Table 4 | Rock Sizing

	Drop		Stilling Basin	
Rock Structure	Max Velocity (ft/s)	D_{30} (ft)	Max Velocity (ft/s)	D_{30} (ft)
1	12.25	3	6.67	1
2	12.18	3	5.48	1
3	12.01	3	5.44	1
4	12.32	3	5.37	1
5	12.73	3	5.54	1
6	12.17	3	5.32	1

8. CONCLUSIONS AND NEXT STEPS

The design and modeling in this study reflect a 30% proof of concept. The results from this study show that the proposed design will reduce peak flow velocities, prevent future vertical and horizontal scour within the rehabilitated section of the creek, and allow native habitat to flourish. The next phases of design will include 60-percent drawings and calculations. The 60-percent design drawings and calculations will include more detailed grading of the channel and the proposed drop structures and will address the long-term maintenance of the channel.

ATTACHMENT 1

SOIL GRADATION RESULTS

Universal Engineering Sciences (UES)
1441 Montiel Road, Suite 115
Escondido, CA 92026
p. 760.746.4955 | TeamUES.com
LEA NO. 008

Report of Soil Sieve Analysis

Project Name: Oso Creek Gradation Test
Project Number: A25165.00509.000 **Lab Number:** 37548
Sampled By: Client **Date Sampled:** 8/26/2025
Tested By: L.V./J.S. **Date Tested** 9/2/2025

Sample Location:
1

Sample Description:
Dark Brown CL

Specifications:
N/A

Total Wet Wt: 240.5
Total Dry Wt: 180.5

U.E.S. Did not sample material

Sieve Size	Wt. (Grams)	% Retained	% Passing		Specifications	Remarks
2 inch (50.8 mm)	0.0	0	100			
1-1/2 inch (38.1 mm)	0.0	0	100			
1 inch (25.4 mm)	0.0	0	100			
3/4 inch (19.1 mm)	0.0	0	100			
1/2 inch (12.7 mm)	0.0	0	100			
3/8 inch (9.5 mm)	0.0	0	100			
#4 (4.75 mm)	0.0	0	100			
#8 (2.36 mm)	1.2	1	99			
#16 (1.18 mm)	3.5	2	98			
#30 (0.6 mm)	5.2	3	97			
#50 (0.3 mm)	7.0	4	96			
#100 (0.15 mm)	39.1	22	78			
#200 (0.075 mm)	97.1	53.8	46.2			

Tested in Accordance with ASTM C117,C136

Reviewed By: [signature] Date: September 11, 2025

Larry Sachs
Lab Supervisor

UES™

Universal Engineering Sciences (UES)
1441 Montiel Road, Suite 115
Escondido, CA 92026
p. 760.746.4955 | TeamUES.com
LEA NO. 008

Report of Soil Sieve Analysis

Project Name: Oso Creek Gradation Test
Project Number: A25165.00509.000 **Lab Number:** 37548
Sampled By: Client **Date Sampled:** 8/26/2025
Tested By: L.V./J.S. **Date Tested** 9/2/2025

Sample Location:
2

Sample Description:
Light Gray SM

Specifications:
N/A

Total Wet Wt:	263.4	U.E.S. Did not sample material
Total Dry Wt:	259.4	

Sieve Size	Wt. (Grams)	% Retained	% Passing		Specifications	Remarks
2 inch (50.8 mm)	0.0	0	100			
1-1/2 inch (38.1 mm)	0.0	0	100			
1 inch (25.4 mm)	0.0	0	100			
3/4 inch (19.1 mm)	0.0	0	100			
1/2 inch (12.7 mm)	0.0	0	100			
3/8 inch (9.5 mm)	0.0	0	100			
#4 (4.75 mm)	11.8	5	95			
#8 (2.36 mm)	17.9	7	93			
#16 (1.18 mm)	33.1	13	87			
#30 (0.6 mm)	85.1	33	67			
#50 (0.3 mm)	144.3	56	44			
#100 (0.15 mm)	177.0	68	32			
#200 (0.075 mm)	193.5	74.6	25.4			

Tested in Accordance with ASTM C117,C136

Reviewed By: [signature]
Larry Sachs
Lab Supervisor

Date: September 11, 2025

Universal Engineering Sciences (UES)
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Report of Soil Sieve Analysis

Project Name: Oso Creek Gradation Test
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Lab Number: 37548
Sampled By: Client
Date Sampled: 8/26/2025
Tested By: L.V./J.S.
Date Tested 9/2/2025

Sample Location:
3

Sample Description:
Dark Gray SM/SC

Specifications:
N/A

Total Wet Wt:	566.8	
Total Dry Wt:	566.8	U.E.S. Did not sample material

Sieve Size	Wt. (Grams)	% Retained	% Passing		Specifications	Remarks
2 inch (50.8 mm)	0.0	0	100			
1-1/2 inch (38.1 mm)	0.0	0	100			
1 inch (25.4 mm)	0.0	0	100			
3/4 inch (19.1 mm)	0.0	0	100			
1/2 inch (12.7 mm)	0.0	0	100			
3/8 inch (9.5 mm)	8.4	1	99			
#4 (4.75 mm)	39.4	7	93			
#8 (2.36 mm)	99.2	17	83			
#16 (1.18 mm)	181.0	32	68			
#30 (0.6 mm)	262.5	46	54			
#50 (0.3 mm)	313.5	55	45			
#100 (0.15 mm)	347.5	61	39			
#200 (0.075 mm)	363.7	64.2	35.8			

Tested in Accordance with ASTM C117,C136

Reviewed By: [signature]
Larry Sachs
Lab Supervisor

Date: September 11, 2025

Universal Engineering Sciences (UES)
1441 Montiel Road, Suite 115
Escondido, CA 92026
p. 760.746.4955 | TeamUES.com
LEA NO. 008

Report of Soil Sieve Analysis

Project Name: Oso Creek Gradation Test
Project Number: A25165.00509.000
Lab Number: 37548
Sampled By: Client
Date Sampled: 8/26/2025
Tested By: L.V./J.S.
Date Tested 9/2/2025

Sample Location:
4

Sample Description:
Dark Brown CL

Specifications:
N/A

Total Wet Wt:	94.4	
Total Dry Wt:	82.2	U.E.S. Did not sample material

Sieve Size	Wt. (Grams)	% Retained	% Passing		Specifications	Remarks
2 inch (50.8 mm)	0.0	0	100			
1-1/2 inch (38.1 mm)	0.0	0	100			
1 inch (25.4 mm)	0.0	0	100			
3/4 inch (19.1 mm)	0.0	0	100			
1/2 inch (12.7 mm)	0.0	0	100			
3/8 inch (9.5 mm)	0.0	0	100			
#4 (4.75 mm)	0.0	0	100			
#8 (2.36 mm)	4.8	6	94			
#16 (1.18 mm)	14.5	18	82			
#30 (0.6 mm)	22.3	27	73			
#50 (0.3 mm)	28.2	34	66			
#100 (0.15 mm)	34.2	42	58			
#200 (0.075 mm)	38.6	47.0	53.0			

Tested in Accordance with ASTM C117,C136

Reviewed By: [signature]
Larry Sachs
Lab Supervisor

Date: September 11, 2025

Universal Engineering Sciences (UES)
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LEA NO. 008

Report of Soil Sieve Analysis

Project Name: Oso Creek Gradation Test
Project Number: A25165.00509.000 **Lab Number:** 37548
Sampled By: Client **Date Sampled:** 8/26/2025
Tested By: L.V./J.S. **Date Tested** 9/2/2025

Sample Location:
5

Sample Description:
Gray SC/CL

Specifications:
N/A

Total Wet Wt:	236.1	
Total Dry Wt:	227.4	U.E.S. Did not sample material

Sieve Size	Wt. (Grams)	% Retained	% Passing		Specifications	Remarks
2 inch (50.8 mm)	0.0	0	100			
1-1/2 inch (38.1 mm)	0.0	0	100			
1 inch (25.4 mm)	0.0	0	100			
3/4 inch (19.1 mm)	0.0	0	100			
1/2 inch (12.7 mm)	0.0	0	100			
3/8 inch (9.5 mm)	0.0	0	100			
#4 (4.75 mm)	0.0	0	100			
#8 (2.36 mm)	5.5	2	98			
#16 (1.18 mm)	21.3	9	91			
#30 (0.6 mm)	40.2	18	82			
#50 (0.3 mm)	62.6	28	72			
#100 (0.15 mm)	99.7	44	56			
#200 (0.075 mm)	123.5	54.3	45.7			

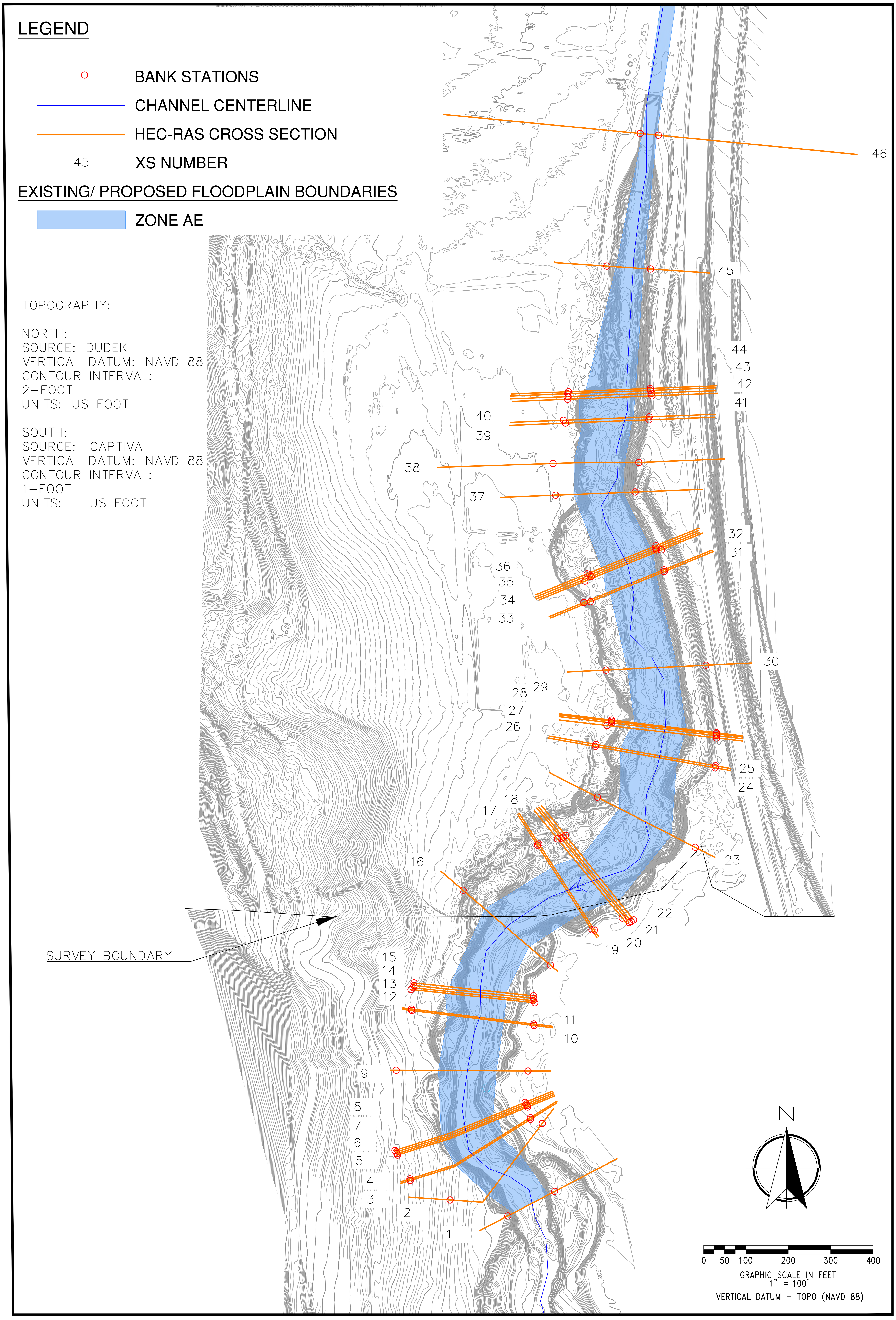
Tested in Accordance with ASTM C117,C136

Reviewed By: ______________ Date: September 11, 2025

Larry Sachs
Lab Supervisor

ATTACHMENT 2

HEC-RAS WORK MAP



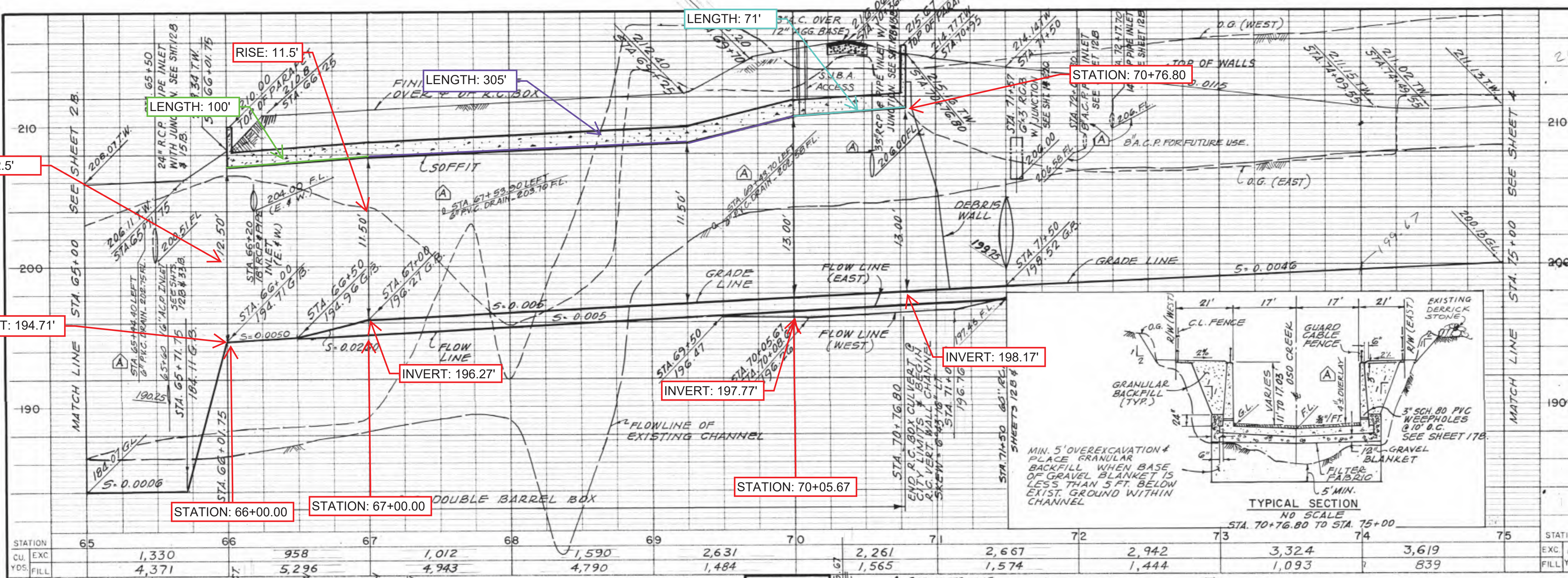
TORY R. WALKER
ENGINEERING
122 Civic Center Drive, Suite 206 Vista, CA 92084

REGISTERED PROFESSIONAL ENGINEER
ROSANNA FRANSSON
No. C77964
Exp. 6-30-2027
CIVIL
STATE OF CALIFORNIA

OSO CREEK
HYDRAULIC WORK MAP
SEPTEMBER 2025

ATTACHMENT 3

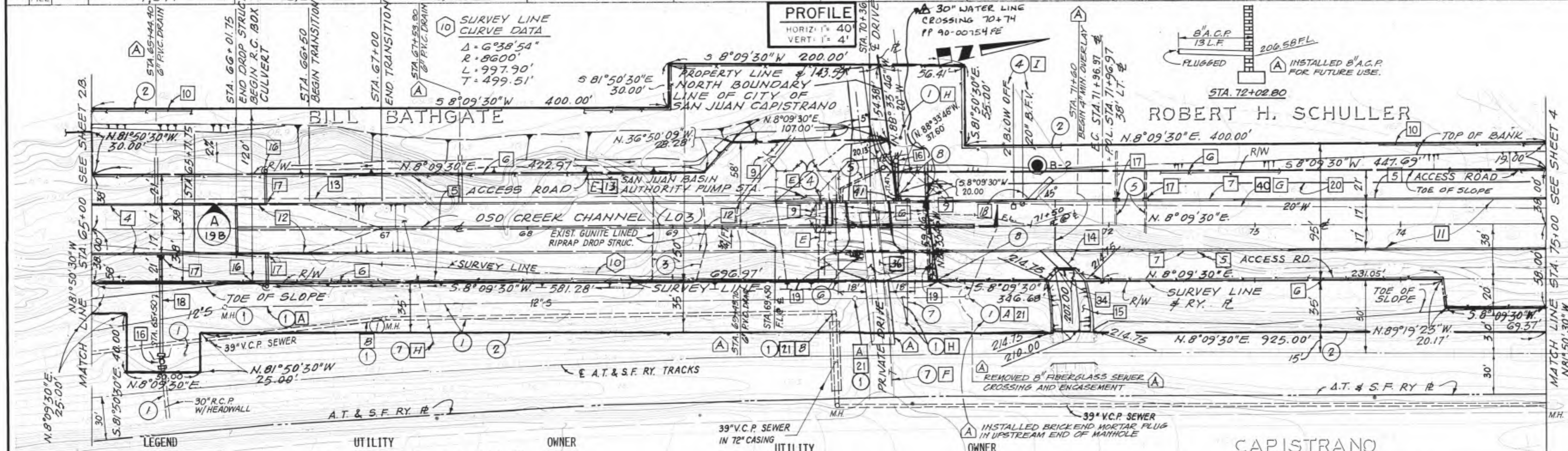
CULVERT AS-BUILTS

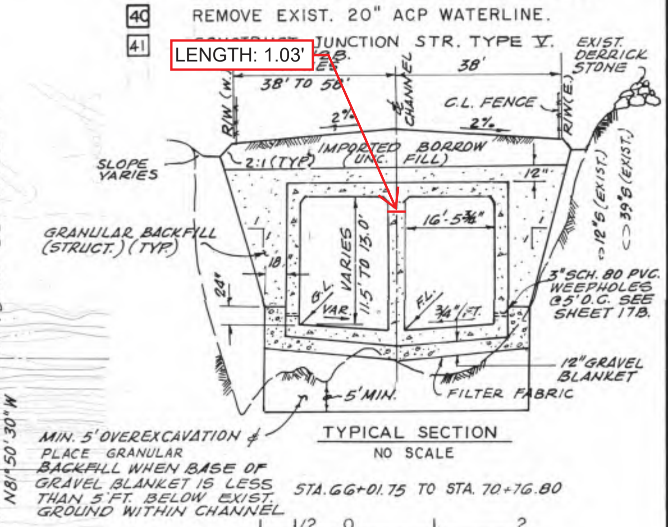


STATION	65–66	66–67	67–68	68–69	69–70	70–71	71–72	72–73	73–74	74–75
CU. YDS. EXC.	1,330	958	1,012	1,590	2,631	2,261	2,667	2,942	3,324	3,619
CU. YDS. FILL	4,371	5,296	4,943	4,790	1,484	1,565	1,574	1,444	1,093	839

CONSTRUCTION NOTES

- [4] CONSTRUCT R.C. DROP STRUCTURE PER PLAN, PROFILE AND DETAILS ON SHEETS 8B, 9B & 18B.
- [5] CONSTRUCT ACCESS ROAD PER PLAN AND PROFILE.
- [6] FURNISH AND INSTALL 5.0' HIGH CHAIN LINK FENCE PER EMA STD. 412.
- [7] FURNISH AND INSTALL 3.5' HIGH GUARD CABLE FENCE PER EMA STD. 413.
- [9] FURNISH AND INSTALL 20' WIDE 5' HIGH DOUBLE SWING GATE PER EMA STD. PLAN 412.
- [10] CONSTRUCT 6' HIGH TEMPORARY CHAIN LINK FENCE ALONG WESTERLY LIMITS OF CONSTRUCTION.
- [11] CONSTRUCT 34' WIDE R.C. RECTANGULAR CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION, SEE SHEET 17B.
- [12] CONSTRUCT 16'5¾" DOUBLE BARREL R.C. BOX CULVERT, DEBRIS EXTENSION & APPURTENANCES, INCLUDING A.C. PAVING, SEE SHEETS 11B, 12B & 19B.
- [13] REMOVE AND RECONSTRUCT SAN JUAN BASIN AUTHORITY DIVERSION STRUCTURE, CONSTRUCT 16" ACP TO DROP STRUCTURE. SEE DETAILS ON SHEETS 31B TO 34B & 35.
- [14] CONSTRUCT R.C. BOX WITH INLET STRUCTURE, SEE SHEET 14.
- [15] CONSTRUCT GROUTED STONE LINING, SEE SHEET 14.
- [16] CONSTRUCT INLET TYPE V PER EMA STD. PLAN 305.
- [17] CONSTRUCT PIPE INLET, PER DETAILS & TABLE, SHEET 12 B.
- [18] CONSTRUCT PIPE INLET WITH MODIFIED JUNCTION STRUCTURE TYPE V PER DETAILS AND TABLE, SHEET 12 B.
- [19] CONSTRUCT 12' WIDE, 5' HIGH SINGLE SWING GATE PER EMA STD. PLAN 412.
- [20] FURNISH & PLACE 20" ASBESTOS CEMENT TRANSMISSION PIPE; T-40,II. SEE SHEETS 29 & 30.
- [21] ADJUST MANHOLE TO GRADE
- [34] CONSTRUCT R.C. HEADWALL PER DETAILS ON SHEET 14.
- [36] REMOVE AND SALVAGE BATHGATE BRIDGE.
- [40] REMOVE EXIST. 20" ACP WATERLINE.
- [41] CONSTRUCT JUNCTION STR. TYPE V. ... 12B.





MIN. 5' OVEREXCAVATION & PLACE GRANULAR BACKFILL WHEN BASE OF GRAVEL BLANKET IS LESS THAN 5 FT. BELOW EXIST. GROUND WITHIN CHANNEL

TYPICAL SECTION
NO SCALE
STA. 66+01.75 TO STA. 70+76.80

3 inches on original drawing

LEGEND

1. PROTECT
2. LIMITS OF CONSTRUCTION AREA
3. REMOVE
4. REMOVE AND SALVAGE
5. REMOVE INTERFERING PORTIONS
6. REMOVE AND RELOCATE
7. TO BE REMOVED OR RELOCATED BY OTHERS
8. PROPERTY CORNERS & MONUMENTS TO BE TRANSFERRED & RESET BY THE EMA.

	UTILITY	OWNER
A	12" SEWER	CITY OF SAN JUAN CAPISTRANO
B	39" SEWER	MOULTON-NIGUEL WATER DISTRICT
E	DIVERSION STRUCTURE*	SAN JUAN BASIN AUTHORITY*
F	4" TELEPHONE CONDUIT AND WIRE	PACIFIC TELEPHONE COMPANY
G	20" ACP	SAN JUAN BASIN AUTHORITY
H	POWER POLES, GUY WIRES, AND OVERHEAD WIRES	S.D.G. & E.
I	2" BLOWOFF AND 20" BUTTERFLY VALVE	SAN JUAN BASIN AUTHORITY

NOTES

*1. DIVERSION STRUCTURE INCLUDES 15'-25' LONG SHEET PILES ACROSS AND ALONG EXISTING CREEK WHICH SHALL BE REMOVED.

2. DECK OF EXISTING BATHGATE BRIDGE SHALL BE REMOVED AND DELIVERED TO LOCATION AS DIRECTED BY THE ENGINEER.

BENCH MARK: O.C.S. B.M. L-785
3.5 MI. N. ALONG A.T.&S.F. RY. FROM STATION AT SAN JUAN CAPISTRANO, 0.2 MI. N. OF MILEPOST 194, 21.5' W. OF WEST RAIL, 10' S. OF T.P. 57/G, 3.3' W. OF A WITNESS POST, SET IN TOP OF A CONCRETE POST PROJECTING 0.2' ABOVE THE GROUND. (1976) EL. 239.109

OSO CREEK CHANNEL HYDRAULIC DATA

STATION TO STATION	Q_{100}	b	S	n=0.013(RCB) n=0.015 dn	Vn	n=0.013(RCB) n=0.017 dn	Vn	dc	Vc
66+50 TO 70+76.80	6,500	(2)16'-5¾"	0.005	9.68	21.49	10.74	19.27	11.16	18.51
70+76.80 TO 75+00	6,400	34'	0.0046	9.33	21.39	10.13	19.61	10.86	18.23

MARK	DATE	DESCRIPTION
B	10-92	P.P. 90-00754 FE
A	5/15/86	AS BUILT

REVISIONS

DESIGNED O.Z.K.
DRAWN F.T. CHECKED G.J.H.

ORANGE COUNTY
ENVIRONMENTAL MANAGEMENT AGENCY

ALTERNATE B
OSO CREEK CHANNEL
PLAN AND PROFILE
STA 65+00 TO STA 75+00

PREPARED UNDER SUPERVISION OF ... 2-17-84 DATE

SCALE	DATE	DWG. NO.	SHEET
AS SHOWN	JAN. 1984	L03-101-1A	3B OF 35

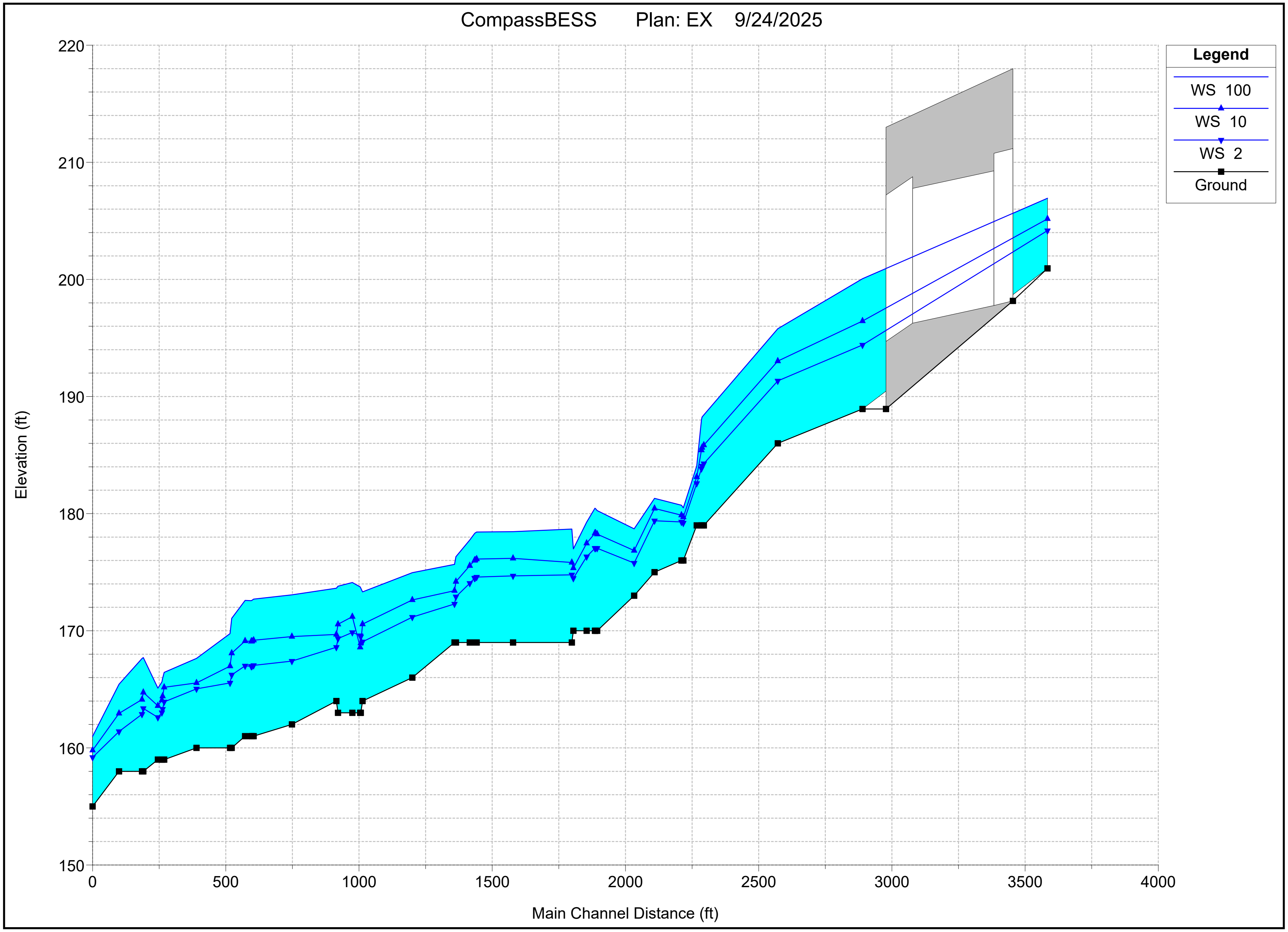
JN 237-83-02

SHEET 3B OF 35

L03-101-1A

ATTACHMENT 4

HEC-RAS RESULTS



CompassBESS Plan: EX 9/24/2025
Legend
WS 100
WS 10
WS 2
Ground
Elevation (ft)
Main Channel Distance (ft)
220
210
200
190
180
170
160
150
0
500
1000
1500
2000
2500
3000
3500
4000

