



**LONE STAR**  
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# Leon Valley Baptist Church Recreational Center Design II - 2025

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# Cover Letter

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Subject: Final Report for the development of an indoor Recreational Center for Leon Valley Baptist Church

Dear City of San Antonio,

Lone Star Engineering has been commissioned to design a one-story indoor recreational center for Leon Valley Baptist Church, located on Grissom Road near Bandera Road in San Antonio, Texas. The planned facility will include an indoor basketball court, multi-use/pickleball rooms, lobby, restrooms, offices, and storage areas, complemented by outdoor amenities such as a sand volleyball pit and a tennis court.

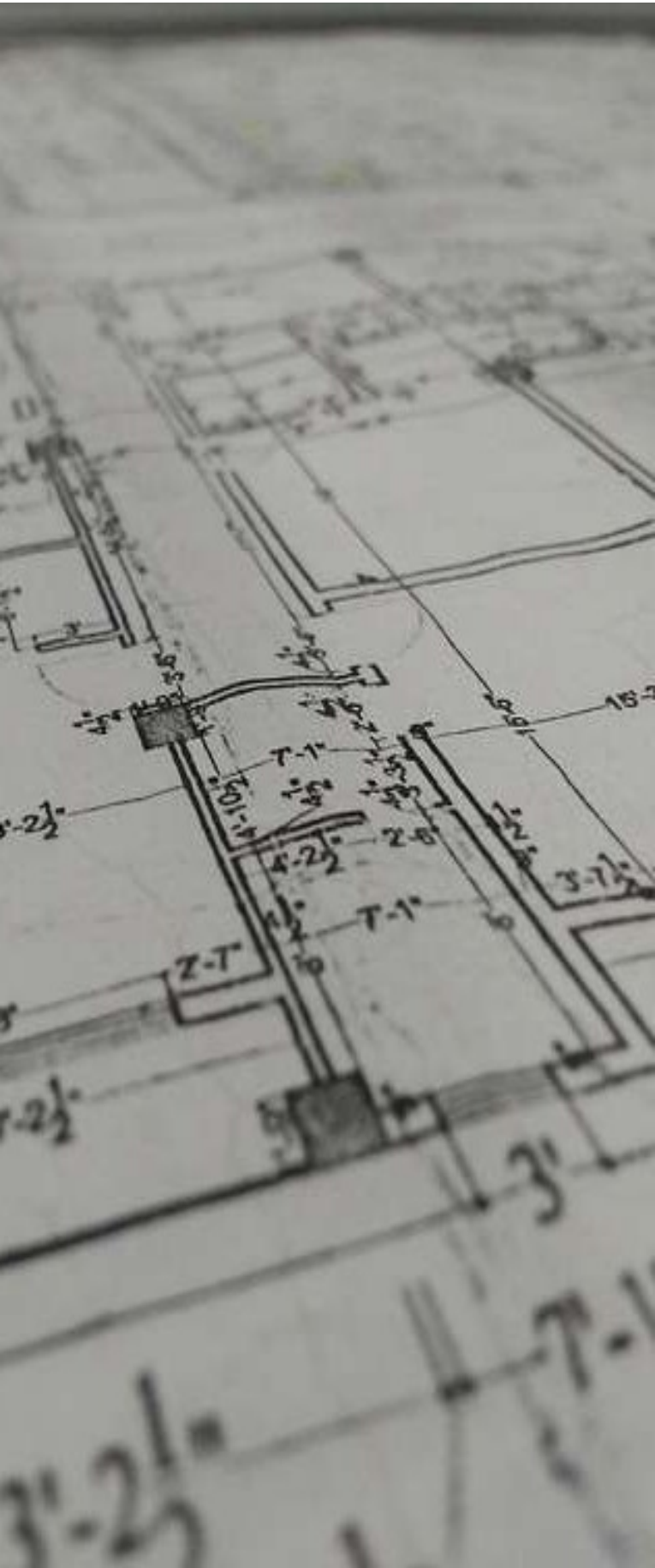
This report provides the documentation necessary for the successful planning and development of the project. Our vision is to create a functional and welcoming recreational space that promotes community engagement, supports healthy lifestyles, and enhances the ministry's outreach.

Lone Star Engineering is committed to upholding the highest professional, ethical, and legal standards throughout the design and development process. We place the utmost importance on safety, integrity, and longevity, ensuring the facility serves both current and future generations of the church and its surrounding community.

We pledge to apply our complete expertise and dedication to deliver a safe, compliant, and enduring recreational center that reflects the values and mission of Leon Valley Baptist Church.

Sincerely,

Lone Star Engineering



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## Project Scope

Leon Valley Baptist Church has acquired 17.434 acres of land directly behind its existing facilities to develop a new indoor recreational center. The proposed building will measure 150 feet by 175 feet, covering approximately 26,250 square feet, not including the planned outdoor amenities. The facility will feature an indoor basketball court, multi-use rooms for activities such as pickleball, a lobby, restrooms, offices, and storage areas, providing flexible, functional space for church members and the broader community, as illustrated in Figure 1.

Outdoor features will include a sand volleyball pit and a tennis court, enhancing on-site recreational options. The project's scope encompasses comprehensive site planning, architectural and structural design, grading and drainage considerations, utility connections, and compliance with all applicable codes and permitting requirements to ensure a safe, sustainable, and durable facility.

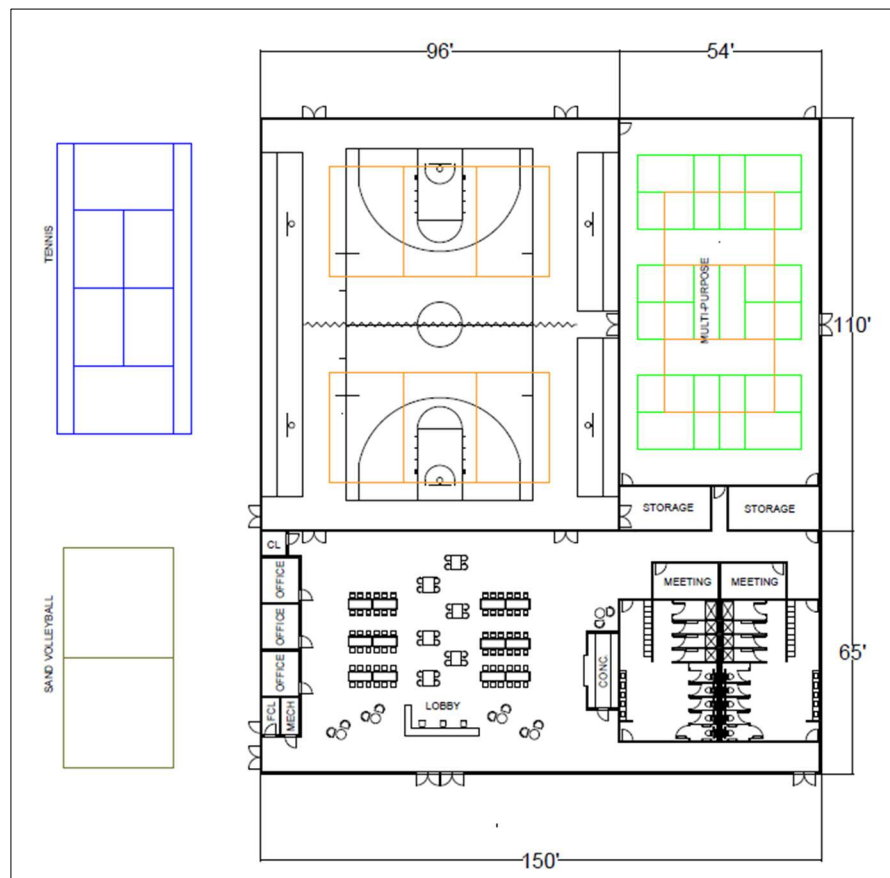


Figure 1: Proposed Floor Plan

## Land Development & Environmental

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Our project will be developed behind the Leon Valley Baptist Church, 7980 Grissom Road, San Antonio, Texas. This means that although it's named after Leon Valley, the property is within the City of San Antonio and is subject to its codes.

### Zoning

The property is currently zoned R-6, with surrounding R-6 and RM-6 zones, both residential and mixed residential. The property does not have a cultural or historic district designation, and it is not a conditional district. Per sec 35-311 of the SA UDC, a recreational facility addition for a church is allowed.

### Plat

The church currently owns the property and is commissioning the project on the 17.434-acre plot. There are no lots or subdivisions, and since we are not fronting a major street, it is considered a major plat.

### Tree Preservation Plan

The property has eight (8) heritage trees, all of which will be preserved. To ensure the root protection zone is not disturbed during construction, a temporary chain link fence will be erected around the heritage trees. For the project, a building permit and a tree removal permit will be needed since some trees will be removed. The tree survey will be done with the Stand delineation method per COSA's UDC, which has requirements of 6" Pixels and a 1" = 400' Scale. The program used is ArcView, which is allowed per the SA UDC. Tree preservation must be done at 35% non-heritage and 100% heritage for the property area not in the floodplain. For the floodplain, 80% of non-heritage trees must be preserved, and 100% of heritage trees must be preserved. Since most of the trees are on the south side of the property, the final tree canopy requirement of 38% for a residential area will be easily met.

### Habitat Compliance Form

A habitat compliance form must be submitted along with the tree preservation plan. The property is not within Karst zones 1 or 2. According to the Fish and Wildlife Services, our property is in Karst zone 3b, which has a low probability of encountering karst invertebrate species, and we are not within any of the seven listed species designated critical habitats. According to the Texas Parks and Wildlife Department's guidance manual, the property is not within the critical habitat for the Golden Cheeked Warbler, and it has a low probability of being a potential habitat because high-density residential areas surround us. The property does not contain Ash Juniper trees in conjunction with the oak species listed and the canopy covers listed. The form is in Appendix A.

### National Park Service (NPS)

Cathedral Rock Park, which lies next to the property, is not managed by the NPS. There are no other nearby parks or trails, so we will not have to worry about NPS restrictions.

### The National Environmental Protection Act 1970

It has constraints associated with property around federal land or properties receiving federal funding, neither of which will apply to the property we are working on. Since there will be no modifications to bodies of water (Culebra Creek, which runs along the bottom of the property), we will not need to coordinate with the DOD/US Army Corps of Engineers.

### The Clean Water Act 1972

Section 404 has constraints on dredged material and fill material that may be discharged into bodies of water. During construction, since our project is larger than 1 acre, we will need a General Permit to Discharge under the Texas Pollutant Discharge Elimination System for any fill material or other debris generated. This will require a Storm Water Pollution Prevention Plan, prepared in accordance with TCEQ and COSA guidelines.

### The Endangered Species Act 1973

Texas has 120 endangered and threatened species with designated critical habitats, and our property is not located in any of them. While 11 species may have a possible range within the property, none were observed during a site visit. These include seven karst species (arachnids and beetles), two birds (Piping plover and Rufa Red Knot), a crustacean (Peck's cave amphipod), and a plant (Texas wild rice). Suppose any of these species is found during construction. In that case, a Conservation Benefit Agreement (CBA) can be arranged with the Fish and Wildlife Service to protect or manage them, facilitating construction and preventing harm.

### The Migratory Bird Treaty Act 1918

The purpose of this initiative is to protect the 1,106 bird species listed, preventing them from being harmed or exploited. The property is located within the range of two threatened species: the Piping Plover and the Rufa Red Knot. While a site visit found no signs of these birds, their migratory nature necessitates vigilance during the year-long construction process. If encountered, the MBTA gives anyone the authority to capture and release them nearby, humanely. For removal from the property, coordination with the US Fish and

Wildlife Service is required, and the primary method will be donation to an authorized recipient within the state, ensuring that no species is held for more than 7 days unless otherwise specified.

#### Storm Water Pollution Prevention Plan (SWPPP)

The Leon Valley Baptist Church Recreational facility will be monitored in accordance with TCEQ TPDES guidelines during its construction. It is a 26.25 sq-ft floor plan on a 17.434-acre property that connects to Grissom Road via Leon Valley Baptist. The Clean Water Act of 1972 maintains water quality in rivers and streams and establishes rules and mitigation measures. The Water Quality Act, enacted in 1987, governs this SWPPP and stormwater runoff management during construction. The property is not within COSA's mandatory detention zone, Edwards Aquifers' recharge or contributing zones, and currently does not have any negative impact on existing drainage or flow paths. Because of the top-down elevation in which the height decreases from north to south. Stormwater currently drains into Culebra Creek with sheet flow throughout the property.

#### Drainage

A detention pond will be in the southwest portion of the property to retain stormwater and prevent any negative impact on the surrounding area, including Leon Creek, which borders the west and south sides of the property. The property has been divided into six distinct areas, all designed to promote sheet flow.

The detention pond will incorporate swales along its western, eastern, and southeastern borders to direct runoff into the pond. These swales will be constructed with 4 inches of topsoil and will be covered with sod to provide permanent erosion control. Additionally, temporary erosion control measures, such as silt fencing, will be installed during construction to prevent construction materials from being washed away during storms.

Select fill will be used for the detention pond berm, and the overall construction process for the property will primarily involve select fill, with minimal excavation required. The detention pond is also designed with an emergency outlet to handle historic rainfall events, which will direct excess water southward into the southwest quadrant of the property, eventually flowing into Culebra Creek.

#### Potential Contamination

The primary area at risk of contamination will be the parking lot, where vehicles may be parked and leaking fluids or importing mud, which can be washed away during rainfall events.

As noted, select fill will be utilized, so a General Permit to Discharge under the Texas Pollutant Discharge Elimination System will be obtained. This Stormwater Pollution Prevention Plan (SWPPP) will be part of that process.

### BMP

The primary method for addressing stormwater contaminants will be through passive means, utilizing a detention pond and the swales that channel water into it. During the first week after installing sod in the swales, a temporary concentrated irrigation system will be implemented to promote growth and rooting of the sod. Additionally, no vehicles will be allowed to park on the property for more than one week. This restriction will be enforced in collaboration with the church and, if necessary, local law enforcement.

### Facility monitoring plans

An inspector will be hired to conduct weekly inspections of the property to ensure BMPs are met and that no additional stormwater pollutants are discharged during construction. A Construction Storm Water Pollution Prevention Plan Field Inspection and Maintenance Report will be conducted every week, regardless of rainfall. These documents will have to be signed, and an archive will be kept. A year after construction is completed, an additional inspection will be conducted, followed by another a year later, to ensure that the facilities' BMPs are being implemented, and a record of their effectiveness will be maintained.

### Implementation

The detention pond and swales will be noted as implemented only after they are fully constructed and operating. The temporary silt fencing will be implemented immediately at the beginning of construction. Sod installation will be done at the end of the detention pond, and swale configuration construction and irrigation will be done for the entire week after. A licensed irrigator will be contracted to do the irrigation. The two annual inspections will be conducted the year after construction is completed and the year following.

An example of a SWPPP is provided in Appendix B.



## Geotechnical

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The results of the Geotechnical Engineering Study for the proposed Leon Valley Baptist Church-Recreational Center, located in San Antonio, Texas, are presented in this report.

The primary objective of this geotechnical study was to conduct subsurface exploration and laboratory testing to determine the soil and groundwater engineering properties at the site.

The exploration involved drilling to a depth of 15 feet using hollow-stem augers, along with Standard Penetration Tests (SPTs) conducted at regular intervals to measure soil resistance. Soil samples were collected using a split-spoon sampler, ensuring their integrity during transportation to the laboratory for classification and analysis. Figure 2 illustrates the site's boring locations.

The laboratory tests included assessing natural moisture content, performing Atterberg limit tests (liquid limit [LL], plastic limit [PL], and plasticity index [PI]), and conducting grain-size analysis. These analyses were crucial for evaluating in situ strength indicators (N values) and classifying soil index properties as illustrated in Appendix C.

Additionally, groundwater levels were monitored during and after drilling to assess potential water-table conditions. This information is vital for understanding the site's hydrological context, which could significantly impact the construction planning and design of the Leon Valley Baptist Church-Recreational Center. The findings of this study will provide essential insights to inform decision-making throughout the project development process.

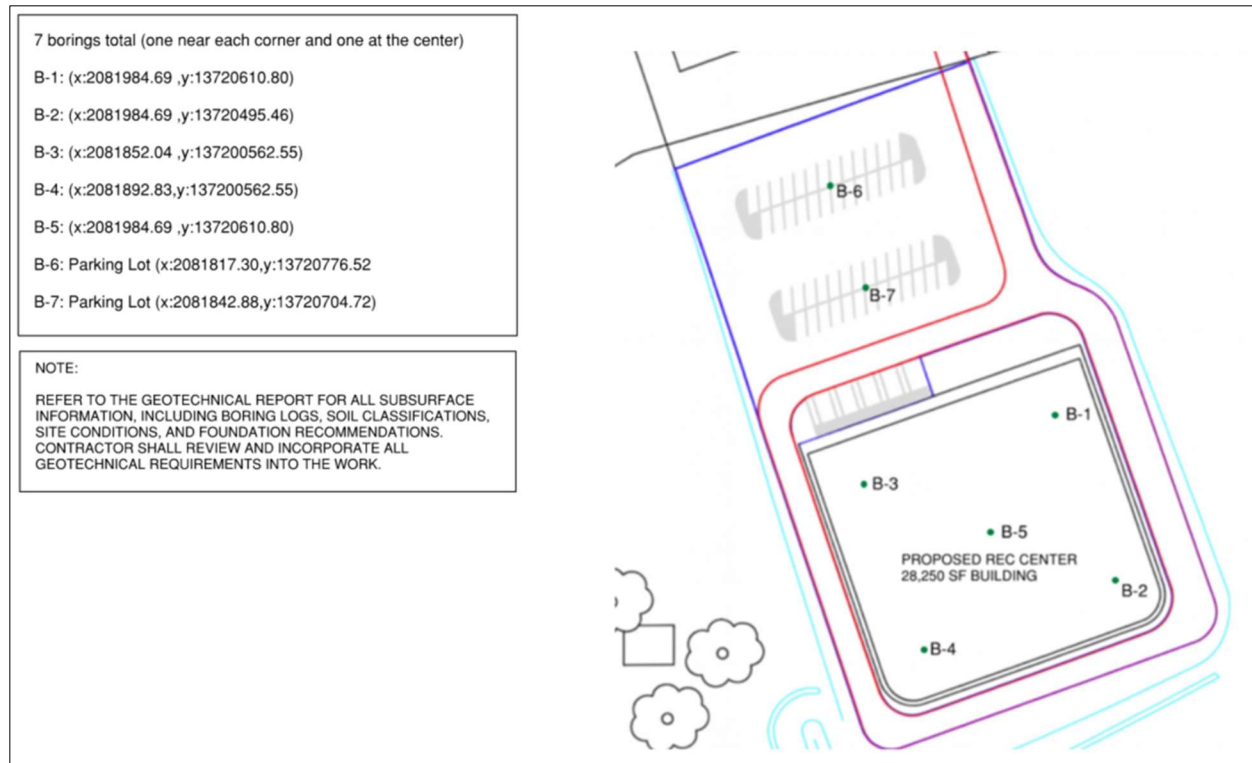


Figure 2: Boring Location Plan

## Foundation

The foundation design for the recreation building will be developed directly from these results, which provide key information on soil stratigraphy, strength, and plasticity. By understanding that the upper soils consist of medium-dense clayey sands underlain by very sandy lean clays with moderate to high plasticity, engineers can specify appropriate allowable bearing capacities, embedment depths, and subgrade improvements to ensure a stable, durable system. The test results ensure that the recommended slab on grade with grade beams is appropriately supported. Settlement risk is minimized, and shrink-swell behavior is controlled, resulting in a safe, cost-effective foundation solution tailored to site conditions. Figure 3 illustrates the foundation design layout and foundation design calculations can be found in Appendix D.

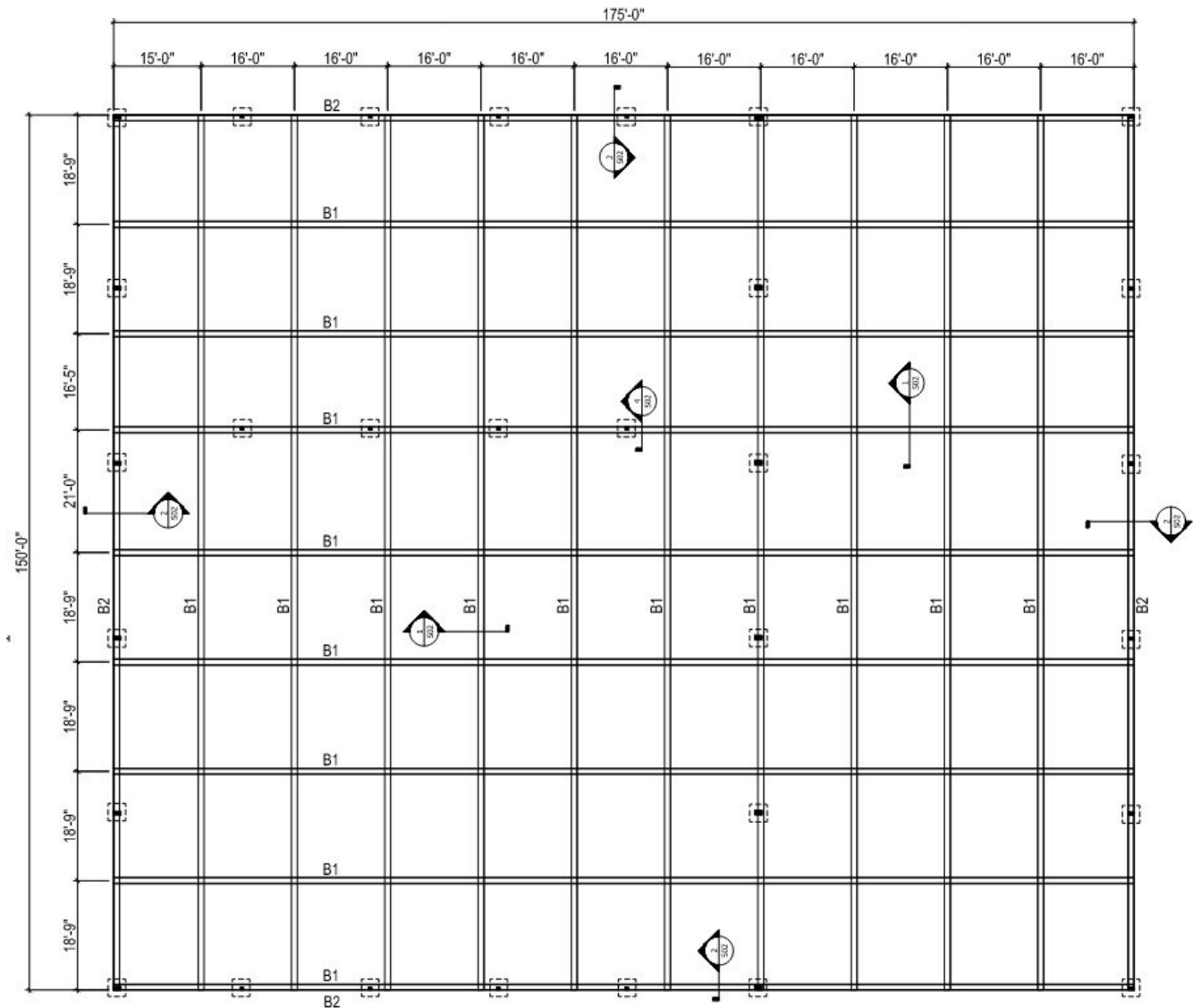


Figure 3: Foundation Design Layout

## Water Resources

This report presents the findings of the drainage analysis conducted for the proposed recreation facility. The objective was to evaluate the existing drainage conditions and design a suitable drainage solution to accommodate the proposed recreational facility, asphalt parking lot and perimeter fire access lane.

### Existing Drainage

Using USGS Quad Lidar data, an overall existing drainage assessment was performed to analyze the current drainage infrastructure and flow patterns for the existing church property and the additional property to the south.

Analysis determined that the existing church pavement to the north drained east to west directly into the greenway via shallow swales in the pavement. These areas do not affect the new property addition to the south.