HEC-RAS Plan: Ex River: OSO_CREEK Reach: OSO_CREEK-DS-0

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	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	48	100	6500.00	200.94	206.94	211.74	225.06	0.012241	34.14	190.37	35.64	2.60	6.00	3.39
OSO_CREEK-DS-0	48	10	3558.00	200.94	205.17	208.37	217.17	0.012228	27.79	128.05	34.86	2.56	4.23	2.49
OSO_CREEK-DS-0	48	2	2178.00	200.94	204.17	206.44	212.63	0.012230	23.33	93.36	34.42	2.50	3.23	1.91
OSO_CREEK-DS-0	47		Culvert											
OSO_CREEK-DS-0	46	100	6500.00	188.94	200.06	200.06	205.29	0.001973	18.35	354.31	33.93	1.00	11.12	0.85
OSO_CREEK-DS-0	46	10	3558.00	188.94	196.45	196.45	200.05	0.001928	15.22	233.75	32.79	1.00	7.51	0.64
OSO_CREEK-DS-0	46	2	2178.00	188.94	194.41	194.41	197.03	0.001924	13.00	167.54	32.13	1.00	5.47	0.50
OSO_CREEK-DS-0	45	100	6500.00	186.00	195.79	195.79	199.21	0.007557	14.83	438.39	64.18	1.00	9.79	3.01
OSO_CREEK-DS-0	45	10	3558.00	186.00	193.03	193.03	195.61	0.008182	12.89	276.04	53.52	1.00	7.03	2.49
OSO_CREEK-DS-0	45	2	2178.00	186.00	191.33	191.33	193.36	0.008748	11.42	190.80	47.14	1.00	5.33	2.11
OSO_CREEK-DS-0	44	100	6500.00	179.00	188.43	190.62	195.56	0.020612	21.42	303.41	52.66	1.57	9.43	6.73
OSO_CREEK-DS-0	44	10	3558.00	179.00	185.85	187.77	191.70	0.023436	19.39	183.51	40.69	1.61	6.85	5.98
OSO_CREEK-DS-0	44	2	2178.00	179.00	184.27	185.78	189.11	0.026851	17.65	123.38	35.21	1.66	5.27	5.38
OSO_CREEK-DS-0	43	100	6500.00	179.00	188.25	190.43	195.42	0.020203	21.48	302.63	51.75	1.57	9.25	6.72
OSO_CREEK-DS-0	43	10	3558.00	179.00	185.64	187.53	191.53	0.023358	19.46	182.83	40.58	1.62	6.64	6.01
OSO_CREEK-DS-0	43	2	2178.00	179.00	184.07	185.58	188.92	0.026253	17.67	123.24	34.89	1.66	5.07	5.36
OSO_CREEK-DS-0	42	100	6500.00	179.00	188.03	190.25	195.35	0.020589	21.71	299.43	51.06	1.58	9.03	6.86
OSO_CREEK-DS-0	42	10	3558.00	179.00	185.42	187.35	191.46	0.024176	19.70	180.57	40.45	1.64	6.42	6.18
OSO_CREEK-DS-0	42	2	2178.00	179.00	183.85	185.42	188.84	0.027010	17.92	121.56	34.54	1.68	4.85	5.51
OSO_CREEK-DS-0	41	100	6500.00	179.00	184.07	186.67	194.41	0.079993	25.79	252.01	97.84	2.83	5.07	12.48
OSO_CREEK-DS-0	41	10	3558.00	179.00	183.14	184.97	190.55	0.096573	21.84	162.91	94.03	2.93	4.14	10.19
OSO_CREEK-DS-0	41	2	2178.00	179.00	182.58	183.97	188.01	0.082694	18.70	116.49	75.60	2.66	3.58	7.76
OSO_CREEK-DS-0	40	100	6500.00	176.00	180.49	182.95	190.29	0.077971	25.10	258.93	105.07	2.82	4.49	11.90
OSO_CREEK-DS-0	40	10	3558.00	176.00	179.71	181.34	185.90	0.075908	19.96	178.24	100.20	2.64	3.71	8.38
OSO_CREEK-DS-0	40	2	2178.00	176.00	179.20	180.40	183.67	0.079357	16.95	128.51	95.58	2.58	3.20	6.63
OSO_CREEK-DS-0	39	100	6500.00	176.00	180.72	183.12	189.51	0.058853	23.79	273.23	97.13	2.50	4.72	10.24
OSO_CREEK-DS-0	39	10	3558.00	176.00	179.86	181.39	185.20	0.053116	18.52	192.11	92.36	2.26	3.86	6.85
OSO_CREEK-DS-0	39	2	2178.00	176.00	179.29	180.39	183.00	0.050160	15.45	140.99	85.32	2.12	3.29	5.15
OSO_CREEK-DS-0	38	100	6500.00	175.00	181.31	182.33	185.34	0.015587	16.12	403.34	92.40	1.36	6.31	4.09
OSO_CREEK-DS-0	38	10	3558.00	175.00	180.44	180.48	182.31	0.009207	10.96	324.52	89.69	1.02	5.44	2.01
OSO_CREEK-DS-0	38	2	2178.00	175.00	179.40	179.40	180.76	0.009769	9.36	232.67	85.67	1.00	4.40	1.61
OSO_CREEK-DS-0	37	100	6500.00	173.00	178.70	180.20	183.93	0.018418	18.34	354.50	76.44	1.50	5.70	5.18
OSO_CREEK-DS-0	37	10	3558.00	173.00	176.85	178.10	181.00	0.024722	16.33	217.84	70.57	1.64	3.85	4.69
OSO_CREEK-DS-0	37	2	2178.00	173.00	175.78	176.84	179.30	0.032406	15.05	144.68	65.23	1.78	2.78	4.44
OSO_CREEK-DS-0	36	100	6500.00	170.00	180.27	179.56	182.05	0.005438	10.73	605.97	117.15	0.83	10.27	1.71
OSO_CREEK-DS-0	36	10	3558.00	170.00	178.25	177.63	179.57	0.005741	9.21	386.24	97.76	0.82	8.25	1.38

HEC-RAS Plan: Ex River: OSO_CREEK Reach: OSO_CREEK-DS-0 (Continued)

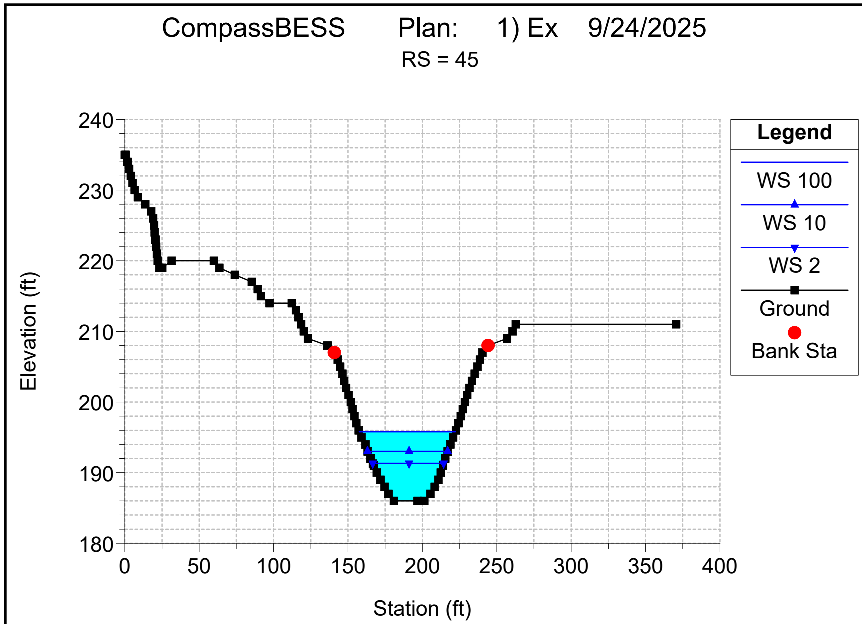
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	36	2	2178.00	170.00	177.05	176.21	178.00	0.005144	7.84	277.88	82.43	0.75	7.05	1.05
OSO_CREEK-DS-0	35	100	6500.00	170.00	180.42	179.35	181.94	0.004772	9.88	657.65	130.16	0.78	10.42	1.46
OSO_CREEK-DS-0	35	10	3558.00	170.00	178.34	177.62	179.48	0.005262	8.58	414.85	109.60	0.78	8.34	1.21
OSO_CREEK-DS-0	35	2	2178.00	170.00	177.06	176.08	177.95	0.004900	7.59	286.78	85.92	0.73	7.06	0.99
OSO_CREEK-DS-0	34	100	6500.00	170.00	180.47	179.30	181.91	0.004868	9.62	675.45	141.58	0.78	10.47	1.41
OSO_CREEK-DS-0	34	10	3558.00	170.00	178.33	177.62	179.47	0.005300	8.54	416.80	111.59	0.78	8.33	1.21
OSO_CREEK-DS-0	34	2	2178.00	170.00	177.04	176.08	177.94	0.004995	7.62	285.79	86.50	0.74	7.04	1.00
OSO_CREEK-DS-0	33	100	6500.00	170.00	179.27	179.27	181.62	0.008109	12.31	528.04	112.04	1.00	9.27	2.32
OSO_CREEK-DS-0	33	10	3558.00	170.00	177.47	177.47	179.20	0.008980	10.54	337.63	97.88	1.00	7.47	1.89
OSO_CREEK-DS-0	33	2	2178.00	170.00	176.32	176.32	177.69	0.009796	9.37	232.55	85.99	1.00	6.32	1.61
OSO_CREEK-DS-0	32	100	6500.00	170.00	176.99	178.01	180.91	0.015897	15.88	409.31	97.90	1.37	6.99	4.02
OSO_CREEK-DS-0	32	10	3558.00	170.00	175.35	176.21	178.40	0.021053	14.00	254.12	91.19	1.48	5.35	3.57
OSO_CREEK-DS-0	32	2	2178.00	170.00	174.49	175.16	176.85	0.024684	12.32	176.78	86.81	1.52	4.49	3.07
OSO_CREEK-DS-0	31	100	6500.00	169.00	178.69	178.09	180.72	0.005878	11.44	568.09	104.07	0.86	9.69	1.92
OSO_CREEK-DS-0	31	10	3558.00	169.00	175.83	176.23	178.11	0.012936	12.11	293.72	89.78	1.18	6.83	2.55
OSO_CREEK-DS-0	31	2	2178.00	169.00	174.78	175.15	176.59	0.014177	10.78	201.99	78.99	1.19	5.78	2.19
OSO_CREEK-DS-0	30	100	6500.00	169.00	178.47	176.44	179.61	0.002686	8.57	758.17	120.76	0.60	9.47	1.02
OSO_CREEK-DS-0	30	10	3558.00	169.00	176.18	174.71	176.98	0.002855	7.17	496.02	108.99	0.59	7.18	0.80
OSO_CREEK-DS-0	30	2	2178.00	169.00	174.69	173.62	175.33	0.003423	6.44	338.29	100.57	0.62	5.69	0.71
OSO_CREEK-DS-0	29	100	6500.00	169.00	178.43	175.29	179.23	0.001551	7.19	903.74	123.47	0.47	9.43	0.69
OSO_CREEK-DS-0	29	10	3558.00	169.00	176.12	173.54	176.62	0.001455	5.69	625.52	117.10	0.43	7.12	0.47
OSO_CREEK-DS-0	29	2	2178.00	169.00	174.59	172.35	174.95	0.001479	4.83	451.35	109.91	0.42	5.59	0.37
OSO_CREEK-DS-0	28	100	6500.00	169.00	178.35	175.54	179.22	0.001831	7.49	868.11	126.45	0.50	9.35	0.76
OSO_CREEK-DS-0	28	10	3558.00	169.00	176.03	173.79	176.61	0.001813	6.07	585.90	116.79	0.48	7.03	0.55
OSO_CREEK-DS-0	28	2	2178.00	169.00	174.51	172.69	174.94	0.001831	5.21	417.71	105.69	0.46	5.51	0.44
OSO_CREEK-DS-0	27	100	6500.00	169.00	178.30	175.56	179.21	0.001963	7.67	847.95	125.50	0.52	9.30	0.80
OSO_CREEK-DS-0	27	10	3558.00	169.00	176.00	173.82	176.60	0.001910	6.23	571.52	113.79	0.49	7.00	0.58
OSO_CREEK-DS-0	27	2	2178.00	169.00	174.49	172.72	174.93	0.001913	5.32	409.13	103.50	0.47	5.49	0.46
OSO_CREEK-DS-0	26	100	6500.00	169.00	177.76	176.17	179.12	0.003741	9.35	695.08	123.72	0.70	8.76	1.27
OSO_CREEK-DS-0	26	10	3558.00	169.00	175.55	174.34	176.52	0.003621	7.88	451.61	101.50	0.66	6.55	0.97
OSO_CREEK-DS-0	26	2	2178.00	169.00	174.05	173.08	174.85	0.004450	7.13	305.26	93.23	0.70	5.05	0.88
OSO_CREEK-DS-0	25	100	6500.00	169.00	176.33	176.33	178.73	0.008202	12.44	522.54	109.41	1.00	7.33	2.36
OSO_CREEK-DS-0	25	10	3558.00	169.00	174.20	174.20	176.14	0.008797	11.17	318.43	82.09	1.00	5.20	2.05
OSO_CREEK-DS-0	25	2	2178.00	169.00	172.90	172.90	174.44	0.009697	9.96	218.73	72.08	1.01	3.90	1.77
OSO_CREEK-DS-0	24	100	6500.00	169.00	175.67	176.08	178.64	0.010005	13.82	470.30	98.04	1.11	6.67	2.91
OSO_CREEK-DS-0	24	10	3558.00	169.00	173.42	173.95	176.02	0.013208	12.92	275.39	78.23	1.21	4.42	2.82

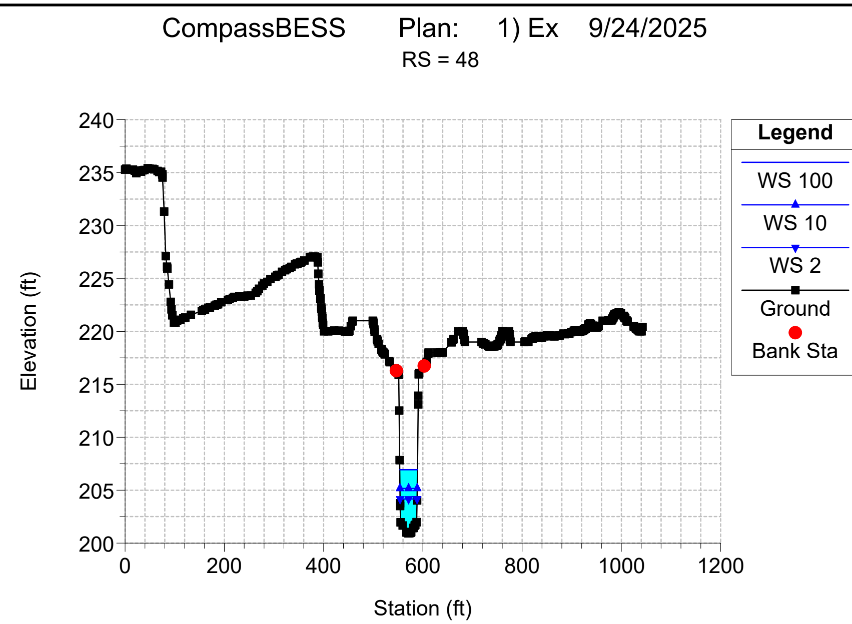
HEC-RAS Plan: Ex   River: OSO_CREEK   Reach: OSO_CREEK-DS-0 (Continued)

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	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	24	2	2178.00	169.00	172.29	172.73	174.33	0.015311	11.45	190.20	72.66	1.25	3.29	2.44
OSO_CREEK-DS-0	23	100	6500.00	166.00	174.96	172.93	176.04	0.002708	8.36	777.62	128.28	0.60	8.96	0.99
OSO_CREEK-DS-0	23	10	3558.00	166.00	172.63	171.16	173.43	0.002987	7.15	497.60	111.85	0.60	6.63	0.80
OSO_CREEK-DS-0	23	2	2178.00	166.00	171.17	170.11	171.80	0.003411	6.37	341.71	100.83	0.61	5.17	0.70
OSO_CREEK-DS-0	22	100	6500.00	164.00	173.32	172.47	175.27	0.005247	11.19	580.66	99.37	0.82	9.32	1.81
OSO_CREEK-DS-0	22	10	3558.00	164.00	170.56	170.56	172.42	0.009028	10.94	325.22	87.53	1.00	6.56	2.00
OSO_CREEK-DS-0	22	2	2178.00	164.00	169.06	169.06	170.71	0.009371	10.29	211.74	64.41	1.00	5.06	1.84
OSO_CREEK-DS-0	21	100	6500.00	163.00	173.64	171.89	175.09	0.003401	9.67	672.53	103.20	0.67	10.64	1.30
OSO_CREEK-DS-0	21	10	3558.00	163.00	168.95	169.93	172.20	0.016937	14.46	246.02	70.17	1.36	5.95	3.55
OSO_CREEK-DS-0	21	2	2178.00	163.00	169.50	168.44	170.40	0.004253	7.62	285.87	75.30	0.69	6.49	0.96
OSO_CREEK-DS-0	20	100	6500.00	163.00	173.75	171.65	175.04	0.002915	9.11	713.80	106.49	0.62	10.75	1.14
OSO_CREEK-DS-0	20	10	3558.00	163.00	168.59	169.66	172.13	0.019627	15.09	235.78	70.65	1.46	5.59	3.93
OSO_CREEK-DS-0	20	2	2178.00	163.00	169.58	168.29	170.35	0.003493	7.02	310.32	79.62	0.63	6.58	0.81
OSO_CREEK-DS-0	19	100	6500.00	163.00	174.12	170.01	174.80	0.001248	6.61	982.65	125.08	0.42	11.12	0.57
OSO_CREEK-DS-0	19	10	3558.00	163.00	171.20	168.29	171.69	0.001281	5.60	635.33	106.87	0.40	8.20	0.45
OSO_CREEK-DS-0	19	2	2178.00	163.00	169.86	167.19	170.16	0.001016	4.39	496.09	101.93	0.35	6.86	0.29
OSO_CREEK-DS-0	18	100	6500.00	163.00	173.80	171.29	174.69	0.002551	7.55	861.37	147.04	0.55	10.80	0.83
OSO_CREEK-DS-0	18	10	3558.00	163.00	170.55	169.43	171.53	0.004297	7.91	449.80	103.99	0.67	7.55	1.02
OSO_CREEK-DS-0	18	2	2178.00	163.00	169.33	168.39	170.02	0.004240	6.66	327.17	96.83	0.64	6.33	0.78
OSO_CREEK-DS-0	17	100	6500.00	164.00	173.64	171.54	174.66	0.003022	8.10	802.89	148.37	0.61	9.64	0.97
OSO_CREEK-DS-0	17	10	3558.00	164.00	169.69	169.63	171.42	0.008809	10.54	337.64	93.64	0.98	5.69	1.88
OSO_CREEK-DS-0	17	2	2178.00	164.00	168.59	168.59	169.92	0.010448	9.23	235.91	91.48	1.01	4.59	1.61
OSO_CREEK-DS-0	16	100	6500.00	162.00	173.07	169.64	174.23	0.002071	8.63	752.87	93.19	0.54	11.07	0.97
OSO_CREEK-DS-0	16	10	3558.00	162.00	169.51	167.44	170.46	0.002566	7.82	454.70	77.03	0.57	7.51	0.88
OSO_CREEK-DS-0	16	2	2178.00	162.00	167.41	166.18	168.23	0.003319	7.25	300.40	70.35	0.62	5.41	0.84
OSO_CREEK-DS-0	15	100	6500.00	161.00	172.71	169.05	173.93	0.001899	8.89	730.93	79.96	0.52	11.71	0.99
OSO_CREEK-DS-0	15	10	3558.00	161.00	169.19	166.73	170.11	0.002179	7.67	463.69	72.06	0.53	8.19	0.82
OSO_CREEK-DS-0	15	2	2178.00	161.00	167.04	165.28	167.79	0.002593	6.92	314.64	66.12	0.56	6.04	0.74
OSO_CREEK-DS-0	14	100	6500.00	161.00	172.60	169.13	173.91	0.002053	9.18	707.97	78.16	0.54	11.60	1.06
OSO_CREEK-DS-0	14	10	3558.00	161.00	169.11	166.76	170.09	0.002339	7.92	449.20	70.04	0.55	8.11	0.88
OSO_CREEK-DS-0	14	2	2178.00	161.00	166.98	165.29	167.77	0.002748	7.13	305.53	64.03	0.58	5.98	0.78
OSO_CREEK-DS-0	13	100	6500.00	161.00	172.57	169.13	173.91	0.002097	9.27	701.16	77.36	0.54	11.57	1.08
OSO_CREEK-DS-0	13	10	3558.00	161.00	169.09	166.75	170.08	0.002372	7.98	445.80	69.36	0.55	8.09	0.89
OSO_CREEK-DS-0	13	2	2178.00	161.00	166.96	165.29	167.76	0.002752	7.16	304.09	63.26	0.58	5.96	0.79
OSO_CREEK-DS-0	12	100	6500.00	161.00	172.59	168.70	173.84	0.001875	8.96	725.33	76.09	0.51	11.59	1.00
OSO_CREEK-DS-0	12	10	3558.00	161.00	169.13	166.31	170.00	0.001923	7.49	475.21	68.50	0.50	8.13	0.77

HEC-RAS Plan: Ex River: OSO_CREEK Reach: OSO_CREEK-DS-0 (Continued)

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	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	12	2	2178.00	161.00	167.00	164.91	167.66	0.002055	6.51	334.68	63.93	0.50	6.00	0.63
OSO_CREEK-DS-0	11	100	6500.00	160.00	171.06	169.51	173.57	0.004476	12.71	511.61	60.80	0.77	11.06	2.10
OSO_CREEK-DS-0	11	10	3558.00	160.00	168.09	166.75	169.78	0.004260	10.43	341.03	53.91	0.73	8.09	1.54
OSO_CREEK-DS-0	11	2	2178.00	160.00	166.23	165.11	167.46	0.004224	8.90	244.83	49.91	0.71	6.23	1.21
OSO_CREEK-DS-0	10	100	6500.00	160.00	169.76	169.76	173.42	0.007777	15.34	423.61	58.55	1.01	9.76	3.20
OSO_CREEK-DS-0	10	10	3558.00	160.00	166.98	166.98	169.64	0.008246	13.09	271.81	51.05	1.00	6.98	2.56
OSO_CREEK-DS-0	10	2	2178.00	160.00	165.54	165.33	167.37	0.007548	10.84	200.84	47.61	0.93	5.54	1.89
OSO_CREEK-DS-0	9	100	6500.00	160.00	167.64	168.42	172.17	0.011250	17.06	380.95	59.04	1.18	7.64	4.11
OSO_CREEK-DS-0	9	10	3558.00	160.00	165.54	165.91	168.45	0.010738	13.67	260.21	55.96	1.12	5.54	2.91
OSO_CREEK-DS-0	9	2	2178.00	160.00	165.04	164.43	166.41	0.005700	9.37	232.40	55.19	0.81	5.04	1.41
OSO_CREEK-DS-0	8	100	6500.00	159.00	166.45	167.35	170.60	0.012567	16.34	397.72	75.32	1.25	7.45	3.96
OSO_CREEK-DS-0	8	10	3558.00	159.00	165.17	165.17	167.31	0.008647	11.73	303.28	72.05	1.01	6.17	2.19
OSO_CREEK-DS-0	8	2	2178.00	159.00	163.93	163.93	165.51	0.009289	10.09	215.91	68.53	1.00	4.93	1.78
OSO_CREEK-DS-0	7	100	6500.00	159.00	165.94	167.08	170.48	0.014897	17.10	380.06	76.58	1.35	6.94	4.43
OSO_CREEK-DS-0	7	10	3558.00	159.00	164.42	164.96	167.19	0.013375	13.35	266.42	72.59	1.23	5.42	2.97
OSO_CREEK-DS-0	7	2	2178.00	159.00	163.31	163.74	165.40	0.014835	11.58	188.14	69.21	1.24	4.31	2.46
OSO_CREEK-DS-0	6	100	6500.00	159.00	165.63	166.93	170.42	0.016361	17.57	370.00	77.00	1.41	6.63	4.72
OSO_CREEK-DS-0	6	10	3558.00	159.00	164.08	164.82	167.12	0.015608	13.99	254.40	72.77	1.32	5.08	3.31
OSO_CREEK-DS-0	6	2	2178.00	159.00	163.01	163.60	165.33	0.017702	12.21	178.45	69.34	1.34	4.01	2.79
OSO_CREEK-DS-0	5	100	6500.00	159.00	165.11	166.54	170.14	0.018083	17.99	361.31	77.97	1.47	6.11	5.01
OSO_CREEK-DS-0	5	10	3558.00	159.00	163.59	164.45	166.84	0.017878	14.45	246.20	74.10	1.40	4.59	3.60
OSO_CREEK-DS-0	5	2	2178.00	159.00	162.60	163.25	165.03	0.019973	12.50	174.24	71.44	1.41	3.60	2.98
OSO_CREEK-DS-0	3.1	100	6500.00	158.00	167.71	166.34	169.46	0.004158	10.61	612.41	95.84	0.74	9.71	1.57
OSO_CREEK-DS-0	3.1	10	3558.00	158.00	164.74	164.11	166.31	0.005694	10.07	353.27	76.93	0.83	6.74	1.57
OSO_CREEK-DS-0	3.1	2	2178.00	158.00	163.37	162.86	164.53	0.005832	8.64	252.11	71.07	0.81	5.37	1.26
OSO_CREEK-DS-0	3	100	6500.00	158.00	167.64	166.36	169.44	0.004357	10.78	603.22	95.40	0.76	9.64	1.63
OSO_CREEK-DS-0	3	10	3558.00	158.00	164.13	164.13	166.23	0.008710	11.62	306.17	74.17	1.01	6.13	2.17
OSO_CREEK-DS-0	3	2	2178.00	158.00	162.88	162.88	164.45	0.009275	10.05	216.67	69.08	1.00	4.88	1.77
OSO_CREEK-DS-0	2	100	6500.00	158.00	165.44	165.44	168.79	0.007878	14.69	442.35	66.18	1.00	7.44	3.01
OSO_CREEK-DS-0	2	10	3558.00	158.00	162.94	163.06	165.41	0.009321	12.61	282.22	62.21	1.04	4.94	2.49
OSO_CREEK-DS-0	2	2	2178.00	158.00	161.39	161.70	163.48	0.012415	11.59	187.96	59.51	1.15	3.39	2.36
OSO_CREEK-DS-0	1	100	6500.00	155.00	160.98	162.82	167.14	0.030249	19.91	326.39	87.88	1.82	5.98	6.64
OSO_CREEK-DS-0	1	10	3558.00	155.00	159.80	160.96	163.73	0.030700	15.91	223.61	86.40	1.74	4.80	4.76
OSO_CREEK-DS-0	1	2	2178.00	155.00	159.20	159.91	161.69	0.027094	12.68	171.79	85.55	1.58	4.20	3.28


CompassBESS Plan: 1) Ex 9/24/2025
RS = 45
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta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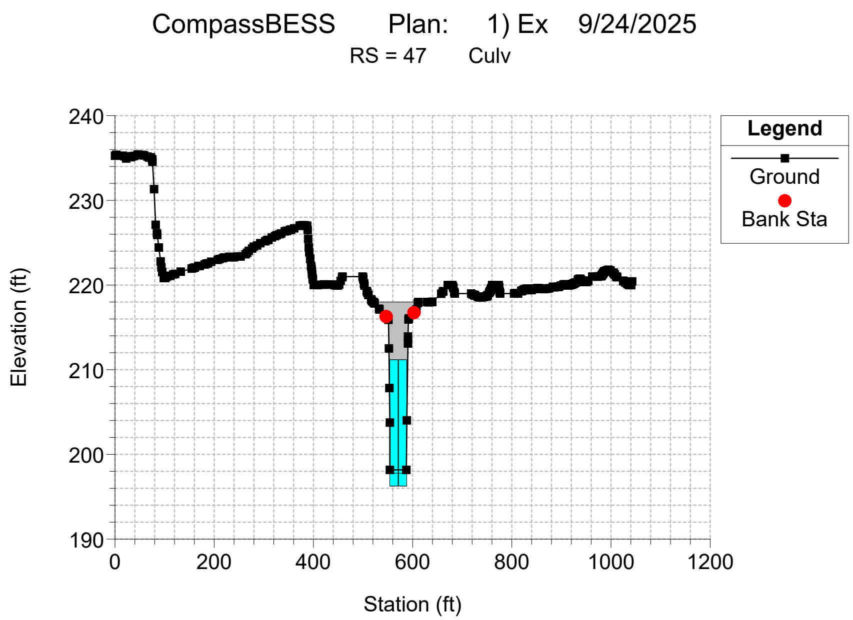
RS = 48
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta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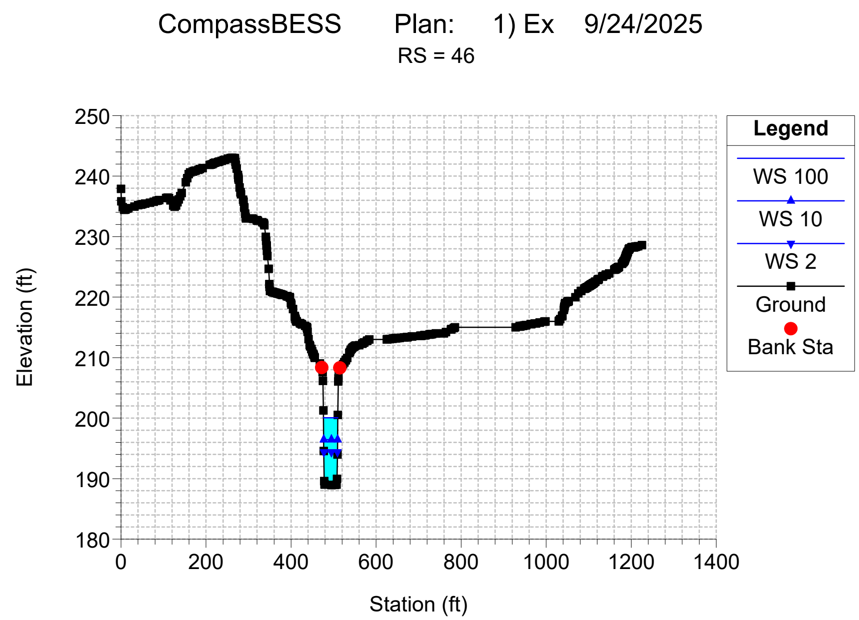
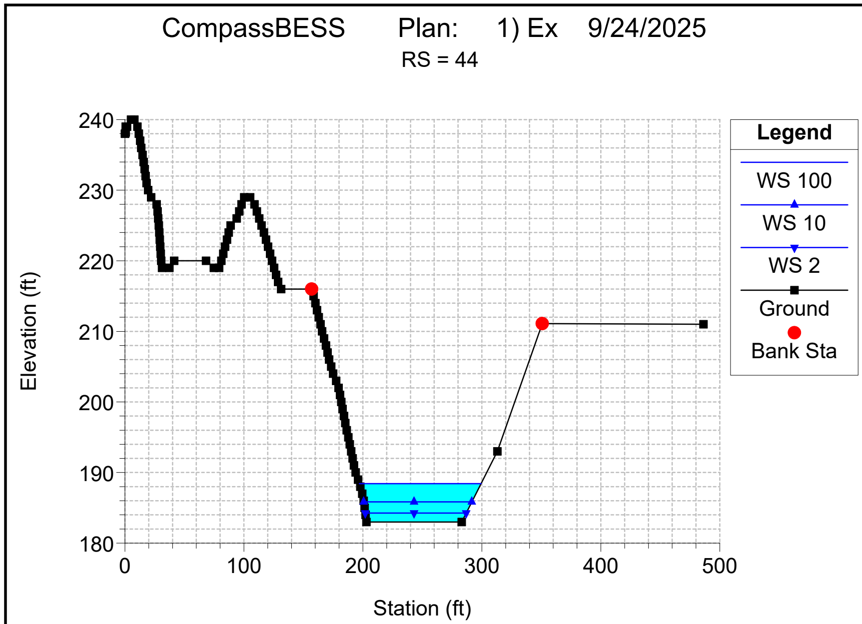
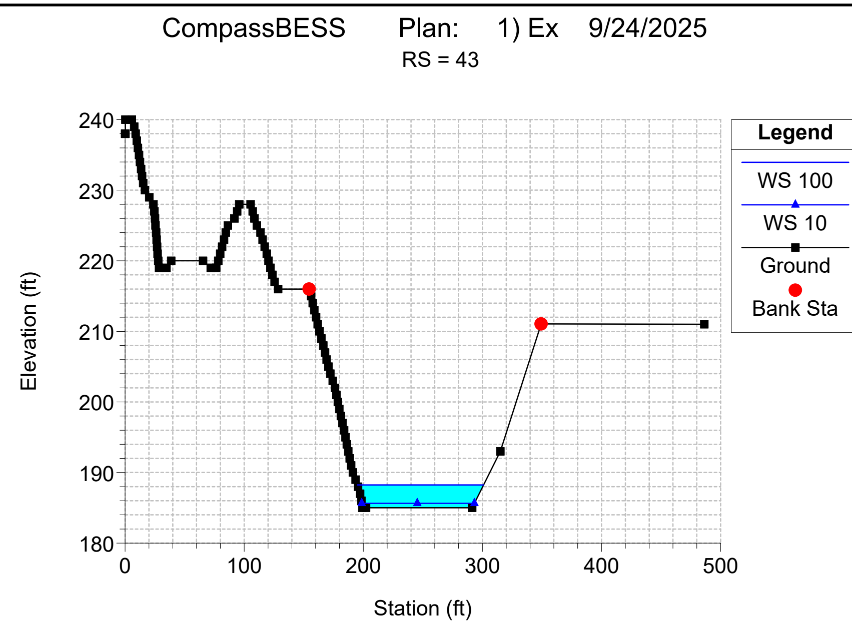
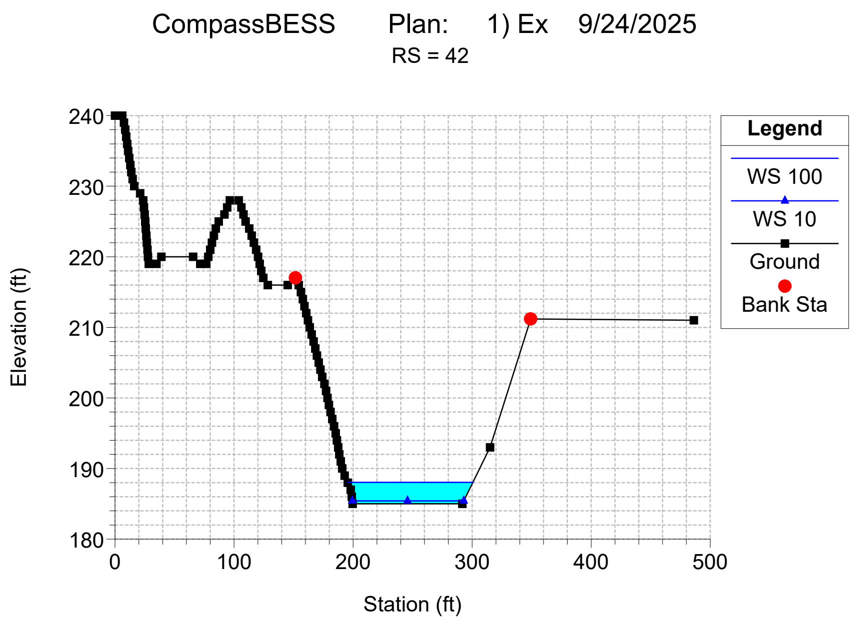
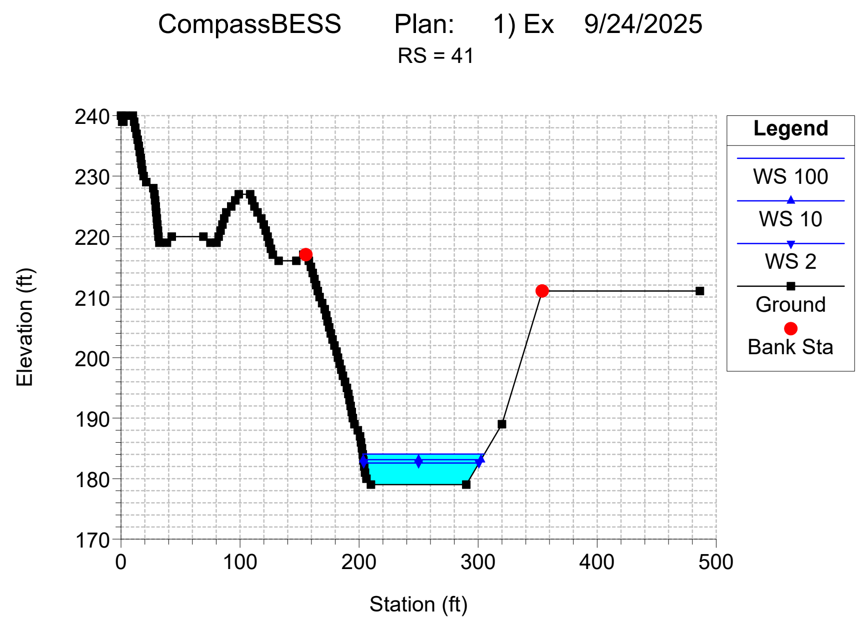
RS = 47 Culv
Elevation (ft)
Station (ft)
Legend
Ground
Bank Sta

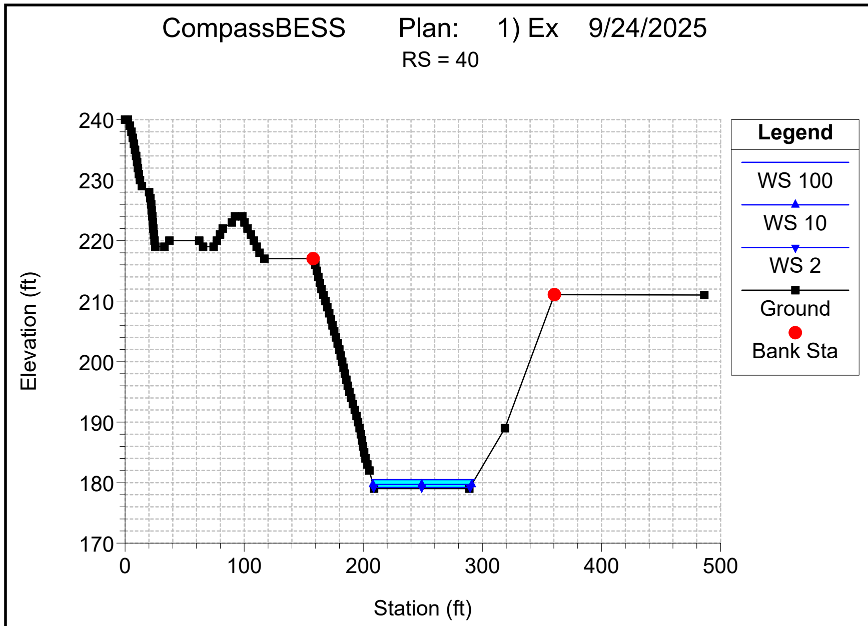

CompassBESS Plan: 1) Ex 9/24/2025
RS = 46
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

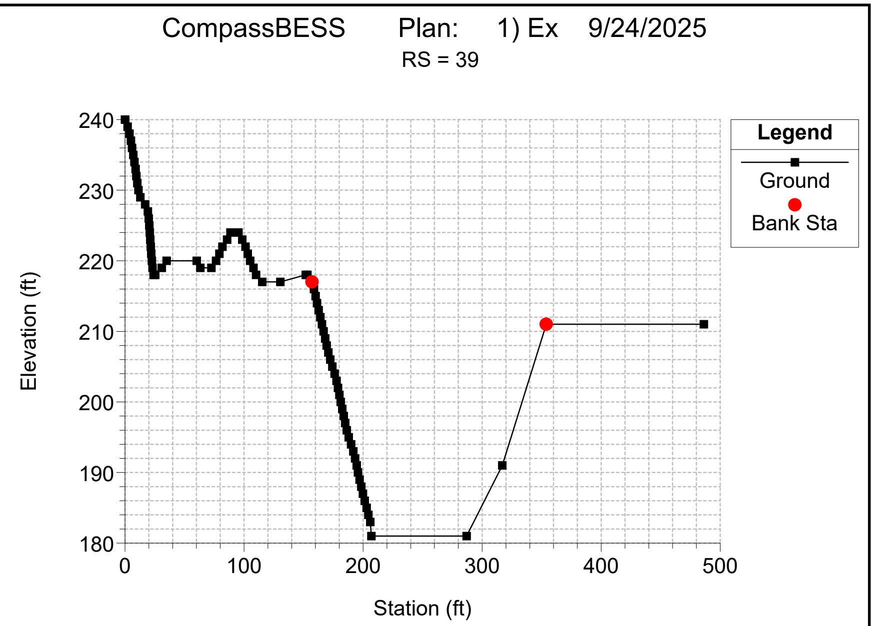

CompassBESS Plan: 1) Ex 9/24/2025
RS = 44
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
240
230
220
210
200
190
180
0
100
200
300
400
500
Station (ft)

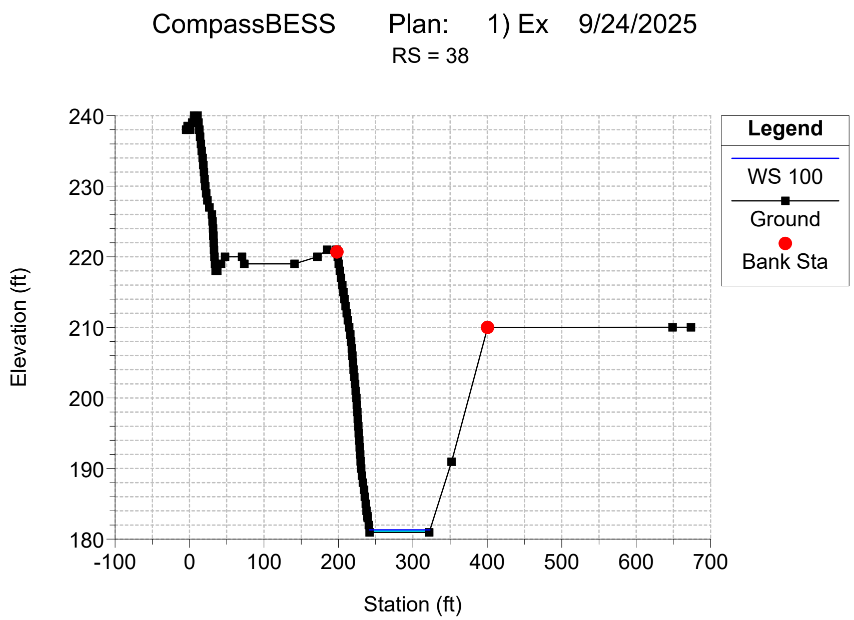

CompassBESS Plan: 1) Ex 9/24/2025
RS = 43
Legend
WS 100
WS 10
Ground
Bank Sta
Elevation (ft)
240
230
220
210
200
190
180
0
100
200
300
400
500
Station (ft)

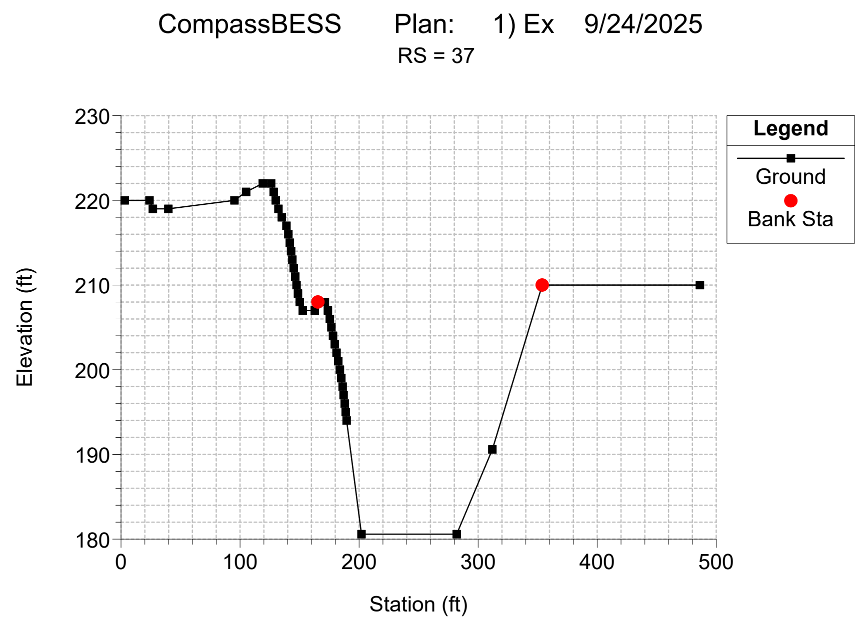

CompassBESS Plan: 1) Ex 9/24/2025
RS = 42
Legend
WS 100
WS 10
Ground
Bank Sta
Elevation (ft)
240
230
220
210
200
190
180
0
100
200
300
400
500
Station (ft)

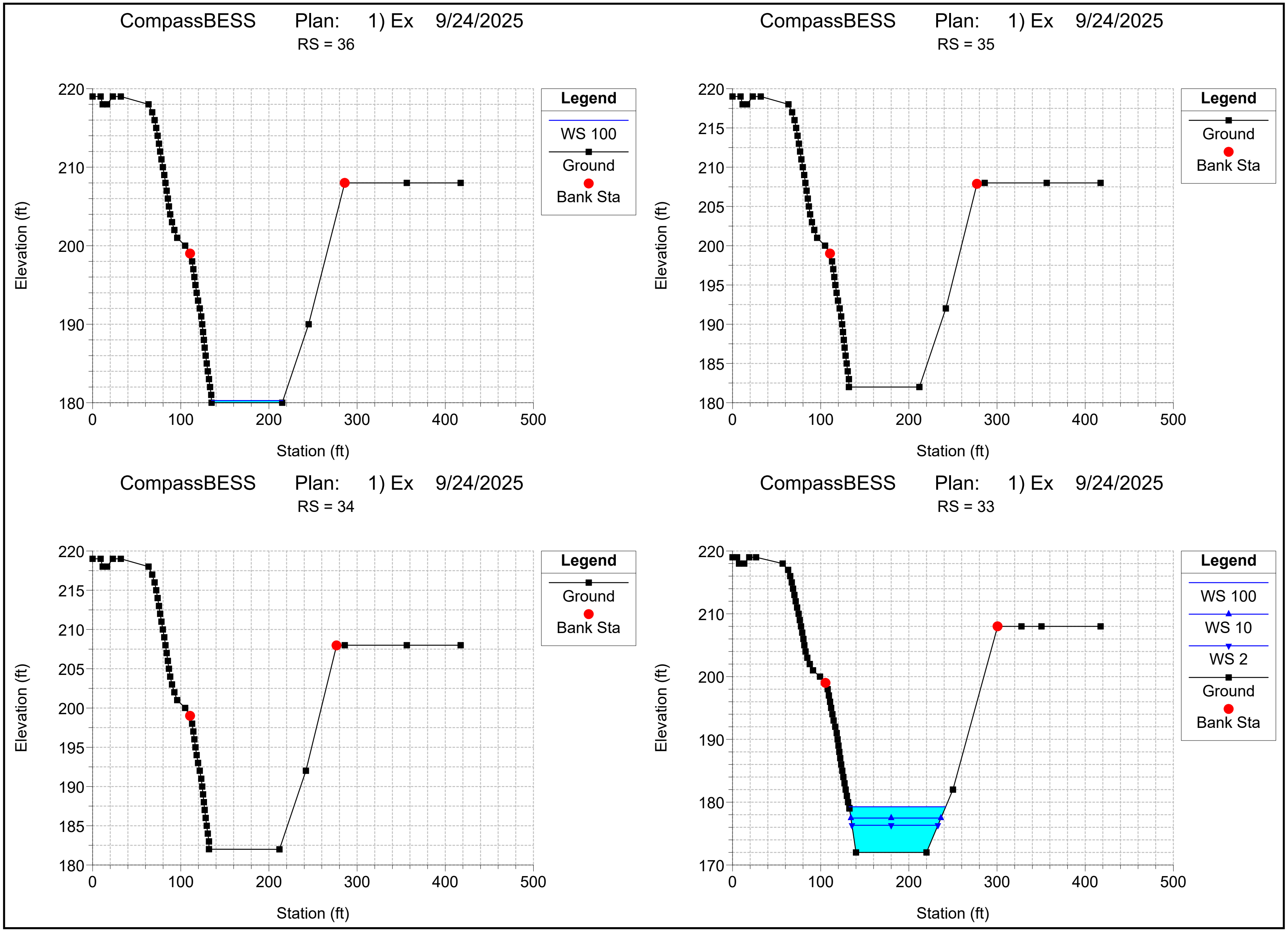

CompassBESS Plan: 1) Ex 9/24/2025
RS = 41
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
240
230
220
210
200
190
180
170
0
100
200
300
400
500
Station (ft)


CompassBESS Plan: 1) Ex 9/24/2025
RS = 40
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
170
0
100
200
300
400
500

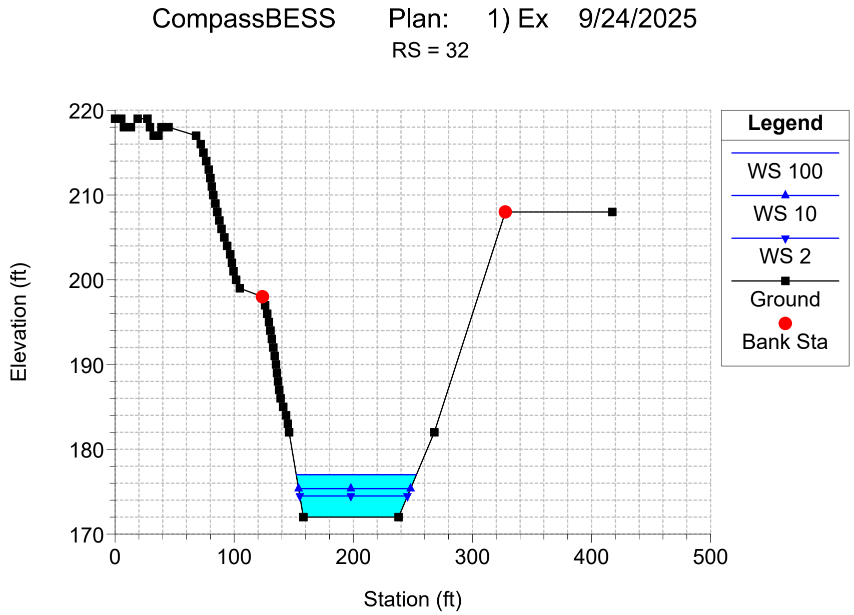

CompassBESS Plan: 1) Ex 9/24/2025
RS = 39
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
0
100
200
300
400
500

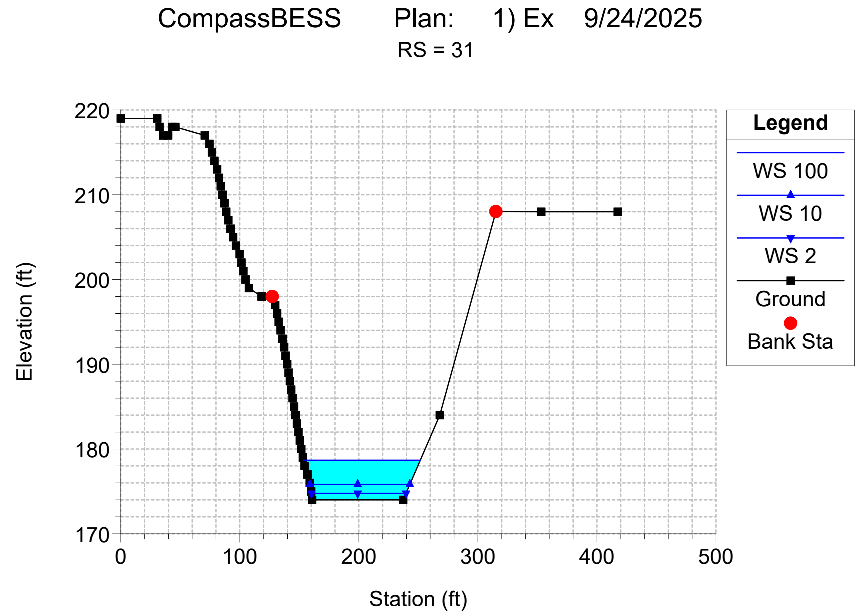

CompassBESS Plan: 1) Ex 9/24/2025
RS = 38
Legend
WS 100
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
-100
0
100
200
300
400
500
600
700

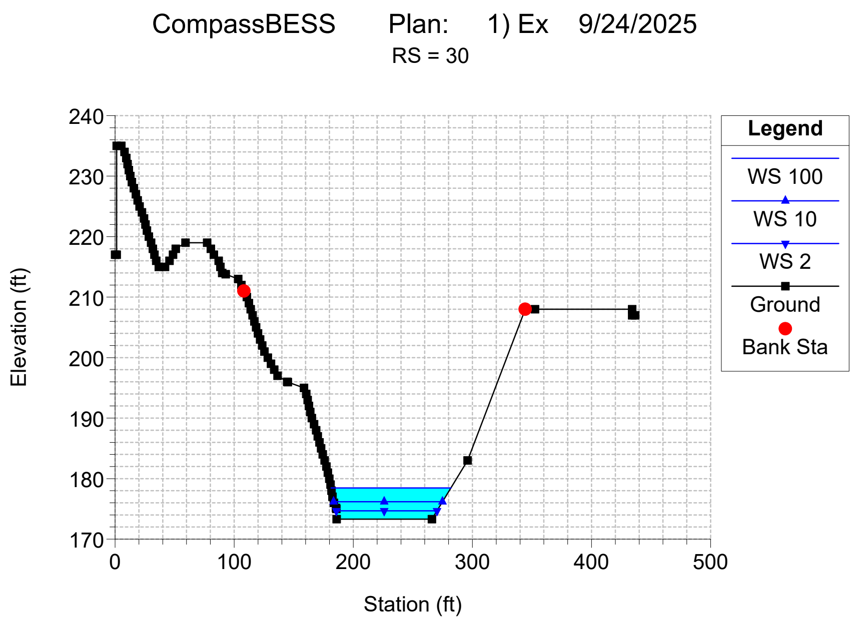

CompassBESS Plan: 1) Ex 9/24/2025
RS = 37
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
230
220
210
200
190
180
0
100
200
300
400
500

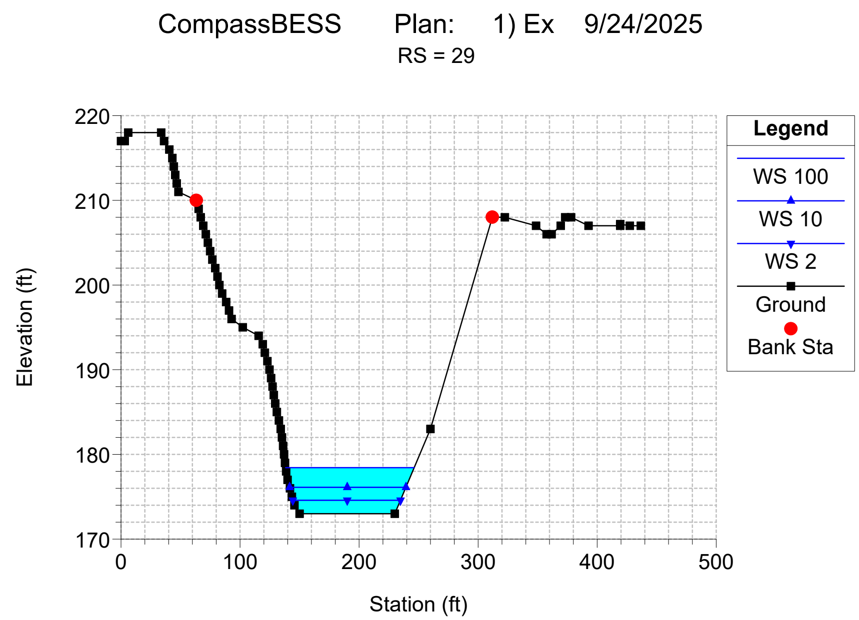


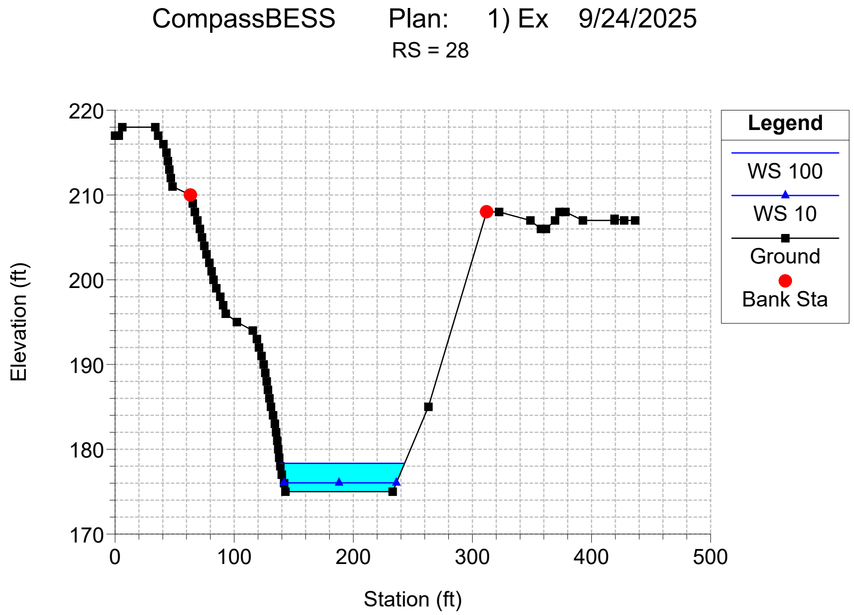
CompassBESS Plan: 1) Ex 9/24/2025
RS = 36
Legend
WS 100
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
0
100
200
300
400
500
CompassBESS Plan: 1) Ex 9/24/2025
RS = 35
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
215
210
205
200
195
190
185
180
0
100
200
300
400
500
CompassBESS Plan: 1) Ex 9/24/2025
RS = 34
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
215
210
205
200
195
190
185
180
0
100
200
300
400
500
CompassBESS Plan: 1) Ex 9/24/2025
RS = 33
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

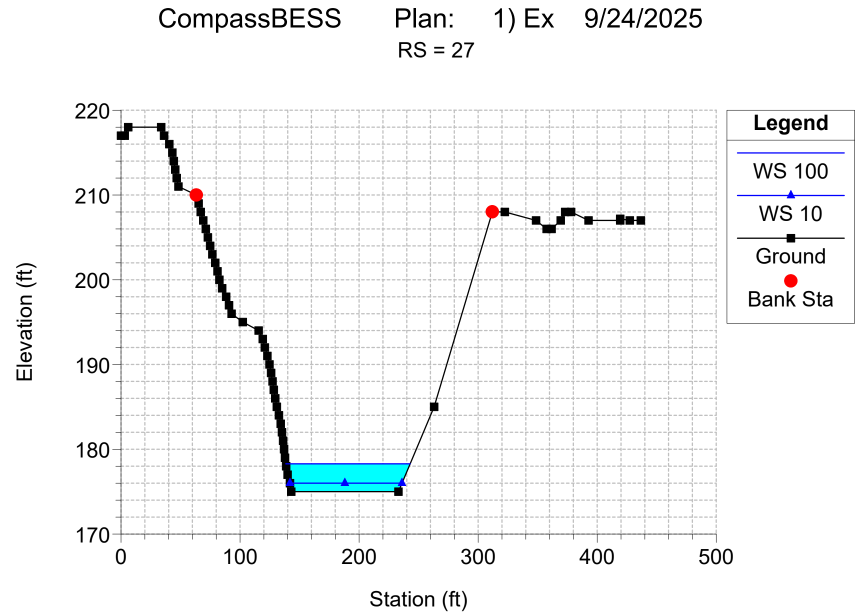

CompassBESS Plan: 1) Ex 9/24/2025
RS = 32
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

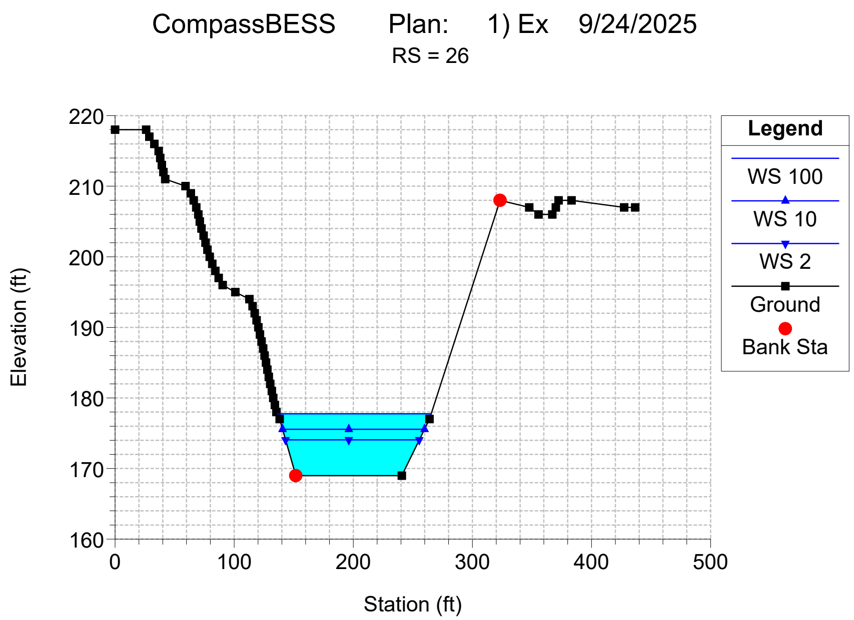

CompassBESS Plan: 1) Ex 9/24/2025
RS = 31
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

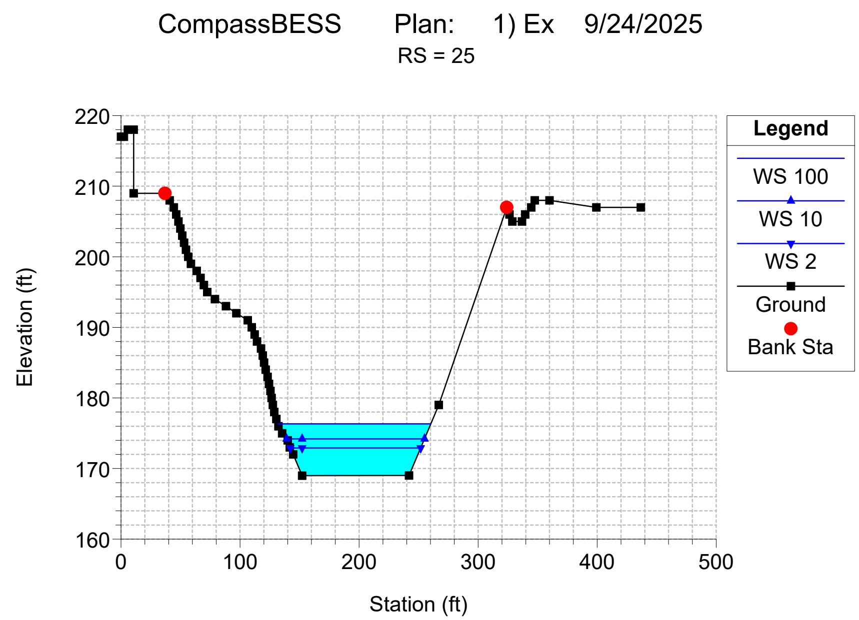

CompassBESS Plan: 1) Ex 9/24/2025
RS = 30
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
170
0
100
200
300
400
500