The property addition to the south was then split into multiple drainage areas that flow south directly into Culebra Creek greenway. Proposed elements were overlaid to determine which areas were affected by the adverse impacts of adding impervious cover. Existing conditions assessment is shown in Table 1 below. These are the established pre-development discharge flows.

Table 1: Existing SCS Unit Hydrograph Peak Flow Calculations

| Subbasin ID  | Area        |         | Base CN | Impervious Cover % | Tc    | Q1         | Q <sub>5</sub> | Q <sub>25</sub> | Q <sub>100</sub> |
|--------------|-------------|---------|---------|--------------------|-------|------------|----------------|-----------------|------------------|
|              | (AC)        | (SQMI)  |         |                    | (MIN) | (CFS)      | (CFS)          | (CFS)           | (CFS)            |
| DA-1         | 1.4         | 0.00214 | 76      | -                  | 8.4   | 0.9        | 2.7            | 5.4             | 8.20             |
| DA-2         | 1.2         | 0.00191 | 76      | -                  | 7.7   | 0.8        | 2.4            | 5.0             | 7.50             |
| DA-3A        | 4.9         | 0.00759 | 76      | 5                  | 11.9  | 3.6        | 9.2            | 17.9            | 26.50            |
| DA-3B        | 3.7         | 0.00583 | 76      | -                  | 5.8   | 2.7        | 8.1            | 16.5            | 24.90            |
| <b>TOTAL</b> | <b>11.2</b> |         |         |                    |       | <b>8.0</b> | <b>22.4</b>    | <b>44.8</b>     | <b>67.10</b>     |

### Proposed Drainage

To address the needs of the proposed recreational facility, an open ditch system around the site perimeter has been designed, along with a detention pond to intercept additional discharge and mitigate adverse impacts on existing conditions.

Flow from the parking lot, building, and fire lane flows directly into the grass-lined ditches via direct runoff from the pavement. These areas have been split into two drainage areas — West and East — using a crowned section through the center of the proposed addition.

Rational Method for the ditches. For the ditch design,  $Q = CiA$  was used, where C is the runoff coefficient, i is the rainfall intensity, and A is the drainage area. The proposed ditch design will be comprised of a V-bottom and 6:1 side-slopes, with a normal depth of 18". The section has been sized using Manning's Equation, combining the hydraulic radius, the flow cross-sectional area, the channel slope, and the roughness coefficient. The ditch material will consist of a grass lining throughout and a rock gabion mattress at the outlet to prevent erosion.

Intensity for each event has been derived from the Intensity-Duration-Frequency (IDF) Values for PA-3, with a time of concentration derived using following “ $T_c = T_t + T_{sc} + T_{ch}$ ” located in the Storm Water Design Criteria Manual – June 2025.

The peak runoff from the facility has been analyzed for the 1-year, 5-year, 25-year, and 100-year storm intensities, based on the local hydrologic data using the SCS Unit Hydrograph method for the pond the 24 hr duration. Excess runoff from the storm resulted in 1.35 ac-ft of water.

The pond sizing has been calculated and shown below in Table 2 – 4.

Table 2: Proposed SCS Unit Hydrograph Peak Flow Calculations

| Subbasin ID                | Area        |         | Base CN | Impervious Cover % | Tc    | Q1          | Q5          | Q25         | Q100         |
|----------------------------|-------------|---------|---------|--------------------|-------|-------------|-------------|-------------|--------------|
|                            | (AC)        | (SQMI)  |         |                    | (MIN) | (CFS)       | (CFS)       | (CFS)       | (CFS)        |
| DA-1                       | 1.3         | 0.00195 | 76      | -                  | 8.4   | 0.8         | 2.4         | 4.9         | 7.50         |
| DA-2                       | 1.2         | 0.00189 | 76      | -                  | 7.7   | 0.8         | 2.4         | 4.9         | 7.40         |
| DA-3A                      | 5.0         | 0.00781 | 80      | 55                 | 8.1   | 13.8        | 22.7        | 34.5        | 45.30        |
| DA-3B                      | 3.7         | 0.00583 | 76      | -                  | 5.8   | 2.6         | 7.8         | 15.9        | 24.10        |
| <b>TOTAL</b>               | <b>11.2</b> |         |         |                    |       | <b>18.0</b> | <b>35.3</b> | <b>60.2</b> | <b>84.30</b> |
|                            |             |         |         |                    |       |             |             |             |              |
| <b>DELTA FROM EXISTING</b> |             |         |         |                    |       | <b>10.0</b> | <b>12.9</b> | <b>15.4</b> | <b>17.20</b> |

Table 3: Detention Pond Elevation and Storage Values

| Elevation (FT) | Incremental Volume (CF) | Cumulative Volume (CF) | Acre Feet | Surface Area (SF) | Acre |
|----------------|-------------------------|------------------------|-----------|-------------------|------|
| 797.00         | 0.77                    | 0.77                   | 0.00      | 16632.43          | 0.38 |
| 797.50         | 8576.69                 | 8577.46                | 0.20      | 17679.55          | 0.41 |
| 798.00         | 9104.33                 | 17681.79               | 0.41      | 18742.08          | 0.43 |
| 798.50         | 9639.00                 | 27320.79               | 0.63      | 19818.56          | 0.45 |
| 799.00         | 10180.76                | 37501.55               | 0.86      | 20909.07          | 0.48 |
| 799.50         | 10729.57                | 48231.12               | 1.11      | 22013.78          | 0.51 |
| 800.00         | 11285.29                | 59516.41               | 1.37      | 23132.56          | 0.53 |
| 800.50         | 11848.45                | 71364.86               | 1.64      | 24265.58          | 0.56 |
| 801.00         | 12418.55                | 83783.41               | 1.92      | 25412.73          | 0.58 |



Table 4: Detention Pond Water Surface Elevations and Peak Inflows and Discharge Rates

| Storm  | WSE<br>(FT) | Peak<br>Inflow (CFS) | Peak<br>Discharge (CFS) |
|--------|-------------|----------------------|-------------------------|
| 5 YR   | 798.20      | 22.70                | 4.70                    |
| 25 YR  | 798.70      | 34.50                | 8.00                    |
| 100 YR | 799.10      | 45.30                | 10.80                   |

A 10-ft gravel maintenance access road to match existing grade has been provided, from the northern side of the property to the detention pond bottom. Regular maintenance of the ditch and detention pond is recommended to prevent sediment build-up and vegetation overgrowth.

Drainage Summary

The property addition will discharge into a detention pond designed to contain the 5-year, 25-year, and 100-year storm events at peak discharge, ensuring no adverse impacts on downstream properties. This aligns with the property's natural drainage patterns and meets local regulatory requirements.

## Utilities

This report outlines the planning and design considerations for the utility systems required to serve the proposed Leon Valley Baptist Church Recreation Facility. The objective of the design is to provide reliable domestic water, fire protection, sanitary sewer, irrigation water, and electrical service while maintaining full compliance with the City of San Antonio Unified Development Code (UDC), SAWS Utility Service Regulations, the 2024 International Fire Code as amended by the City of San Antonio, the 2024 International Plumbing Code, and applicable TCEQ standards. The existing church property is currently served by public water, sewer, and electrical utilities along Grissom Road and at the southern edge of the site; however, no direct utility connections exist at the new recreation center’s location. Therefore, new utility extensions and laterals will be constructed to support the building.

For water service, a new 2-inch domestic line, a 6-inch fire line, and a 2-inch irrigation branch will extend approximately 670 linear feet from the existing public water main to the facility. The domestic line was sized using the 2024 IPC

Appendix G Water Supply Fixture Unit (WSFU) method. Based on ten water closets, ten lavatories, and eight showers, the total fixture load equates to approximately 152 WSFU, corresponding to a peak demand of roughly 57 gpm per IPC Appendix E, Table E103.3(3). Hazen-Williams calculations confirm that a 2-inch line provides this flow at an acceptable velocity of approximately 5.1 ft/s.

The fire protection system, which includes a full NFPA 13 automatic sprinkler system and one private on-site hydrant, requires a dedicated 6-inch fire service in accordance with NFPA 24 and SAWS fire protection standards. Per the 2024 City of San Antonio Amendments to IFC Appendix G, the base fire-flow requirement for a Type V-B building of approximately 26,250 sq ft is 3,000 gpm for 3 hours (Table B105.1). Section B105.2 allows a 50% reduction for fully sprinklered buildings, resulting in a required design fire flow of **1,500 gpm for 2 hours**. The 6-inch fire line meets NFPA 24 minimum fire main sizing requirements and is routed through a double-check detector assembly (DCDA) as required by SAWS.

Fire department access for the recreation center complies with IFC requirements via the existing drive aisle off Grissom Road, providing the required 150-foot apparatus access distance to all exterior portions of the building. Hydrant coverage is achieved through two existing public hydrants on Grissom Road and the proposed private hydrant located at the southeast corner of the building. Hose-lay distances conform to IFC Section 507.5.1, and final hydrant placement will be coordinated with the Fire Marshal's Office during permit review.

A new 6-inch building lateral discharging will provide sanitary sewer service to a proposed 8-inch private sewer main extension, which will then connect into the existing 42-inch public sewer located on the south side of the site. The lateral incorporates four cleanouts—one at the building and three spaced at 100-foot intervals—in accordance with SAWS Utility Service Regulations and standard wastewater design practice.

Wastewater generation was calculated using TCEQ 30 TAC 285.91(3), Table III, which classifies the facility as a recreation building with showers. Using a building area of 50 square feet per person, the estimated daily occupancy is 525 persons. At a TCEQ loading rate of 15 gallons per person per day, total wastewater generation is 7,875 gallons per day. SAWS applies a standard conversion of 200 gallons per day per Equivalent Dwelling Unit (EDU), resulting in approximately 40 EDUs for impact fee and system capacity evaluation.



Irrigation demand for the facility was assumed to be 60 gpm based on standard commercial rotor zone sizing. Per Irrigation Association design guidelines, typical commercial rotors operate at 0.5–1.0 gpm per head, with approximately 8–12 heads per zone and 4–6 zones operating during peak irrigation scheduling, resulting in a design mainline flow of 50–60 gpm. The proposed 2-inch irrigation branch adequately serves this flow.

CPS Energy will provide electrical service for the building via the existing underground distribution corridor along the southern boundary of the property. Transformer specifications, conduit routing, and metering requirements will be finalized through CPS Energy’s design coordination process. They will ensure adequate capacity for HVAC, lighting, and equipment loads with appropriate allowance for future expansion.

All proposed utility alignments have been designed to comply with SAWS, CPS Energy, TCEQ, and City of San Antonio standards. Required horizontal and vertical separations between utilities have been maintained throughout the site, and alignments have been coordinated with architectural, structural, and drainage features. Construction sequencing will prioritize installing underground utilities before paving and structural work to avoid conflicts and maintain long-term serviceability.

Appendix G contains the completed SAWS sewer design sheet, wastewater calculations, and the handwritten domestic, irrigation, and fire service sizing worksheets used to support this design.

## Structural

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This report summarizes the preliminary structural design of the roof system and columns for a proposed recreation center with total dimensions of 150 feet by 176 feet. The stepped roof and distinct zones within the structure will create separate areas, including a gymnasium equipped with a basketball court and a smaller multi-purpose room marked for volleyball or multiple pickleball courts. The gymnasium area will measure 150 feet by 110 feet, and this design aims to provide a clear interior span free of intermediate supports, suitable for athletic activities and necessary clearances. Additionally, this section of the structure will feature a lower roof clearance of 12 feet.

Moreover, the center will include an entryway, restrooms, meeting space, and a social space measuring 150 feet by 65 feet, sharing one wall with the gym area.

The design for this portion also focuses on maintaining a clear interior span without intermediate supports, allowing for greater construction flexibility, as all interior walls will function as partitions. The framing concept will utilize long-span steel joists (DLH series) supported by joist girders at two perimeter column lines.

This report evaluates the feasibility of spans, joist and girder spacing, tributary load paths, column layouts, and approximate designs for trusses, girders, and columns. The design considerations adhere to several codes, including the San Antonio UDCs, ASCE 7-22, ACI 318-19 for concrete connections to beams, AISC 360 for all steel components, and TMS 402 for the masonry aesthetic features that will be incorporated into the exterior.

Design loads and combinations have been determined in accordance with ASCE 7-22, taking into account the building's classification as Risk Category III due to its use as a public assembly facility. Dead load contributions consist of a uniform 16.3 psf (pounds per square foot) for superimposed dead loads, supplemented by an additional 10 psf for mechanical and electrical allowances to account for suspended lighting, ductwork, and miscellaneous utilities. The steel roof system contributes an additional 6.3 psf, which includes insulation and purlins. Partition loads will vary based on material and location.

Live loads have been selected according to Table 4.3-1 of ASCE 7-22, with 100 psf applied to the gymnasium, corridor, and lobby areas, and a reduced roof live load of 12 psf. Environmental loads were calculated using site-specific parameters. The ground snow load is 10 psf, which results in a flat-roof snow pressure of 6.3 psf and a balanced design load of 14.3 psf, accounting for exposure and thermal coefficients. Seismic effects are minimal, with parameters of  $I_e = 1.25$ ,  $SDS = 0.045$ , and Seismic Design Category A, indicating negligible seismic demand.

Wind loading is governed by a design speed of 114 mph, categorized under exposure category B. Using the parameters  $K_d = 0.85$ ,  $K_z = 0.72$ ,  $K_{zt} = 1.0$ ,  $K_e = 0.97$ , and a gust factor  $G = 0.85$ , the velocity pressure  $q_z$  is calculated as 23.24 psf. The resultant pressures on the gymnasium are approximately +22.8 psf on the windward face, -15.8 psf on the leeward face, and uplift pressures ranging from -25.1 to -43.6 psf. The lower-profile lobby experiences slightly reduced pressures of +19.4 psf on the windward face, -13.5 psf on the leeward face, and uplift values between -21.4 and -37.2 psf.

Tornado resistance has also been considered due to the region's exposure. Using a reference velocity pressure of 27.16 psf and a velocity coefficient  $K_vT = 1.3$ ,

internal, external, and corner pressures are estimated as -31.8, -41.4, and -51.0 psf, respectively, applied over zone widths of 11 feet for the gym and 4.8 feet for the lobby. The governing load combinations, developed per ASCE 7-22 Section 2.3.1, were analyzed for both roof systems. For the gym and lobby roofs, with  $1.2D + 1.6S$  as the controlling factor, the factored roof load is determined to be 42.44 psf.

Structural steel design is based on LRFD (Load and Resistance Factor Design), with  $\phi = 0.9$  for flexure and axial members and  $\phi = 0.75$  for bolted and welded connections. Material specifications include wide-flange beams of ASTM A992 Grade 50, angles and channel shapes of ASTM A36, plates of A572 Grade 50, and all bolts conforming to ASTM A325, with threads included in the shear plane. All structural members will be checked for strength (including bending, shear, axial, and combined moments where applicable), serviceability (deflection), and stability (buckling, lateral-torsional buckling, and local slenderness).

### Gym Roof Joists

- open-web steel joists spanning the full gym width. **64DLH13**, underslung, with a two-way pitched top chord (1:96).
- Loading:
  - Roof live load and roof self-weight are within the listed joist capacity (approx. 500 plf).
  - Factored flexural demand from combined roof loads is less than the joist design capacity.
- Framing and spacing:
  - Joists span 110 ft (gym direction).
  - Cold-formed steel purlins are spaced at **5 ft o.c.**, running perpendicular to joists.
- Bracing:
  - Top chord is continuously braced by the purlin lines and roof deck.
  - Bottom chord uplift and lateral stability are provided by **L1½×1½×1/8** angles used as horizontal bracing at approximately **22 ft** spacing, with additional diagonal braces between about 0.4L and 0.6L every four joists.
  - The bracing layout satisfies required chord brace forces from joist buckling and uplift checks.

## Lobby Roof Joists

- open-web steel joists over lobby roof area. **36LH09**, underslung, with a one-way pitched top chord (1:96).
- Loading:
  - Roof live load and self-weight are within the joist's tabulated uniform load capacity.
  - Factored moment demand is less than the rated joist bending capacity.
- Framing and spacing:
  - Joists span approximately **65 ft** across the lobby.
  - Purlins run perpendicular to joists at **5 ft o.c.** similar to the gym.
- Bracing:
  - Top chord is braced by purlins and deck.
  - Bottom chord is braced using **L1½×1½×1/8** angles at about **16'-3"** spacing, with additional diagonal bracing between roughly 0.25L and 0.5L every four joists.
  - Bracing forces are within the capacities of the selected angle members and their connections.

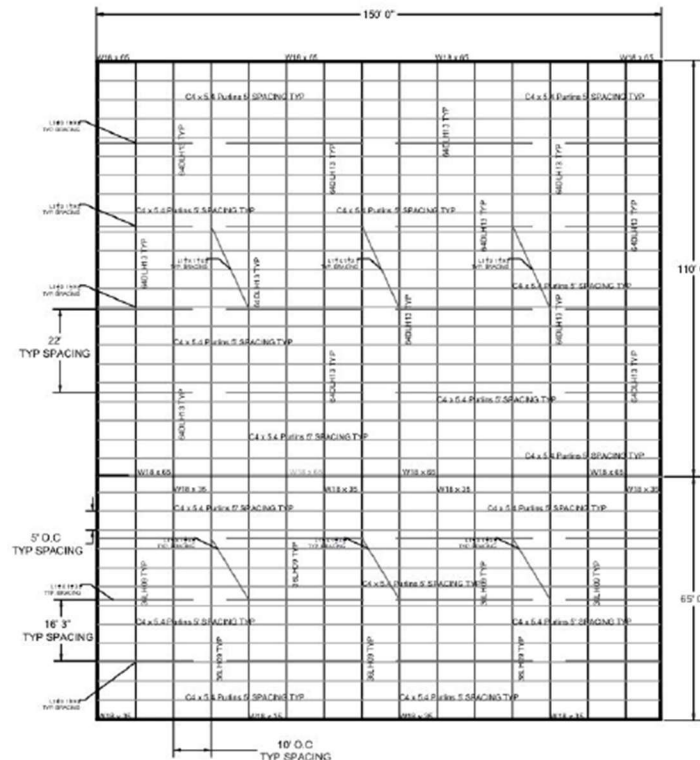


Figure 4: Lobby Roof Joist Diagram

### Gym Girders

- **W18×65 (A992)** spanning **30 ft** shall support lines of DLH joists and transfers roof loads to the gym columns.
- Strength and stability:
  - Factored bending moment from truss reactions and self-weight is less than the available flexural capacity, including lateral-torsional buckling effects.
  - Kicker bracing is introduced so that the unbraced length of the compression flange is reduced to 20 ft, which significantly increases the available flexural strength and provides a comfortable margin above demand.
  - Shear capacity of the web is more than the maximum factored reaction.
- Serviceability:
  - Computed girder deflections under service loads satisfy L/360 limits using the provided moment of inertia.

### Lobby Girders

- **W18×35 (A992)** spanning **30 ft** shall support LH joists and collect roof loads to lobby columns.
- Strength and stability:
  - Factored bending demand is less than the flexural strength considering lateral-torsional buckling with bracing at 20 ft.
  - Local slenderness of flanges and web is within compact/non-slender limits, and shear capacity comfortably exceeds required shear.
- Serviceability:
  - Deflection under service load combinations is within L/360, with the provided stiffness ( $I_x \approx 800 \text{ in}^4$ ) exceeding the required inertia.

### Exterior Gym Columns (Loadbearing)

- **W14×90 (A992)** shall support gym roof girders and resist significant combined axial load and bending from frame action and wind.
- Checks:
  - Strong- and weak-axis slenderness ratios are within acceptable buckling ranges.

- Axial capacity is well above factored axial load (utilization around 20%).
- Combined axial and bending interaction satisfies AISC requirements with a utilization significantly less than 1.0 when using W14×90.
- Shear capacity of the web is adequate for any incidental shear from frame action.

#### Exterior Lobby Columns (Loadbearing)

- **W6×16 (A992)** at the lobby perimeter shall support lobby girders and roof framing with primarily axial load.
- Checks:
  - Column slenderness and axial buckling strength have been evaluated; the factored axial load is close to but within the reduced compression capacity.
  - A slightly heavier W6×20 section would be conservative; W6×16 is used with the benefit of framing restraint from adjacent beams and walls.

#### Interior Gym / Lobby Columns (Shared)

- **W12×50 (A992)** shall be interior columns supporting both gym and lobby framing where grids align.
- Checks:
  - Axial and slenderness checks show adequate compression strength with a utilization ratio well below 1.0.
  - These columns also provide stiffness for the girder connections and lateral bracing where applicable.

#### Non-Loadbearing Columns

- Exterior non-loadbearing: **W14×38**
  - Supports façade / veneer and acts as a wind frame element, with bending demands within about 90% of available flexural capacity and adequate stiffness for cladding serviceability.
- Interior non-loadbearing: **W8×18**
  - Supports interior framing and light partitions; bending and shear are well within capacity, and deflection limits are satisfied.

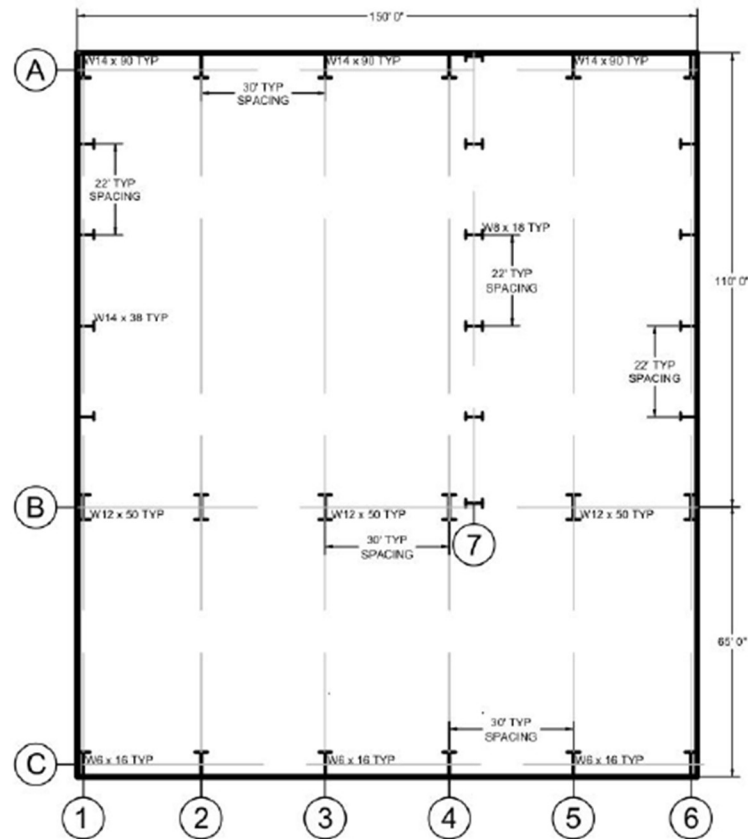


Figure 5: Column Diagram

### Truss Bracing

- Gym Trusses:
  - Top chord braced by roof purlins and deck.
  - Bottom chord bracing uses  $L1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{8}$  angles arranged as horizontal struts plus periodic diagonals.
  - Member and connection capacities exceed required brace forces derived from truss compression chord demands and uplift.
- Lobby Trusses:
  - Similar bracing scheme with the same angle size but slightly tighter spacing due to shorter span and different brace force demands.

### Girder Bracing

- Gym Girders:
  - Lateral-torsional bracing provided by  $L2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$  kicker braces, framing from girder compression flange back to framing points or columns.



- Each brace is designed for the required percentage of girder compression flange force and is checked as a compression member.
- Lobby Girders:
  - Braced using  $L2 \times 2 \times \frac{1}{4}$  kicker braces sized for the smaller brace forces of the lobby girders.

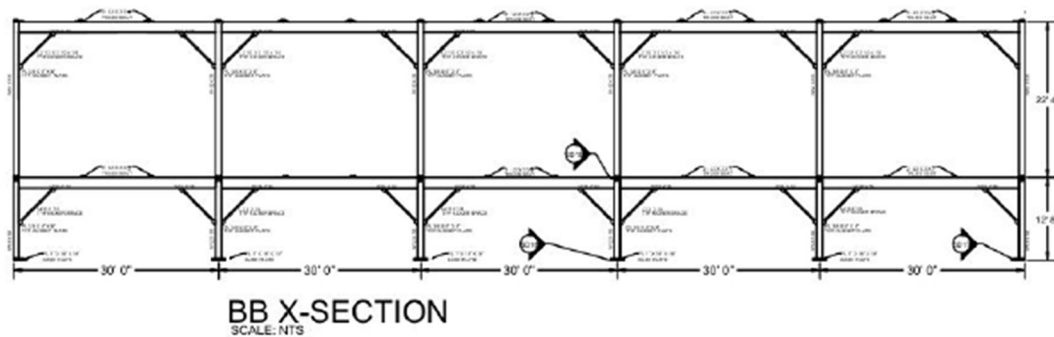


Figure 6: BB Cross Section

Overall, the bracing system provides stability for compression flanges of joists and girders and for column systems, ensuring adequate buckling resistance and controlling lateral displacements.

### Roof Purlins

- **C4×5.4** cold-formed channels, **5 ft o.c.** spanning approximately **10 ft** between joists.
- Checks:
  - Flexural demand from roof loads is significantly less than the available moment capacity.
  - Reactions into the joists and connections are small compared to bolt and weld capacities.
  - Deflections are well within  $L/360$  under service loads.

### Wall Girts

- 30 ft bay spacing (typical exterior wall):
  - Girt type: **C8×11.5** spanning 30 ft.
  - Bending capacity and stiffness are adequate for wind pressures and cladding loads, with utilization well below 1.0.
- Exterior walls with 22 ft spacing:
  - Girt type: **C6×10.5**.

- Designed for wind pressures; flexure and deflection checks are acceptable.
- Interior girts (22 ft span, lower loads):
  - Girt type: **C4×5.4**, carrying reduced interior loads; strength and serviceability are easily satisfied.

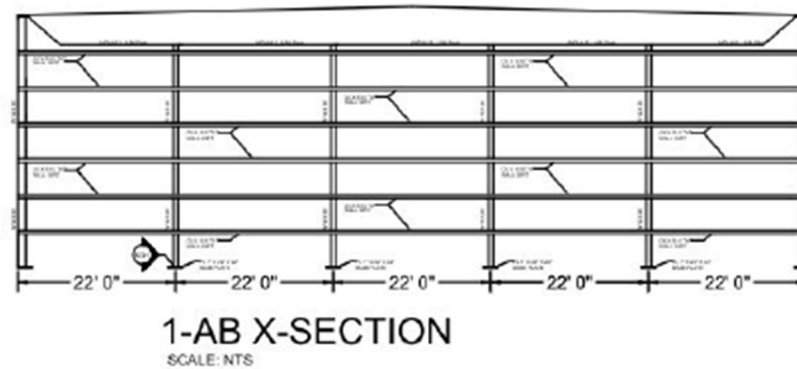


Figure 7: 1-AB Cross Section

### Purlin-to-Joist Connections

- **L2×2×3/16** clip angle shall with one ½" A325 bolt from angle to purlin and 3/16" fillet welds from angle to joist (both sides, short weld lengths).
- Bolt shear, bearing, and weld strength all exceed the factored reaction from the purlins.

### Truss-to-Girder Connections (Gym and Lobby)

- (2) **L3×3×¼** angles forming a seat connection where angles are welded to the girder seat plate and to the truss bottom chord.
- Angle axial capacities (yielding and rupture) are several times larger than required truss reactions. Weld sizes (¼" fillet) and lengths are sufficient to develop the angle strength.

### Bracing Connections

- Truss bottom-chord brace connection:
  - Small plate welded to truss chord, with 3/16" fillet welds and a single ½" A325 bolt connecting the brace angle.
  - Both weld and bolt capacities exceed the brace forces.
- Girder brace gussets:
  - 3/8" gusset plates welded to both sides of the girder web.

- Braces ( $L2\frac{1}{2}\times 2\frac{1}{2}\times \frac{1}{4}$  for the gym,  $L2\times 2\times \frac{1}{4}$  for the lobby) are bolted with two bolts each.
- Brace axial capacities and bolt strengths comfortably exceed the required brace forces.

### Girder-to-Column Shear Connections

- Gym girders:
  - Shear plate connection using a  $\frac{3}{8}$ " plate with multiple  $\frac{3}{4}$ " A325 bolts.
  - Plate bearing, column web bearing, and bolt shear capacities exceed factored reactions.
  - Fillet welds between plate and column are sized to exceed the required shear transfer.
- Lobby girders:
  - Similar shear plate connection at smaller reactions, using a  $\frac{3}{8}$ " plate with two  $\frac{3}{4}$ " bolts.
  - Plate and column checks are all satisfactory with ample reserve capacity.

### Wall Girt Connections

- Girts are connected to column flanges using **two  $\frac{3}{4}$ " A325 bolts** per connection.
- Bolt capacities exceed the factored girt reactions from wind loading.

### Gym Exterior Columns (W14×90)

- Base plate shall be  $1\frac{1}{2}"\times 30"\times 30"$  plate under W14×90.
  - compression footing with significant overturning.
- Anchors shall be  **$1\frac{1}{4}"$  diameter** anchor rods, arranged with two on the tension side and two on the compression side.
- A  $\frac{3}{4}"$  thick stiffener plate welded to the column web improves load transfer to the base plate.
- A continuous  $\frac{3}{8}"$  fillet weld around the column perimeter provides full transfer to the base plate.

### Interior Gym / Lobby Columns (W12×50)

- Base plate shall be  $1"\times 20"\times 20"$ .

- Anchors shall be four  $\frac{3}{4}$ " **diameter** rods; each rod's tension capacity exceeds factored demands.
- A continuous  $\frac{1}{4}$ " fillet weld around the column perimeter provides full transfer to the base plate.

#### Lobby Exterior Columns (W6×16)

- Base plate shall be  $\frac{1}{2}$ "×16"×16".
- Anchors shall be  $\frac{5}{8}$ " **diameter** rods with adequate tension capacity.

#### Non-Loadbearing Exterior Columns (W14×38)

- Base plate shall be 1"×22"×22" designed for combined moment and small axial load from façade and wind.
- Anchors shall be four  $1\frac{1}{4}$ " **diameter** rods providing sufficient tensile resistance.
- $\frac{3}{8}$ " fillet welds at flanges and web fully develop the column base.

#### Non-Loadbearing Interior Columns (W8×18)

- Base plate shall be  $\frac{5}{8}$ "×14"×14".
- Anchors shall be four  $\frac{7}{8}$ " **diameter** rods with adequate tension capacity under combined gravity and minor moment.
- Column is fully welded to the base plate with  $\frac{1}{4}$ " fillet welds around the perimeter.

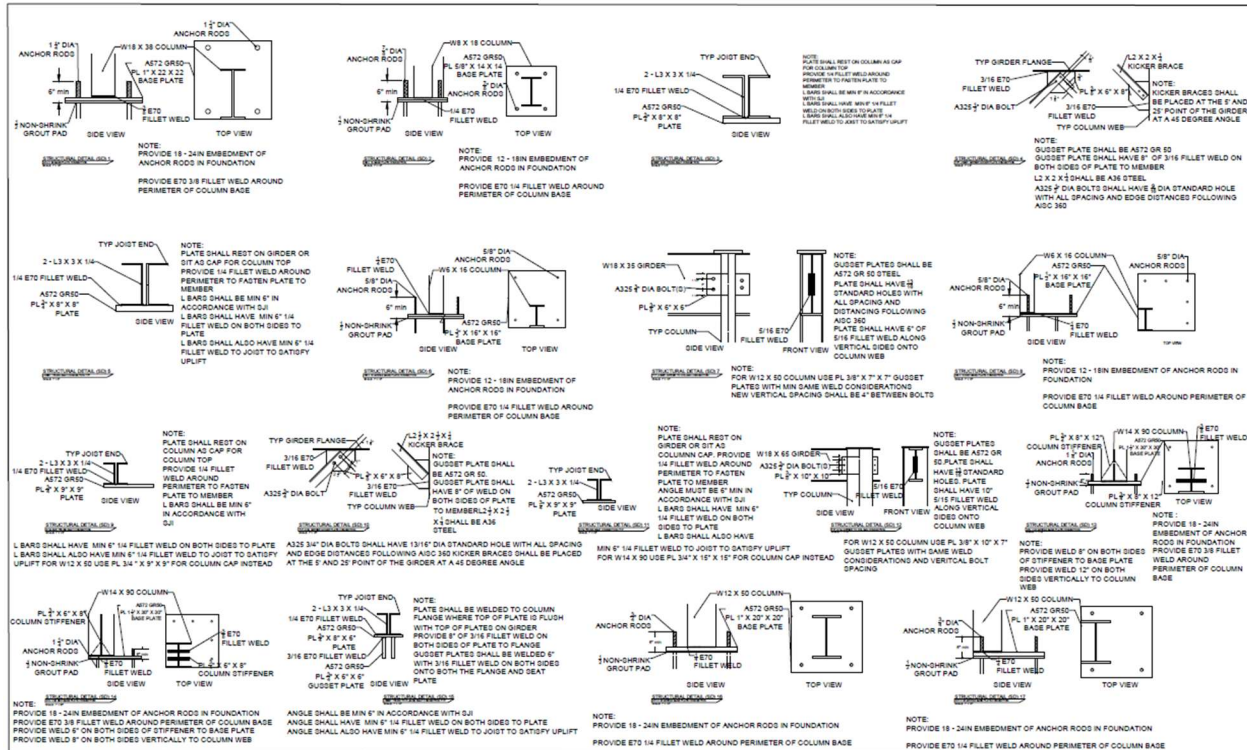


Figure 8: Column/Beam details

## Transportation

The Leon Valley Baptist Church campus is located along Grissom Road near Bandera Road in San Antonio, Texas. The existing property includes the main church building and two 24-foot-wide driveways providing access to the site. The proposed Leon Valley Baptist Church Recreational Center will be located behind the existing church and will measure approximately 150 feet by 175 feet (26,250 square feet GFA). The new facility will primarily serve church members and is classified under the City of San Antonio Unified Development Code (UDC) as a Recreational Community Facility (ITE Land Use Code 495).

### Grissom Road

Grissom Road runs primarily east-west, with a posted speed limit of 45 miles per hour. The typical configuration of the roadway includes two 12-foot lanes in each direction and a 12-foot Two-Way Turn Lane (TWTL). In 2024, Grissom Road had an Average Annual Daily Traffic (AADT) of 29,493 vehicles.

### Trip Generation and Traffic Impact

Based on ITE Trip Generation Manual, 12th Edition (Land Use 495), the proposed 26,250-sf facility is expected to generate approximately 61 weekday PM peak-hour trips (29 entering, 32 exiting) under typical weekday programming as illustrated in Table 5. This trip volume remains below the 76-trip threshold that triggers a complete Traffic Impact Analysis (TIA) per City of San Antonio and TxDOT guidelines.

Table 5: Trip Generation Summary (ITE 495)

| Trip Generation Calculation                      |       |               |     |                 |     |                 |     |          |      |        |
|--------------------------------------------------|-------|---------------|-----|-----------------|-----|-----------------|-----|----------|------|--------|
| Recreational Community Center - ITE Land Use 495 |       |               |     |                 |     |                 |     |          |      |        |
| 1000 Sq. Ft. GFA                                 | 26.25 | Weekday 24 Hr |     | Weekday AM Peak |     | Weekday PM Peak |     | Saturday |      | Sunday |
| Trips/1000 Sq. Ft. GFA                           |       | 28.82         |     | 1.76            |     | 2.31            |     | 9.1      |      | 13.6   |
| %Enter/%Exit                                     |       | 50%           | 50% | 66%             | 34% | 47%             | 53% | 50 %     | 50 % | 50 %   |
| Total Trips                                      |       | 757           |     | 47              |     | 61              |     | 239      |      | 357    |
| Enter/Exit                                       |       | 379           | 379 | 31              | 16  | 29              | 32  | 119      | 120  | 179    |

A TIA worksheet (Appendix J) has been prepared that summarizes projected daily and peak-hour trip generation for normal operations and special event conditions. Under standard use, traffic impacts are minor and can be accommodated within the existing roadway network without requiring intersection or turn lane improvements. However, for special events or large gatherings, estimated peak-hour trip generation may temporarily increase to approximately 65 – 70 trips. These conditions will be mitigated through an Event Traffic Management Plan, including:

- Use of church volunteers to assist with ingress/egress
- Staggered events start and dismissal times
- Temporary on-site signage and traffic control
- Use of overflow parking areas and internal circulation coordination with the existing church lot

### Access and Circulation

Vehicular access will remain through the two existing 24-foot-wide driveways along Grissom Road, which currently provide safe and adequate sight distance.

The internal circulation network will connect the existing church parking area to the new recreational center parking lot.

The traffic study will confirm:

- Driveway spacing and alignment with city standards
- Adequate sight distance per TxDOT design criteria
- Compliance with fire lane access (minimum 20 feet clear width)
- Safe pedestrian circulation between the church and the new facility

Turn lane warrants and queueing analyses indicate that no additional turn lanes are required along Grissom Road under existing or projected traffic conditions.

### Parking and Bicycle

Parking demand was evaluated in accordance with UDC Table 526-3a for recreational facilities, and the results are illustrated in Table 6.

Table 6: Minimum Code Requirements

| Use Classification                | Minimum Vehicle Spaces | Maximum Vehicle Spaces |
|-----------------------------------|------------------------|------------------------|
| Recreational Facility (ITE 495)   | 1.5 per 1,000 sf       | 10 per 1,000 sf        |
| Recreational Facility (26,250 sf) | 40                     | 262                    |

Based on the minimum code requirements and anticipated demand for the facility, we have elected to provide parking at a ratio of 2 spaces per 1,000 square feet of gross floor area (GFA), resulting in approximately 52 vehicle spaces. In addition, the site will exceed the minimum accessibility and bicycle standards by including 5 ADA-compliant spaces (with van-accessible design) and five bicycle parking spaces, ensuring adequate accommodation for all users while remaining well within the UDC parking requirements.

### Rough Proportionality Analysis

A rough proportionality assessment (Appendix K) was conducted in accordance with the City of San Antonio TIA Guidelines to ensure the proposed improvements are proportionate to the traffic impacts generated by the project. Given that the facility generates fewer than 100 PM peak-hour trips and utilizes existing driveway infrastructure, the required mitigation measures are limited to on-site circulation enhancements, ADA upgrades, and signage improvements. No



off-site roadway or intersection improvements are warranted under current conditions.

### Pavement Plan

The Pavement Plan establishes the materials, structural sections, and layout for vehicular pavement areas serving the proposed Leon Valley Baptist Church Recreation Center. The design provides long-term performance under expected traffic loads while meeting City of San Antonio (CoSA) design standards and ADA accessibility requirements.

### Pavement Design Criteria

All proposed asphalt pavement materials, thicknesses, and construction practices shall comply with the City of San Antonio Design Criteria Manual (DCM), the Unified Development Code (UDC), and applicable TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges. The pavement section has been designed to support light to medium-duty traffic typically associated with institutional and recreational facilities, including passenger vehicles, church vans, maintenance equipment, and periodic delivery trucks.

### Design Parameters

- Design Life: 20 years
- Subgrade Strength: Minimum CBR  $\geq 6$ , consistent with anticipated native clayey soils in the Leon Valley area
- Traffic Loading: Less than 1,000,000 ESALs, appropriate for non-industrial parking facilities
- Surface Drainage: Positive drainage required toward curb inlets, swales, or approved discharge locations
- Cross Slope:
  - Asphalt pavement: 1.5%–2.0%
  - Adjacent concrete surfaces: 2.0% minimum
- Recommended Pavement Structure:
  - 8 in. compacted granular base (TxDOT Grade 1 or 2, Type B or C)
  - 3 in. hot-mix asphalt (HMA) binder course

- 2 in. HMA surface course using Superpave mix with PG 70-22 binder grade (PG 70-20)

#### *Notes and Considerations:*

- Pavement thicknesses are based on assumed subgrade conditions; field verification and proof-rolling are recommended prior to construction.
- Superpave surface mix is selected to provide improved rut resistance and performance in high-temperature climates typical of the San Antonio region.
- Base and asphalt lifts must be compacted in accordance with COSA and TxDOT density requirements to achieve structural integrity and long-term durability.
- Additional pavement reinforcement or increased thickness may be required in fire lane areas subject to higher wheel loads.

#### Traffic Summary and Conclusion

The proposed Leon Valley Baptist Church Recreational Center is expected to integrate seamlessly into the existing church campus, using existing access points and circulation systems. The modest trip generation confirms that a full TIA is not required, and on-site improvements will maintain safe and efficient operation.

By providing compliant parking, ADA access, bicycle facilities, and proactive event management, the project will operate effectively without adversely impacting adjacent roadways or neighboring properties.

## Schedule & Budget

---

The proposed construction schedule for the Leon Valley Baptist Church Recreation Center establishes a structured sequence of work extending from November 2025 through December 2026. The schedule is organized to support the efficient progression of site development, building construction, and commissioning activities while maintaining logical trade coordination.

The project begins with Pre-Construction and Permitting, which allow for regulatory approvals and mobilization activities. This phase is followed by Site Preparation, during which the construction area is cleared, graded, and readied for foundational work. Foundation construction then proceeds as the first significant structural activity.



Subsequent phases include Structural Framing and Roof installation, establishing the primary building structure, and the Building Envelope phase, which provides enclosure and weather protection. With the facility dried in, MEP and utility rough-in is conducted to install essential building systems before interior architectural work.

The schedule then advances into Interior Construction and Finishes, the most comprehensive phase of the project, during which interior walls, finishes, and building systems integration are completed. In parallel, Exterior Site Work addresses paving, drainage, and final grading to ensure site functionality and code compliance.

Following substantial completion of construction activities, the project enters Final Inspections and Commissioning, during which all building systems are tested and validated for operational readiness. The schedule concludes with a Project Closeout phase, encompassing documentation, punch list completion, and turnover to the Owner.

Overall, the planned schedule provides a logical, sequential framework that supports efficient construction, maintains trade coordination, and targets facility completion by late 2026 (406 days) as illustrated in Figure 9.

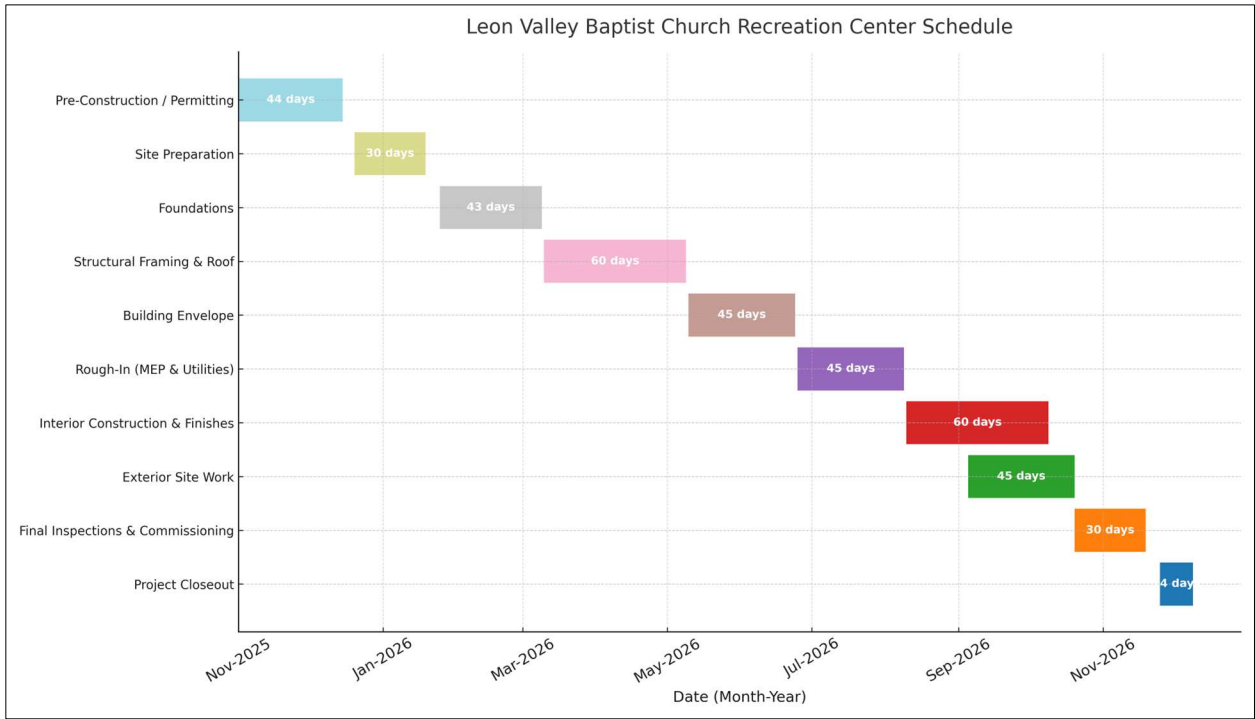


Figure 9: Project Schedule

## Cost Summary

A detailed cost estimate was prepared for the proposed Leon Valley Baptist Church Recreation Center to establish an anticipated total project budget and to provide a breakdown of the primary cost drivers as illustrated in Appendix L. The estimate incorporates direct construction costs, building systems, site improvements, engineering and design fees, and associated soft costs. The total projected cost for the facility is \$9,500,000. This estimate provides a comprehensive foundation for project budgeting, funding allocation, and subsequent design-phase refinement.

### **1. Facility Building Costs — \$4,250,000**

These costs represent the core building construction and account for the largest portion of the project budget.

- Main Building Structure — **\$3,000,000**
  - Interior Build-Out — **\$750,000**
  - MEP Systems — **\$500,000**
- 

### **2. Construction Materials — \$883,000**

Covers materials required to complete the building envelope and interior components.

- Concrete & Rebar — **\$250,000**
  - Structural Steel — **\$225,000**
  - Roofing & Envelope Materials — **\$200,000**
  - Finishes & Fixtures — **\$208,000**
- 

### **3. Site Work — \$550,000**

Includes all on-site improvements and utility connections.

- Earthwork & Grading — **\$200,000**
  - Paving & Parking — **\$175,000**
-

- Utilities (Water/Sewer/Electric) — **\$125,000**
  - Landscaping — **\$50,000**
- 

#### **4. Structural Components — \$320,000**

Structural systems supporting the building.

- Foundations — **\$140,000**
  - Slab-on-Grade — **\$100,000**
  - Beams/Columns/Girders — **\$80,000**
- 

#### **5. Miscellaneous Construction — \$118,700**

Jobsite provisions and temporary work.

- General Conditions — **\$70,000**
  - Safety & Temporary Facilities — **\$48,700**
- 

#### **6. Mobilization, Insurance & Bond — \$1,200,000**

Contractor startup, insurance coverage, and bonding requirements.

- Mobilization — **\$600,000**
  - Insurance & Bonding — **\$600,000**
- 

#### **7. Construction Contingency — \$1,280,000**

Allowance for unknown conditions, design development, and escalation.

---

#### **8. Engineering & Design Fees — \$888,300**

Professional services for planning, design, and engineering coordination.

- Architectural — **\$388,300**
-

- Civil/Structural/MEP Engineering — **\$500,000**
- 

**9. Permitting, Testing & Administration — \$10,000**

Regulatory approvals and quality control.