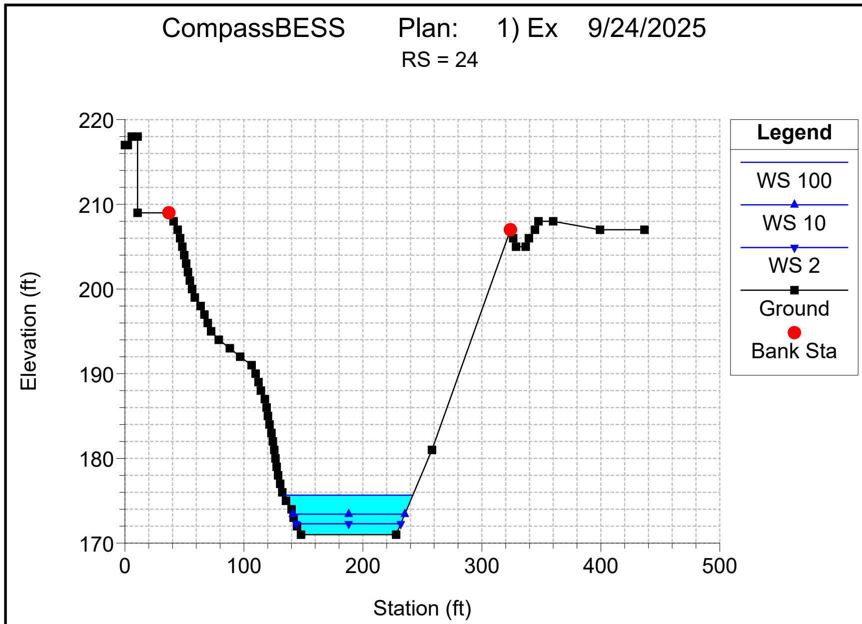

CompassBESS Plan: 1) Ex 9/24/2025
RS = 29
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

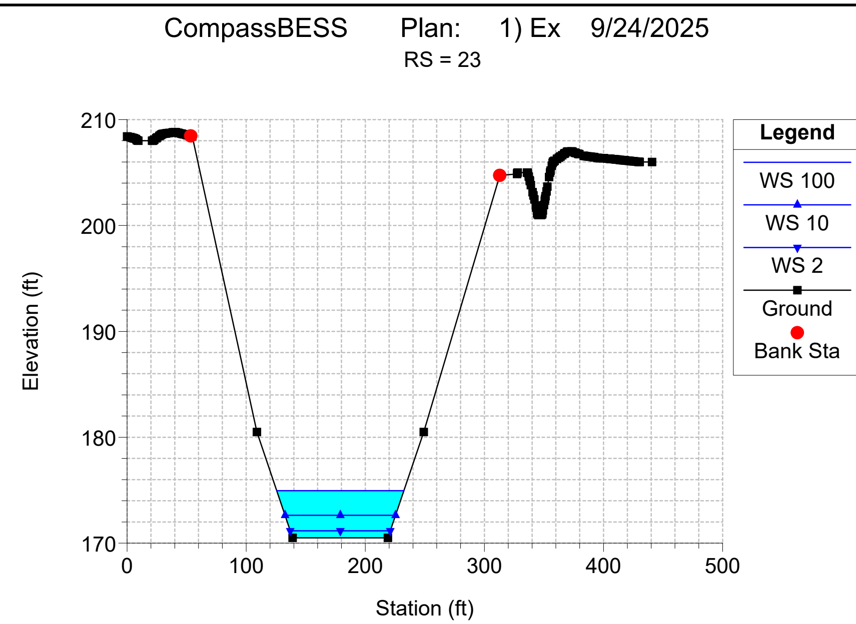

CompassBESS Plan: 1) Ex 9/24/2025
RS = 28
Legend
WS 100
WS 10
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

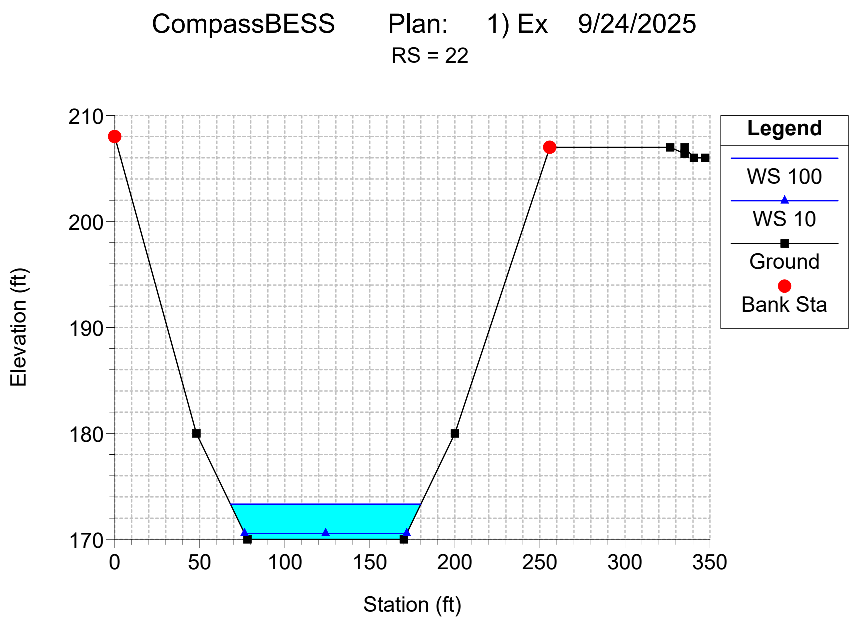

CompassBESS Plan: 1) Ex 9/24/2025
RS = 27
Legend
WS 100
WS 10
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

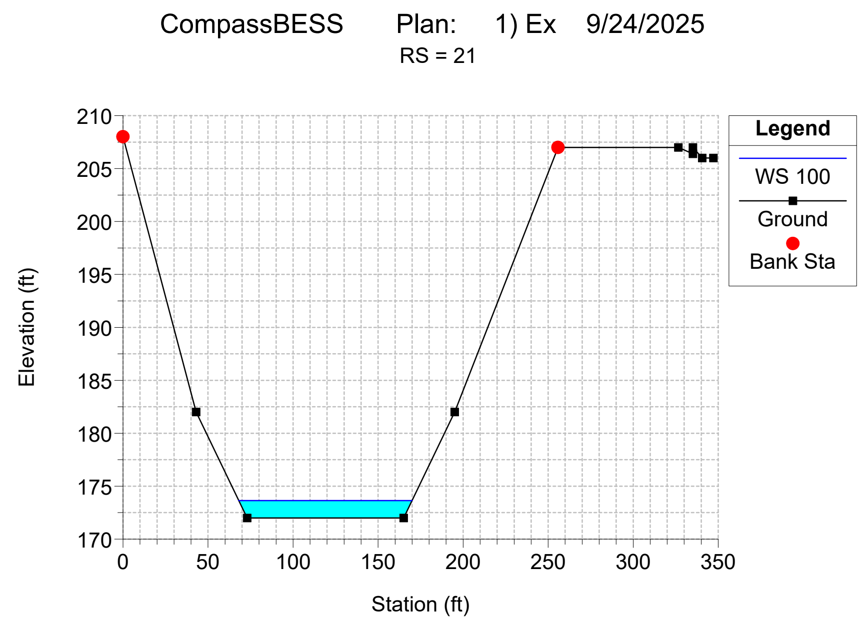

CompassBESS Plan: 1) Ex 9/24/2025
RS = 26
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
0
100
200
300
400
500

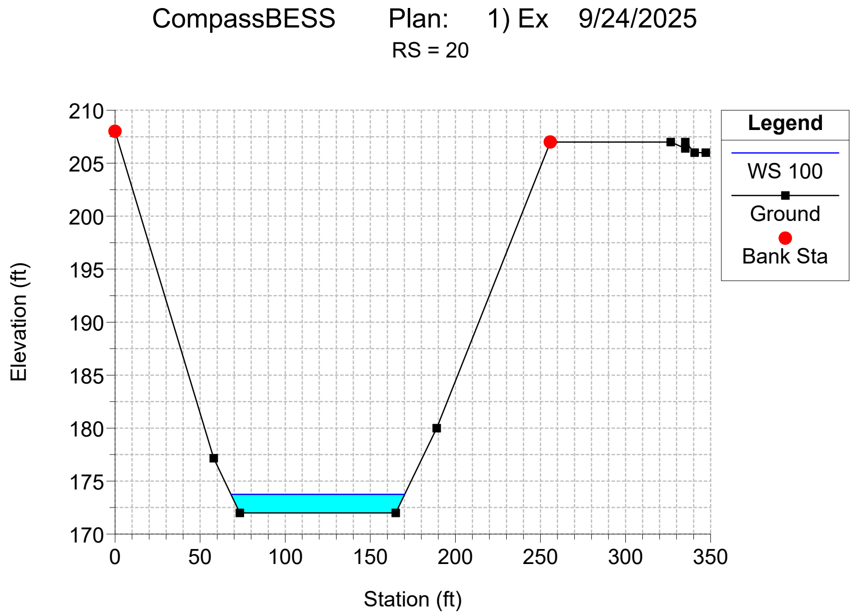

CompassBESS Plan: 1) Ex 9/24/2025
RS = 25
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
0
100
200
300
400
500

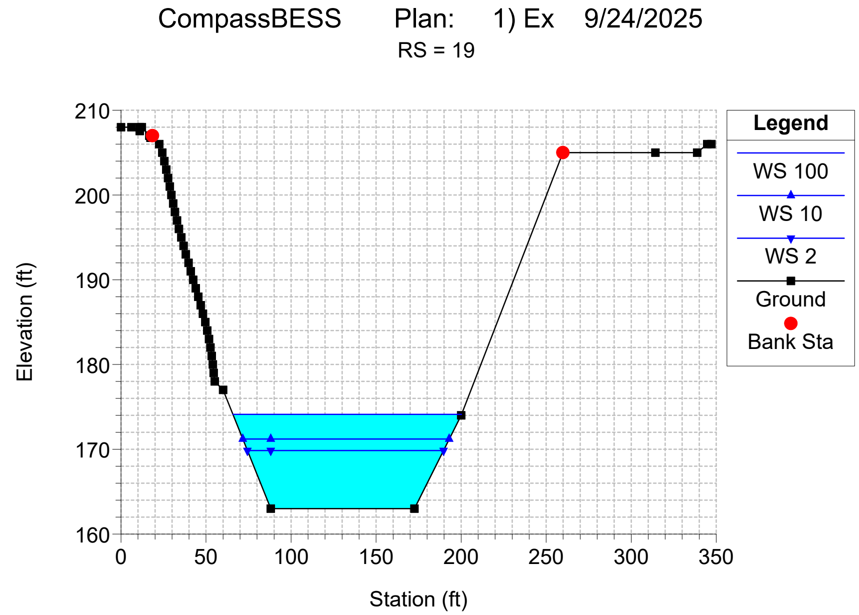

CompassBESS Plan: 1) Ex 9/24/2025
RS = 24
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

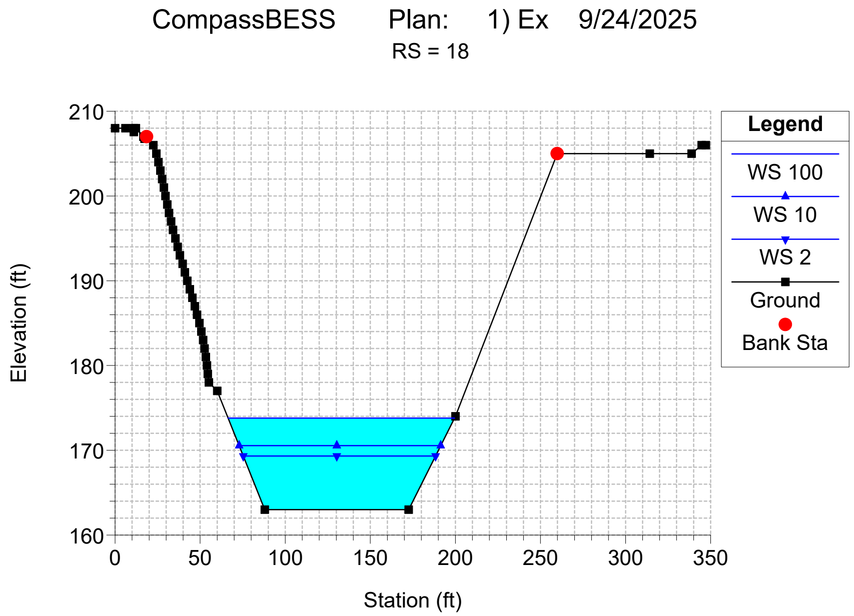

CompassBESS Plan: 1) Ex 9/24/2025
RS = 23
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
210
200
190
180
170
0
100
200
300
400
500

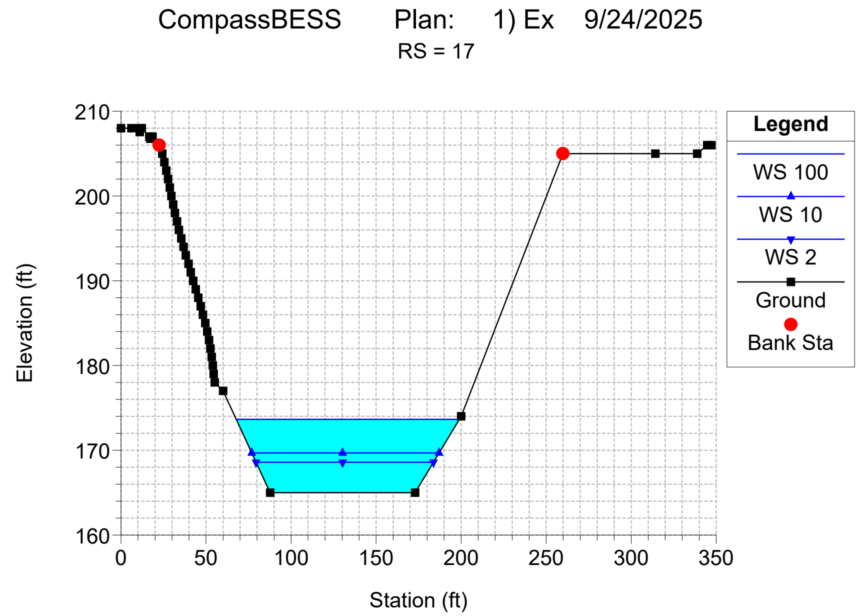

CompassBESS Plan: 1) Ex 9/24/2025
RS = 22
Legend
WS 100
WS 10
Ground
Bank Sta
Elevation (ft)
Station (ft)
210
200
190
180
170
0
50
100
150
200
250
300
350


CompassBESS Plan: 1) Ex 9/24/2025
RS = 21
Legend
WS 100
Ground
Bank Sta
Elevation (ft)
Station (ft)
210
205
200
195
190
185
180
175
170
0
50
100
150
200
250
300
350

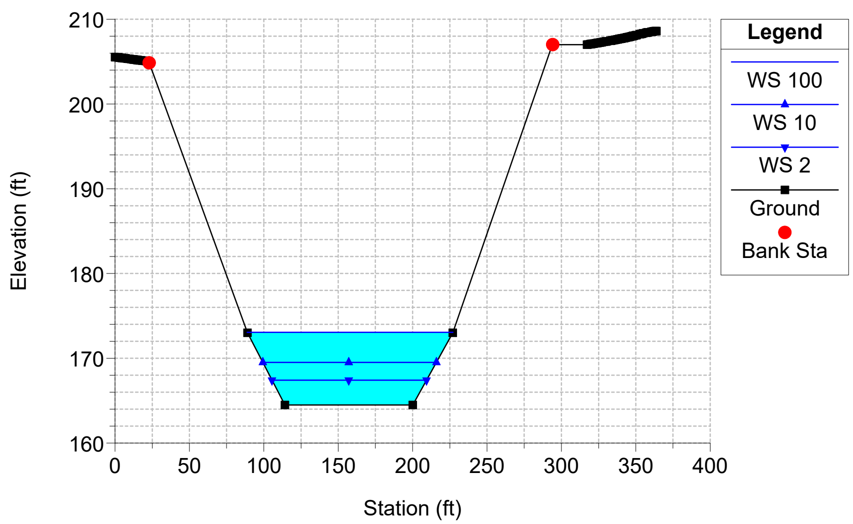

CompassBESS Plan: 1) Ex 9/24/2025
RS = 20
Elevation (ft)
Station (ft)
Legend
WS 100
Ground
Bank Sta


CompassBESS Plan: 1) Ex 9/24/2025
RS = 19
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

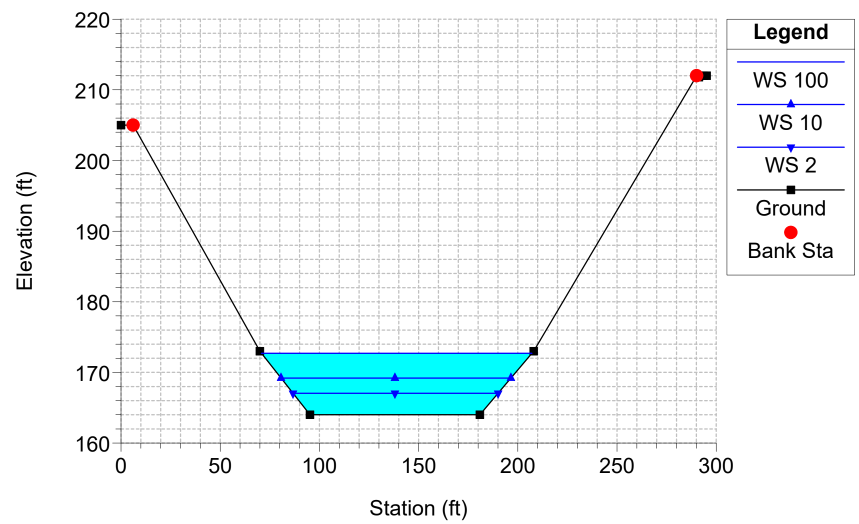

CompassBESS Plan: 1) Ex 9/24/2025
RS = 18
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: 1) Ex 9/24/2025
RS = 17
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

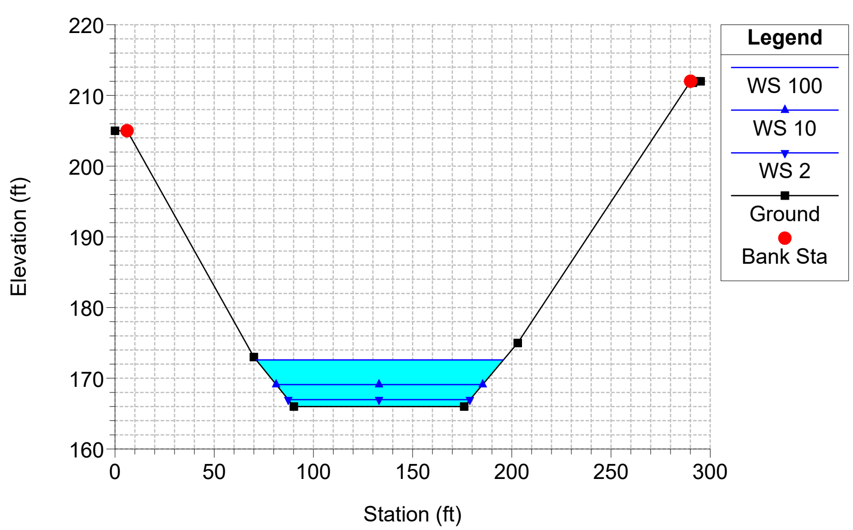
CompassBESS Plan: 1) Ex 9/24/2025
RS = 16



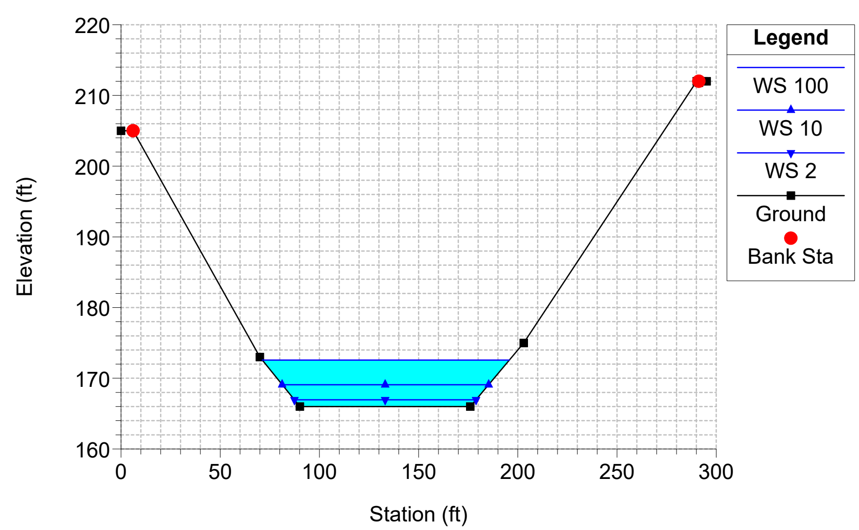
CompassBESS Plan: 1) Ex 9/24/2025
RS = 15

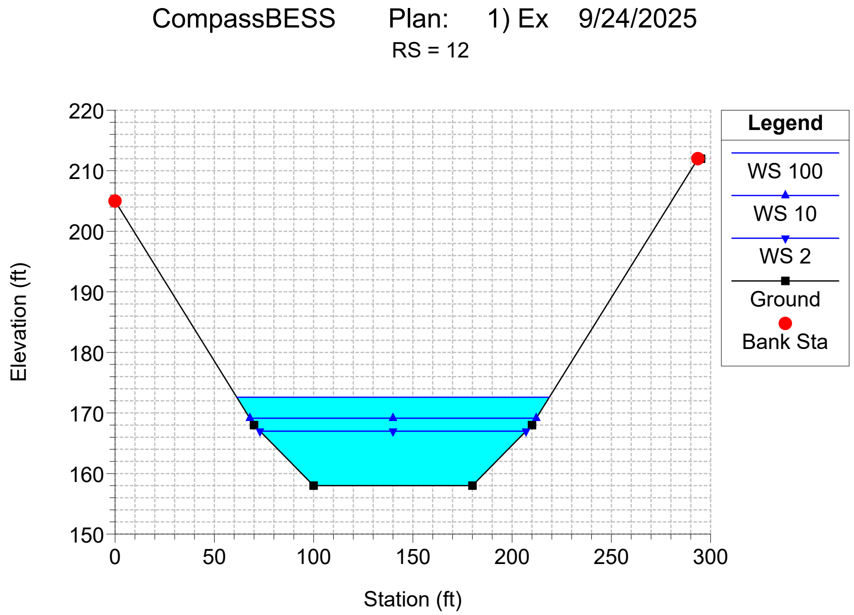


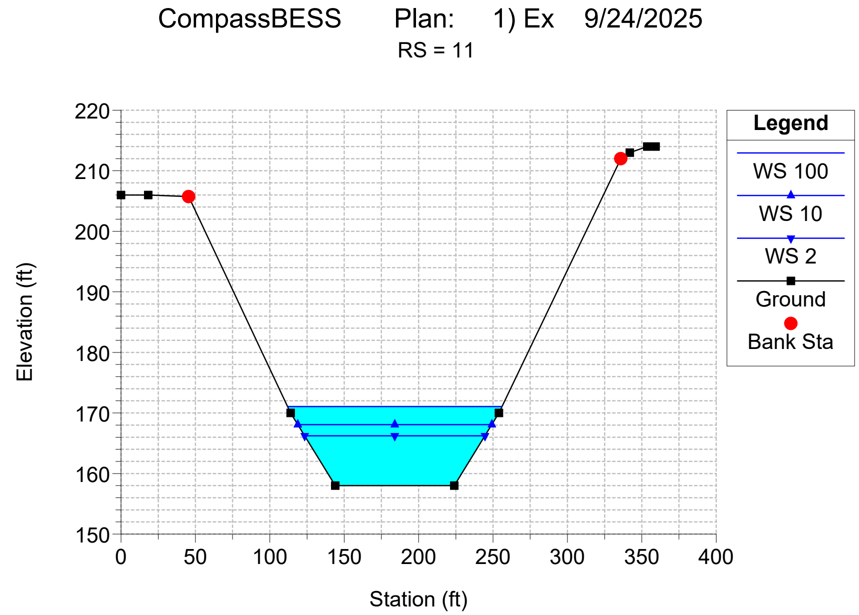
CompassBESS Plan: 1) Ex 9/24/2025
RS = 14

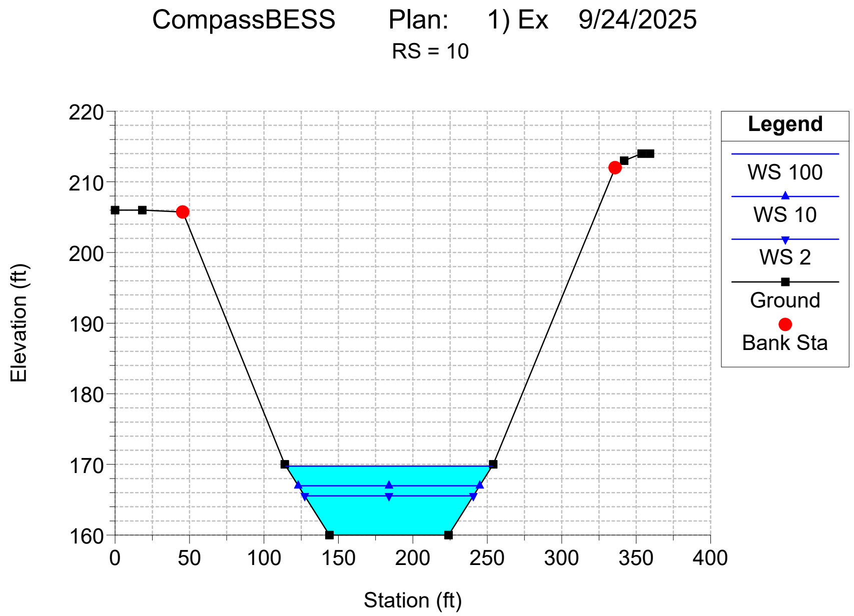


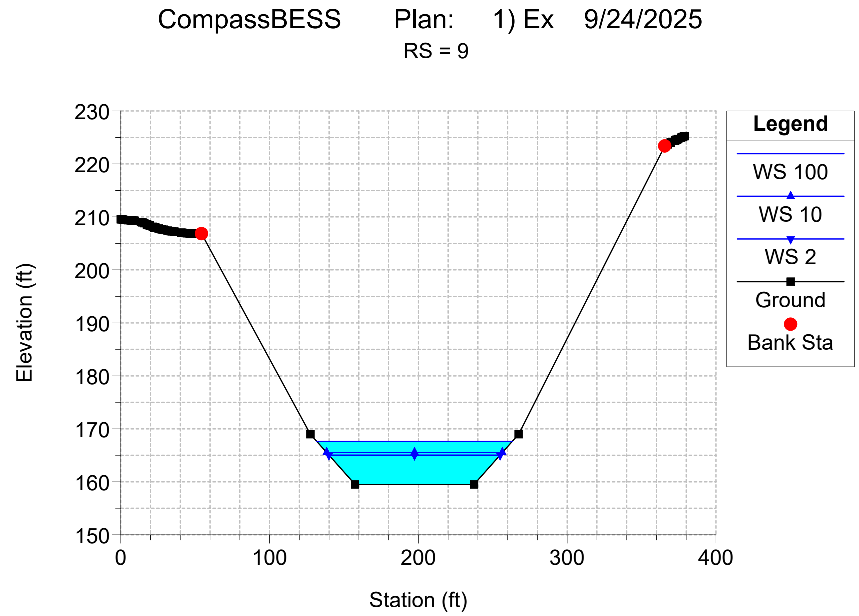
CompassBESS Plan: 1) Ex 9/24/2025
RS = 13

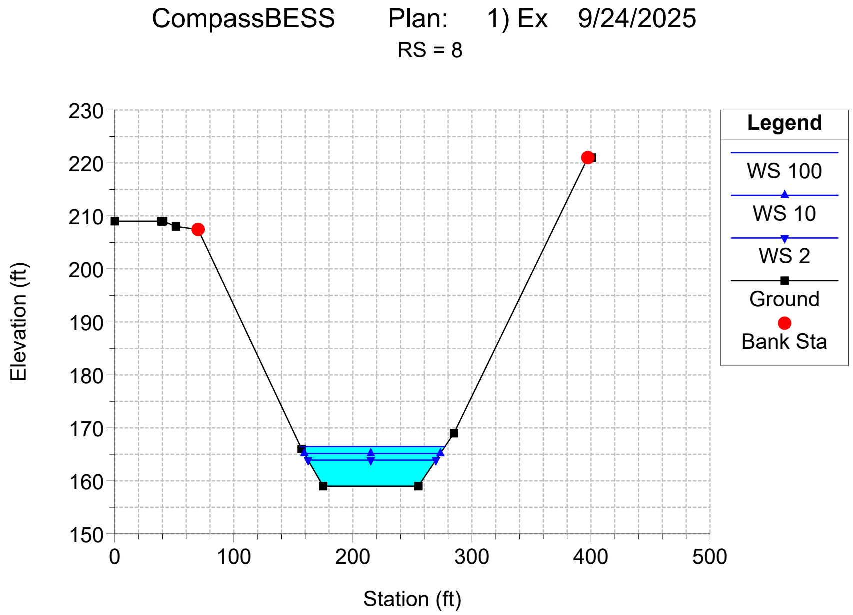


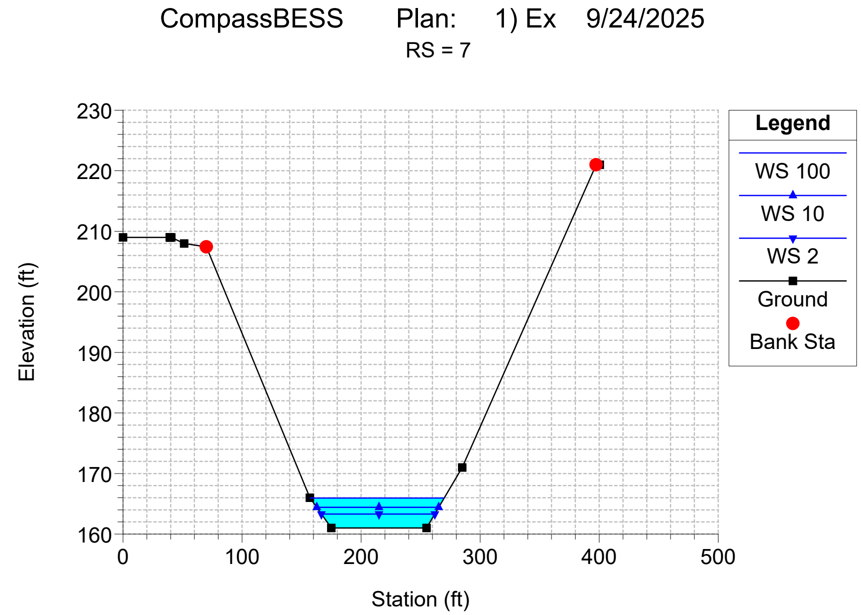

CompassBESS Plan: 1) Ex 9/24/2025
RS = 12
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

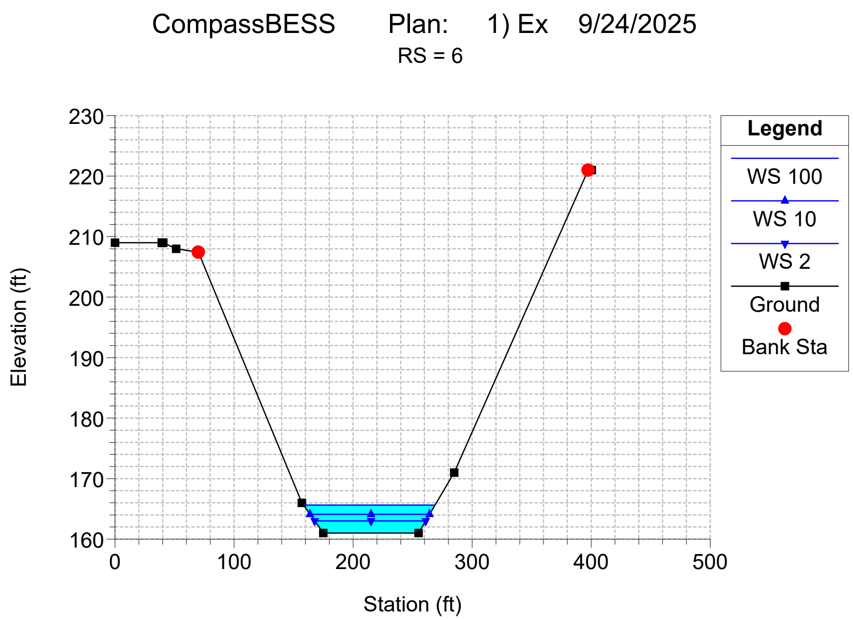

CompassBESS Plan: 1) Ex 9/24/2025
RS = 11
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

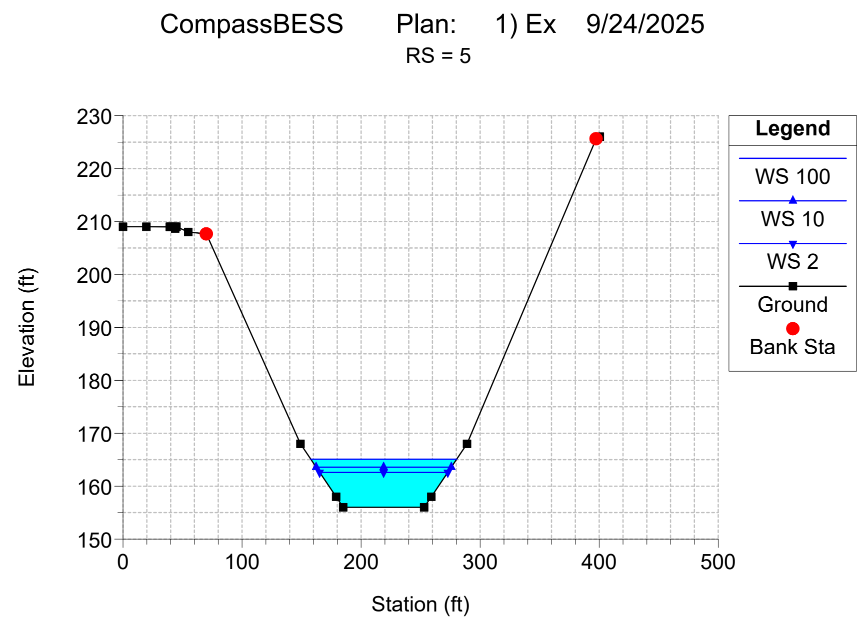

CompassBESS Plan: 1) Ex 9/24/2025
RS = 10
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

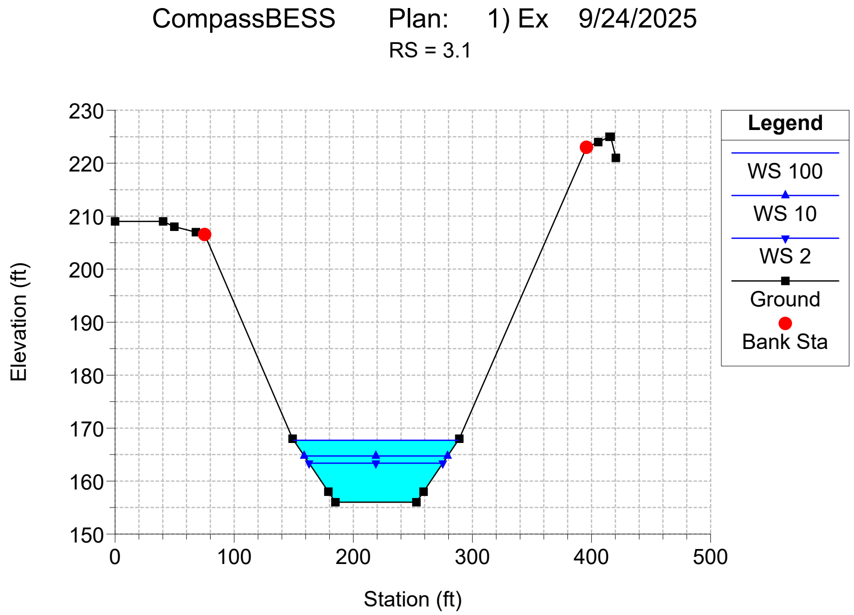

CompassBESS Plan: 1) Ex 9/24/2025
RS = 9
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

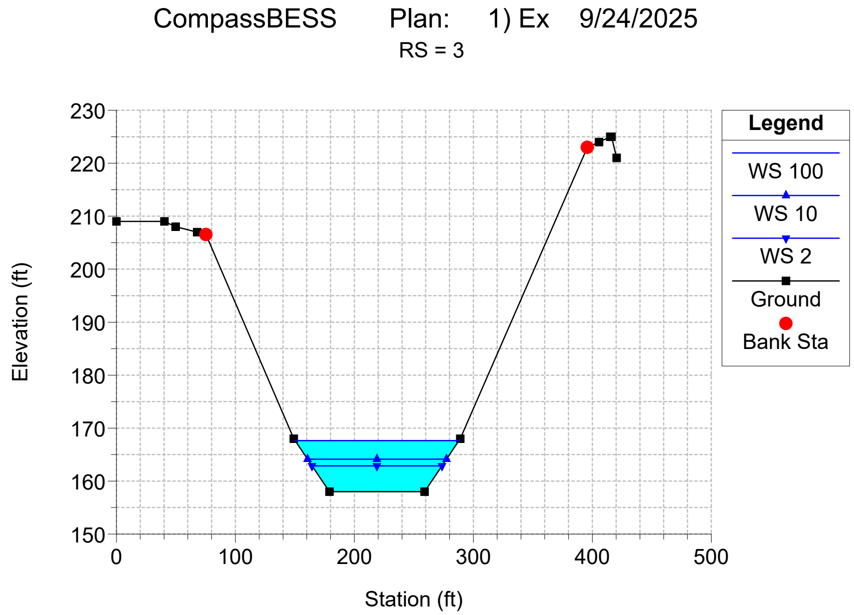

CompassBESS Plan: 1) Ex 9/24/2025
RS = 8
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
150
160
170
180
190
200
210
220
230
0
100
200
300
400
500

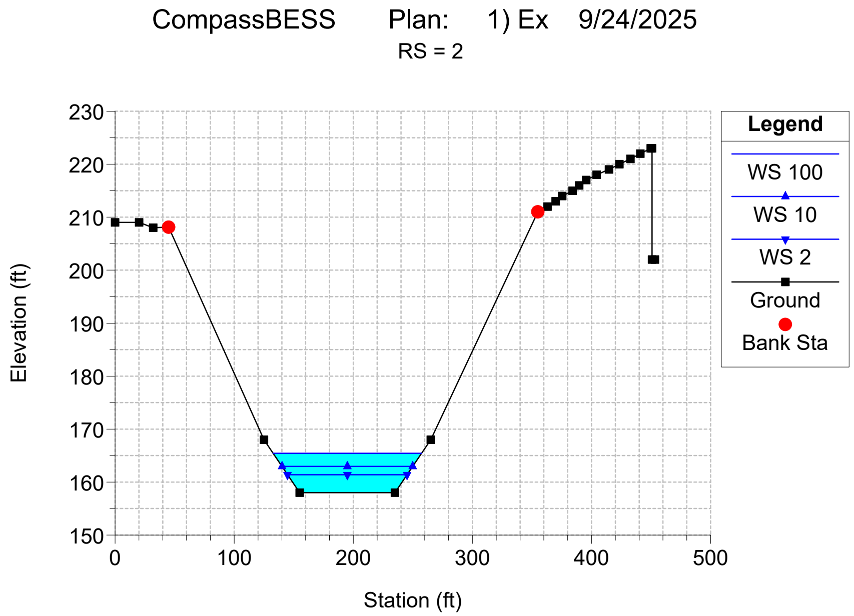

CompassBESS Plan: 1) Ex 9/24/2025
RS = 7
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
160
170
180
190
200
210
220
230
0
100
200
300
400
500

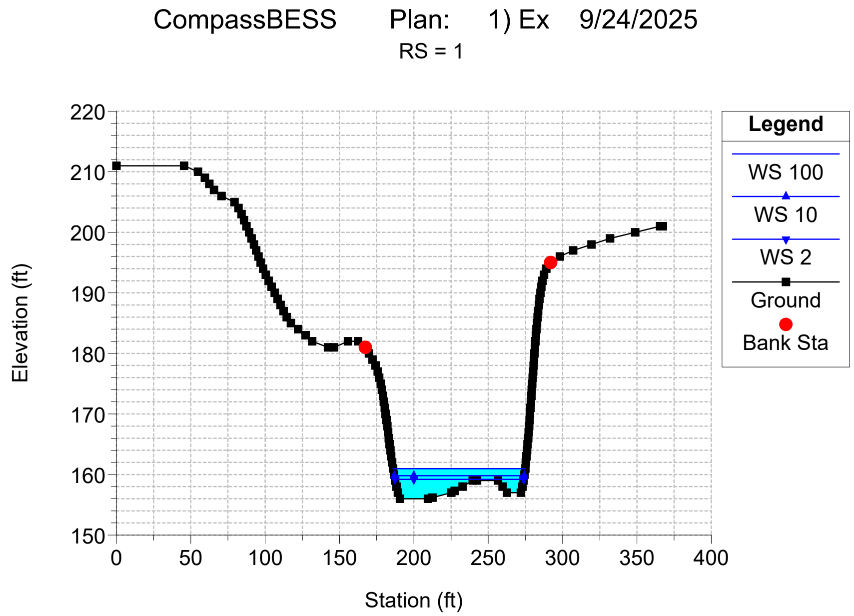

CompassBESS Plan: 1) Ex 9/24/2025
RS = 6
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
160
170
180
190
200
210
220
230
0
100
200
300
400
500

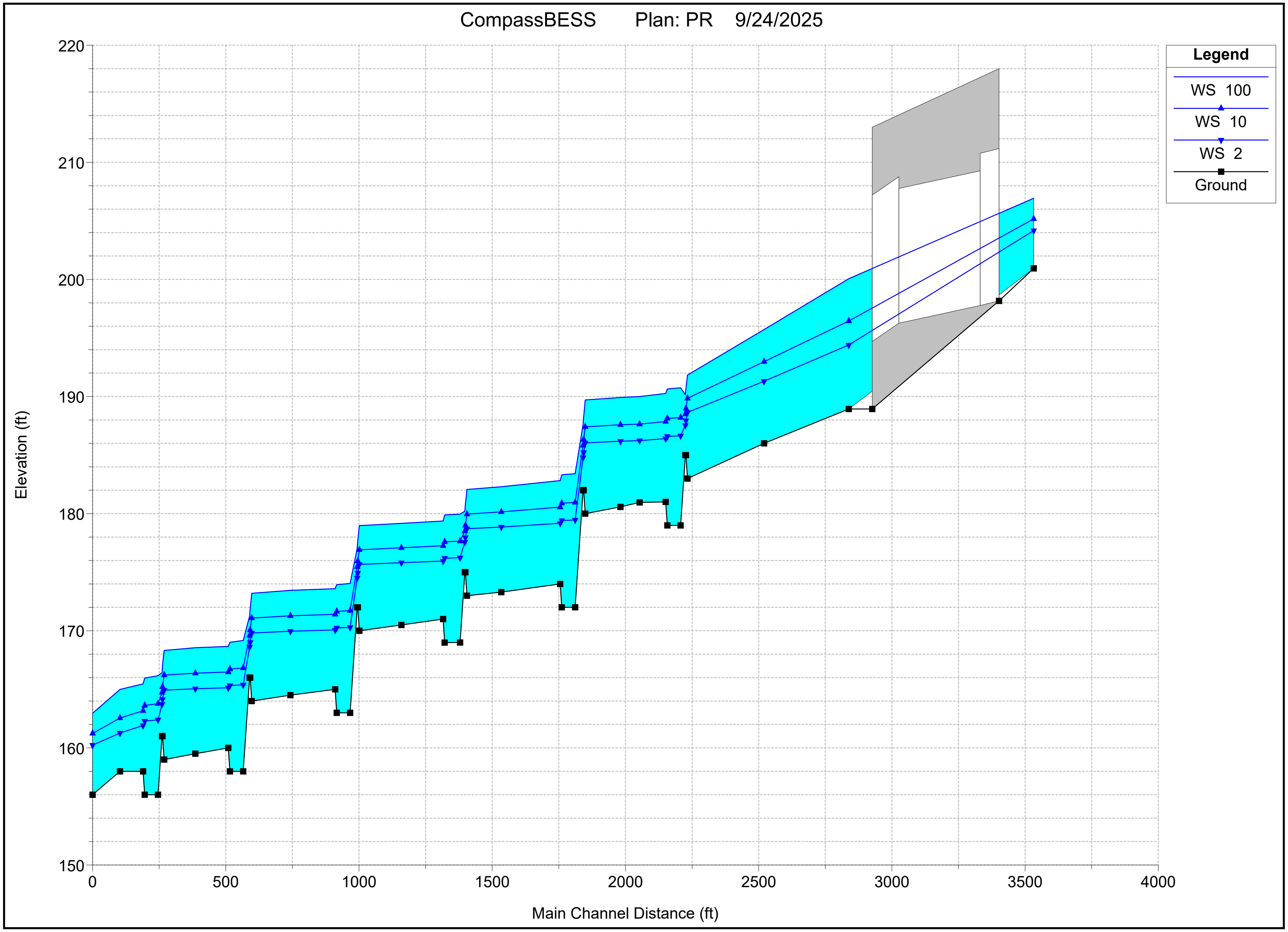

CompassBESS Plan: 1) Ex 9/24/2025
RS = 5
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
150
160
170
180
190
200
210
220
230
0
100
200
300
400
500


CompassBESS Plan: 1) Ex 9/24/2025
RS = 3.1
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


CompassBESS Plan: 1) Ex 9/24/2025
RS = 3
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


CompassBESS Plan: 1) Ex 9/24/2025
RS = 2
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


CompassBESS Plan: 1) Ex 9/24/2025
RS = 1
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


CompassBESS Plan: PR 9/24/2025
Legend
WS 100
WS 10
WS 2
Ground
Elevation (ft)
Main Channel Distance (ft)
220
210
200
190
180
170
160
150
0
500
1000
1500
2000
2500
3000
3500
4000

HEC-RAS Plan: PR River: OSO_CREEK Reach: OSO_CREEK-DS-0

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	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	48	100	6500.00	200.94	206.94	211.74	225.06	0.012241	34.14	190.37	35.64	2.60	6.00	3.39
OSO_CREEK-DS-0	48	10	3558.00	200.94	205.17	208.37	217.17	0.012228	27.79	128.05	34.86	2.56	4.23	2.49
OSO_CREEK-DS-0	48	2	2178.00	200.94	204.17	206.44	212.63	0.012230	23.33	93.36	34.42	2.50	3.23	1.91
OSO_CREEK-DS-0	47		Culvert											
OSO_CREEK-DS-0	46	100	6500.00	188.94	200.06	200.06	205.29	0.001973	18.35	354.31	33.93	1.00	11.12	0.85
OSO_CREEK-DS-0	46	10	3558.00	188.94	196.45	196.45	200.05	0.001928	15.22	233.75	32.79	1.00	7.51	0.64
OSO_CREEK-DS-0	46	2	2178.00	188.94	194.41	194.41	197.03	0.001924	13.00	167.54	32.13	1.00	5.47	0.50
OSO_CREEK-DS-0	45	100	6500.00	186.00	195.71	195.71	199.15	0.021242	14.87	436.99	64.27	1.01	9.71	8.44
OSO_CREEK-DS-0	45	10	3558.00	186.00	192.98	192.98	195.56	0.022762	12.88	276.20	53.69	1.00	6.98	6.92
OSO_CREEK-DS-0	45	2	2178.00	186.00	191.30	191.30	193.32	0.024317	11.38	191.33	47.53	1.00	5.30	5.84
OSO_CREEK-DS-0	44	100	6500.00	183.00	191.83	188.62	192.70	0.004690	7.50	866.81	117.90	0.49	8.83	2.07
OSO_CREEK-DS-0	44	10	3558.00	183.00	189.85	186.82	190.33	0.003433	5.54	641.80	109.32	0.40	6.85	1.22
OSO_CREEK-DS-0	44	2	2178.00	183.00	188.64	185.78	188.92	0.002494	4.24	513.80	103.25	0.34	5.64	0.75
OSO_CREEK-DS-0	43	100	6500.00	185.00	190.72	190.16	192.56	0.015870	10.87	597.92	118.05	0.85	5.72	4.90
OSO_CREEK-DS-0	43	10	3558.00	185.00	188.97	188.50	190.21	0.016493	8.92	398.76	109.50	0.82	3.97	3.68
OSO_CREEK-DS-0	43	2	2178.00	185.00	187.95	187.54	188.83	0.016906	7.54	289.02	104.49	0.80	2.95	2.87
OSO_CREEK-DS-0	42	100	6500.00	185.00	190.17	190.17	192.47	0.022574	12.17	533.98	116.12	1.00	5.17	6.34
OSO_CREEK-DS-0	42	10	3558.00	185.00	188.50	188.50	190.13	0.025469	10.24	347.58	107.77	1.00	3.50	5.04
OSO_CREEK-DS-0	42	2	2178.00	185.00	187.54	187.54	188.76	0.027998	8.84	246.44	102.50	1.00	2.54	4.14
OSO_CREEK-DS-0	41	100	6500.00	179.00	190.75	184.50	191.17	0.001617	5.23	1241.95	128.67	0.30	11.75	0.93
OSO_CREEK-DS-0	41	10	3558.00	179.00	188.20	182.74	188.43	0.001162	3.85	923.92	119.20	0.24	9.20	0.54
OSO_CREEK-DS-0	41	2	2178.00	179.00	186.65	181.72	186.78	0.000816	2.92	744.99	111.85	0.20	7.65	0.33
OSO_CREEK-DS-0	40	100	6500.00	179.00	190.65	184.58	191.09	0.001679	5.32	1221.17	127.35	0.30	11.65	0.96
OSO_CREEK-DS-0	40	10	3558.00	179.00	188.13	182.80	188.37	0.001200	3.90	911.35	118.57	0.25	9.13	0.55
OSO_CREEK-DS-0	40	2	2178.00	179.00	186.60	181.77	186.74	0.000855	2.97	734.34	112.61	0.20	7.60	0.34
OSO_CREEK-DS-0	39	100	6500.00	181.00	190.26	186.64	191.04	0.003960	7.09	917.36	119.35	0.45	9.26	1.82
OSO_CREEK-DS-0	39	10	3558.00	181.00	187.86	184.83	188.34	0.003397	5.53	643.36	108.93	0.40	6.86	1.21
OSO_CREEK-DS-0	39	2	2178.00	181.00	186.41	183.78	186.71	0.002899	4.45	489.61	102.47	0.36	5.41	0.84
OSO_CREEK-DS-0	38	100	6500.00	180.96	190.00	186.54	190.81	0.001509	7.24	898.32	118.52	0.46	9.04	0.69
OSO_CREEK-DS-0	38	10	3558.00	180.96	187.65	184.76	188.14	0.001296	5.64	630.81	108.72	0.41	6.69	0.46
OSO_CREEK-DS-0	38	2	2178.00	180.96	186.23	183.73	186.55	0.001099	4.53	481.30	102.53	0.37	5.27	0.31
OSO_CREEK-DS-0	37	100	6500.00	180.58	189.92	186.20	190.70	0.001388	7.08	918.32	116.67	0.44	9.34	0.65
OSO_CREEK-DS-0	37	10	3558.00	180.58	187.59	184.40	188.04	0.001127	5.42	656.87	107.51	0.39	7.01	0.41
OSO_CREEK-DS-0	37	2	2178.00	180.58	186.18	183.35	186.47	0.000909	4.27	509.80	102.00	0.34	5.60	0.27
OSO_CREEK-DS-0	36	100	6500.00	180.00	189.70	185.62	190.40	0.003335	6.72	967.83	119.47	0.42	9.70	1.61
OSO_CREEK-DS-0	36	10	3558.00	180.00	187.41	183.82	187.81	0.002564	5.05	704.60	110.44	0.35	7.41	0.98

HEC-RAS Plan: PR River: OSO_CREEK Reach: OSO_CREEK-DS-0 (Continued)

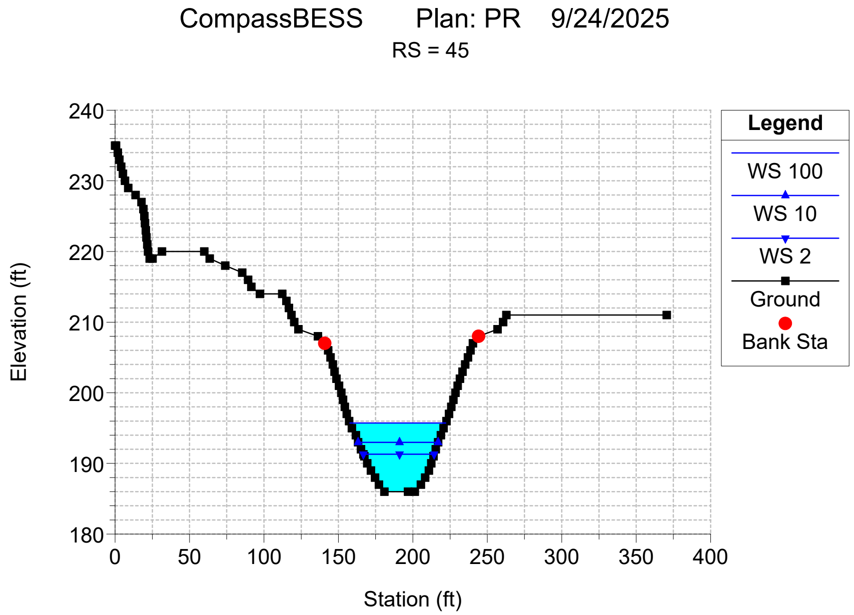
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	36	2	2178.00	180.00	186.05	182.78	186.28	0.001948	3.91	557.30	104.94	0.30	6.05	0.63
OSO_CREEK-DS-0	35	100	6500.00	182.00	188.28	187.62	190.24	0.015397	11.23	578.65	104.86	0.84	6.28	5.11
OSO_CREEK-DS-0	35	10	3558.00	182.00	186.34	185.82	187.68	0.016359	9.30	382.60	97.13	0.83	4.34	3.91
OSO_CREEK-DS-0	35	2	2178.00	182.00	185.22	184.78	186.18	0.016917	7.89	276.15	92.51	0.80	3.22	3.08
OSO_CREEK-DS-0	34	100	6500.00	182.00	187.63	187.63	190.15	0.022528	12.73	510.51	102.28	1.00	5.63	6.78
OSO_CREEK-DS-0	34	10	3558.00	182.00	185.83	185.83	187.60	0.025040	10.67	333.53	95.06	1.00	3.83	5.34
OSO_CREEK-DS-0	34	2	2178.00	182.00	184.79	184.79	186.11	0.027563	9.21	236.47	90.71	1.01	2.79	4.39
OSO_CREEK-DS-0	33	100	6500.00	172.00	183.42	177.60	183.89	0.001862	5.51	1179.79	126.28	0.32	11.42	1.04
OSO_CREEK-DS-0	33	10	3558.00	172.00	180.96	175.82	181.22	0.001325	4.04	880.51	117.12	0.26	8.96	0.60
OSO_CREEK-DS-0	33	2	2178.00	172.00	179.46	174.77	179.61	0.000937	3.07	709.85	110.46	0.21	7.46	0.36
OSO_CREEK-DS-0	32	100	6500.00	172.00	183.32	177.59	183.79	0.001900	5.54	1172.74	126.49	0.32	11.32	1.05
OSO_CREEK-DS-0	32	10	3558.00	172.00	180.89	175.80	181.15	0.001342	4.06	877.19	117.26	0.26	8.89	0.60
OSO_CREEK-DS-0	32	2	2178.00	172.00	179.42	174.77	179.56	0.000947	3.07	708.43	111.06	0.21	7.42	0.36
OSO_CREEK-DS-0	31	100	6500.00	174.00	182.83	179.72	183.73	0.004873	7.64	851.02	116.14	0.50	8.83	2.15
OSO_CREEK-DS-0	31	10	3558.00	174.00	180.56	177.92	181.11	0.004160	5.94	598.62	106.49	0.44	6.56	1.42
OSO_CREEK-DS-0	31	2	2178.00	174.00	179.18	176.85	179.53	0.003560	4.78	455.65	100.51	0.40	5.18	0.98
OSO_CREEK-DS-0	30	100	6500.00	173.30	182.30	178.93	183.14	0.001599	7.38	880.85	116.87	0.47	9.00	0.72
OSO_CREEK-DS-0	30	10	3558.00	173.30	180.15	177.13	180.63	0.001233	5.56	640.08	107.48	0.40	6.85	0.44
OSO_CREEK-DS-0	30	2	2178.00	173.30	178.86	176.09	179.15	0.000947	4.32	504.73	102.22	0.34	5.56	0.28
OSO_CREEK-DS-0	29	100	6500.00	173.00	182.06	178.46	182.81	0.003792	6.95	935.84	122.02	0.44	9.06	1.75
OSO_CREEK-DS-0	29	10	3558.00	173.00	179.96	176.72	180.38	0.002851	5.17	688.45	113.87	0.37	6.96	1.05
OSO_CREEK-DS-0	29	2	2178.00	173.00	178.71	175.71	178.96	0.002128	3.97	549.09	109.13	0.31	5.71	0.65
OSO_CREEK-DS-0	28	100	6500.00	175.00	180.80	180.21	182.66	0.015518	10.93	594.91	114.11	0.84	5.80	4.91
OSO_CREEK-DS-0	28	10	3558.00	175.00	179.00	178.53	180.26	0.016516	9.00	395.38	107.25	0.83	4.00	3.73
OSO_CREEK-DS-0	28	2	2178.00	175.00	177.97	177.57	178.86	0.017123	7.61	286.30	103.20	0.81	2.97	2.92
OSO_CREEK-DS-0	27	100	6500.00	175.00	180.21	180.21	182.57	0.022476	12.32	527.45	111.81	1.00	5.21	6.45
OSO_CREEK-DS-0	27	10	3558.00	175.00	178.53	178.53	180.18	0.025376	10.32	344.84	105.40	1.01	3.53	5.10
OSO_CREEK-DS-0	27	2	2178.00	175.00	177.57	177.57	178.79	0.027900	8.87	245.50	101.51	1.01	2.57	4.16
OSO_CREEK-DS-0	26	100	6500.00	169.00	179.96	174.26	180.39	0.001613	5.37	1248.87	136.76	0.30	10.96	0.96
OSO_CREEK-DS-0	26	10	3558.00	169.00	177.65	172.56	177.88	0.001133	3.88	941.96	128.84	0.25	8.65	0.54
OSO_CREEK-DS-0	26	2	2178.00	169.00	176.24	171.59	176.36	0.000798	2.92	764.18	122.29	0.20	7.24	0.32
OSO_CREEK-DS-0	25	100	6500.00	168.99	179.89	174.18	180.29	0.001628	5.08	1279.80	142.18	0.30	10.90	0.89
OSO_CREEK-DS-0	25	10	3558.00	168.99	177.60	172.52	177.81	0.001153	3.70	962.82	134.00	0.24	8.61	0.50
OSO_CREEK-DS-0	25	2	2178.00	168.99	176.19	171.56	176.32	0.000819	2.80	779.06	128.04	0.20	7.20	0.30
OSO_CREEK-DS-0	24	100	6500.00	171.00	179.38	176.48	180.23	0.001749	7.42	875.92	125.97	0.50	8.38	0.74
OSO_CREEK-DS-0	24	10	3558.00	171.00	177.26	174.75	177.77	0.001499	5.75	618.25	116.73	0.44	6.26	0.49

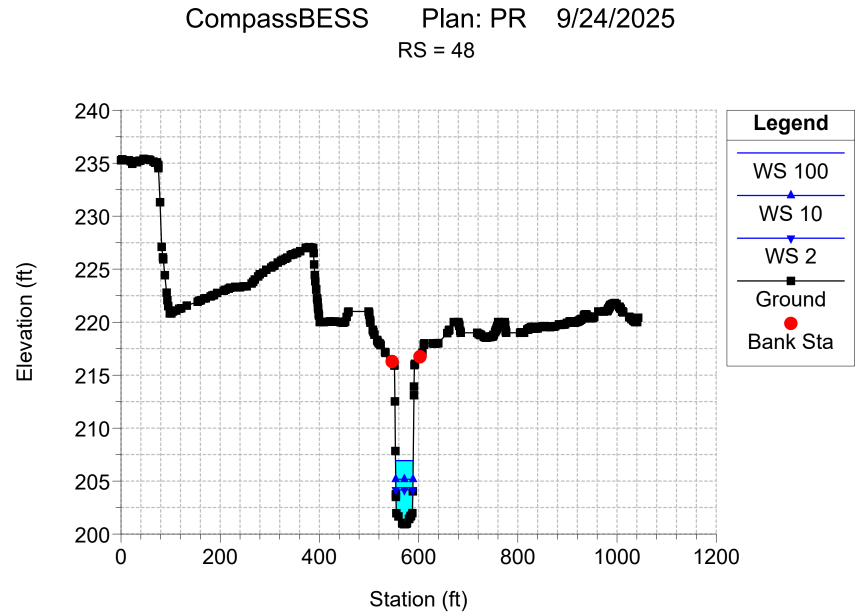
HEC-RAS Plan: PR River: OSO_CREEK Reach: OSO_CREEK-DS-0 (Continued)