- Permits — **\$5,000**
  - Testing & Inspections — **\$5,000**
- 

**Total Project Cost: \$9,500,000**

## Appendix A – Habitat Compliance



**HABITAT COMPLIANCE  
FORM****Part 1. Commentary:**

For information on endangered species habitat within Bexar County as may be established, see 2011 Final Recovery Plan for Bexar County Karst Invertebrates, available on US Fish and Wildlife Service's website, [https://ecos.fws.gov/docs/recovery\\_plan/Final%202001%20Bexar%20Co%20Invertebrates%20Recovery%20Plan\\_1.pdf](https://ecos.fws.gov/docs/recovery_plan/Final%202001%20Bexar%20Co%20Invertebrates%20Recovery%20Plan_1.pdf) and Management Guidelines for the Golden-cheeked Warbler in Rural Landscapes by Texas Parks and Wildlife Department available on their website, [https://tpwd.texas.gov/publications/pwspubs/media/pwd\\_bk\\_w7009\\_0013\\_golden\\_cheeked\\_warbler\\_mgmt.pdf](https://tpwd.texas.gov/publications/pwspubs/media/pwd_bk_w7009_0013_golden_cheeked_warbler_mgmt.pdf).

**Part 2. Applicant Contact Information:**

|                                                                |                                                                                                |
|----------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Project Name: Leon Valley Baptist Church Recreational Facility |                                                                                                |
| Property Owner: Leon Valley Baptist Church                     | E-mail: <a href="mailto:Lonestarengineering@lonestar.com">Lonestarengineering@lonestar.com</a> |
| Address: 7980 Grissom Road, San Antonio TX                     | Zip code: 78280 Phone: 210-755-9000                                                            |
| Agent: Leon Valley Baptist Church                              | E-mail: <a href="mailto:Lonestarengineering@lonestar.com">Lonestarengineering@lonestar.com</a> |
| Address: 7980 Grissom Road, San Antonio TX                     | Zip code: 78249 Phone: 210-755-9000                                                            |
| Contact Person Name: Jose Arvizu                               | E-mail: <a href="mailto:jose@lonestar.com">jose@lonestar.com</a>                               |
| Company: Lone Star Engineering                                 | Relationship to Owner: Contracted                                                              |
| Address: 1234 UTSA Boulevard San Antonio TX                    | Zip code: 1234 Phone: 210-755-9000                                                             |

**Part 3. Property Location:**

Property address or nearest street intersection if address not available: \_\_\_\_\_  
Acres: 12.434 Ferguson map grid: 15 USGS Grid: Pa-D  
In addition to this form, please submit an aerial map designating property boundaries based on the most recently available imagery. Maps can be obtained from [www.sanantonio.gov/dsd](http://www.sanantonio.gov/dsd) and saved into a PDF format.

**Part 4. Application Type (check one):**

|                                                        |                                                              |
|--------------------------------------------------------|--------------------------------------------------------------|
| <input type="checkbox"/> Master Development Plan (MDP) | <input type="checkbox"/> Tree Permit                         |
| <input checked="" type="checkbox"/> Major Plat         | <input type="checkbox"/> Planned Unit Development (PUD) Plan |
| <input type="checkbox"/> Development Plat              | <input type="checkbox"/> Minor Plat                          |

**Part 5. Endangered Species Act Coverage (check one):**

☒ The activity subject to the application to the City of San Antonio is covered under an existing individual Section 10(a) permit or an individual Section 7 Biological Opinion analyzing the activity as proposed, and the activity is identical or very similar to the activity proposed in permit and located in the same geographic location. Applicants checking this box must provide either the Section 7 consultation number ( ) or the individual Section 10(a) permit number ( ). *Complete part 7 of this form, no affidavit required.*

☐ The activity subject to the application to the City of San Antonio is covered by participation in the Southern Edwards Plateau Habitat Conservation Plan (SEP HCP) or another approved Regional Habitat Conservation Plan. Applicants checking this box must provide a copy of the Participation Certificate. *Complete part 7 of this form, no affidavit required.*

☐ The activity subject to the application to the City of San Antonio is not covered by an existing Section 10(a) permit or a Section 7 Biological Opinion nor participation in an approved Regional Habitat Conservation Plan. *(Complete parts 6, 7 and 8 of this form if applicable)*

Habitat Compliance Form | Updated July 9, 2024

Page 1 of 3

**HABITAT COMPLIANCE  
FORM****Part 6. Description for Activities Without Coverage (check one box for both parts A and B):**

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. Golden-cheeked Warbler Endangered Species</b> | 1. <input checked="" type="checkbox"/> No part of the tract subject to the application to the City of San Antonio is located in the presumptive habitat area for Golden-cheeked Warblers as described below. While this requirement applies throughout the jurisdiction of the City of San Antonio, there is a presumption that areas located outside of Loop 1604, and north of U.S. Highway 90, and west of Interstate Highway 35 do contain habitat. If the property is located in the presumptive habitat area, as described, this box may not be checked.                                                                                                                                                                                                                                                                                                                                                                              |
|                                                     | 2. <input type="checkbox"/> The tract or portions of the tract subject to the application to the City of San Antonio is within a presumptive habitat area or contains habitat types that may be used by Golden-cheeked Warblers as set forth in <i>Management Guidelines for the Golden-cheeked Warbler in Rural Landscapes, Texas Parks and Wildlife Department, available on their website</i> and an Endangered Species Survey or Habitat Assessment has been completed within the last 3 years by a Biologist permitted by U.S. Fish and Wildlife and copies have been sent or will be sent to: U.S. Fish and Wildlife (USFWS) Ecological Services Field Office, 10711 Burnet Road, Suite 200, Austin, TX 78758<br><br>Biologist Name and permit number _____<br>Date of Survey/Assessment _____<br>Biologist has been notified that their survey/assessment has been utilized <input type="checkbox"/> Yes <input type="checkbox"/> No |
|                                                     | 3. <input type="checkbox"/> The tract or portions of the tract subject to the application to the City of San Antonio is within a presumptive habitat area or contains habitat types that may be used by Golden-cheeked Warblers as set forth in <i>Management Guidelines for the Golden-cheeked Warbler in Rural Landscapes, Texas Parks and Wildlife Department, available on their website</i> , and an Endangered Species Survey has NOT been submitted to U.S. Fish and Wildlife. <i>(Selecting this box requires the applicant to complete the Habitat Compliance Affidavit in part 8 of the form.)</i>                                                                                                                                                                                                                                                                                                                                |
| <b>B. Karst Invertebrate Endangered Species</b>     | 1. <input checked="" type="checkbox"/> No part of the tract subject to the application to the City of San Antonio is located within karst zone 1 or 2 as identified by the USFWS. (Applicant must provide a map demonstrating that the tract is outside of karst zone 1 or 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                     | 2. <input type="checkbox"/> The tract or portions of the tract subject to the application to the City of San Antonio is located within Karst Zone 1 or 2 as identified by the USFWS and a karst feature survey or Endangered Species Survey has been completed by a Biologist permitted by U.S. Fish and Wildlife and copies have been sent or will be sent to: U.S. Fish and Wildlife (USFWS) Ecological Services Field Office, 10711 Burnet Road, Suite 200, Austin, TX 78758<br><br>Biologist Name and permit number _____<br>Date of Survey/Assessment _____<br>Biologist has been notified that their survey/assessment has been utilized <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                                                                                                                     |
|                                                     | 3. <input type="checkbox"/> The tract or portions of the tract subject to the application to the City of San Antonio is located within Karst Zone 1 or 2 as identified by the USFWS and a karst feature survey or Endangered Species Survey has NOT been submitted to U.S. Fish and Wildlife. <i>(Selecting this box requires the applicant to complete the Habitat Compliance Affidavit in part 8 of the form.)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

Habitat Compliance Form | Updated July 9, 2024

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**HABITAT COMPLIANCE  
FORM****Part 7. Owner or Authorized Representative (form is considered incomplete without this part of the form completed):**

I certify that the information provided in this Habitat Compliance Form is true and accurate.

|                                                                                                  |                                            |
|--------------------------------------------------------------------------------------------------|--------------------------------------------|
| Print Name: Jose                                                                                 | Title: Engineer                            |
| Signature: _____                                                                                 | Date: 10/30/2024                           |
| <input type="checkbox"/> Owner                                                                   |                                            |
| <input checked="" type="checkbox"/> Authorized Representative                                    |                                            |
| <input type="checkbox"/> I affirm that I am authorized to sign this form on behalf of the owner. |                                            |
| Address: UTSA Boulevard                                                                          | City: San Antonio State: TX Zip Code: 1234 |
| E-mail: <a href="mailto:jose@lonestarengineering.com">jose@lonestarengineering.com</a>           |                                            |

**Part 8. Affidavit of Compliance** (required for properties in karst zones 1 or 2 or located in the area identified as potential habitat as set forth in *Management Guidelines for the Golden-cheeked Warbler in Rural Landscapes, Texas Parks and Wildlife Department, available on their website* when there is no Section 10(a) permit, Section 7 Biological Opinion, Regional Habitat Conservation Plan, nor endangered species survey submitted to US Fish and Wildlife):

|                                                                                                                                                |  |
|------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Affidavit of Compliance</b>                                                                                                                 |  |
| Before me, the undersigned authority, on this day personally appeared _____ ("Affiant") who, being first duly sworn, upon his/her oath states: |  |
| My name is _____ and I am the owner of the property that is the subject of this application to the City of San Antonio.                        |  |
| _____ A habitat assessment/survey was not conducted or I have elected not to provide the information.                                          |  |
| Please explain below with an additional narrative why no survey has been conducted or why you have elected to not provide the information:     |  |
| _____                                                                                                                                          |  |
| I, as the owner, understand that I am responsible for the property's compliance with the Endangered Species Act.                               |  |
| Signed this _____ day of _____, _____.                                                                                                         |  |
| Signature: _____                                                                                                                               |  |
| STATE OF TEXAS §                                                                                                                               |  |
| COUNTY OF BEXAR §                                                                                                                              |  |
| Sworn to and subscribed to before me on _____, by _____.                                                                                       |  |
| _____<br>Notary Public, State of Texas                                                                                                         |  |

Habitat Compliance Form | Updated July 9, 2024

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## Appendix B – SWPPP Example

# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



## CITY OF SAN ANTONIO TRANSPORTATION & CAPITAL IMPROVEMENTS CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

- ☒ TCEQ TPDES CGP  
☐ EPA NPDES GCP

### Inspection of Controls Report

Complete this form every seven days and retain in your SWP3.

| General Information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------|
| <b>Name of Project:</b><br>LEON VALLEY BAPTIST<br>CHURCH - RECREATIONAL<br>CENTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>EPA CGP Tracking No.:</b><br>7779 | <b>Inspection Date:</b><br>10/30/25 |
| <b>Date of Last Rainfall:</b> 10/28/25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Amount of Last Rainfall:</b> 0.1  |                                     |
| <b>Inspector Name, Title &amp; Contact Information</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                      | Example, PE, 210-755-9000           |
| <b>Present Phase of Construction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                      | 0                                   |
| <b>Inspection Location</b> (if multiple inspections are required, specify location where this inspection is being conducted)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                      | Grissom Road 78249                  |
| <b>Inspection Frequency</b> (Note: you may be subject to different inspection frequencies in different areas of the site. Check all that apply.)<br><b>Standard Frequency:</b> <input checked="" type="checkbox"/> Weekly<br><b>Increased Frequency:</b> <input type="checkbox"/> Every 7 days and within 24 hours of a 0.25" rain (for areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3)<br><b>Reduced Frequency:</b><br><input type="checkbox"/> Once per month (for stabilized areas)<br><input type="checkbox"/> Once per month and within 24 hours of a 0.25" rain (for arid, semi-arid, or drought-stricken areas during seasonally dry periods or during drought)<br><input type="checkbox"/> Once per month (for frozen conditions where earth-disturbing activities are being conducted) |                                      |                                     |
| <b>Was this inspection triggered by a 0.25" storm event?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br><b>If yes, how did you determine whether a 0.25" storm event has occurred?</b><br><input type="checkbox"/> Rain gauge on site <input type="checkbox"/> Weather station representative of site. Specify weather station source:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                      |                                     |
| <b>Total rainfall amount that triggered the inspection</b> (in inches):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                     |

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## CITY OF SAN ANTONIO TRANSPORTATION & CAPITAL IMPROVEMENTS CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

**Unsafe Conditions for Inspection**  
Did you determine that any portion of your site was unsafe for inspection per CGP Part 4.1.5?

☐ Yes ☒ No  
If "yes", complete the following:  
Describe the conditions that prevented you from conducting the inspection in this location:

Location(s) where conditions were found:

| Inspection Type:            | Inspected?<br>(Y/N)                 | Areas of Concern<br>(Describe in detail in the narrative section) |
|-----------------------------|-------------------------------------|-------------------------------------------------------------------|
| Disturbed Soil Areas        | <input checked="" type="checkbox"/> |                                                                   |
| Material Storage Areas      | <input checked="" type="checkbox"/> |                                                                   |
| Structural Controls         | <input checked="" type="checkbox"/> |                                                                   |
| Sediment & Erosion Controls | <input checked="" type="checkbox"/> |                                                                   |
| Entrance(s) and Exit(s)     | <input checked="" type="checkbox"/> |                                                                   |

### Discharges:

| Nature of discharge (silt, gravel, sand, other pollutant) | Location on-site of discharge   |
|-----------------------------------------------------------|---------------------------------|
| Lean Clay                                                 | North to Center of the property |
| Fat Clay                                                  | North to Center of the property |
| Select fill                                               | North to Center of the property |
| Automobile fluid                                          | North                           |

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## CITY OF SAN ANTONIO TRANSPORTATION & CAPITAL IMPROVEMENTS CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

### Best Management Practices Inspected: Add additional rows if needed.

| BMP                               | Station Number | Left or Right of Center Line | OK<br>(no action required)          | BMP failed<br>(describe failure) | Failure due to Maintenance or Improper Design? | Describe corrective actions needed<br>(include schedule) |
|-----------------------------------|----------------|------------------------------|-------------------------------------|----------------------------------|------------------------------------------------|----------------------------------------------------------|
| Detention Pond                    | 01             | Left                         | <input checked="" type="checkbox"/> |                                  |                                                |                                                          |
| Perm. erosion Control: Sod        | 02             | Left                         | <input checked="" type="checkbox"/> |                                  |                                                |                                                          |
| Temp. Erosion Control: Silt Fence | 03             | Left                         | <input checked="" type="checkbox"/> |                                  |                                                |                                                          |
| Temp. Erosion Control: Silt Fence | 04             | Right                        | <input checked="" type="checkbox"/> |                                  |                                                |                                                          |
| Perm. erosion Control: sod        | 05             | Right                        | <input checked="" type="checkbox"/> |                                  |                                                |                                                          |
| Sod Irrigation                    | 06             | Left                         | <input checked="" type="checkbox"/> |                                  |                                                |                                                          |
|                                   |                |                              | <input type="checkbox"/>            |                                  |                                                |                                                          |

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# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



CITY OF SAN ANTONIO  
TRANSPORTATION & CAPITAL IMPROVEMENTS

## CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

| Additional BMPs Needed |                              |                          |                                            |
|------------------------|------------------------------|--------------------------|--------------------------------------------|
| Station Number         | Left or Right of Center Line | Best Management Practice | Replacing Existing BMP? (include schedule) |
| N/A                    |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |
|                        |                              |                          |                                            |

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CITY OF SAN ANTONIO  
TRANSPORTATION & CAPITAL IMPROVEMENTS

## CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

| Uninstalled/Missing BMPs (per SWP3) |                              |                          |                                                     |
|-------------------------------------|------------------------------|--------------------------|-----------------------------------------------------|
| Station Number                      | Left or Right of Center Line | Best Management Practice | Schedule for installing BMP? (or reason for change) |
| N/A                                 |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |
|                                     |                              |                          |                                                     |

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CITY OF SAN ANTONIO  
TRANSPORTATION & CAPITAL IMPROVEMENTS

## CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

### SWP3 Updates and Required Recordkeeping Practices

Yes No

☒ ☐

Complete all required text fields. Fill out all text fields. Only by filling out all fields will the template be compliant with the requirements of the permit. (Note: Where you do not need the number of rows provided in the template form for your inspection, you may leave those rows blank. Or, if you need more space to document your findings, you may add an additional sheet.)

☒ ☐

Use your site map to document inspection findings. In several places in the template, you are directed to specify the location of certain features of your site, including where stormwater controls are installed and where you will be stabilizing exposed soil. You are also asked to fill in location information for unsafe conditions and the locations of any discharges occurring during your inspections. Where you are asked for location information, EPA encourages you to reference the point on your SWPPP site map that corresponds to the requested location on the inspection form. Using the site map as a tool in this way will help you conduct efficient inspections, will assist you in evaluating problems found, and will ensure proper documentation.

☒ ☐

Sign and certify each inspection report. Each inspection report must be signed and certified by the permittee to be considered complete. Where your inspections are carried out by a contractor or subcontractor, it is recommended that you also have the form signed and certified by the inspector. In addition to the signature and certification required of the permitted operator. The template includes a signature block for both parties.

☒ ☐

Include the inspection form with your SWPPP. Once your form is complete, make sure to include a copy of the inspection form in your SWPPP in accordance with Part 7.2.12.4 of the CGP.

Retain copies of all inspection reports with your records. You must also retain in your records copies of all inspection reports in accordance with the requirements in Part 4.1.7.3 of the 2012 CGP. These reports must be retained for at least 3 years from the date your permit coverage expires or is terminated.

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CITY OF SAN ANTONIO  
TRANSPORTATION & CAPITAL IMPROVEMENTS

## CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN FIELD INSPECTION AND MAINTENANCE REPORT

### TPDES Inspection Certification

#### TPDES Certification

Check One and Complete Signature.

☒ With the corrective actions noted (if any), the site is in compliance with the CGP regulations and the SWP3.

☐ The site is in potential non-compliance with the CGP regulations and/or the SWP3. Potential non-compliance issues are described below:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

|                                                         |             |                  |
|---------------------------------------------------------|-------------|------------------|
| Representative's Name (Print clearly):<br>Example       | Title<br>PE | Date<br>10/30/25 |
| Representative's Signature:<br>Example                  |             |                  |
| Representative's Organization:<br>Lone Star Engineering |             |                  |
| Certification Number:<br>999021645                      |             |                  |

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CITY OF SAN ANTONIO  
TRANSPORTATION & CAPITAL IMPROVEMENTSCONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN  
FIELD INSPECTION AND MAINTENANCE REPORT

## ■ NPDES Inspection Certification

*(Natural gas line projects in Texas are regulated by the EPA)*

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Permittee or  
"Duly Authorized Representative":  
Lone Star Engineering

Date: 10/30/25

Printed Name and Affiliation: Example-Lone Star Engineering

**Contractor Notification (City Inspector Use Only)**

Furnish a copy of this inspection report to the Contractor within one calendar day of the inspection. Corrective actions must be taken as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. If corrective actions are not made within this timeframe and become potential noncompliance issues, other work on the project may be suspended by the Engineer.

**Time charges will continue until the project is brought into compliance and documentation of corrective action is provided. This in no way releases the contractor of liability for noncompliance.**

|                                                     |       |       |
|-----------------------------------------------------|-------|-------|
| Contractor's Representative's Name (Print clearly): | Title | Date: |
| Contractor's Representative's Signature:            |       |       |

|                                               |       |       |
|-----------------------------------------------|-------|-------|
| COSA's Representative's Name (Print clearly): | Title | Date: |
| COSA's Representative's Signature:            |       |       |

## Appendix C – Geotechnical Report

# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



| Styron Reyes Geotechnical, LLC<br>16100 Henderson Pass #160<br>San Antonio, Texas 78232<br>Telephone: 210.857.9377 |  | <b>BORING NUMBER B-01</b><br>PAGE 1 OF 1 |  |                            |  |                          |  |  |  |
|--------------------------------------------------------------------------------------------------------------------|--|------------------------------------------|--|----------------------------|--|--------------------------|--|--|--|
| CLIENT _____                                                                                                       |  |                                          |  | PROJECT NAME _____         |  |                          |  |  |  |
| PROJECT NUMBER _____                                                                                               |  |                                          |  | PROJECT LOCATION _____     |  |                          |  |  |  |
| DATE STARTED <u>8/13/25</u>                                                                                        |  | COMPLETED <u>8/13/25</u>                 |  | GROUND ELEVATION _____     |  | HOLE SIZE <u>5"</u>      |  |  |  |
| DRILLING CONTRACTOR <u>BEA</u>                                                                                     |  |                                          |  | GROUND WATER LEVELS:       |  |                          |  |  |  |
| DRILLING METHOD <u>Dry Auger</u>                                                                                   |  |                                          |  | AT TIME OF DRILLING _____  |  |                          |  |  |  |
| LOGGED BY <u>D. Rocha</u>                                                                                          |  |                                          |  | CHECKED BY <u>R. Burge</u> |  | AT END OF DRILLING _____ |  |  |  |
| NOTES <u>Groundwater not encountered during drilling operations.</u>                                               |  |                                          |  | AFTER DRILLING _____       |  |                          |  |  |  |

| DEPTH<br>(ft) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                              | SAMPLE TYPE<br>NUMBER | RECOVERY %<br>(RCD) | BLOW<br>COUNTS<br>(N VALUE) | POCKET PEN.<br>(tsf) | DRY UNIT WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | ATTERBERG<br>LIMITS |                  |                     | FINES CONTENT<br>(%) |
|---------------|----------------|-------------------------------------------------------------------|-----------------------|---------------------|-----------------------------|----------------------|-----------------------|-------------------------|---------------------|------------------|---------------------|----------------------|
|               |                |                                                                   |                       |                     |                             |                      |                       |                         | LIQUID<br>LIMIT     | PLASTIC<br>LIMIT | PLASTICITY<br>INDEX |                      |
| 0             |                | Stratum I - Stiff to very stiff, dark grayish brown FAT CLAY (CH) | SS<br>1               |                     | 3-6-7<br>(13)               |                      |                       | 16                      | 74                  | 29               | 45                  |                      |
|               |                | Stratum II - Very stiff to hard, white CHALK                      | SS<br>2               |                     | 10-11-20<br>(31)            |                      |                       |                         |                     |                  |                     |                      |
|               |                |                                                                   | SS<br>3               |                     | 12-21-28<br>(49)            |                      |                       |                         |                     |                  |                     |                      |
| 5             |                | Stratum III - Hard, tan LEAN CLAY (CL)                            | SS<br>4               |                     | 16-25-33<br>(58)            |                      | 10                    | 46                      | 16                  | 30               |                     |                      |
|               |                | - grades tan and light gray in color below 8 feet                 | SS<br>5               |                     | 5-15-19<br>(34)             |                      | 13                    |                         |                     |                  |                     |                      |
| 10            |                |                                                                   | SS<br>6               |                     | 4-16-24<br>(40)             |                      |                       |                         |                     |                  |                     |                      |
| 15            |                | Bottom of hole at 15.0 feet.                                      |                       |                     |                             |                      |                       |                         |                     |                  |                     |                      |

GEOTECH BH COLUMNS (BEA) 12-25-1376 SRS - CIRCULO TOWNHOMES GPJ GANT US GDT 8/21/25



# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



|                                                                             |  |                                                                                                                    |  |                                          |  |
|-----------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------|--|------------------------------------------|--|
|                                                                             |  | Styron Reyes Geotechnical, LLC<br>16100 Henderson Pass #160<br>San Antonio, Texas 78232<br>Telephone: 210.857.9377 |  | <b>BORING NUMBER B-02</b><br>PAGE 1 OF 1 |  |
|                                                                             |  |                                                                                                                    |  |                                          |  |
| <b>CLIENT</b> _____                                                         |  | <b>PROJECT NAME</b> _____                                                                                          |  |                                          |  |
| <b>PROJECT NUMBER</b> _____                                                 |  | <b>PROJECT LOCATION</b> _____                                                                                      |  |                                          |  |
| <b>DATE STARTED</b> <u>8/13/25</u> <b>COMPLETED</b> <u>8/13/25</u>          |  | <b>GROUND ELEVATION</b> _____                                                                                      |  | <b>HOLE SIZE</b> <u>5"</u>               |  |
| <b>DRILLING CONTRACTOR</b> <u>BEA</u>                                       |  | <b>GROUND WATER LEVELS:</b>                                                                                        |  |                                          |  |
| <b>DRILLING METHOD</b> <u>Dry Auger</u>                                     |  | <b>AT TIME OF DRILLING</b> ____                                                                                    |  |                                          |  |
| <b>LOGGED BY</b> <u>D. Rocha</u> <b>CHECKED BY</b> <u>R. Burge</u>          |  | <b>AT END OF DRILLING</b> ____                                                                                     |  |                                          |  |
| <b>NOTES</b> <u>Groundwater not encountered during drilling operations.</u> |  | <b>AFTER DRILLING</b> ____                                                                                         |  |                                          |  |

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION                                              | SAMPLE TYPE NUMBER | RECOVERY % (ROD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS |               |                  | FINES CONTENT (%) |
|------------|-------------|-------------------------------------------------------------------|--------------------|------------------|-----------------------|-------------------|--------------------|----------------------|------------------|---------------|------------------|-------------------|
|            |             |                                                                   |                    |                  |                       |                   |                    |                      | LIQUID LIMIT     | PLASTIC LIMIT | PLASTICITY INDEX |                   |
| 0          |             | Stratum I - Stiff to very stiff, dark grayish brown FAT CLAY (CH) | SS-1               |                  | 3-6-6 (12)            |                   |                    | 5                    | 82               | 33            | 49               |                   |
|            |             |                                                                   | SS-2               |                  | 7-13-17 (30)          |                   |                    | 16                   | 86               | 31            | 55               |                   |
| 5          |             | Stratum II - Hard, light tan CHALK                                | SS-3               |                  | 13-19-27 (46)         |                   |                    | 9                    |                  |               |                  |                   |
|            |             | Stratum III - Hard, tan and light gray FAT CLAY (CH)              | SS-4               |                  | 17-19-24 (43)         |                   |                    |                      |                  |               |                  |                   |
|            |             | - with calcareous deposits from 6 to 8 feet                       | SS-5               |                  | 16-27-33 (60)         |                   |                    |                      |                  |               |                  |                   |
|            |             | - becomes marly below 8 feet                                      | SS-6               |                  | 8-28-35 (63)          |                   |                    | 12                   |                  |               |                  |                   |
| 15         |             | Bottom of hole at 15.0 feet.                                      |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |

GEOTECHNICAL COLUMNS: BOREAL 12-25-0310 3145 - CIRCULO 11000000013.0001 - GWT 1.05 GWT 8/27/25



# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



|                                                                      |  |                                                                                                                    |  |                          |  |                     |  |
|----------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------|--|--------------------------|--|---------------------|--|
|                                                                      |  | Styron Reyes Geotechnical, LLC<br>16100 Henderson Pass #160<br>San Antonio, Texas 78232<br>Telephone: 210.857.9377 |  | BORING NUMBER B-03       |  | PAGE 1 OF 1         |  |
|                                                                      |  |                                                                                                                    |  |                          |  |                     |  |
| CLIENT _____                                                         |  | PROJECT NAME _____                                                                                                 |  |                          |  |                     |  |
| PROJECT NUMBER _____                                                 |  | PROJECT LOCATION _____                                                                                             |  |                          |  |                     |  |
| DATE STARTED <u>8/13/25</u>                                          |  | COMPLETED <u>8/13/25</u>                                                                                           |  | GROUND ELEVATION _____   |  | HOLE SIZE <u>5"</u> |  |
| DRILLING CONTRACTOR <u>BEA</u>                                       |  | GROUND WATER LEVELS:                                                                                               |  |                          |  |                     |  |
| DRILLING METHOD <u>Dry Auger</u>                                     |  | AT TIME OF DRILLING _____                                                                                          |  |                          |  |                     |  |
| LOGGED BY <u>D. Rocha</u>                                            |  | CHECKED BY <u>R. Burge</u>                                                                                         |  | AT END OF DRILLING _____ |  |                     |  |
| NOTES <u>Groundwater not encountered during drilling operations.</u> |  | AFTER DRILLING _____                                                                                               |  |                          |  |                     |  |

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION                                              | SAMPLE TYPE NUMBER | RECOVERY % (ROD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS |               |                  | FINES CONTENT (%) |
|------------|-------------|-------------------------------------------------------------------|--------------------|------------------|-----------------------|-------------------|--------------------|----------------------|------------------|---------------|------------------|-------------------|
|            |             |                                                                   |                    |                  |                       |                   |                    |                      | LIQUID LIMIT     | PLASTIC LIMIT | PLASTICITY INDEX |                   |
| 0          |             | Stratum I - Stiff to very stiff, dark grayish brown FAT CLAY (CH) | SS 1               |                  | 8-6-8 (14)            |                   |                    | 19                   | 97               | 30            | 67               |                   |
|            |             | Stratum II - Very stiff to hard, white CHALK                      | SS 2               |                  | 10-10-12 (22)         |                   |                    |                      |                  |               |                  |                   |
| 5          |             |                                                                   | SS 3               |                  | 11-14-22 (36)         |                   |                    | 13                   | 49               | 23            | 26               |                   |
|            |             | Stratum III - Very stiff to hard, tan LEAN CLAY (CL)              | SS 4               |                  | 11-22-24 (46)         |                   |                    |                      |                  |               |                  |                   |
|            |             | - with calcareous deposits from 6 to 10 feet                      | SS 5               |                  | 8-13-16 (29)          |                   |                    | 18                   |                  |               |                  |                   |
|            |             | - becomes tan and light gray in color below 8 feet                |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |
| 10         |             | - becomes marly below 12 feet                                     | SS 6               |                  | 17-37-50/3*           |                   |                    | 12                   | 49               | 19            | 30               |                   |
| 15         |             | Bottom of hole at 15.0 feet.                                      |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |

GEOTECH B4 COLUMBUS AREA 12-05-0306 SRG - CIRILO TOWNHOMES (GPJ) GINT US DOT 8/21/25

# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



|                                                                      |  |                                                                                                                    |  |                     |  |
|----------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
|                                                                      |  | Styron Reyes Geotechnical, LLC<br>16100 Henderson Pass #160<br>San Antonio, Texas 78232<br>Telephone: 210.857.9377 |  | BORING NUMBER B-04  |  |
|                                                                      |  | PAGE 1 OF 1                                                                                                        |  |                     |  |
| CLIENT _____                                                         |  | PROJECT NAME _____                                                                                                 |  |                     |  |
| PROJECT NUMBER _____                                                 |  | PROJECT LOCATION _____                                                                                             |  |                     |  |
| DATE STARTED <u>8/13/25</u> COMPLETED <u>8/13/25</u>                 |  | GROUND ELEVATION _____                                                                                             |  | HOLE SIZE <u>5"</u> |  |
| DRILLING CONTRACTOR <u>BEA</u>                                       |  | GROUND WATER LEVELS:                                                                                               |  |                     |  |
| DRILLING METHOD <u>Dry Auger</u>                                     |  | AT TIME OF DRILLING _____                                                                                          |  |                     |  |
| LOGGED BY <u>D. Rocha</u> CHECKED BY <u>R. Burge</u>                 |  | AT END OF DRILLING _____                                                                                           |  |                     |  |
| NOTES <u>Groundwater not encountered during drilling operations.</u> |  | AFTER DRILLING _____                                                                                               |  |                     |  |

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION                                                | SAMPLE TYPE NUMBER | RECOVERY % (ROD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS |               |                  | FINES CONTENT (%) |
|------------|-------------|---------------------------------------------------------------------|--------------------|------------------|-----------------------|-------------------|--------------------|----------------------|------------------|---------------|------------------|-------------------|
|            |             |                                                                     |                    |                  |                       |                   |                    |                      | LIQUID LIMIT     | PLASTIC LIMIT | PLASTICITY INDEX |                   |
| 0          |             | Stratum I - Hard, dark brown FAT CLAY (CH)                          | ST 1               |                  |                       | 4.5+              |                    |                      |                  |               |                  |                   |
|            |             | Stratum II - Hard, light tan CHALK                                  | ST 2               |                  |                       | 4.5+              |                    | 9                    | 47               | 21            | 26               |                   |
| 5          |             |                                                                     | SS 3               |                  | 13-24-24 (48)         |                   |                    | 10                   |                  |               |                  |                   |
|            |             | Stratum III - Very stiff to hard, tan and light gray LEAN CLAY (CL) | SS 4               |                  | 8-12-10 (22)          |                   |                    |                      |                  |               |                  |                   |
|            |             | - becomes marly below 8 feet                                        | SS 5               |                  | 9-18-23 (41)          |                   |                    | 13                   |                  |               |                  |                   |
| 10         |             |                                                                     |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |
|            |             |                                                                     | SS 6               |                  | 8-21-34 (55)          |                   |                    |                      |                  |               |                  |                   |
| 15         |             | Bottom of hole at 15.0 feet.                                        |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |

GEOTECHNICAL COLUMNS (B&A) 12-25-23 3:45 - CIRCULO TUBERIAS 3" - 12" GUT. 8/21/23



12345678910111213141516171819202122232425262728293031323334353637383940414243444546474849505152535455565758596061626364656667686970717273747576777879808182838485868788899091929394959697989910010110210310410510610710810911011111211311411511611711811912012112212312412512612712812913013113213313413513613713813914014114214314414514614714814915015115215315415515615715815916016116216316416516616716816917017117217317417517617717817918018118218318418518618718818919019119219319419519619719819920020120220320420520620720820921021121221321421521621721821922022122222322422522622722822923023123223323423523623723823924024124224324424524624724824925025125225325425525625725825926026126226326426526626726826927027127227327427527627727827928028128228328428528628728828929029129229329429529629729829930030130230330430530630730830931031131231331431531631731831932032132232332432532632732832933033133233333433533633733833934034134234334434534634734834935035135235335435535635735835936036136236336436536636736836937037137237337437537637737837938038138238338438538638738838939039139239339439539639739839940040140240340440540640740840941041141241341441541641741841942042142242342442542642742842943043143243343443543643743843944044144244344444544644744844945045145245345445545645745845946046146246346446546646746846947047147247347447547647747847948048148248348448548648748848949049149249349449549649749849950050150250350450550650750850951051151251351451551651751851952052152252352452552652752852953053153253353453553653753853954054154254354454554654754854955055155255355455555655755855956056156256356456556656756856957057157257357457557657757857958058158258358458558658758858959059159259359459559659759859960060160260360460560660760860961061161261361461561661761861962062162262362462562662762862963063163263363463563663763863964064164264364464564664764864965065165265365465565665765865966066166266366466566666766866967067167267367467567667767867968068168268368468568668768868969069169269369469569669769869970070170270370470570670770870971071171271371471571671771871972072172272372472572672772872973073173273373473573673773873974074174274374474574674774874975075175275375475575675775875976076176276376476576676776876977077177277377477577677777877978078178278378478578678778878979079179279379479579679779879980080180280380480580680780880981081181281381481581681781881982082182282382482582682782882983083183283383483583683783883984084184284384484584684784884985085185285385485585685785885986086186286386486586686786886987087187287387487587687787887988088188288388488588688788888989089189289389489589689789889990090190290390490590690790890991091191291391491591691791891992092192292392492592692792892993093193293393493593693793893994094194294394494594694794894995095195295395495595695795895996096196296396496596696796896997097197297397497597697797897998098198298398498598698798898999099199299399499599699799899910001001100210031004100510061007100810091010101110121013101410151016101710181019102010211022102310241025102610271028102910301031103210331034103510361037103810391040104110421043104410451046104710481049105010511052105310541055105610571058105910601061106210631064106510661067106810691070107110721073107410751076107710781079108010811082108310841085108610871088108910901091109210931094109510961097109810991100110111021103110411051106110711081109111011111112111311141115111611171118111911201121112211231124112511261127112811291130113111321133113411351136113711381139114011411142114311441145114611471148114911501151115211531154115511561157115811591160116111621163116411651166116711681169117011711172117311741175117611771178117911801181118211831184118511861187118811891190119111921193119411951196119711981199120012011202120312041205120612071208120912101211121212131214121512161217121812191220122112221223122412251226122712281229123012311232123312341235123612371238123912401241124212431244124512461247124812491250125112521253125412551256125712581259126012611262126312641265126612671268126912701271127212731274127512761277127812791280128112821283128412851286128712881289129012911292129312941295129612971298129913001

# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



|                                                                             |  |                                                                                                                                   |  |                                          |  |
|-----------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------|--|
|                                                                             |  | Styron Reyes Geotechnical, LLC<br>16100 Henderson Pass #160<br>San Antonio, Texas 78232<br>Telephone: 210.857.9377                |  | <b>BORING NUMBER B-06</b><br>PAGE 1 OF 1 |  |
|                                                                             |  | <b>CLIENT</b> _____ <b>PROJECT NAME</b> _____<br><b>PROJECT NUMBER</b> _____ <b>PROJECT LOCATION</b> _____                        |  |                                          |  |
| <b>DATE STARTED</b> <u>8/13/25</u> <b>COMPLETED</b> <u>8/13/25</u>          |  | <b>GROUND ELEVATION</b> _____ <b>HOLE SIZE</b> <u>5"</u>                                                                          |  |                                          |  |
| <b>DRILLING CONTRACTOR</b> <u>BEA</u>                                       |  | <b>GROUND WATER LEVELS:</b><br><b>AT TIME OF DRILLING</b> _____<br><b>AT END OF DRILLING</b> _____<br><b>AFTER DRILLING</b> _____ |  |                                          |  |
| <b>DRILLING METHOD</b> <u>Dry Auger</u>                                     |  | <b>LOGGED BY</b> <u>D. Rocha</u> <b>CHECKED BY</b> <u>R. Burge</u>                                                                |  |                                          |  |
| <b>NOTES</b> <u>Groundwater not encountered during drilling operations.</u> |  |                                                                                                                                   |  |                                          |  |

| DEPTH<br>(ft) | GRAPHIC<br>LOG | MATERIAL DESCRIPTION                                                              | SAMPLE TYPE<br>NUMBER | RECOVERY %<br>(RQD) | BLOW<br>COUNTS<br>(IN VALUE) | POCKET PEN.<br>(tsf) | DRY UNIT WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | ATTERBERG<br>LIMITS |                  |                     | FINES CONTENT<br>(%) |
|---------------|----------------|-----------------------------------------------------------------------------------|-----------------------|---------------------|------------------------------|----------------------|-----------------------|-------------------------|---------------------|------------------|---------------------|----------------------|
|               |                |                                                                                   |                       |                     |                              |                      |                       |                         | LIQUID<br>LIMIT     | PLASTIC<br>LIMIT | PLASTICITY<br>INDEX |                      |
| 0             |                | POSSIBLE FILL - Brown sandy clay                                                  | SS 1                  |                     | 12-15-16<br>(31)             |                      |                       |                         |                     |                  |                     |                      |
|               |                |                                                                                   | SS 2                  |                     | 16-19-22<br>(41)             |                      |                       | 9                       | 48                  | 21               | 27                  |                      |
| 5             |                | Stratum III - Hard, tan and light gray LEAN CLAY (CL)<br>- marly from 4 to 8 feet | SS 3                  |                     | 11-21-28<br>(49)             |                      |                       |                         |                     |                  |                     |                      |
|               |                |                                                                                   | SS 4                  |                     | 16-25-29<br>(54)             |                      |                       | 11                      | 46                  | 17               | 29                  |                      |
|               |                | - grades to hard, tan and light gray FAT CLAY (CH) below 8 feet                   | SS 5                  |                     | 14-26-30<br>(56)             |                      |                       | 13                      |                     |                  |                     |                      |
| 10            |                |                                                                                   | SS 6                  |                     | 7-19-26<br>(45)              |                      |                       | 14                      |                     |                  |                     | 98                   |
| 15            |                | Bottom of hole at 15.0 feet.                                                      |                       |                     |                              |                      |                       |                         |                     |                  |                     |                      |

GEOTECH BH COLUMNS (BEAL 12-25-63)N SRG - CIRILOLO TOWNHOMES (GPJ GINT US DOT 8/21/25)

# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



| Styron Reyes Geotechnical, LLC<br>16100 Henderson Pass #160<br>San Antonio, Texas 78232<br>Telephone: 210.857.9377 |  | <b>BORING NUMBER B-07</b><br>PAGE 1 OF 1 |  |  |                           |  |  |  |  |                     |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------|--|------------------------------------------|--|--|---------------------------|--|--|--|--|---------------------|--|--|--|--|
| CLIENT _____                                                                                                       |  |                                          |  |  | PROJECT NAME _____        |  |  |  |  |                     |  |  |  |  |
| PROJECT NUMBER _____                                                                                               |  |                                          |  |  | PROJECT LOCATION _____    |  |  |  |  |                     |  |  |  |  |
| DATE STARTED <u>8/13/25</u> COMPLETED <u>8/13/25</u>                                                               |  |                                          |  |  | GROUND ELEVATION _____    |  |  |  |  | HOLE SIZE <u>5"</u> |  |  |  |  |
| DRILLING CONTRACTOR <u>BEA</u>                                                                                     |  |                                          |  |  | GROUND WATER LEVELS:      |  |  |  |  |                     |  |  |  |  |
| DRILLING METHOD <u>Dry Auger</u>                                                                                   |  |                                          |  |  | AT TIME OF DRILLING _____ |  |  |  |  |                     |  |  |  |  |
| LOGGED BY <u>D. Rocha</u> CHECKED BY <u>R. Burge</u>                                                               |  |                                          |  |  | AT END OF DRILLING _____  |  |  |  |  |                     |  |  |  |  |
| NOTES <u>Groundwater not encountered during drilling operations.</u>                                               |  |                                          |  |  | AFTER DRILLING _____      |  |  |  |  |                     |  |  |  |  |

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION                                                          | SAMPLE TYPE NUMBER | RECOVERY % (ROD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) | MOISTURE CONTENT (%) | ATTERBERG LIMITS |               |                  | FINES CONTENT (%) |
|------------|-------------|-------------------------------------------------------------------------------|--------------------|------------------|-----------------------|-------------------|--------------------|----------------------|------------------|---------------|------------------|-------------------|
|            |             |                                                                               |                    |                  |                       |                   |                    |                      | LIQUID LIMIT     | PLASTIC LIMIT | PLASTICITY INDEX |                   |
| 0          |             | FILL - Brown clayey sand                                                      | SS 1               |                  | 4-6-12 (18)           |                   |                    | 11                   | 55               | 24            | 31               |                   |
|            |             |                                                                               | SS 2               |                  | 12-19-23 (42)         |                   |                    |                      |                  |               |                  |                   |
| 5          |             | Stratum II - Hard, tan CHALK                                                  | SS 3               |                  | 15-32-50/4"           |                   |                    | 8                    |                  |               |                  |                   |
|            |             | Stratum III - Hard, tan and light gray LEAN CLAY (CL)<br>- marly below 6 feet | SS 4               |                  | 24-32-39 (71)         |                   |                    |                      |                  |               |                  |                   |
|            |             |                                                                               | SS 5               |                  | 12-17-27 (44)         |                   |                    | 11                   |                  |               |                  | 98                |
| 10         |             | - grades to very stiff, tan and light gray FAT CLAY (CH) below 12 feet        |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |
|            |             |                                                                               | SS 6               |                  | 6-9-19 (28)           |                   |                    | 12                   | 60               | 18            | 42               |                   |
| 15         |             | Bottom of hole at 15.0 feet.                                                  |                    |                  |                       |                   |                    |                      |                  |               |                  |                   |

GEOTECH BH COLUMNS (BEA) 12-25-2376 SRG - CIRILOLO TOWNHOMES.GPJ GINT US.GDT 8/21/25

## Appendix D – Foundation Slab-on-Grade Design Calculations

### Geotechnical Exploration Plan (8 Borings)

**Building footprint:** 150 ft × 175 ft

**Foundation concept (anticipated):** Shallow spread footings + slab-on-grade (recreational floor use)

**Number of borings:** 5 (four corners inset + one center) 3 in parking lot

**Exploration depth target:** 15 ft below existing grade (extend if soft/organics/loose sands or until competent stratum/refusal)

Even though **roof+dead**  $\approx 35$  psf is light, **column/footing reactions** can still influence 2 – 3B below footings (B = footing width). A 3 – 4 ft footing implies **6 – 10 ft** influence depth; exploring to **15ft** ensures we catch deeper soft layers, collapsible sands, or high-PI clays that could drive settlement or slab movement.

## Slab-on-Grade

Codes and Design Guides Utilized :

- ASCE 7-16
- IBC 2018
- ACI 318-19
- AISC 360-16, 15th Edition
- AISC Design Guide 1
- WRI TF 700-R-07

### Stiffened Slab-on-Grade Design

A slab-on-grade foundation for a recreational building consists of a reinforced concrete slab placed directly on prepared and compacted subgrade to provide a durable, uniform, and economical base for the structure. This type of foundation is ideal for large, single-story facilities such as gyms, community centers, or multipurpose halls, where loads are primarily vertical and evenly distributed. The slab typically includes thickened edge and interior grade beams to resist differential settlement and support structural and architectural loads such as walls and columns. Reinforcement is placed within the slab to control cracking due to shrinkage, temperature changes, and minor ground movement. Beneath the slab, a compacted granular subbase and vapor retarder are provided to



enhance stability and protect against moisture intrusion. Designed in accordance with ACI 360R and geotechnical recommendations, the slab-on-grade system offers a low-maintenance foundation capable of supporting both dynamic and static loads common in recreational facilities while ensuring long-term performance and serviceability.

## Slab-on-Grade Design Calculations

*Effective P.I. = 31*

*Equivalent PI must be corrected for Slope and Degree of Consolidation.*

$$\text{Effective PI} = \text{Equivalent PI} \times C_s \times C_o$$

*C<sub>s</sub> = slope correction coefficient*

*C<sub>o</sub> = consolidation correction*

*coefficient*

| Depth (ft) | Soil Stratum   | Soil Type      | PI | Factor | Factor x PI                 |
|------------|----------------|----------------|----|--------|-----------------------------|
| 0-5        | Stratum I      | Fat Clay (CH)  | 46 | 3      | 138                         |
| 5-10       | Stratum II     | Chalk (NP)     | 0  | 2      | 0                           |
| 10-15      | Stratum III    | Lean Clay (CL) | 30 | 1      | 30                          |
|            | $\Sigma F = 6$ |                |    |        | $\Sigma(F \times PI) = 168$ |

*Using values estimated from Fig. 8 and*

*Fig. 9*

*(WRI TF 700 R 07):*

*Equivalent PI = 28*

*Ground slope = 2.5% → C<sub>s</sub> = 1.02*

*Unconfined compressive strength ≈ 3 TSF → C<sub>o</sub> =*

*1.10*

*Effective PI = 28 × 1.02 × 1.10 = 31.4 ≈ 31*

### Site Specifications :

- Effective P.I. = 31
- Climatic Rating, C<sub>w</sub> = 17
- Slope = 2.5%
- Unconfined compression, q<sub>u</sub> = 2,500

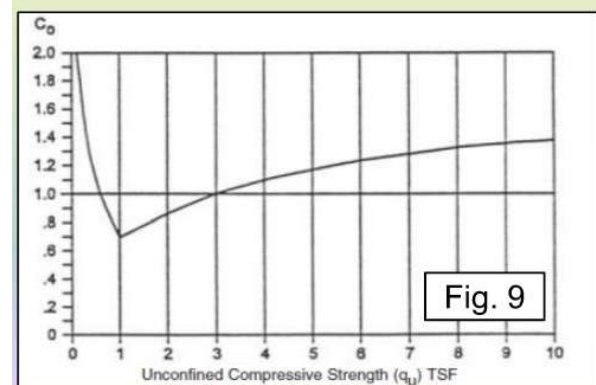
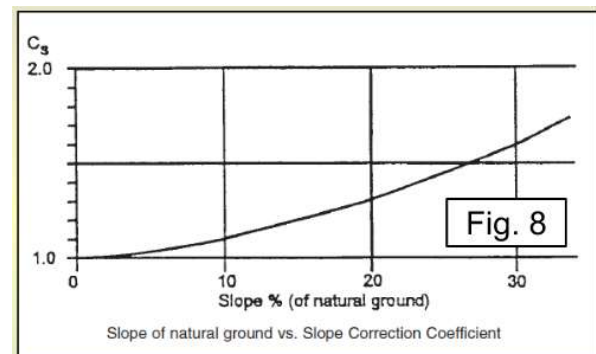
$$\text{Weighted PI} = \Sigma(F \times PI) / \Sigma F = 168 / 6 = 28$$

Interpretation:

Weighted Plasticity Index = 28 → **Moderately Expansive Soil.**

Design Implication: For PI = 25-35, classify as Moderate Plasticity.