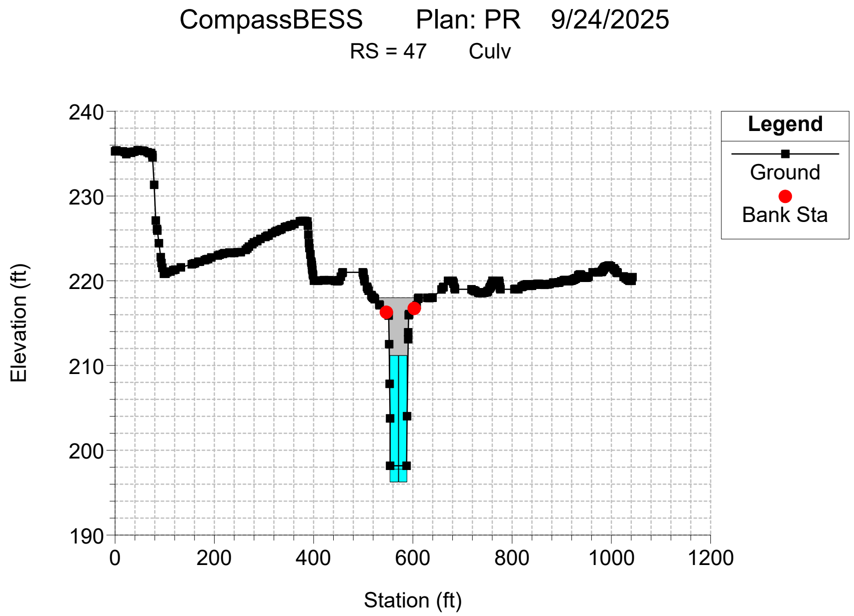
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	24	2	2178.00	171.00	175.96	173.73	176.29	0.001290	4.63	470.49	110.44	0.40	4.96	0.34
OSO_CREEK-DS-0	23	100	6500.00	170.50	179.17	175.99	179.95	0.001575	7.07	919.50	132.04	0.47	8.67	0.67
OSO_CREEK-DS-0	23	10	3558.00	170.50	177.08	174.25	177.54	0.001265	5.42	656.47	119.49	0.41	6.58	0.43
OSO_CREEK-DS-0	23	2	2178.00	170.50	175.81	173.24	176.10	0.001006	4.27	509.65	111.87	0.35	5.31	0.28
OSO_CREEK-DS-0	22	100	6500.00	170.00	178.98	175.06	179.55	0.003032	6.09	1067.64	145.86	0.40	8.98	1.36
OSO_CREEK-DS-0	22	10	3558.00	170.00	176.91	173.45	177.23	0.002298	4.57	779.06	133.46	0.33	6.91	0.82
OSO_CREEK-DS-0	22	2	2178.00	170.00	175.67	172.51	175.86	0.001718	3.52	618.34	126.03	0.28	5.67	0.52
OSO_CREEK-DS-0	21	100	6500.00	172.00	177.73	177.06	179.41	0.014727	10.38	626.26	126.41	0.82	5.73	4.49
OSO_CREEK-DS-0	21	10	3558.00	172.00	175.95	175.45	177.12	0.015933	8.66	410.69	115.72	0.81	3.95	3.49
OSO_CREEK-DS-0	21	2	2178.00	172.00	174.93	174.51	175.78	0.016586	7.37	295.46	109.59	0.79	2.93	2.77
OSO_CREEK-DS-0	20	100	6500.00	172.00	177.07	177.07	179.31	0.022795	12.01	541.16	121.90	1.01	5.07	6.23
OSO_CREEK-DS-0	20	10	3558.00	172.00	175.46	175.46	177.04	0.025371	10.09	352.78	112.30	1.00	3.46	4.93
OSO_CREEK-DS-0	20	2	2178.00	172.00	174.52	174.52	175.70	0.028004	8.72	249.71	106.69	1.01	2.52	4.06
OSO_CREEK-DS-0	19	100	6500.00	163.00	174.04	168.41	174.49	0.001840	5.39	1206.61	134.15	0.32	11.04	1.00
OSO_CREEK-DS-0	19	10	3558.00	163.00	171.72	166.67	171.96	0.001271	3.92	907.51	123.74	0.26	8.72	0.56
OSO_CREEK-DS-0	19	2	2178.00	163.00	170.29	165.67	170.43	0.000889	2.96	735.51	117.31	0.21	7.29	0.34
OSO_CREEK-DS-0	18	100	6500.00	163.00	173.94	168.40	174.40	0.001897	5.44	1193.96	133.73	0.32	10.94	1.02
OSO_CREEK-DS-0	18	10	3558.00	163.00	171.65	166.67	171.90	0.001302	3.95	900.19	123.47	0.26	8.65	0.58
OSO_CREEK-DS-0	18	2	2178.00	163.00	170.25	165.67	170.38	0.000906	2.98	731.09	117.15	0.21	7.25	0.34
OSO_CREEK-DS-0	17	100	6500.00	165.00	173.60	170.32	174.36	0.001511	7.00	928.98	130.93	0.46	8.60	0.65
OSO_CREEK-DS-0	17	10	3558.00	165.00	171.41	168.62	171.87	0.001274	5.43	655.13	119.29	0.41	6.41	0.43
OSO_CREEK-DS-0	17	2	2178.00	165.00	170.07	167.64	170.36	0.001076	4.35	500.18	112.16	0.36	5.07	0.29
OSO_CREEK-DS-0	16	100	6500.00	164.50	173.46	169.76	174.09	0.001221	6.40	1015.41	139.84	0.42	8.96	0.54
OSO_CREEK-DS-0	16	10	3558.00	164.50	171.28	168.08	171.65	0.000996	4.92	723.37	127.46	0.36	6.78	0.35
OSO_CREEK-DS-0	16	2	2178.00	164.50	169.96	167.12	170.19	0.000799	3.89	560.31	119.38	0.32	5.46	0.23
OSO_CREEK-DS-0	15	100	6500.00	164.00	173.20	169.29	173.82	0.003164	6.28	1034.48	138.83	0.41	9.20	1.44
OSO_CREEK-DS-0	15	10	3558.00	164.00	171.08	167.60	171.43	0.002416	4.73	752.48	126.85	0.34	7.08	0.88
OSO_CREEK-DS-0	15	2	2178.00	164.00	169.81	166.63	170.01	0.001818	3.66	595.40	119.42	0.29	5.81	0.56
OSO_CREEK-DS-0	14	100	6500.00	166.00	171.86	171.27	173.66	0.015602	10.77	603.70	120.27	0.85	5.86	4.81
OSO_CREEK-DS-0	14	10	3558.00	166.00	170.06	169.60	171.31	0.016698	8.97	396.49	109.66	0.83	4.06	3.72
OSO_CREEK-DS-0	14	2	2178.00	166.00	169.01	168.63	169.92	0.017329	7.64	285.13	103.51	0.81	3.01	2.95
OSO_CREEK-DS-0	13	100	6500.00	166.00	171.26	171.26	173.57	0.022616	12.18	533.57	116.82	1.00	5.26	6.35
OSO_CREEK-DS-0	13	10	3558.00	166.00	169.59	169.59	171.23	0.025287	10.27	346.52	107.01	1.01	3.59	5.06
OSO_CREEK-DS-0	13	2	2178.00	166.00	168.62	168.62	169.85	0.027703	8.87	245.48	101.31	1.00	2.62	4.15
OSO_CREEK-DS-0	12	100	6500.00	158.00	169.30	163.47	169.70	0.001635	5.06	1285.03	144.93	0.30	11.30	0.88
OSO_CREEK-DS-0	12	10	3558.00	158.00	166.88	161.74	167.10	0.001203	3.76	947.22	133.29	0.25	8.88	0.52

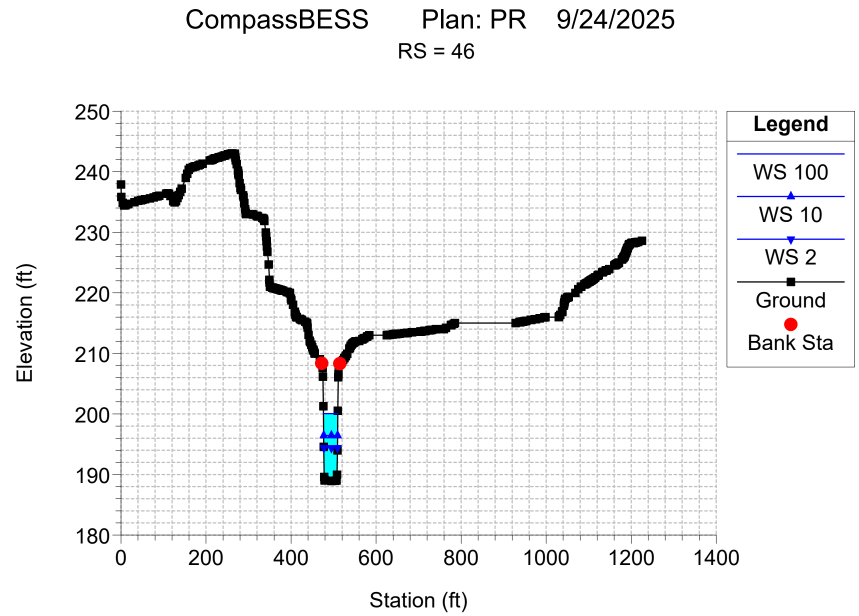
HEC-RAS Plan: PR River: OSO_CREEK Reach: OSO_CREEK-DS-0 (Continued)

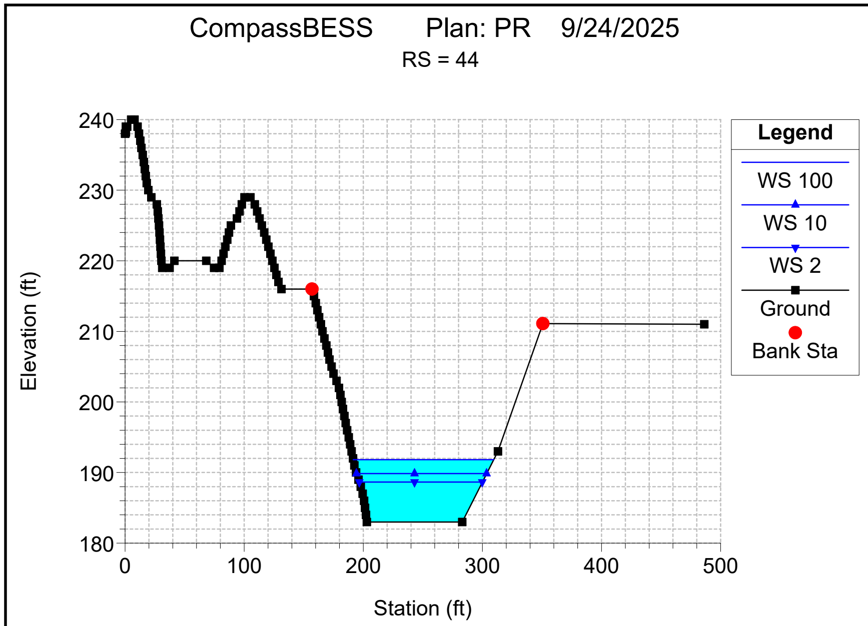
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Max Chl Dpth	Shear Chan
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(lb/sq ft)
OSO_CREEK-DS-0	12	2	2178.00	158.00	165.41	160.74	165.54	0.000865	2.88	757.34	124.45	0.21	7.41	0.32
OSO_CREEK-DS-0	11	100	6500.00	158.00	169.15	163.53	169.60	0.001880	5.40	1202.71	135.75	0.32	11.15	1.01
OSO_CREEK-DS-0	11	10	3558.00	158.00	166.79	161.77	167.04	0.001322	3.97	896.53	123.96	0.26	8.79	0.58
OSO_CREEK-DS-0	11	2	2178.00	158.00	165.35	160.75	165.49	0.000933	3.01	723.08	116.75	0.21	7.35	0.35
OSO_CREEK-DS-0	10	100	6500.00	160.00	168.82	165.48	169.56	0.001483	6.92	938.87	132.92	0.46	8.82	0.64
OSO_CREEK-DS-0	10	10	3558.00	160.00	166.54	163.76	167.01	0.001291	5.46	651.94	119.26	0.41	6.54	0.43
OSO_CREEK-DS-0	10	2	2178.00	160.00	165.17	162.74	165.47	0.001109	4.41	493.35	111.00	0.37	5.17	0.30
OSO_CREEK-DS-0	9	100	6500.00	159.50	168.72	164.95	169.37	0.001241	6.46	1005.81	138.22	0.42	9.22	0.55
OSO_CREEK-DS-0	9	10	3558.00	159.50	166.45	163.23	166.84	0.001028	5.02	708.64	123.90	0.37	6.95	0.36
OSO_CREEK-DS-0	9	2	2178.00	159.50	165.09	162.23	165.33	0.000835	3.99	545.39	115.28	0.32	5.59	0.24
OSO_CREEK-DS-0	8	100	6500.00	159.00	168.43	164.57	169.15	0.002936	7.19	1000.47	131.38	0.41	9.43	1.73
OSO_CREEK-DS-0	8	10	3558.00	159.00	166.27	162.79	166.67	0.002262	5.30	728.76	120.37	0.35	7.27	1.03
OSO_CREEK-DS-0	8	2	2178.00	159.00	164.96	161.76	165.19	0.001729	4.06	575.37	113.19	0.29	5.96	0.64
OSO_CREEK-DS-0	7	100	6500.00	161.00	167.12	166.52	169.00	0.013358	11.49	611.82	118.69	0.82	6.12	5.10
OSO_CREEK-DS-0	7	10	3558.00	161.00	165.24	164.76	166.55	0.014819	9.48	398.49	107.98	0.81	4.24	3.92
OSO_CREEK-DS-0	7	2	2178.00	161.00	164.15	163.75	165.10	0.015764	8.01	284.49	100.77	0.80	3.15	3.10
OSO_CREEK-DS-0	6	100	6500.00	161.00	166.52	166.52	168.91	0.019361	12.91	541.63	115.64	0.97	5.52	6.67
OSO_CREEK-DS-0	6	10	3558.00	161.00	164.76	164.76	166.48	0.022508	10.79	347.93	104.85	0.98	3.76	5.29
OSO_CREEK-DS-0	6	2	2178.00	161.00	163.75	163.75	165.03	0.025283	9.27	244.66	98.13	0.99	2.75	4.34
OSO_CREEK-DS-0	5	100	6500.00	156.00	166.05	162.07	166.81	0.002930	7.49	986.38	128.30	0.42	10.05	1.84
OSO_CREEK-DS-0	5	10	3558.00	156.00	163.73	160.17	164.16	0.002329	5.61	704.77	114.37	0.36	7.73	1.12
OSO_CREEK-DS-0	5	2	2178.00	156.00	162.37	159.05	162.63	0.001765	4.29	555.20	106.24	0.30	6.37	0.70
OSO_CREEK-DS-0	3.1	100	6500.00	156.00	165.86	162.07	166.65	0.003153	7.67	961.58	127.13	0.43	9.86	1.94
OSO_CREEK-DS-0	3.1	10	3558.00	156.00	163.59	160.17	164.04	0.002493	5.73	688.64	113.52	0.37	7.59	1.18
OSO_CREEK-DS-0	3.1	2	2178.00	156.00	162.27	159.05	162.54	0.001873	4.37	544.29	105.62	0.31	6.27	0.73
OSO_CREEK-DS-0	3	100	6500.00	158.00	165.29	163.55	166.58	0.002635	9.56	742.46	123.73	0.62	7.29	1.20
OSO_CREEK-DS-0	3	10	3558.00	158.00	163.10	161.78	163.98	0.002842	7.82	485.54	110.57	0.61	5.10	0.90
OSO_CREEK-DS-0	3	2	2178.00	158.00	161.88	160.76	162.49	0.002780	6.45	355.47	103.27	0.58	3.88	0.67
OSO_CREEK-DS-0	2	100	6500.00	158.00	164.74	163.55	166.29	0.003504	10.46	674.91	120.41	0.71	6.74	1.47
OSO_CREEK-DS-0	2	10	3558.00	158.00	162.39	161.78	163.63	0.004812	9.21	408.94	106.34	0.78	4.39	1.32
OSO_CREEK-DS-0	2	2	2178.00	158.00	161.18	160.76	162.13	0.005572	7.99	284.45	99.06	0.79	3.18	1.11
OSO_CREEK-DS-0	1	100	6500.00	156.00	162.95	162.91	165.65	0.008211	13.18	493.35	90.90	1.00	6.95	2.58
OSO_CREEK-DS-0	1	10	3558.00	156.00	161.23	161.11	162.95	0.008199	10.52	338.34	89.20	0.95	5.23	1.84
OSO_CREEK-DS-0	1	2	2178.00	156.00	160.23	160.06	161.41	0.008204	8.73	249.46	87.99	0.91	4.23	1.39

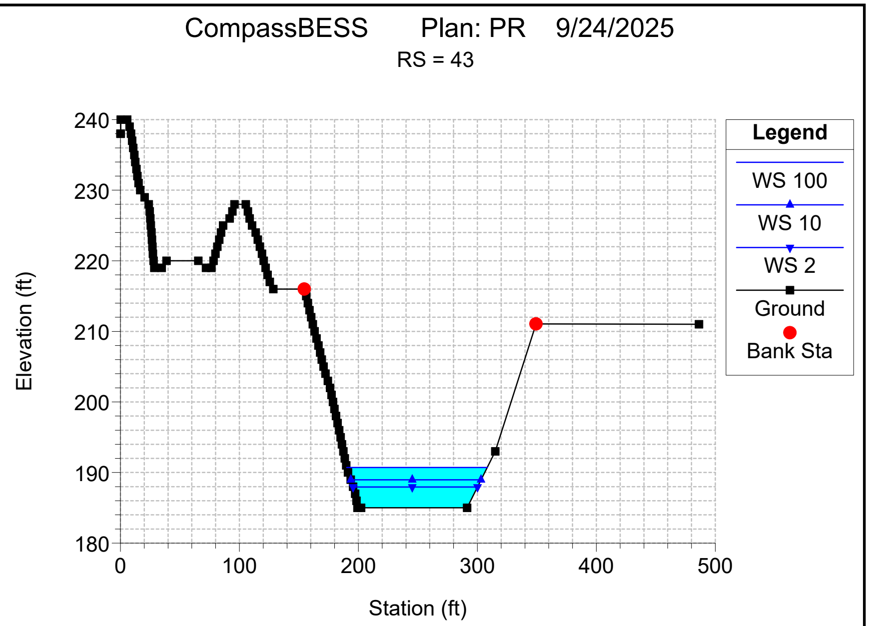

CompassBESS Plan: PR 9/24/2025
RS = 45
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
0
50
100
150
200
250
300
350
400

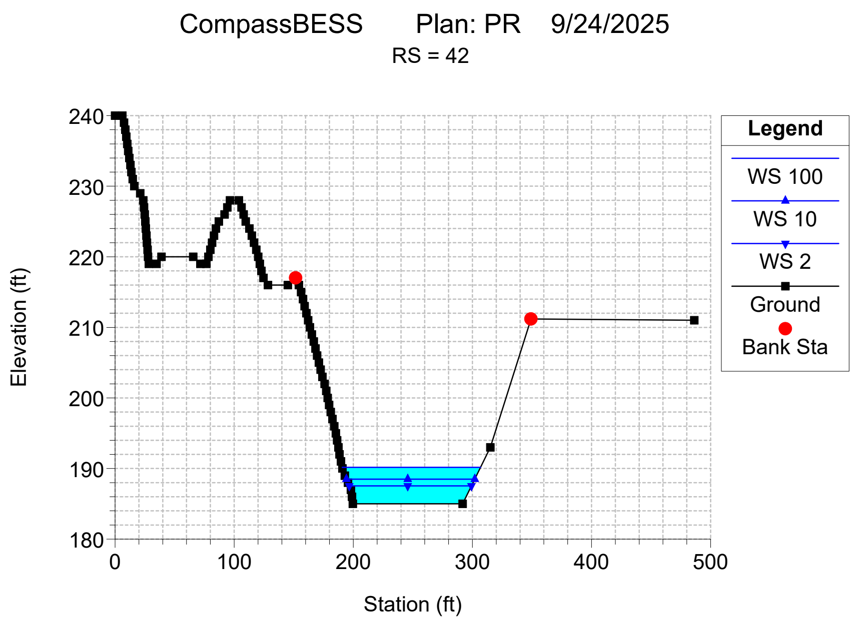

CompassBESS Plan: PR 9/24/2025
RS = 48
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
235
230
225
220
215
210
205
200
0
200
400
600
800
1000
1200

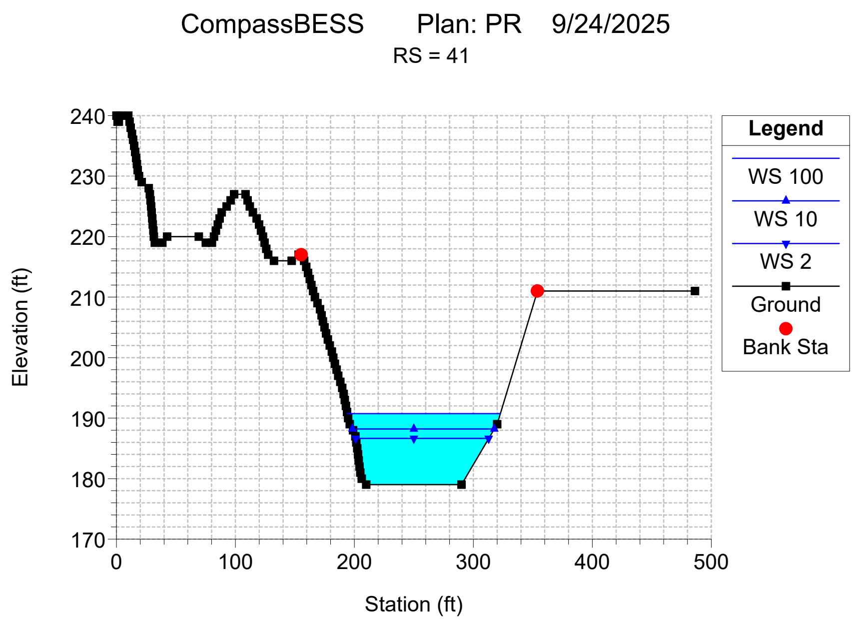

CompassBESS Plan: PR 9/24/2025
RS = 47 Culv
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
240
230
220
210
200
190
0
200
400
600
800
1000
1200

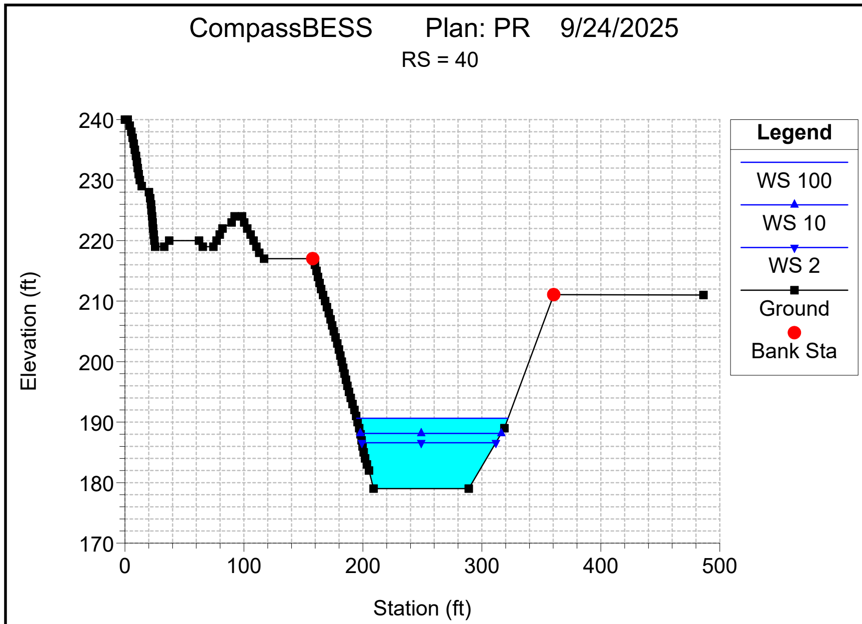

CompassBESS Plan: PR 9/24/2025
RS = 46
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
250
240
230
220
210
200
190
180
0
200
400
600
800
1000
1200
1400

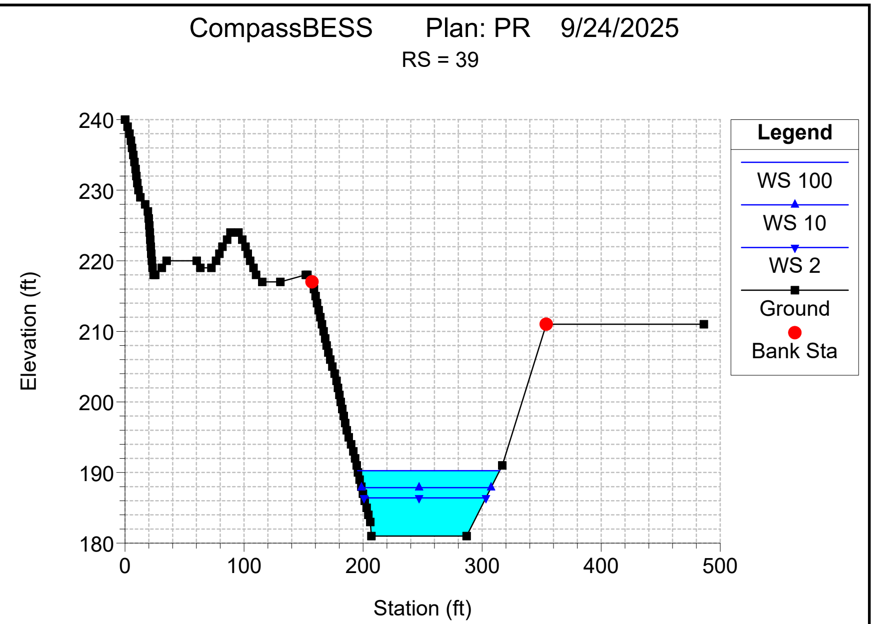

CompassBESS Plan: PR 9/24/2025
RS = 44
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

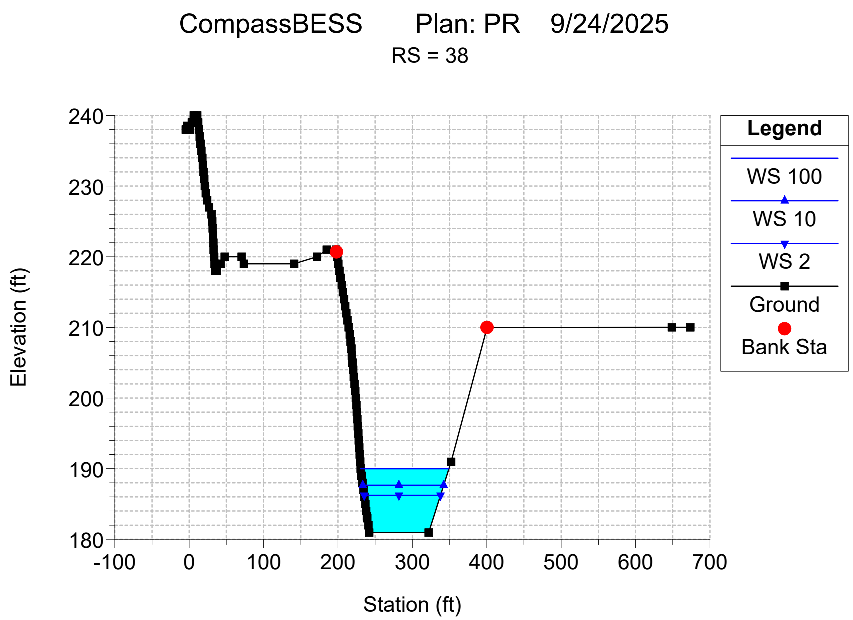

CompassBESS Plan: PR 9/24/2025
RS = 43
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

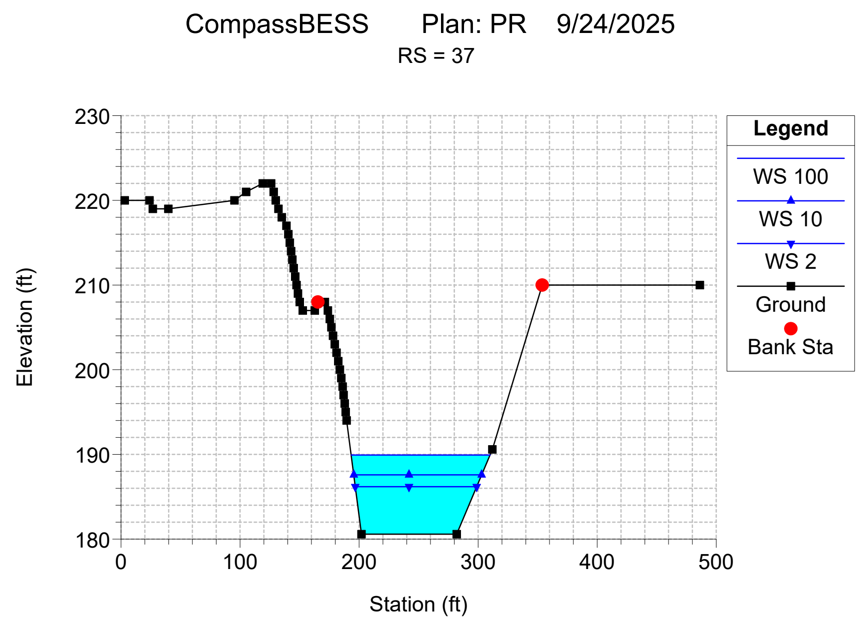

CompassBESS Plan: PR 9/24/2025
RS = 42
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

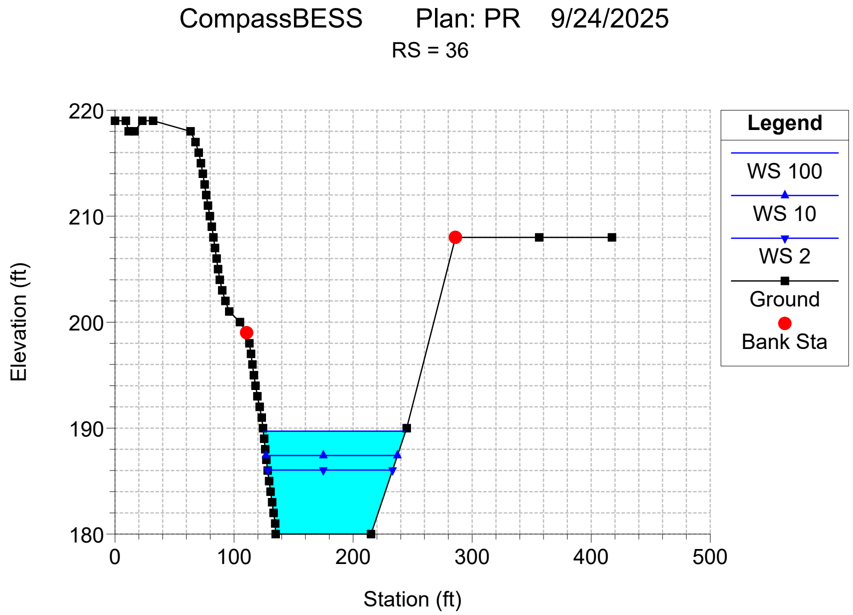

CompassBESS Plan: PR 9/24/2025
RS = 41
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

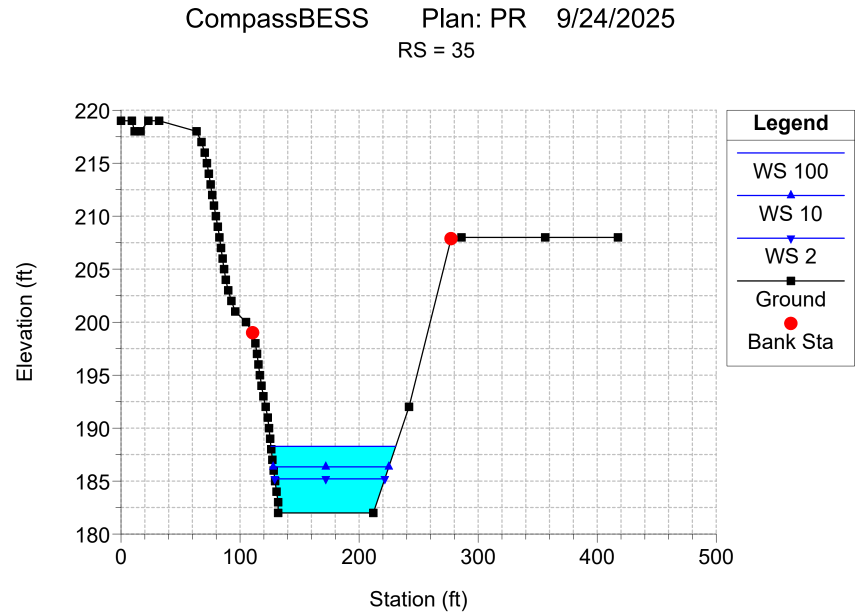

CompassBESS Plan: PR 9/24/2025
RS = 40
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
170
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

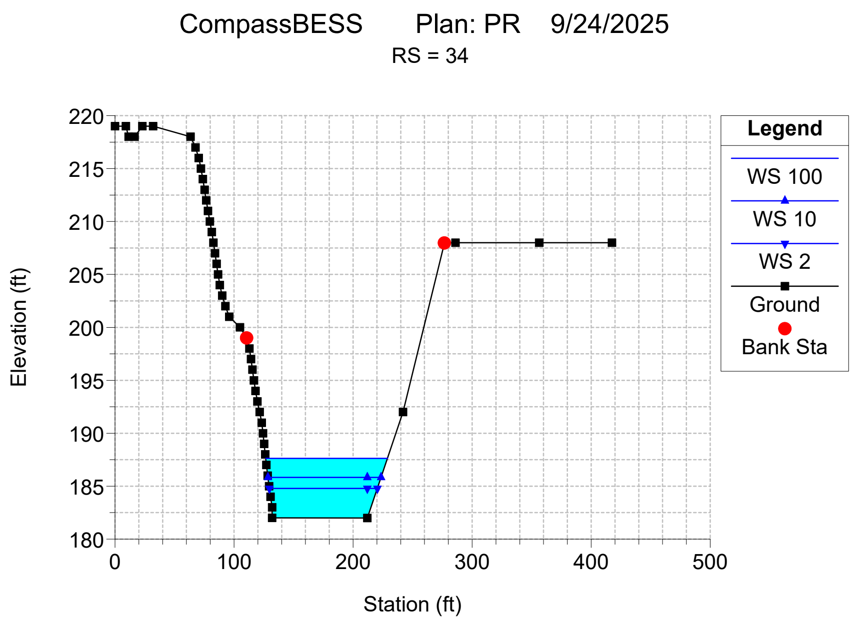

CompassBESS Plan: PR 9/24/2025
RS = 39
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

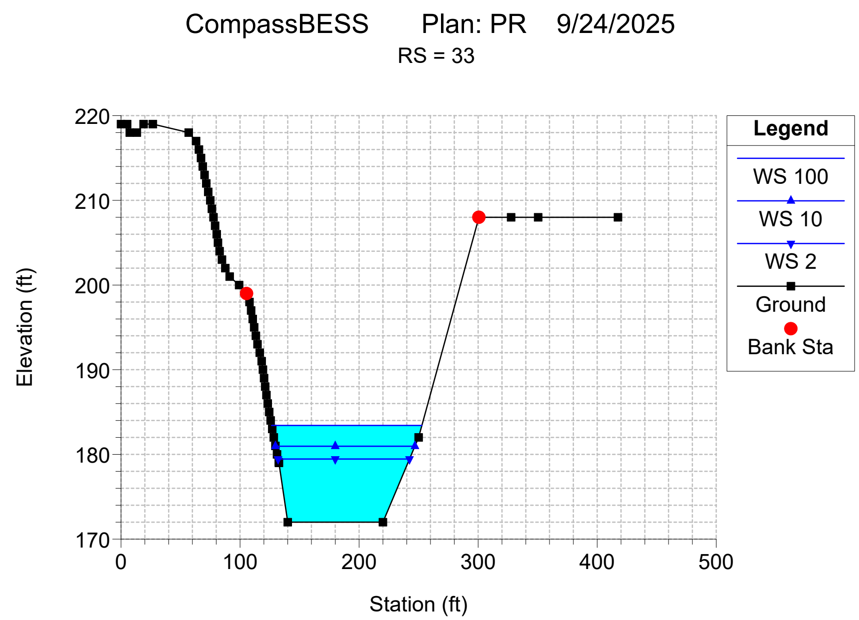

CompassBESS Plan: PR 9/24/2025
RS = 38
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
-100
0
100
200
300
400
500
600
700
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

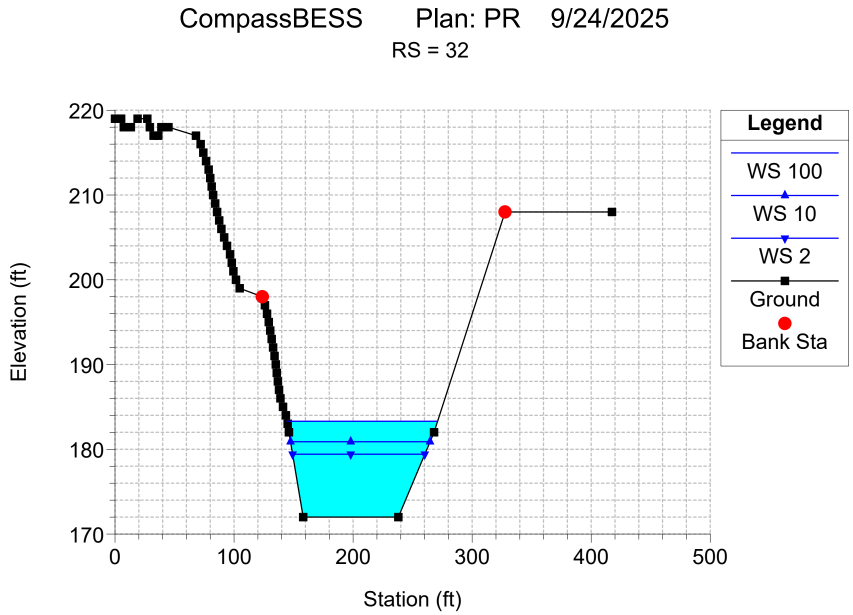

CompassBESS Plan: PR 9/24/2025
RS = 37
Elevation (ft)
Station (ft)
230
220
210
200
190
180
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

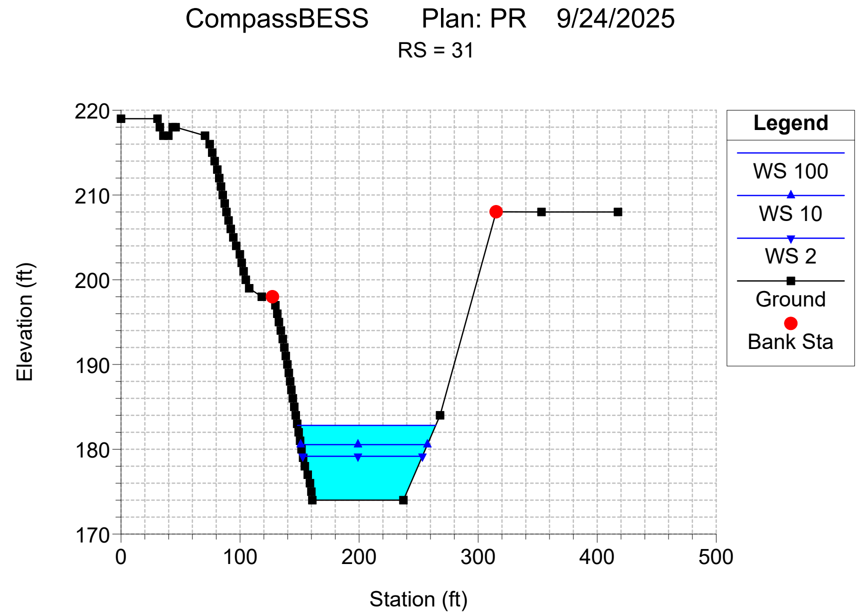

CompassBESS Plan: PR 9/24/2025
RS = 36
Elevation (ft)
220
210
200
190
180
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

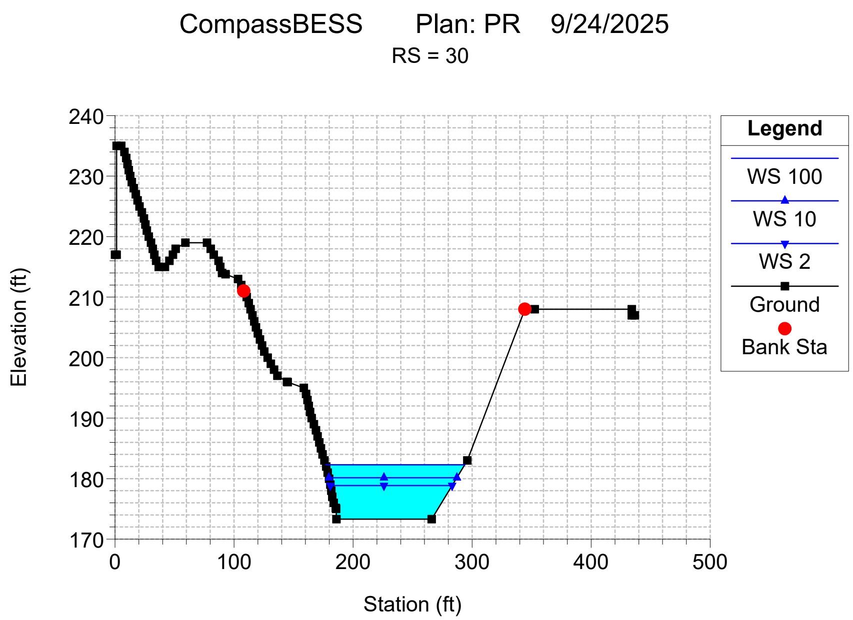

CompassBESS Plan: PR 9/24/2025
RS = 35
Elevation (ft)
220
215
210
205
200
195
190
185
180
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

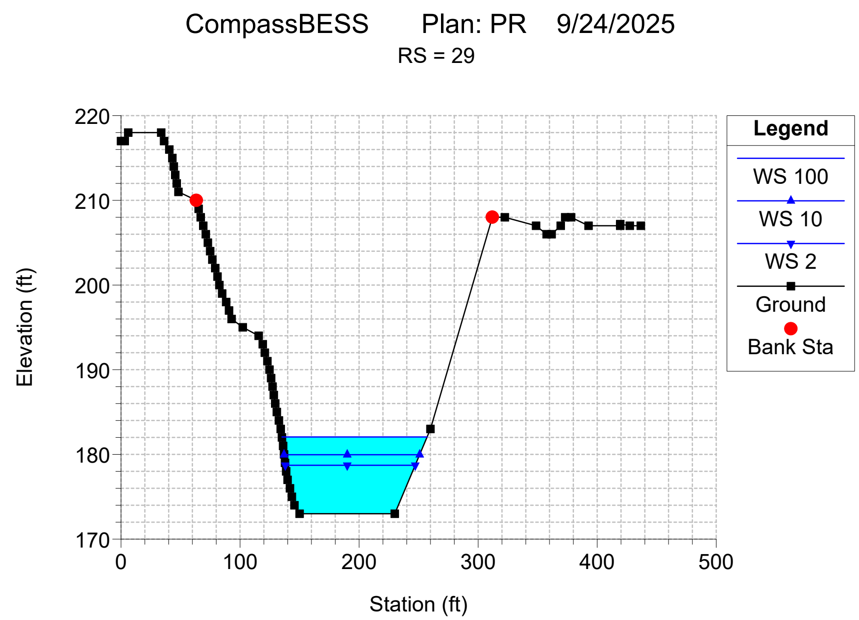

CompassBESS Plan: PR 9/24/2025
RS = 34
Elevation (ft)
220
215
210
205
200
195
190
185
180
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

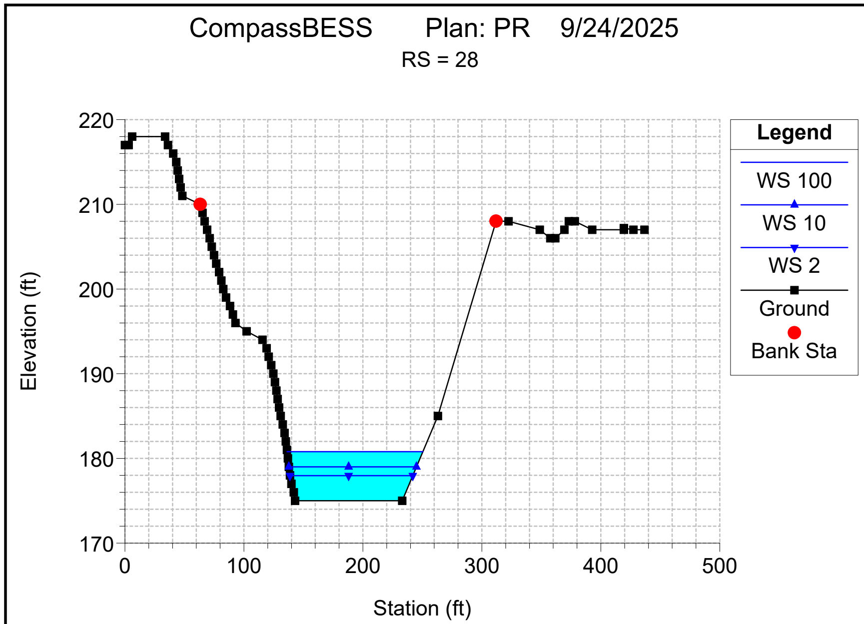

CompassBESS Plan: PR 9/24/2025
RS = 33
Elevation (ft)
220
210
200
190
180
170
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

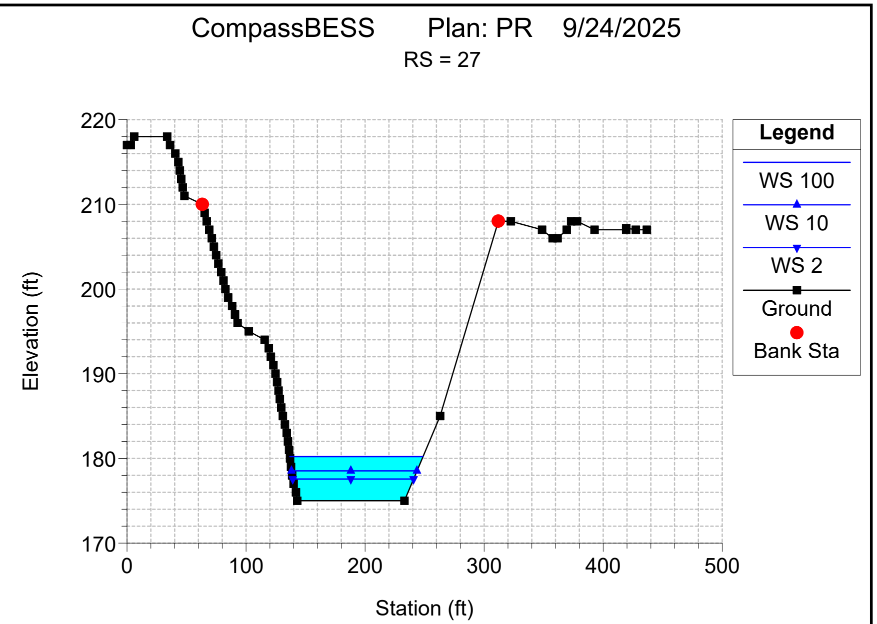

CompassBESS Plan: PR 9/24/2025
RS = 32
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

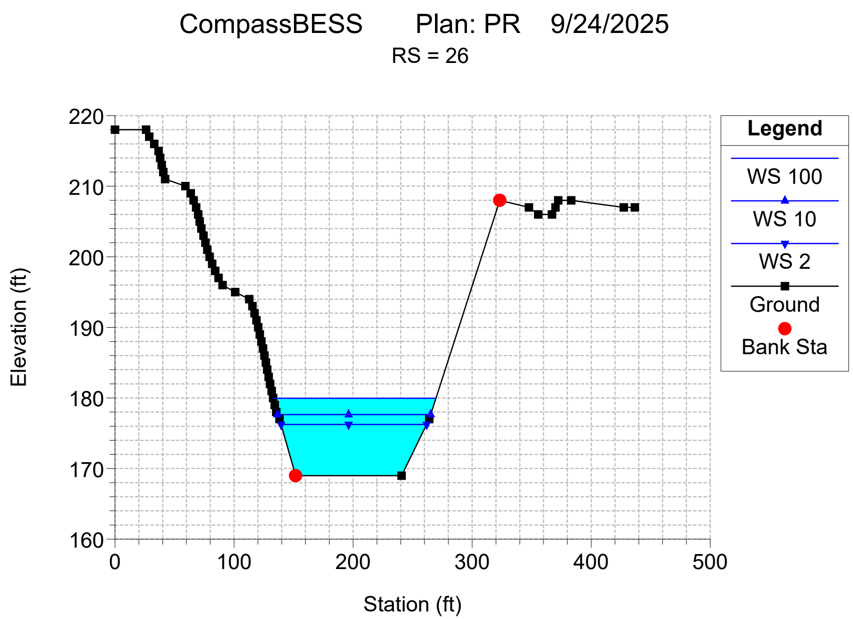

CompassBESS Plan: PR 9/24/2025
RS = 31
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

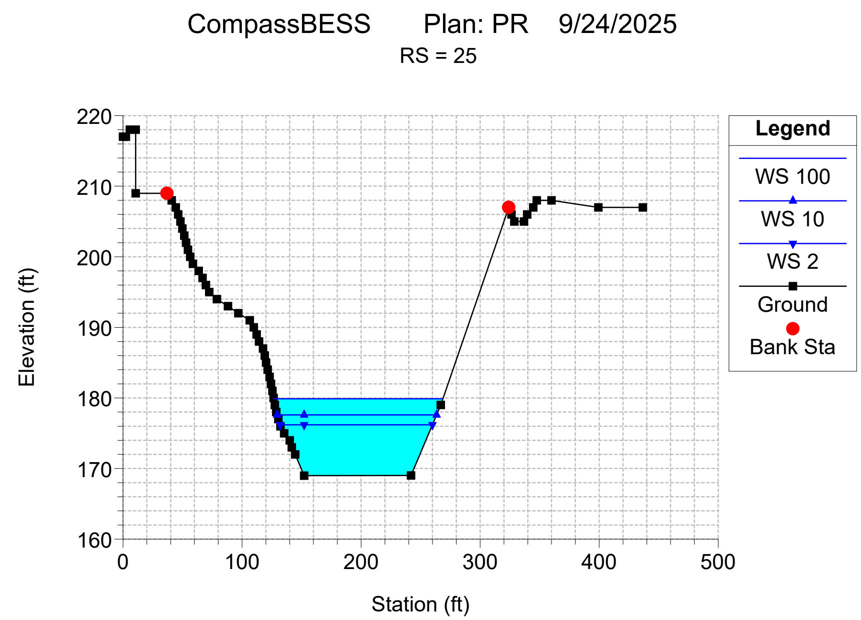

CompassBESS Plan: PR 9/24/2025
RS = 30
Elevation (ft)
Station (ft)
240
230
220
210
200
190
180
170
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

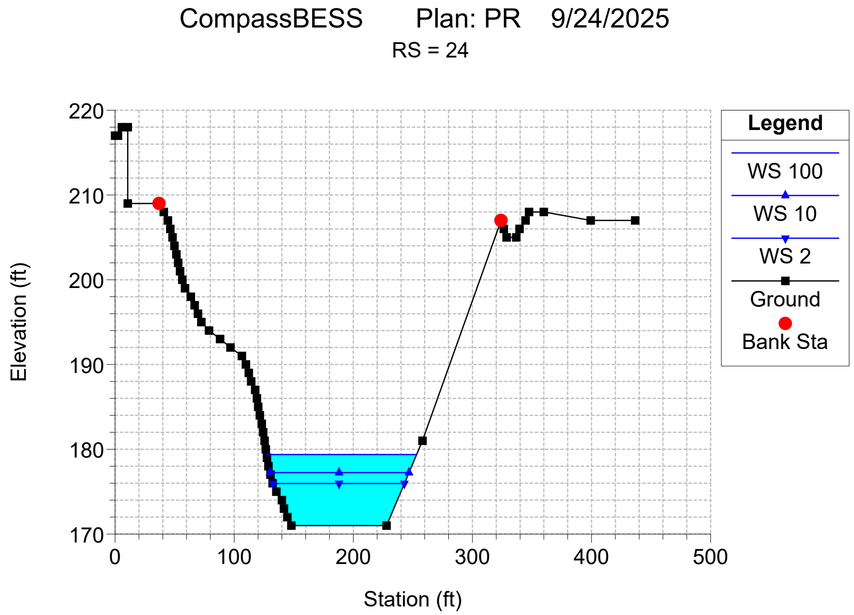

CompassBESS Plan: PR 9/24/2025
RS = 29
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

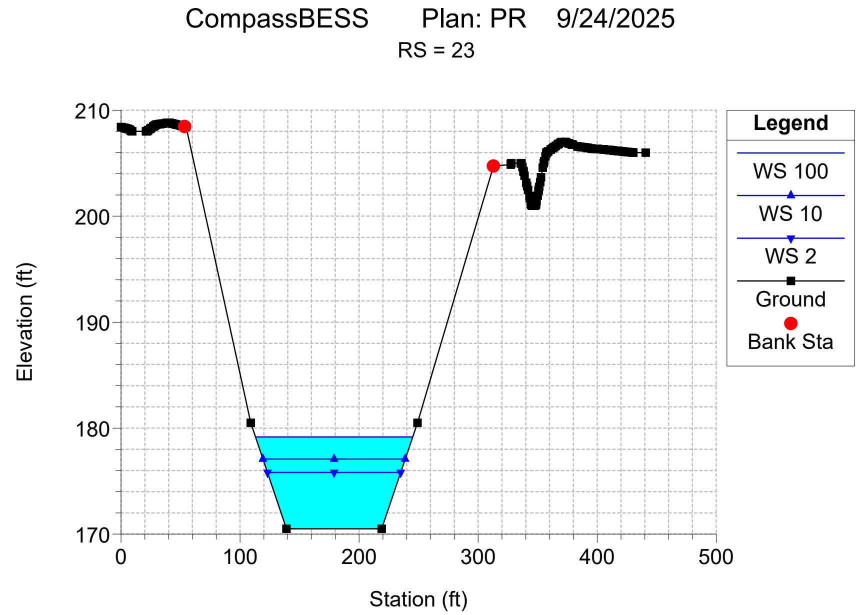

CompassBESS Plan: PR 9/24/2025
RS = 28
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500

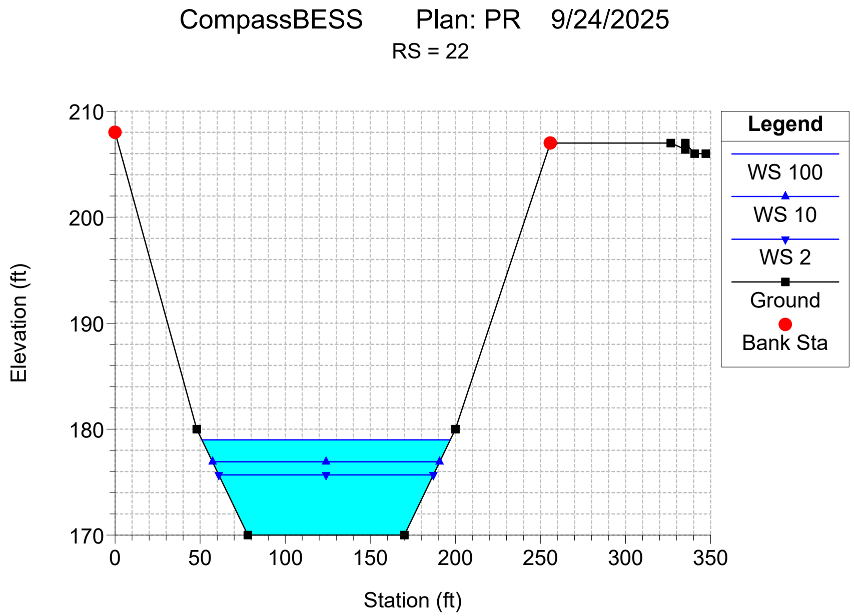

CompassBESS Plan: PR 9/24/2025
RS = 27
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 26
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 25
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 24
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
220
210
200
190
180
170
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 23
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
210
200
190
180
170
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 22
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
210
200
190
180
170
0
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100
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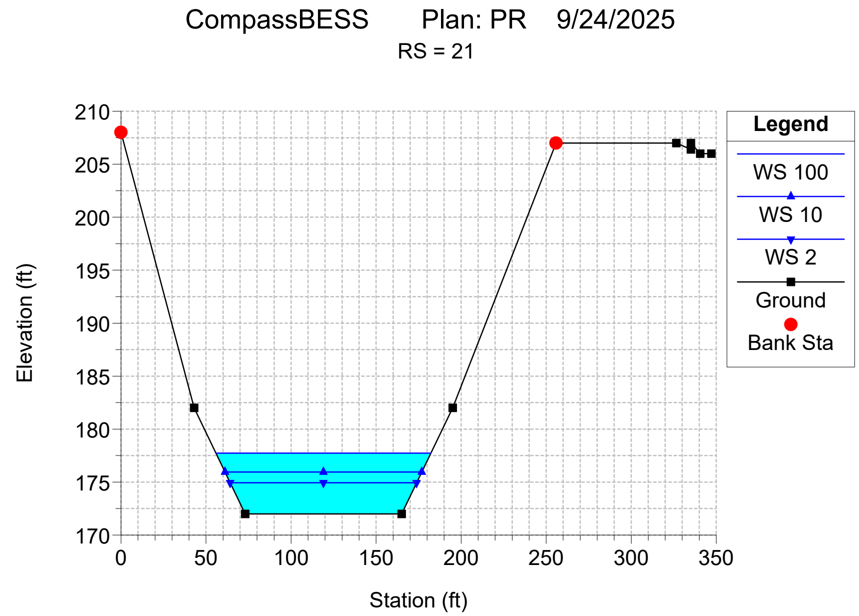
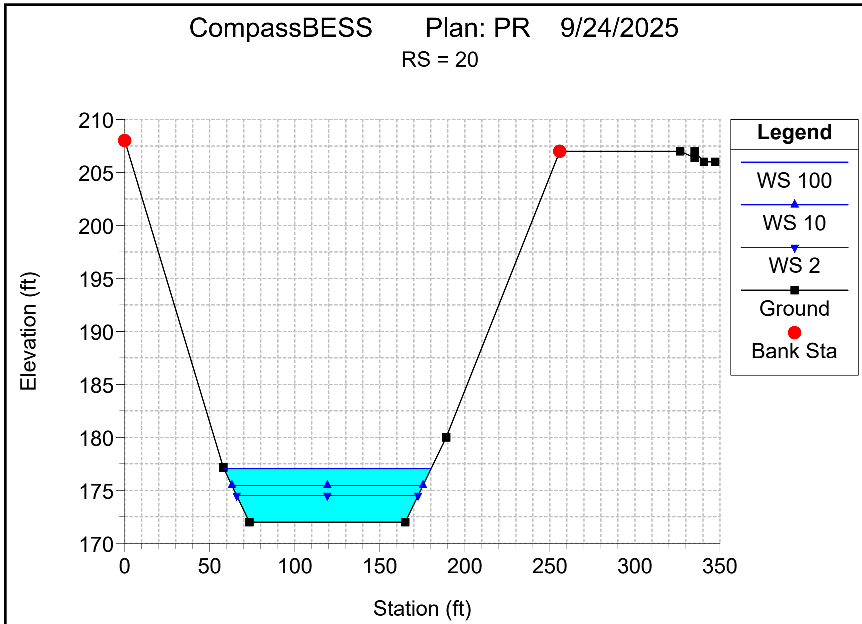
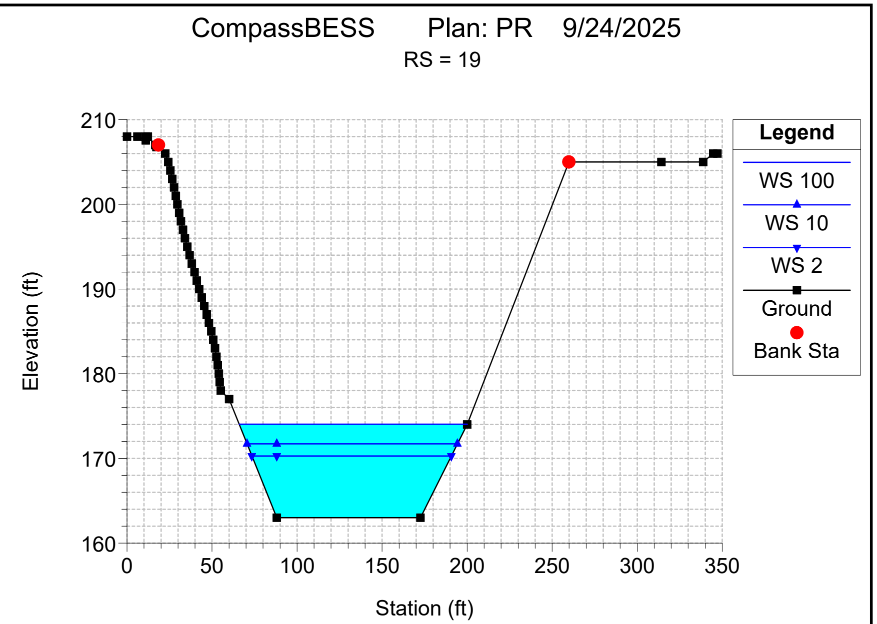
200
250
300
350


CompassBESS Plan: PR 9/24/2025
RS = 21
Elevation (ft)
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
210
205
200
195
190
185
180
175
170
0
50
100
150
200
250
300
350