Recommend stiffened slab-on-grade foundation with uniform moisture control and positive drainage (≥2% for first 10 ft).



### Building Specifications:

Building Length = 176 ft

Building Depth = 150 ft

Height = Lobby 12 ft

Gym 35 ft

Slab Thickness = 5in

### Loads:

Loads Calculated using ASCE 7-22 as per San Antonio UDC

Dead Load = 16.3psf

Live Roof Load = 12psf

Snow/Rain Load = 14.3psf

Wind load = - 25.1(gym) , - 21.4 (lobby)

Load combination(s):

1.4D, 1.2D+1.6Lr+0.5S, 1.2D+1.6S+0.5W

1.2D + 1.6S = 44.24psf (control)

### WRI Design Based on Building and Site

#### Specifications :

Slab = rectangle

S = 18 ft, max

$l_c = 5.5$

$A_s f_y = 4000$

$K_l \text{ \& } K_s = 1$

Number of Beams in each direction:

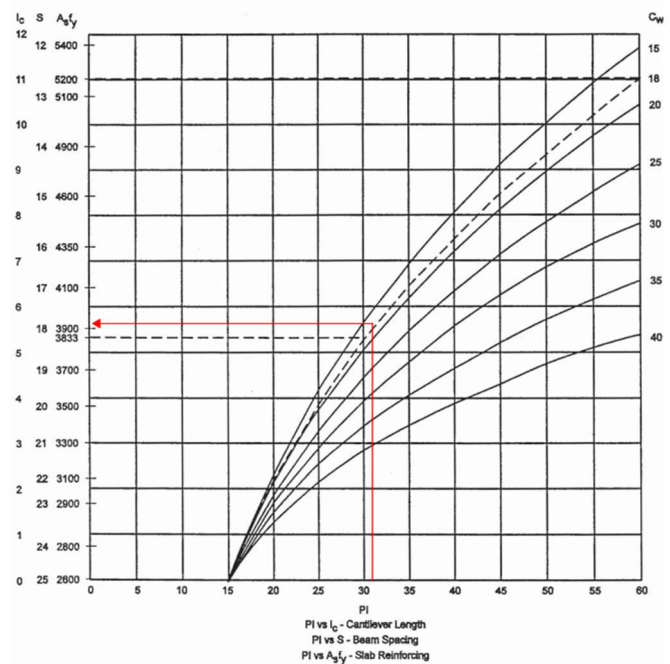


Figure 5

Long Beams  $N = 150/18 + 1 = 9$

$N = \frac{L'}{S} + 1$  Where:  $S$  = Spacing ft (m) from Fig. 5  
 $L'$  = width of slab, ft (m)

$$\text{Spacing} = 150 / (9-1) = 18' - 9''$$

9 beams will be used W-E 18' - 9" OC

Short Beams  $N = 176/18 + 1 = 10$  Short Beams

$$\text{Spacing} = 176 / (10-1) = 19' - 6 \frac{3}{4}''$$

11 beams will be used S-N @ 16' - 0" OC

B individual = assumed 12"

Moment:

Slab load only = 150 pcf x (5-12)ft = 62.5 psf

- Long direction (use  $L = 176$  ft):

$$M_L = \frac{62.5 \times 176 \times (5.5)^2}{2000} = 166.4 \text{ kip}\backslash$$

- Short direction (use  $L = 150$  ft):

$$M_s = \frac{62.5 \times 150 \times (5.5)^2}{2000} = 141.8 \text{ kip}\backslash$$

Beam Design :

Beam depths :

$$d_L = \left( \frac{664 M_L \ell_c}{7 \cdot 12} \right)^{1/3}, \quad d_s = \left( \frac{664 M_s \ell_c}{6 \cdot 12} \right)^{1/3}$$

- $d_L = \left( \frac{664 \times 166.4 \times 5.5}{84} \right)^{1/3} = 19.34 \text{ in} \rightarrow \text{say } 20\text{--}22 \text{ in}$
- $d_s = \left( \frac{664 \times 141.8 \times 5.5}{72} \right)^{1/3} = 19.30 \text{ in} \rightarrow \text{say } 20\text{--}22 \text{ in}$

- Moments:  $M_L = 166.4 \text{ kip}\cdot\text{ft}$ ,  $M_S = 141.8 \text{ kip}\cdot\text{ft}$
- $f'_c = 3 \text{ ksi}$ ,  $f_y = 60 \text{ ksi}$ ,  $\phi_{\text{flex}} = 0.90$
- Cover = 3 in, stirrup = #3 ( $\approx 0.375$  in), #6 bar  $A_b = 0.44 \text{ in}^2$ ,  $d_b = 0.75 \text{ in}$
- Effective depth with  $h = 24$  in:  
 $d \approx 24 - 3 - 0.75/2 = 20.625 \text{ in}$

Required steel:

Using  $\phi M_n \geq M_u$  with  $a = \frac{A_s f_y}{0.85 f'_c b}$  and  $M_n = A_s f_y \left(d - \frac{a}{2}\right)$ :

- **Long (L) dir**  $\rightarrow A_{s,req} = \mathbf{1.98 \text{ in}^2}$  (was 2.34 in<sup>2</sup> at h=22)  
 $\rightarrow a = 3.88 \text{ in}; \phi M_n \approx 1996.8/12 = \mathbf{166.4 \text{ kip}\cdot\text{ft}}$  (meets exactly at the solve point)
- **Short (S) dir**  $\rightarrow A_{s,req} = \mathbf{1.66 \text{ in}^2}$  (was 1.87 in<sup>2</sup> at h=22)  
 $\rightarrow a = 3.25 \text{ in}; \phi M_n \approx 1701.6/12 = \mathbf{141.8 \text{ kip}\cdot\text{ft}}$  (meets exactly)

#6 Bars w/b=12in we can fit 3 #6 per layer max ( $\geq 1"$  clear).

- **Long (need  $\geq 1.98 \text{ in}^2$ )**
  - 5-#6 (3 + 2)  $\rightarrow A_s = 2.20 \text{ in}^2 \rightarrow \phi M_n \approx \mathbf{182.8 \text{ kip}\cdot\text{ft}} \geq 166.4 \checkmark$
  - 6-#6 (3 + 3)  $\rightarrow A_s = 2.64 \text{ in}^2 \rightarrow \phi M_n \approx \mathbf{214.3 \text{ kip}\cdot\text{ft}}$  (more reserve)

Exterior beams measure 12 in  $\times$  24 in

Reinforced with 5-#5 bars (2 top + 3 bottom) continuous.

At column lines, add two additional #5 top bars. Shear reinforcement consists of #3 ties at 24 in oc.

Clear spacing:  $\geq 1$  in (or bar dia);  $\geq \sim 1.5$  in vertical clear between layers

- **Short (need  $\geq 1.66 \text{ in}^2$ )**
  - 4-#6 (2 + 2 or 3 + 1)  $\rightarrow A_s = 1.76 \text{ in}^2 \rightarrow \phi M_n \approx \mathbf{149.7 \text{ kip}\cdot\text{ft}} \geq 141.8 \checkmark$
  - 5-#6  $\rightarrow A_s = 2.20 \text{ in}^2 \rightarrow \phi M_n \approx \mathbf{182.8 \text{ kip}\cdot\text{ft}}$  (extra reserve)

Interior beams range from 12 in  $\times$  24 in.

Each beam includes 4-#5 bars (2 bottom + 2 top) continuous, with two additional

#5 top bars at column intersections. Shear reinforcement uses #3 ties at 24 in oc.

Clear spacing:  $\geq 1$  in (or bar dia);  $\geq \sim 1.5$  in vertical clear between layers

- Lap grade beam and slab reinforcement splices 40 bar diameters (not less than 18in)

- Refer to structural documents for foundation plan, grade beam schedule, typical beam sections, and further slab information.

### Slab-on-Grade Design

Assume slab thickness  $t = 5$  in; joints at 12 – 15 ft. Service floor load  $L = 35$  psf (no forklifts).

Self-weight of slab:

$$t = 5 \text{ in} = 5/12 \text{ ft} = 0.4167 \text{ ft}$$

$$\gamma_c = 150 \text{ pcf}$$

$$w_{\text{slab}} = \gamma_c \times t = 150 \times 0.4167 = 62.5 \text{ psf}$$

$$q_{\text{service}} = w_{\text{slab}} + L = 62.5 + 35 = 97.5 \text{ psf}$$

Bearing check vs allowable contact:

$$q_{\text{service}} = 97.5 \text{ psf} \ll q_a = 2,500 \text{ psf} \rightarrow \text{OK}$$

Crack-control reinforcement selection (WRI, PI=23, Cw=17):

Target  $A_s \approx 0.20 \text{ in}^2/\text{ft}$  each way  $\rightarrow$  Provide #4 @ 12 in OC EW ( $A_{s,\text{prov}} = 0.20 \text{ in}^2/\text{ft}$ ).

Joints: Saw-cut control @ 12 – 15 ft; Isolation joints at columns/grade beams and exterior interfaces.

### Two way (punching) shear check (approx.):

Critical perimeter  $b_0$  at  $d/2$  from column face:  $a = 12$  in;  $d \approx 16$  in

$$b_0 = 4 \times (a + d) = 4 \times (12 + 16) = 112 \text{ in}$$

$$V_u (\text{conserv.}) \approx P = 50,000 \text{ lb}$$

$$v_u = V_u / (b_0 \cdot d) = 50,000 / (112 \times 16) = 27.9 \text{ psi}$$

$$\phi_{vc} (\text{ACI}) \approx 0.75 \times 2 \sqrt{f'_c} = 0.75 \times 2 \times \sqrt{4000} = 0.75 \times 2 \times 63.25 = 94.9 \text{ psi}$$

$$v_u = 27.9 \text{ psi} < 94.9 \text{ psi} \rightarrow \text{OK}$$

### Base Plate & Anchor Bolt Design (Axial, concentric)

Axial bearing only (no net moment). Concrete support at  $f'_c = 4,000$  psi, grout bed provided.

Required bearing area (AISC/AISC DG1 approach):

$$\phi \cdot 0.85 f'_c \cdot A_{plate} \geq P \text{ (take } \phi \approx 0.65 - 0.75; \text{ for a quick check use } 0.85 f'_c$$

without  $\phi$  for service)

$$0.85 f'_c = 0.85 \times 4000 = 3400 \text{ psi}$$

$$A_{req} = P / (0.85 f'_c) = 50,000 / 3,400 = 14.7 \text{ in}^2$$

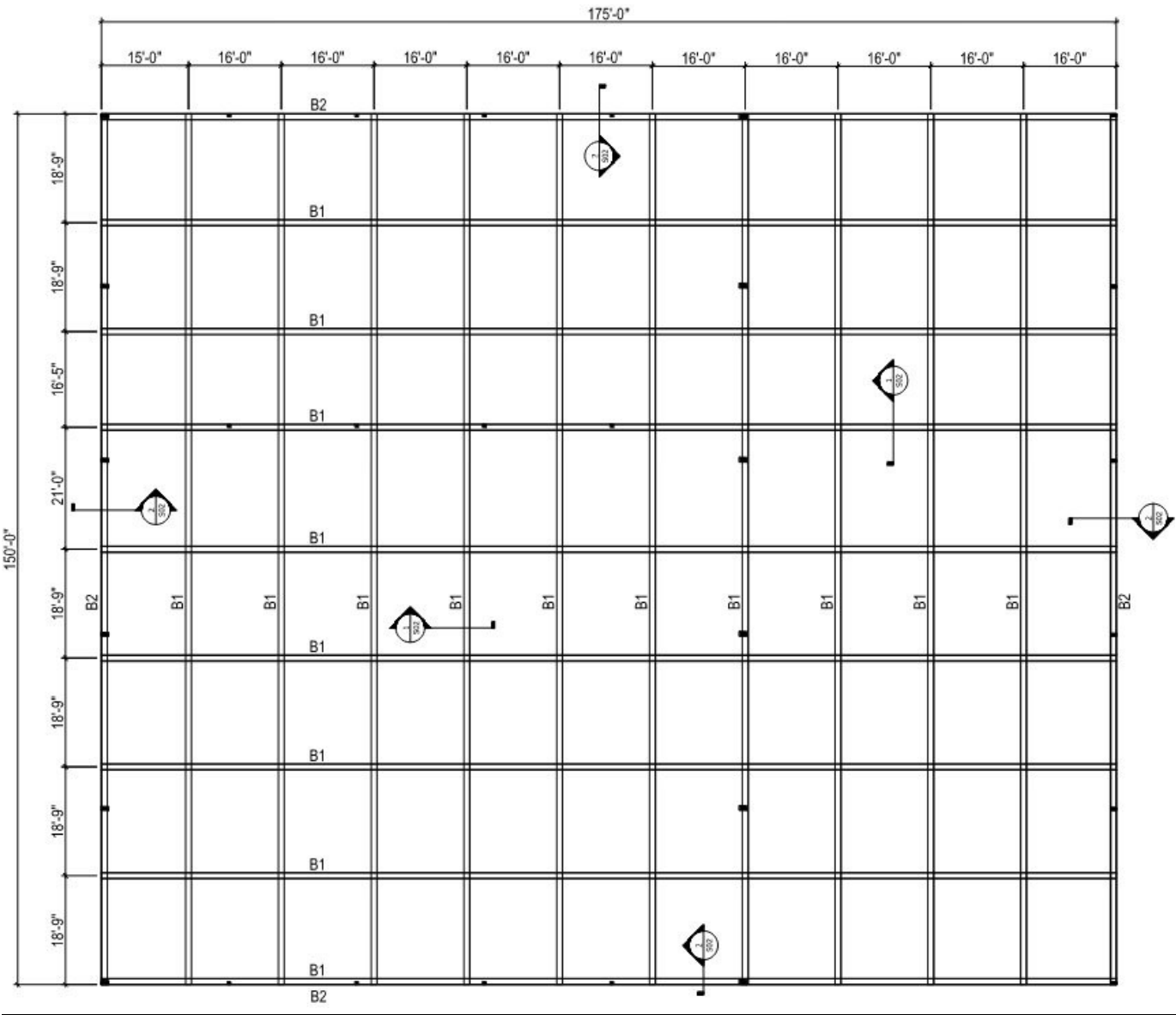
Select base plate: 12 in  $\times$  12 in  $\times$  1 in  $\rightarrow A = 144 \text{ in}^2 \gg 14.7 \text{ in}^2$  (OK)

Anchor bolts (uplift/shear not governing for axial only):

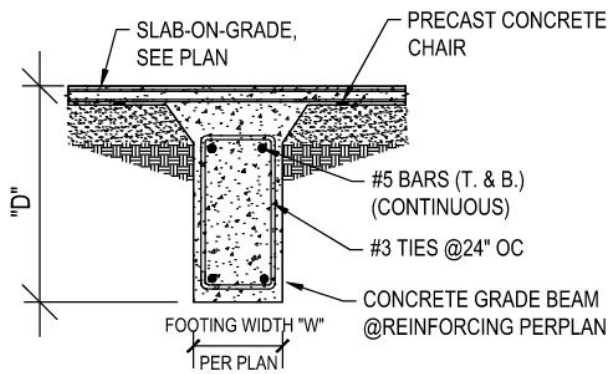
Provide 4- $\emptyset 3/4$  in F1554 Gr. 55 with 12 in embedment (template with 9 in  $\times$  9 in bolt circle).

Non shrink grout under plate; 1/2 in grout thickness; leveling nuts/washers; edge distance  $\geq 1.5$  in

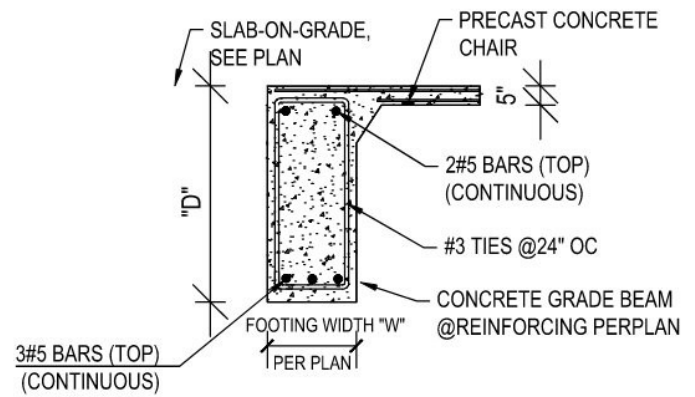
Foundation Floor Plan:



Typical Details :



TYP. INTERIOR BEAM DETAIL



TYP. EXTERIOR BEAM DETAIL



## Appendix E – HEC-HMS Results

**Project:** Sdii  
**Simulation Run:** 100yr\_prop  
**Simulation Start:** 7 November 2025, 24:00  
**Simulation End:** 8 November 2025, 06:00

**HMS Version:** 4.12  
**Executed:** 17 November 2025, 00:14

Global Parameter Summary - Subbasin

| Area (MI2)   |            |
|--------------|------------|
| Element Name | Area (MI2) |
| DA - 3A      | 0.01       |
| DA - 3B      | 0.01       |
| DA - 1       | 0          |
| DA - 2       | 0          |

| Downstream   |               |
|--------------|---------------|
| Element Name | Downstream    |
| DA - 3A      | Reservoir - 1 |
| DA - 3B      | Creek         |
| DA - 1       | Creek1        |
| DA - 2       | Creek2        |

| Loss Rate: Scs |                         |              |
|----------------|-------------------------|--------------|
| Element Name   | Percent Impervious Area | Curve Number |
| DA - 3A        | 55                      | 80           |
| DA - 3B        | 0                       | 76           |
| DA - 1         | 0                       | 76           |
| DA - 2         | 0                       | 76           |

| Transform: Scs |     |                |
|----------------|-----|----------------|
| Element Name   | Lag | Unitgraph Type |
| DA - 3A        | 5   | Standard       |
| DA - 3B        | 4   | Standard       |
| DA - 1         | 5   | Standard       |
| DA - 2         | 4.6 | Standard       |

# Global Parameter Summary - Reach

| Downstream   |            |
|--------------|------------|
| Element Name | Downstream |
| Reach - 1    | Creek      |

| Route: Lag   |        |                  |      |
|--------------|--------|------------------|------|
| Element Name | Method | Initial Variable | Lag  |
| Reach - 1    | Lag    | Combined Inflow  | 1.24 |

# Global Results Summary

| Hydrologic Element | Drainage Area (MI2) | Peak Discharge (CFS) | Time of Peak     | Volume (IN) |
|--------------------|---------------------|----------------------|------------------|-------------|
| DA - 3A            | 0.01                | 45.31                | 08Nov2025, 00:36 | 3.34        |
| Reservoir - 1      | 0.01                | 10.77                | 08Nov2025, 00:57 | 3.09        |
| Junction - 1       | 0.01                | 10.77                | 08Nov2025, 00:57 | 3.09        |
| Reach - 1          | 0.01                | 10.77                | 08Nov2025, 00:58 | 3.09        |
| DA - 3B            | 0.01                | 24.06                | 08Nov2025, 00:36 | 1.92        |
| Creek              | 0.01                | 28.31                | 08Nov2025, 00:37 | 2.58        |
| DA - 1             | 0                   | 7.48                 | 08Nov2025, 00:37 | 1.92        |
| Creek1             | 0                   | 7.48                 | 08Nov2025, 00:37 | 1.92        |
| DA - 2             | 0                   | 7.43                 | 08Nov2025, 00:37 | 1.92        |
| Creek2             | 0                   | 7.43                 | 08Nov2025, 00:37 | 1.92        |

# Subbasin: DA-3A

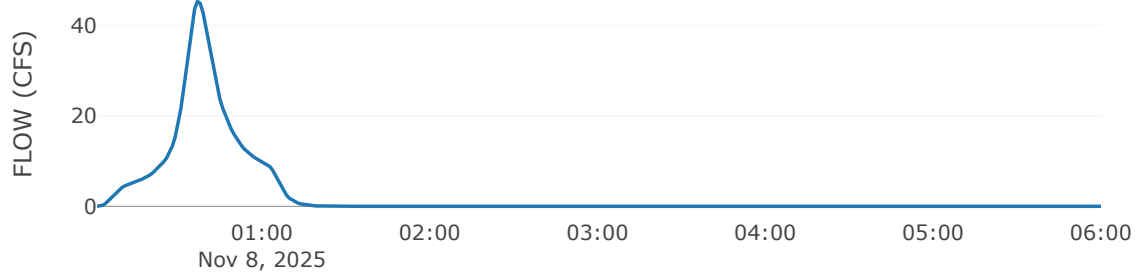
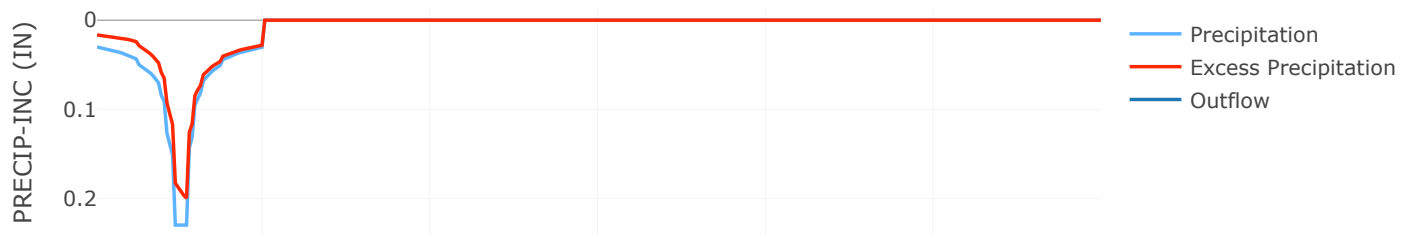
Area (MI<sup>2</sup>) : 0.01  
Downstream : Reservoir - 1

| Loss Rate: Scs          |    |
|-------------------------|----|
| Percent Impervious Area | 55 |
| Curve Number            | 80 |

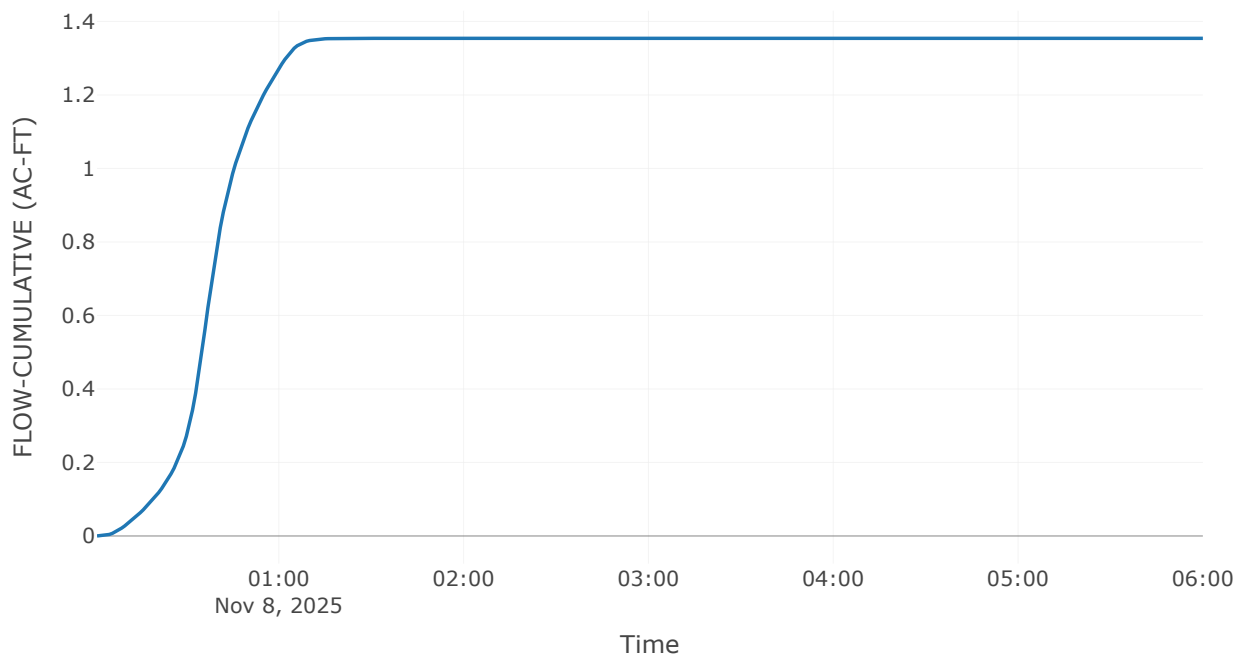
| Transform: Scs |          |
|----------------|----------|
| Lag            | 5        |
| Unitgraph Type | Standard |

| Results: DA-3A                 |                  |
|--------------------------------|------------------|
| Peak Discharge (CFS)           | 45.31            |
| Time of Peak Discharge         | 08Nov2025, 00:36 |
| Volume (IN)                    | 3.34             |
| Precipitation Volume (AC - FT) | 1.72             |
| Loss Volume (AC - FT)          | 0.36             |
| Excess Volume (AC - FT)        | 1.35             |
| Direct Runoff Volume (AC - FT) | 1.35             |
| Baseflow Volume (AC - FT)      | 0                |