CompassBESS Plan: PR 9/24/2025
RS = 20
Elevation (ft)
210
205
200
195
190
185
180
175
170
0
50
100
150
200
250
300
350
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 19
Elevation (ft)
210
200
190
180
170
160
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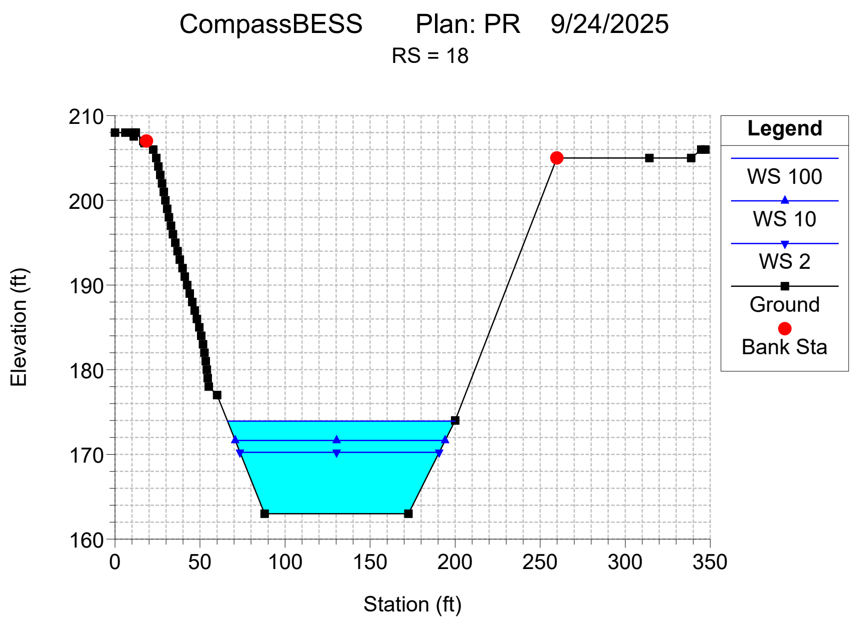
50
100
150
200
250
300
350
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 18
Elevation (ft)
210
200
190
180
170
160
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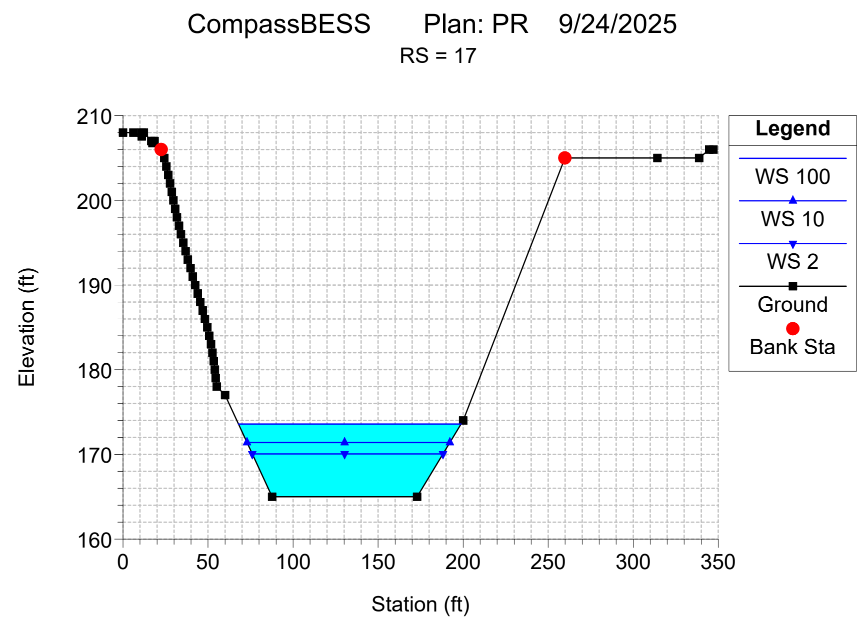
50
100
150
200
250
300
350
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 17
Elevation (ft)
210
200
190
180
170
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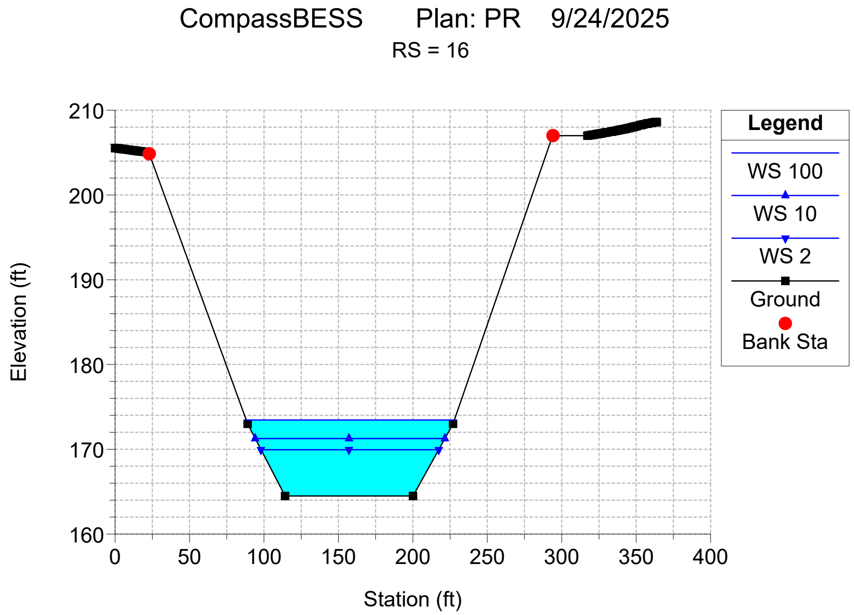
100
150
200
250
300
350
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 16
Elevation (ft)
Station (ft)
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200
190
180
170
160
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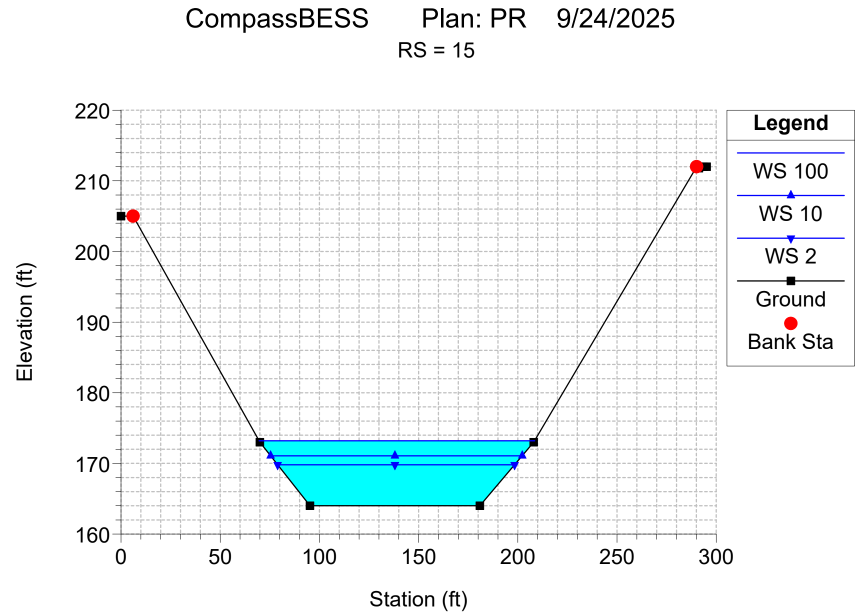
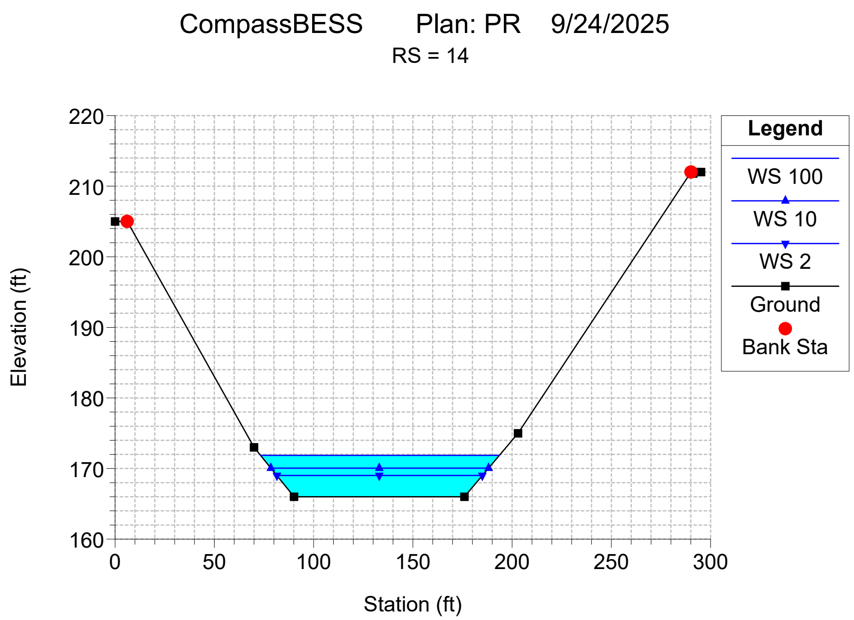
100
150
200
250
300
350
400
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 15
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
0
50
100
150
200
250
300
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 14
Elevation (ft)
Station (ft)
220
210
200
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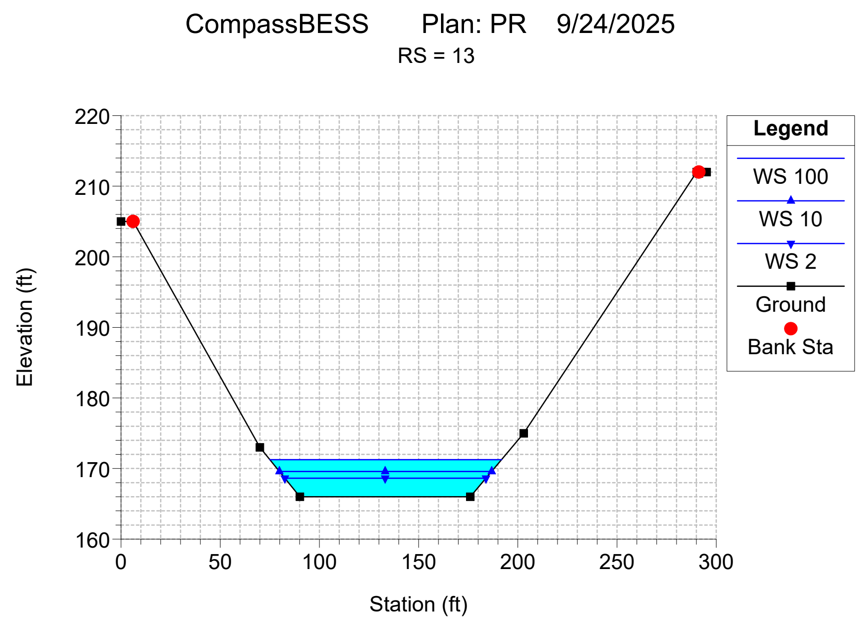
100
150
200
250
300
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 13
Elevation (ft)
Station (ft)
220
210
200
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180
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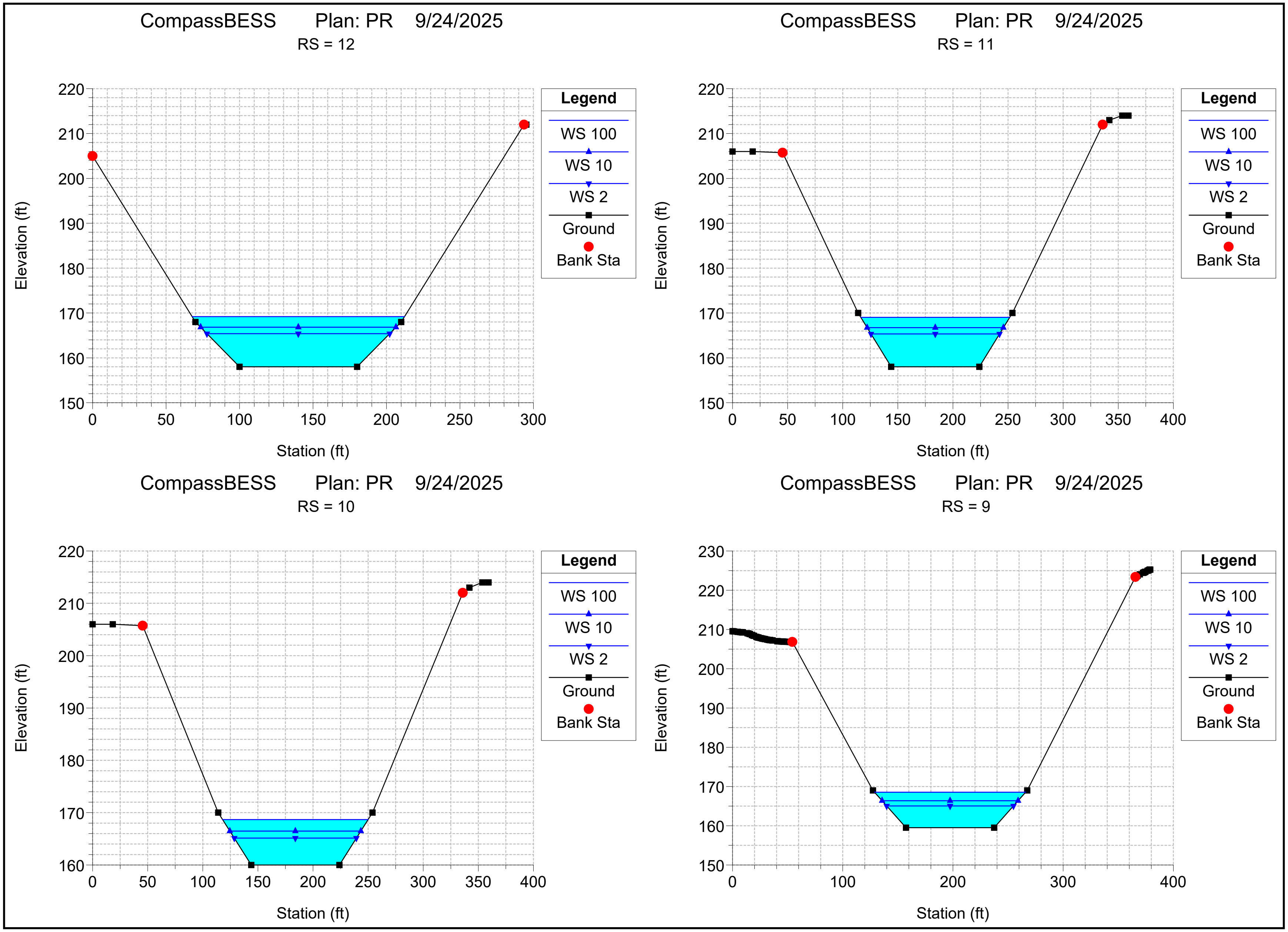
160
0
50
100
150
200
250
300
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 12
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
150
0
50
100
150
200
250
300
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
CompassBESS Plan: PR 9/24/2025
RS = 11
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
150
0
50
100
150
200
250
300
350
400
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
CompassBESS Plan: PR 9/24/2025
RS = 10
Elevation (ft)
Station (ft)
220
210
200
190
180
170
160
0
50
100
150
200
250
300
350
400
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
CompassBESS Plan: PR 9/24/2025
RS = 9
Elevation (ft)
Station (ft)
230
220
210
200
190
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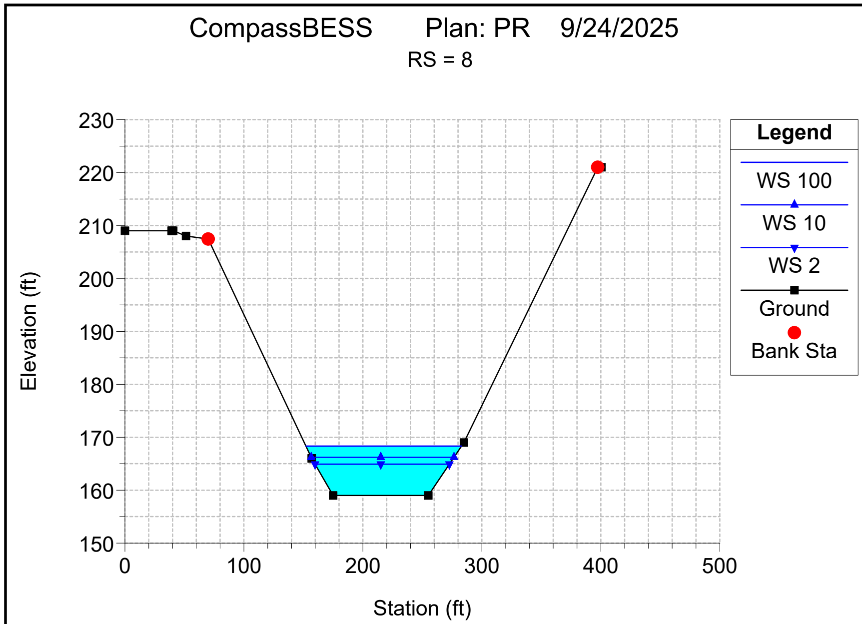
170
160
150
0
100
200
300
400
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 8
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
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180
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160
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200
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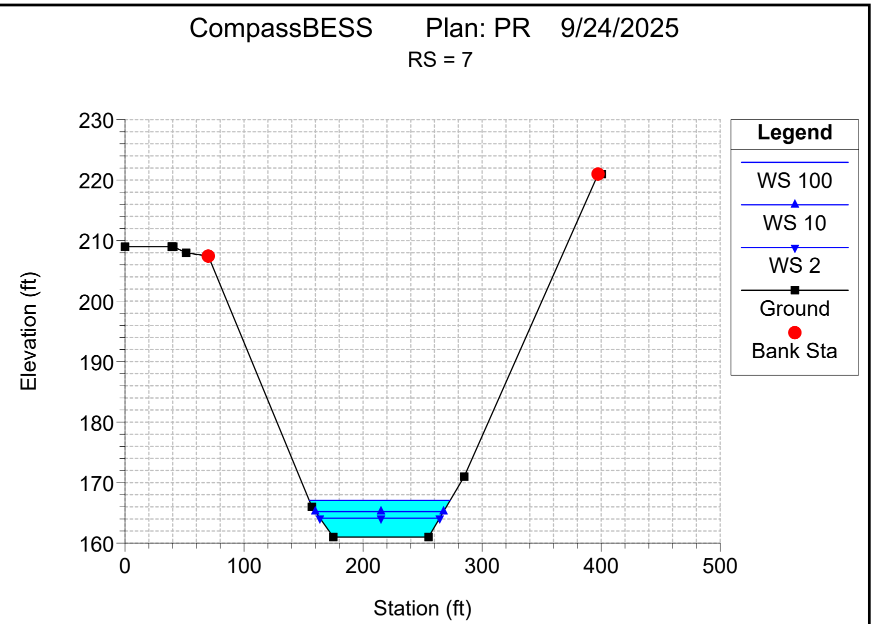
400
500


CompassBESS Plan: PR 9/24/2025
RS = 7
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
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170
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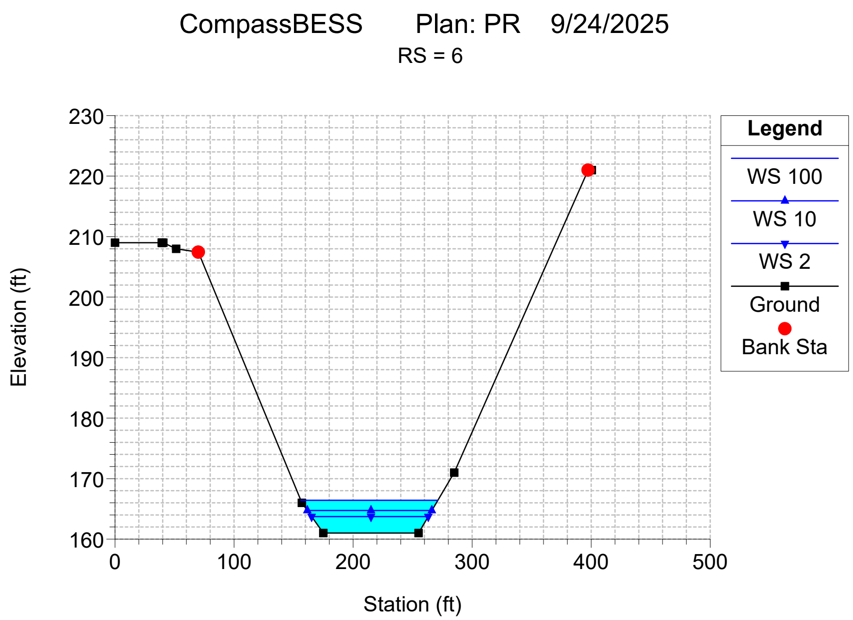
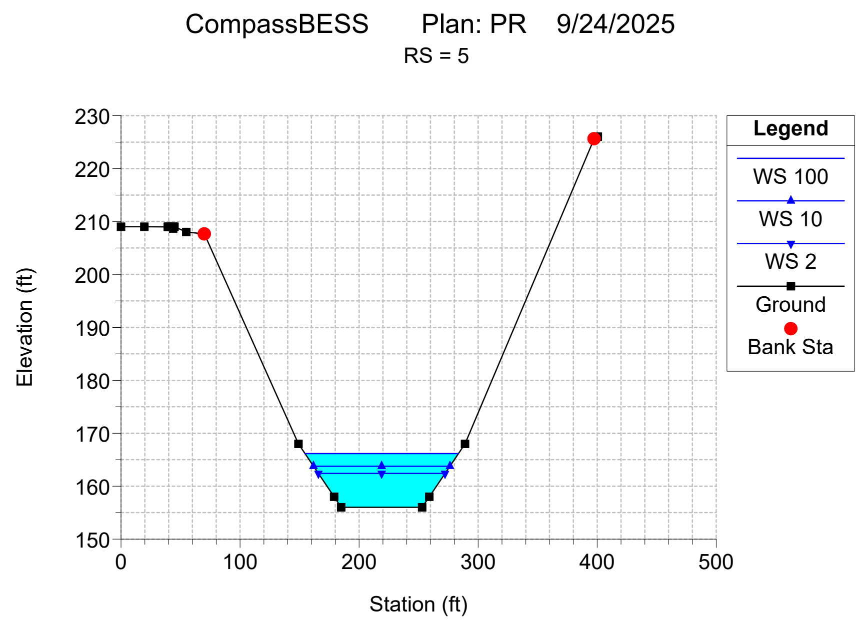
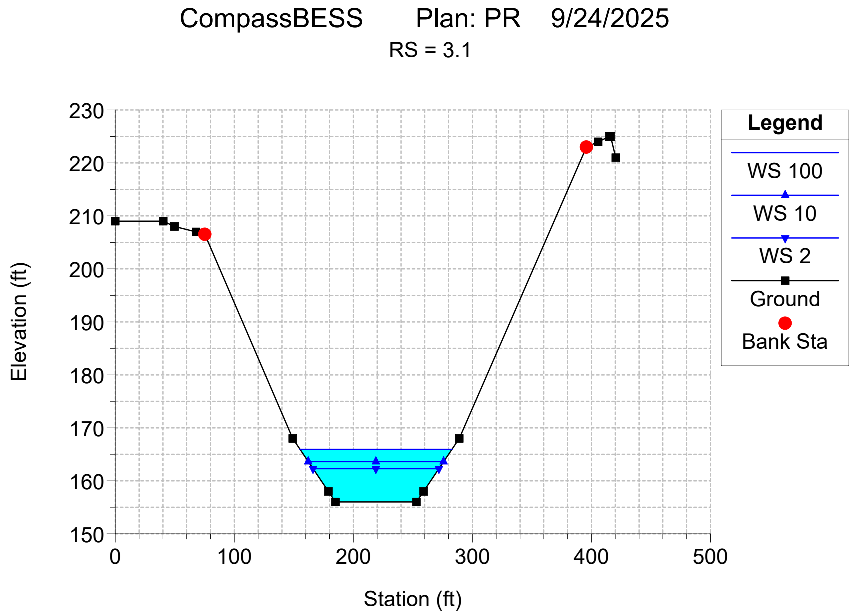
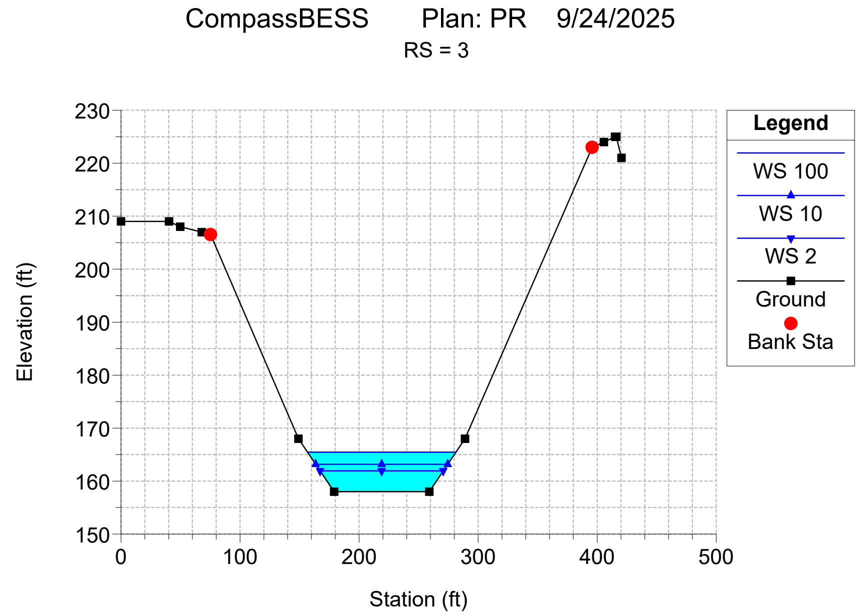
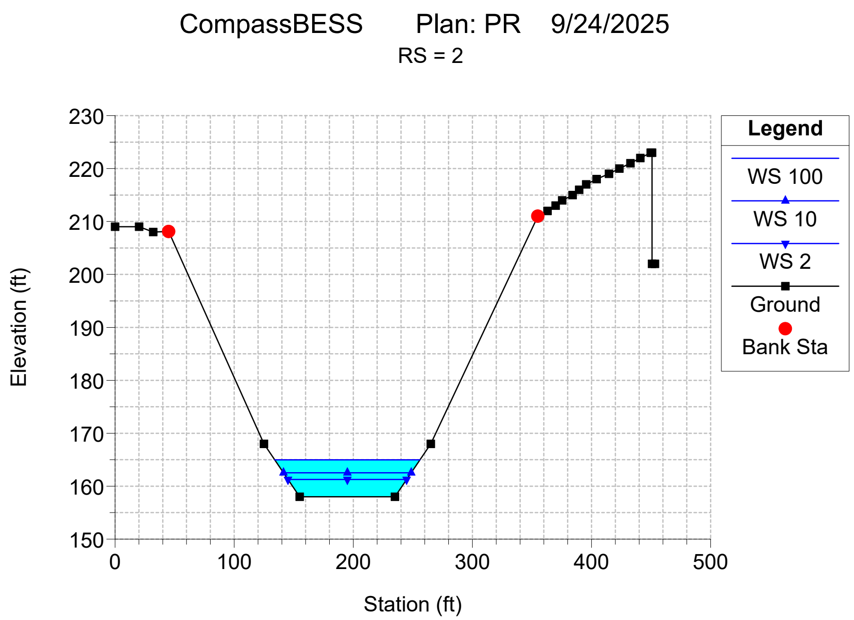
100
200
300
400
500

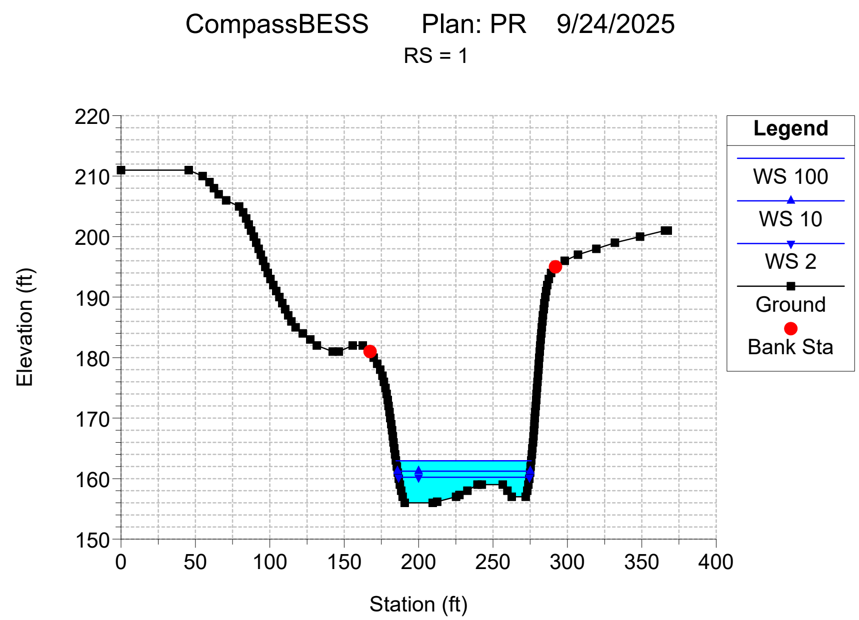

CompassBESS Plan: PR 9/24/2025
RS = 6
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
230
220
210
200
190
180
170
160
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 5
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
230
220
210
200
190
180
170
160
150
0
100
200
300
400
500


CompassBESS Plan: PR 9/24/2025
RS = 3.1
Elevation (ft)
230
220
210
200
190
180
170
160
150
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 3
Elevation (ft)
230
220
210
200
190
180
170
160
150
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 2
Elevation (ft)
230
220
210
200
190
180
170
160
150
0
100
200
300
400
500
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta


CompassBESS Plan: PR 9/24/2025
RS = 1
Elevation (ft)
220
210
200
190
180
170
160
150
0
50
100
150
200
250
300
350
400
Station (ft)
Legend
WS 100
WS 10
WS 2
Ground
Bank Sta

ATTACHMENT 5

ROCK SIZING CALCULATIONS

$$D_{30} = (FS)C_s C_V C_T D \left[\left(\frac{\gamma_w}{\gamma_s - \gamma_w}\right)^{1/2} \frac{V}{\sqrt{K_1 g D}}\right]^{5/2}$$

Where: D_{30} = riprap size of which 30 percent is finer by weight (ft)
FS = safety factor
C_s = stability coefficient for incipient failure
C_V = vertical velocity distribution coefficient
C_T = thickness coefficient
D = local depth of flow (ft)
γ_w = unit weight of water (lb/ft^3)
γ_s = saturated surface dry specific unit weight of stone (lb/ft^3)
V = local depth-averaged velocity (ft/s)
K_1 = side slope correction factor
g = gravitational constant = 32.2 ft/s^2

Use of this equation should be limited to longitudinal slopes less than 2 percent. Further explanation regarding the variables shown above is included in EM 1110-2-1601 (USACE, 1994).

S_f = safety factor (see c below)

* C_s = stability coefficient for incipient failure, D_{85}/D_{15} = 1.7 to 5.2

= 0.30 for angular rock

* = 0.375 for rounded rock

C_V = vertical velocity distribution coefficient

= 1.0 for straight channels, inside of bends

= 1.283 - 0.2 log (R/W), outside of bends (1 for (R/W) > 26)

= 1.25, downstream of concrete channels

= 1.25, ends of dikes

C_T = thickness coefficient (see d(1) below)

* = 1.0 for thickness = $1D_{100}$(max) or 1.5 D_{50}(max), whichever is greater

* d = local depth of flow, length (same location as V)

γ_w = unit weight of water, weight/volume

* V = local depth-averaged velocity, V_{ss} for side slope riprap, length/time

K_1 = side slope correction factor (see d(1) below)

g = gravitational constant, length/time^2

$$K_1 = \sqrt{1 - \frac{\sin^2\theta}{\sin^2\phi}} \qquad (3\text{-}4)$$

where

θ = angle of side slope with horizontal

ϕ = angle of repose of riprap material (normally 40 deg)

Structure 1 at Drop:

D30=	**2.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	4.61	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	12.25	ft/s
K1	0.87	
g	32	ft/s2

Structure 1 at Basin:

D30=	**0.4**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	8.12	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	6.67	ft/s
K1	0.87	
g	32	ft/s2

Structure 2 at Drop:

D30=	**2.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	4.69	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	12.18	ft/s
K1	0.87	
g	32	ft/s2

Structure 2 at Basin:

D30=	**0.3**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	8.75	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	5.48	ft/s
K1	0.87	
g	32	ft/s2

Structure 3 at Drop:

D30=	**2.1**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	4.69	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	12.01	ft/s
K1	0.87	
g	32	ft/s2

Structure 3 at Basin:

D30=	**0.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	9.03	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	5.44	ft/s
K1	0.87	
g	32	ft/s2

Structure 4 at Drop:

D30=	**2.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	4.72	ft
γW	62.4	lb/cu ft
γS	150	lb/cu ft
V	12.32	ft/s
K1	0.87	
g	32	ft/s2

Structure 4 at Basin:

D30=	**0.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	8.89	ft
γW	62.4	lb/cu ft
γS	150	lb/cu ft
V	5.37	ft/s
K1	0.87	
g	32	ft/s2

Structure 5 at Drop:

D30=	**2.4**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	4.99	ft
γW	62.4	lb/cu ft
γS	150	lb/cu ft
V	12.73	ft/s
K1	0.87	
g	32	ft/s2

Structure 5 at Basin:

D30=	**0.3**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	9.27	ft
γW	62.4	lb/cu ft
γS	150	lb/cu ft
V	5.54	ft/s
K1	0.87	
g	32	ft/s2

Structure 6 at Drop:

D30=	**2.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	4.6	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	12.17	ft/s
K1	0.87	
g	32	ft/s2

Structure 6 at Basin:

D30=	**0.2**	**ft**
FS	2	
Cs	0.3	
Cv	1	
Ct	1	
D	9.67	ft
γw	62.4	lb/cu ft
γs	150	lb/cu ft
V	5.32	ft/s
K1	0.87	
g	32	ft/s2

ATTACHMENT 6

30% DESIGN DRAWINGS