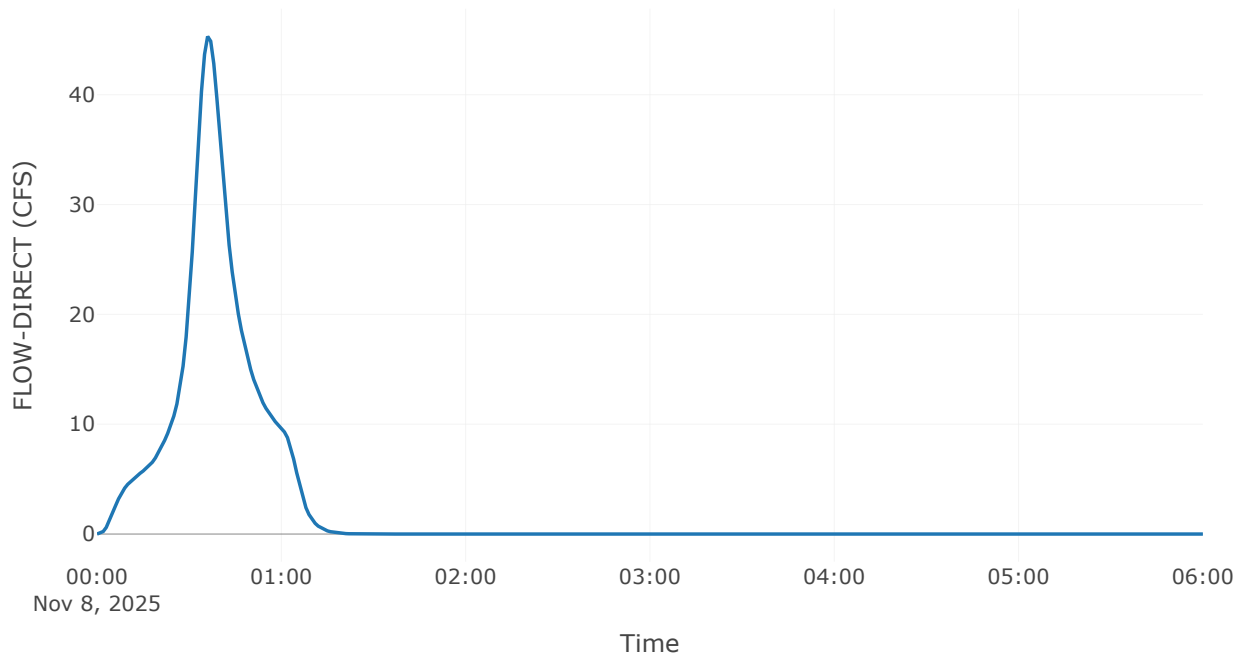
## Precipitation and Outflow



## Cumulative Outflow



## Direct Runoff

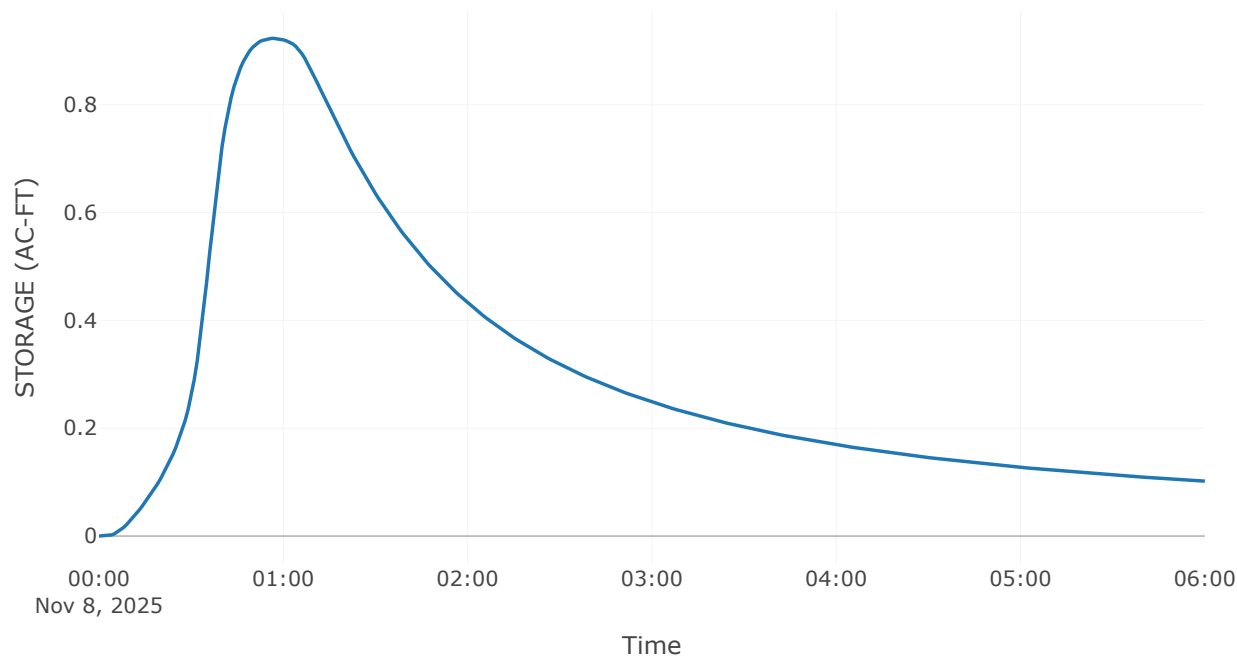


# Reservoir: Reservoir-1

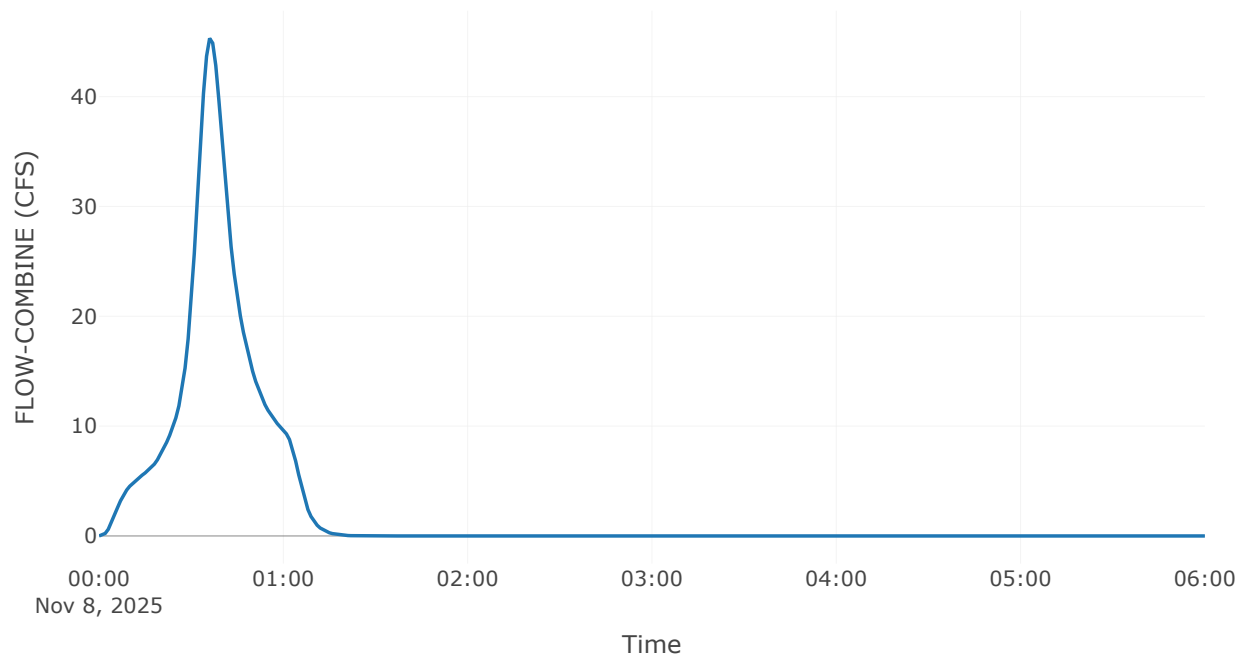
Downstream : Junction - 1

| Results: Reservoir-1       |                  |
|----------------------------|------------------|
| Peak Discharge (CFS)       | 10.77            |
| Time of Peak Discharge     | 08Nov2025, 00:57 |
| Volume (IN)                | 3.09             |
| Peak Inflow (CFS)          | 45.31            |
| Time of Peak Inflow        | 08Nov2025, 00:36 |
| Inflow Volume (AC - FT)    | 1.35             |
| Maximum Storage (AC - FT)  | 0.92             |
| Peak Elevation (FT)        | 799.13           |
| Discharge Volume (AC - FT) | 1.25             |

Storage

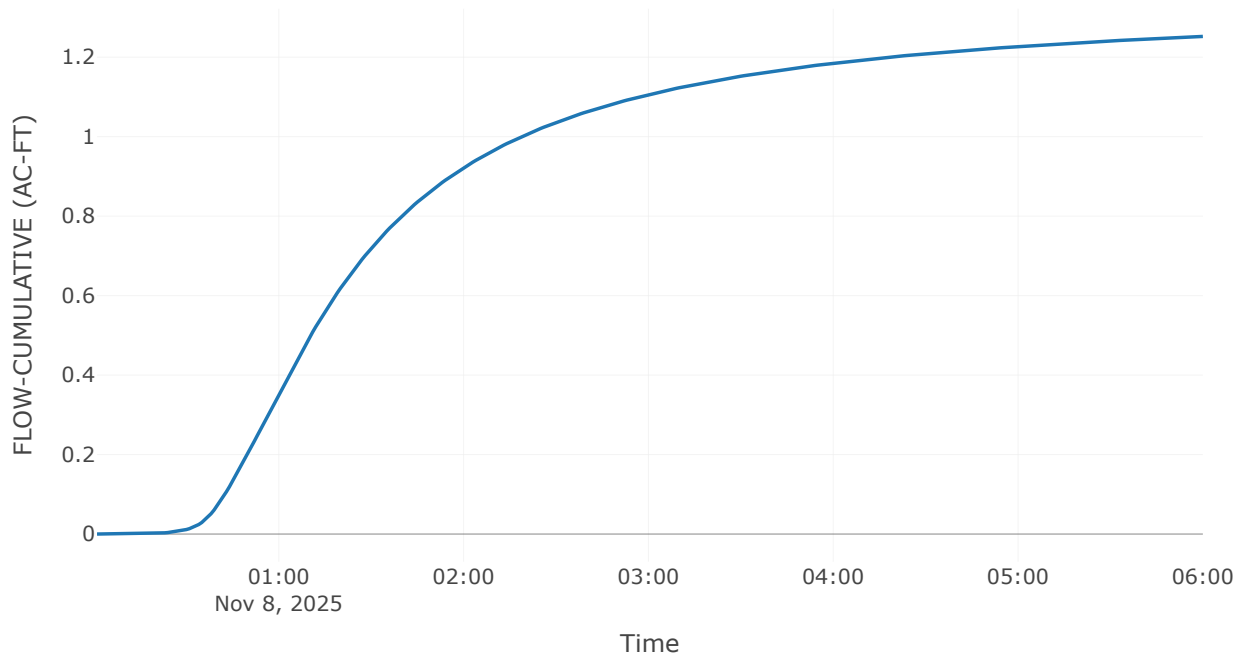


Combined Inflow

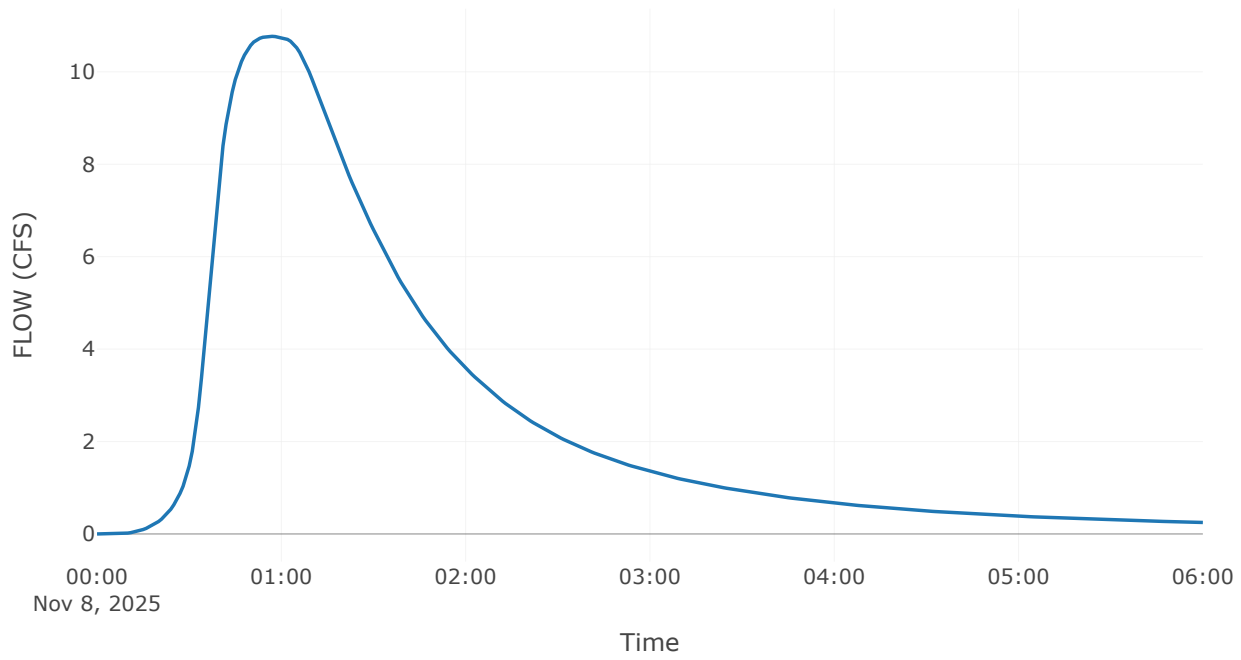




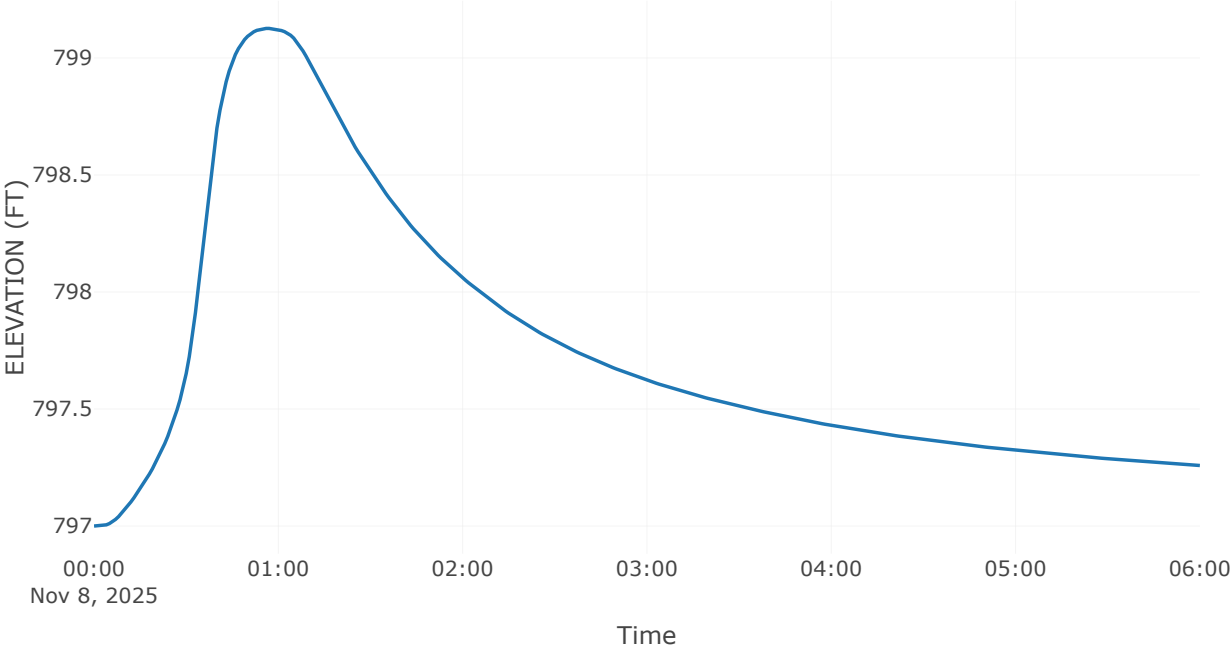
Cumulative Outflow



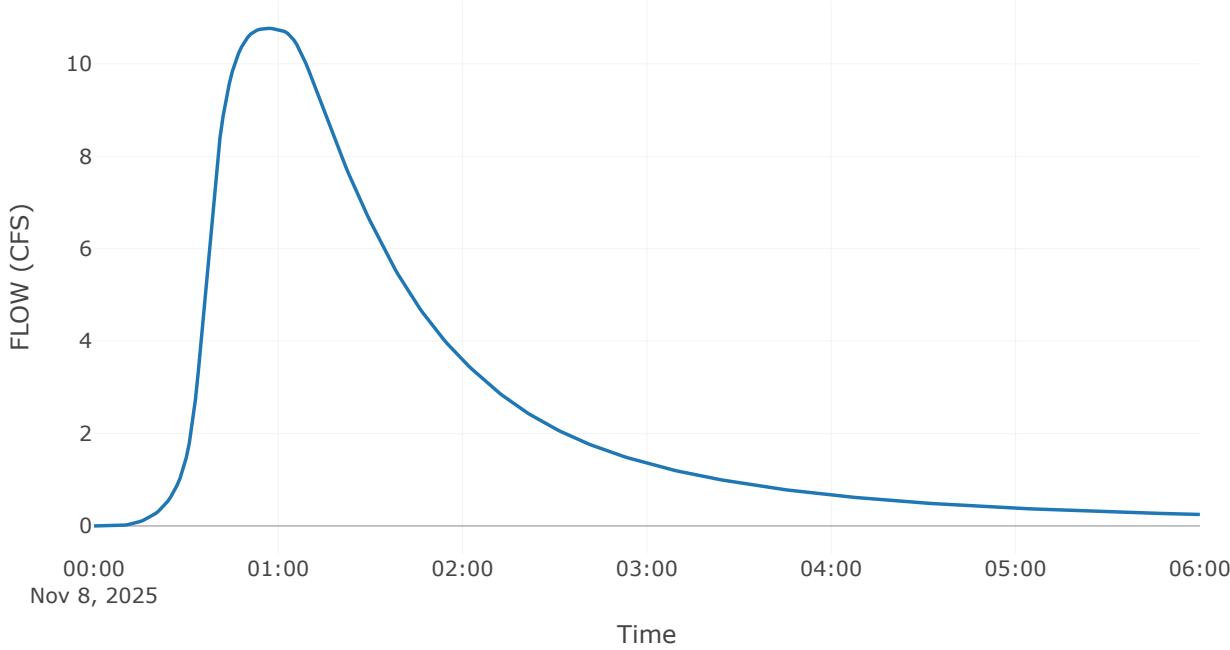
Outlet 1



Pool Elevation



Outflow

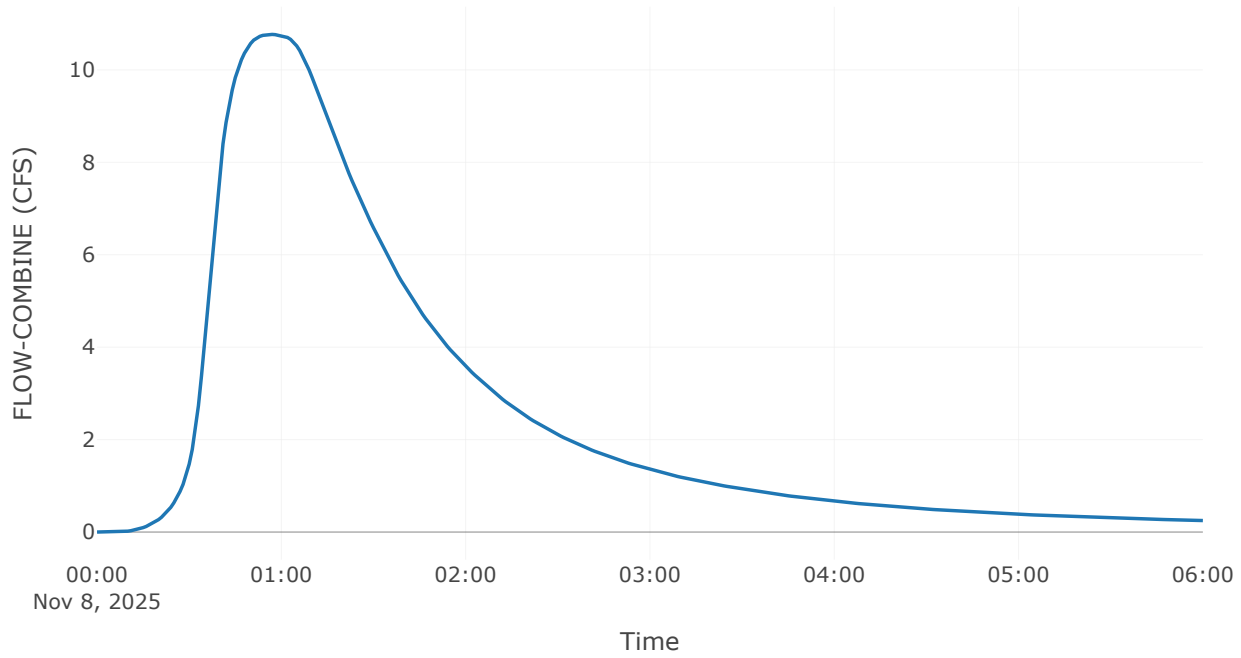


# Junction: Junction-1

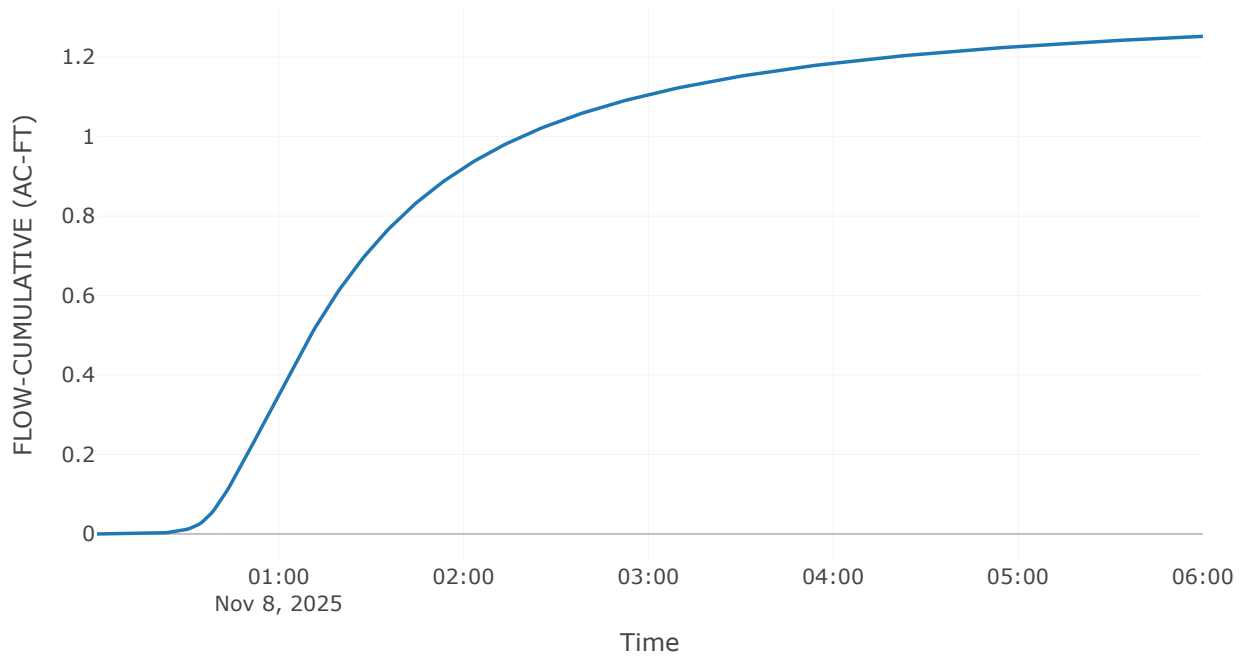
Downstream : Reach - 1

| Results: Junction-1    |                  |
|------------------------|------------------|
| Peak Discharge (CFS)   | 10.77            |
| Time of Peak Discharge | 08Nov2025, 00:57 |
| Volume (IN)            | 3.09             |

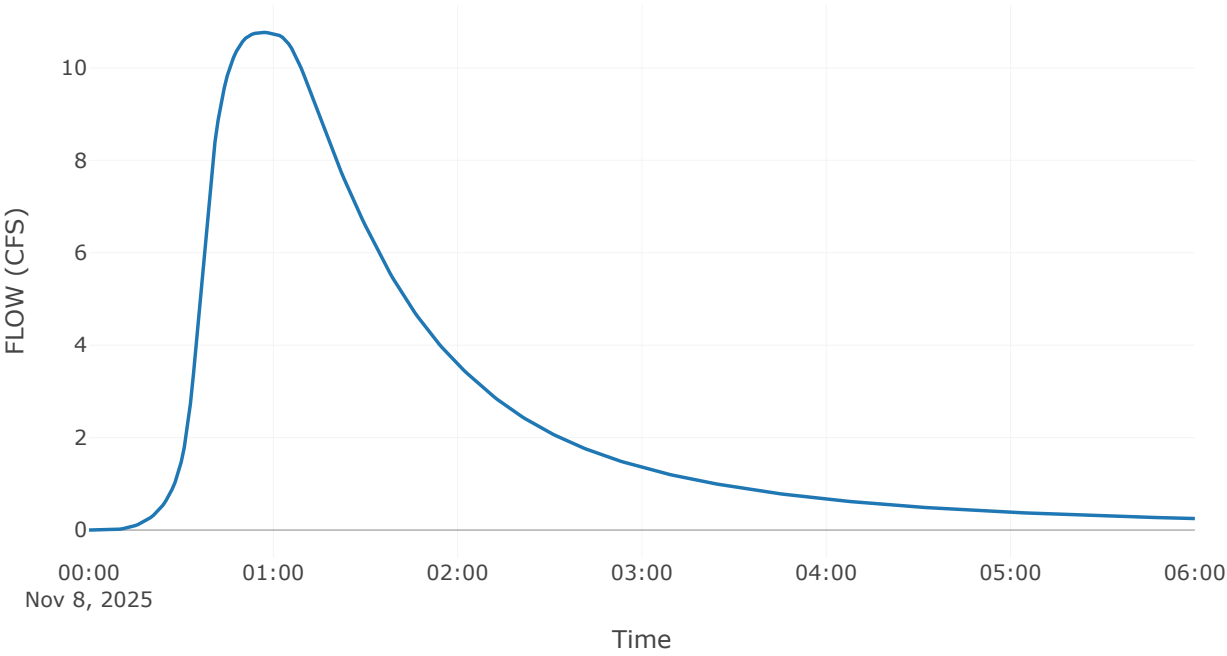
Combined Inflow



Cumulative Outflow



Outflow



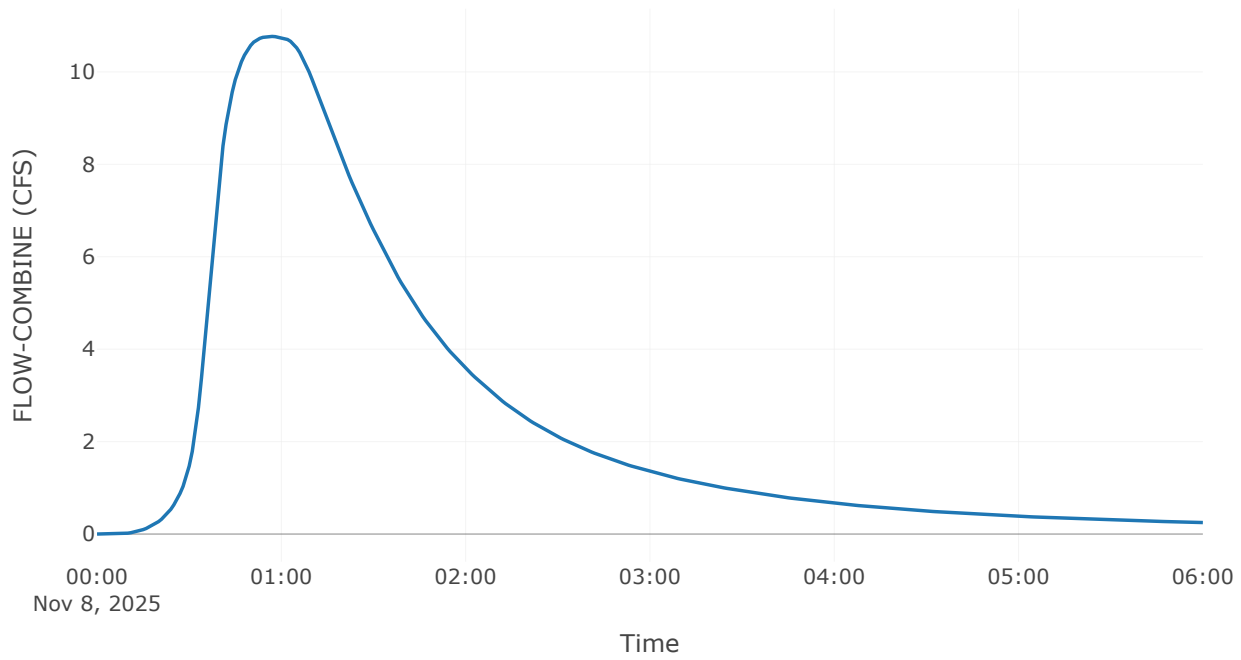
Reach: Reach-1

Downstream : Creek

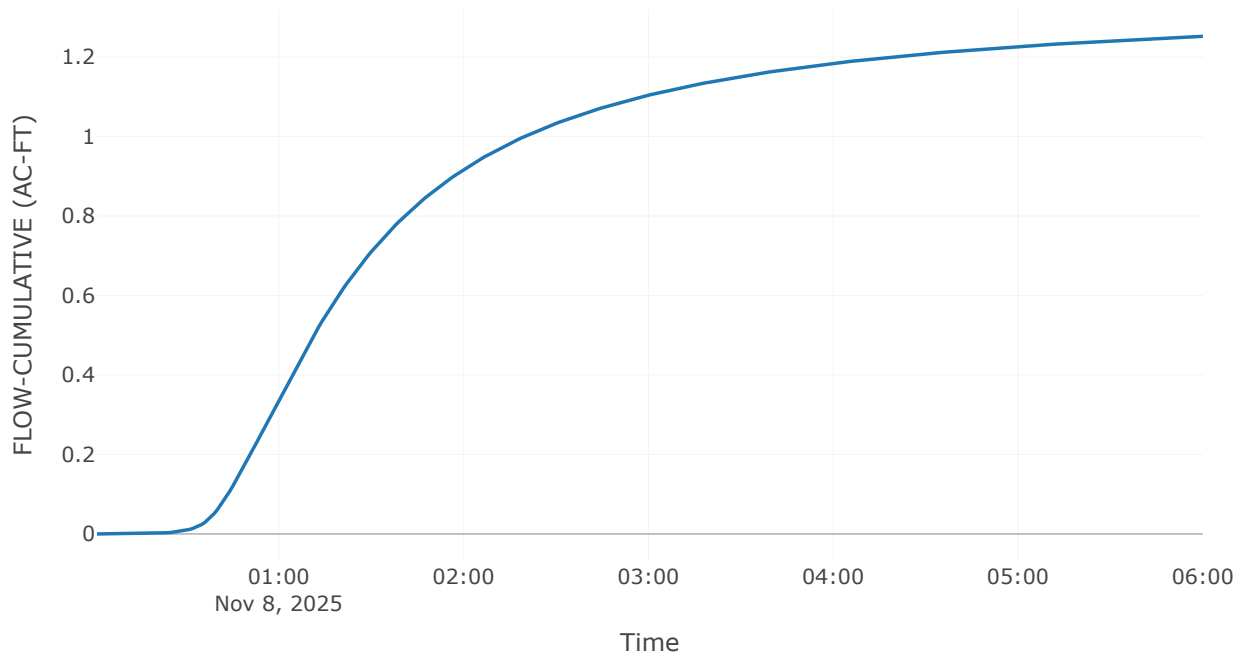
| Route: Lag       |                 |
|------------------|-----------------|
| Method           | Lag             |
| Initial Variable | Combined Inflow |
| Lag              | 1.24            |

| Results: Reach-1        |                  |
|-------------------------|------------------|
| Peak Discharge (CFS)    | 10.77            |
| Time of Peak Discharge  | 08Nov2025, 00:58 |
| Volume (IN)             | 3.09             |
| Peak Inflow (CFS)       | 10.77            |
| Inflow Volume (AC - FT) | 1.25             |

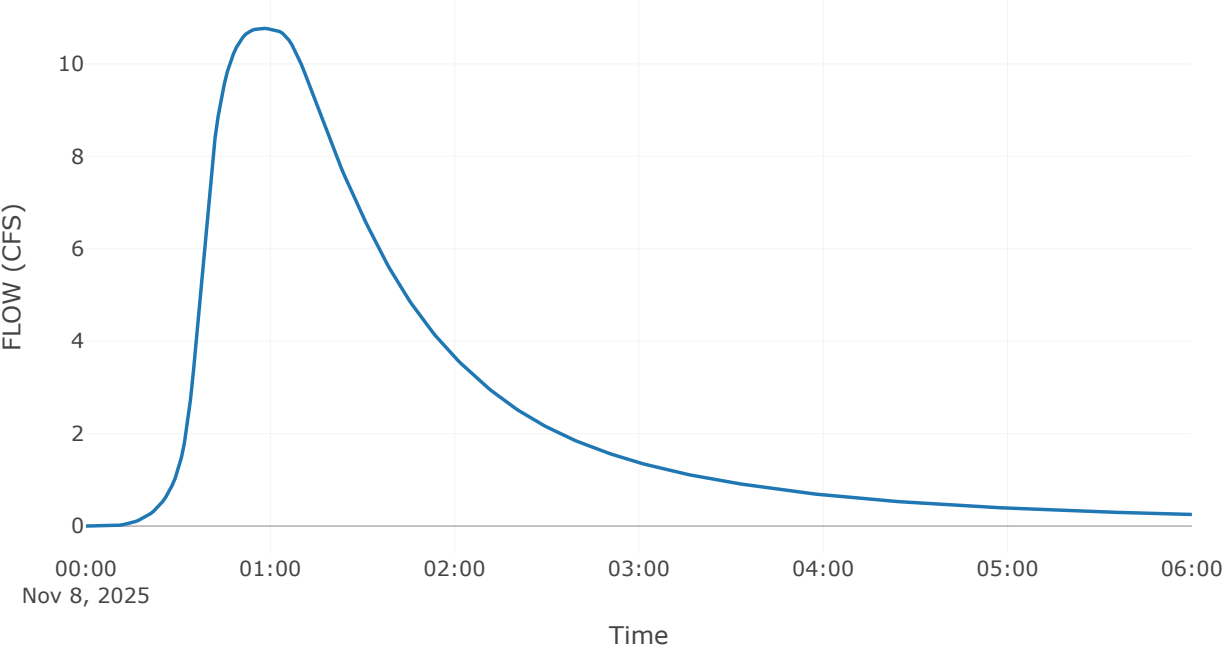
Combined Inflow



Cumulative Outflow



Outflow





Subbasin: DA-3B

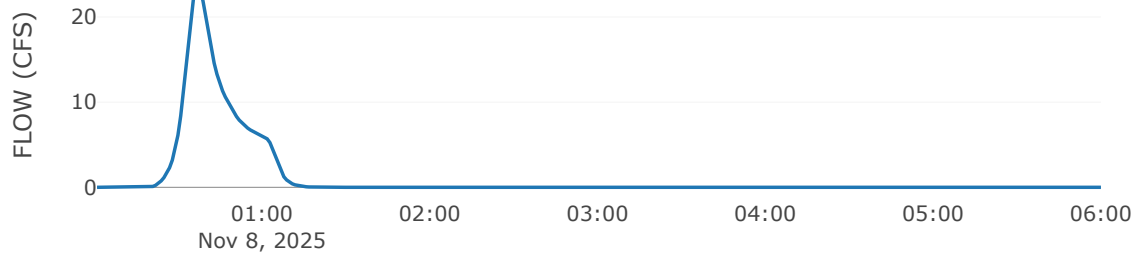
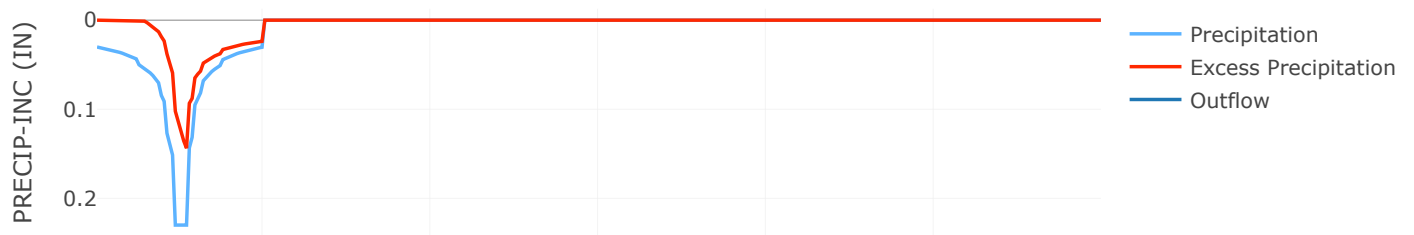
Area (MI<sup>2</sup>) : 0.01  
Downstream : Creek

| Loss Rate: SCS          |    |
|-------------------------|----|
| Percent Impervious Area | 0  |
| Curve Number            | 76 |

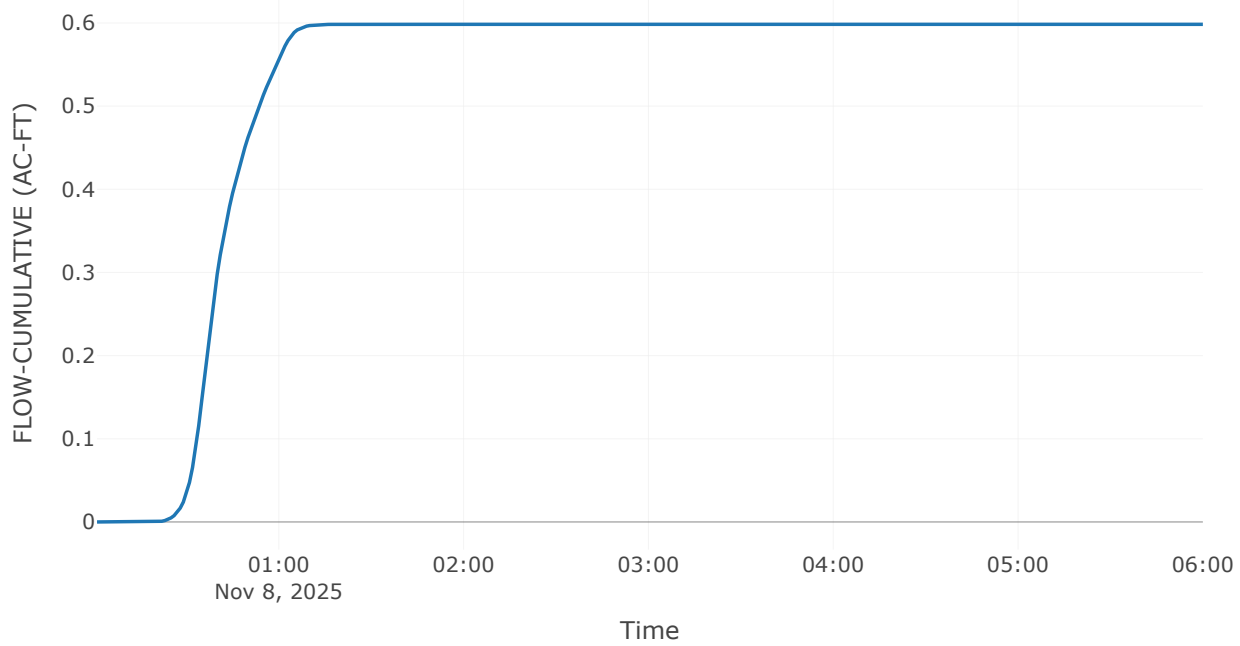
| Transform: SCS |          |
|----------------|----------|
| Lag            | 4        |
| Unitgraph Type | Standard |

| Results: DA-3B                 |                  |
|--------------------------------|------------------|
| Peak Discharge (CFS)           | 24.06            |
| Time of Peak Discharge         | 08Nov2025, 00:36 |
| Volume (IN)                    | 1.92             |
| Precipitation Volume (AC - FT) | 1.32             |
| Loss Volume (AC - FT)          | 0.72             |
| Excess Volume (AC - FT)        | 0.6              |
| Direct Runoff Volume (AC - FT) | 0.6              |
| Baseflow Volume (AC - FT)      | 0                |

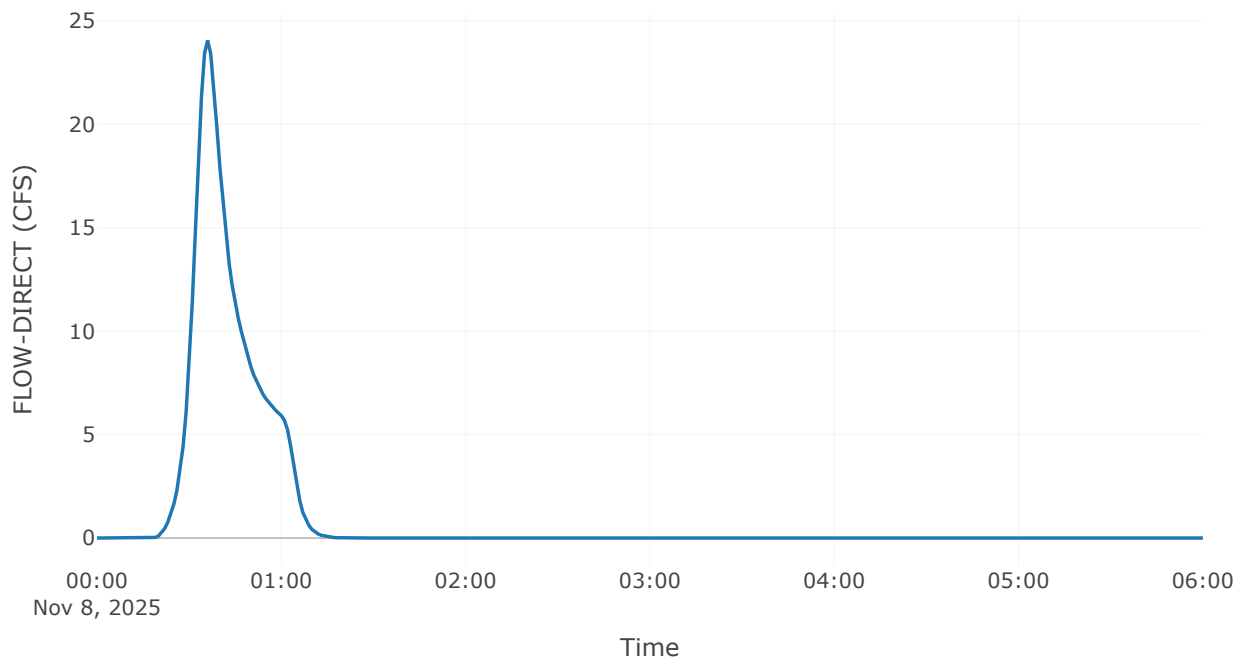
## Precipitation and Outflow



## Cumulative Outflow



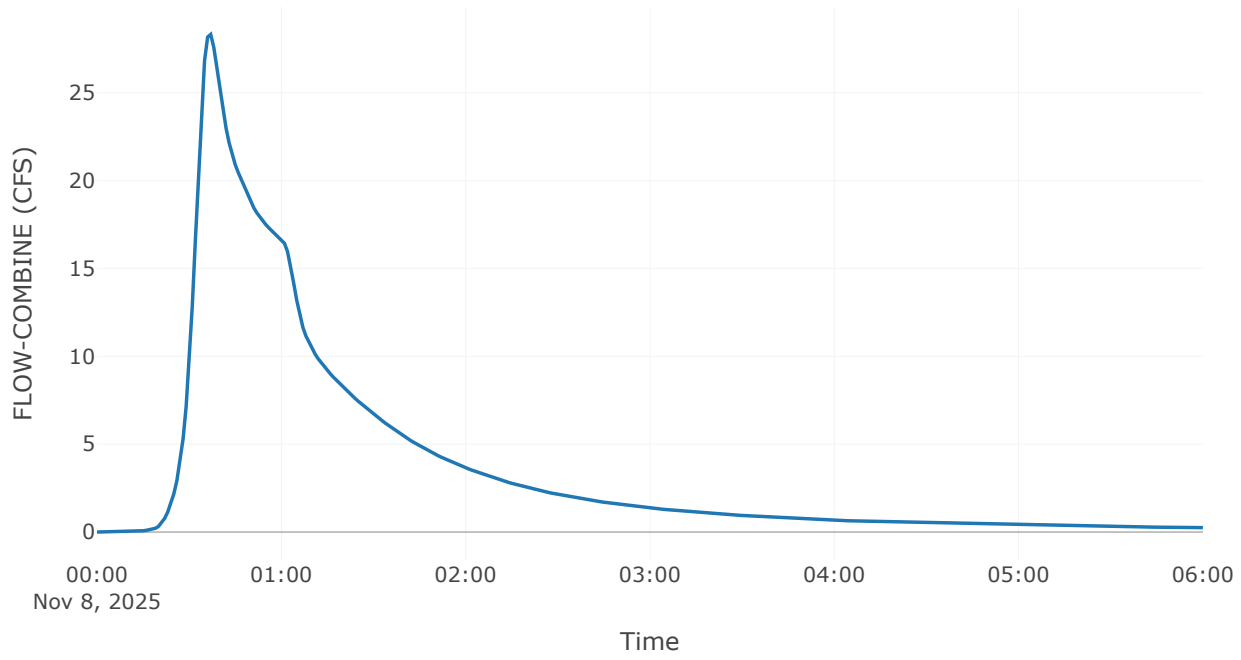
## Direct Runoff



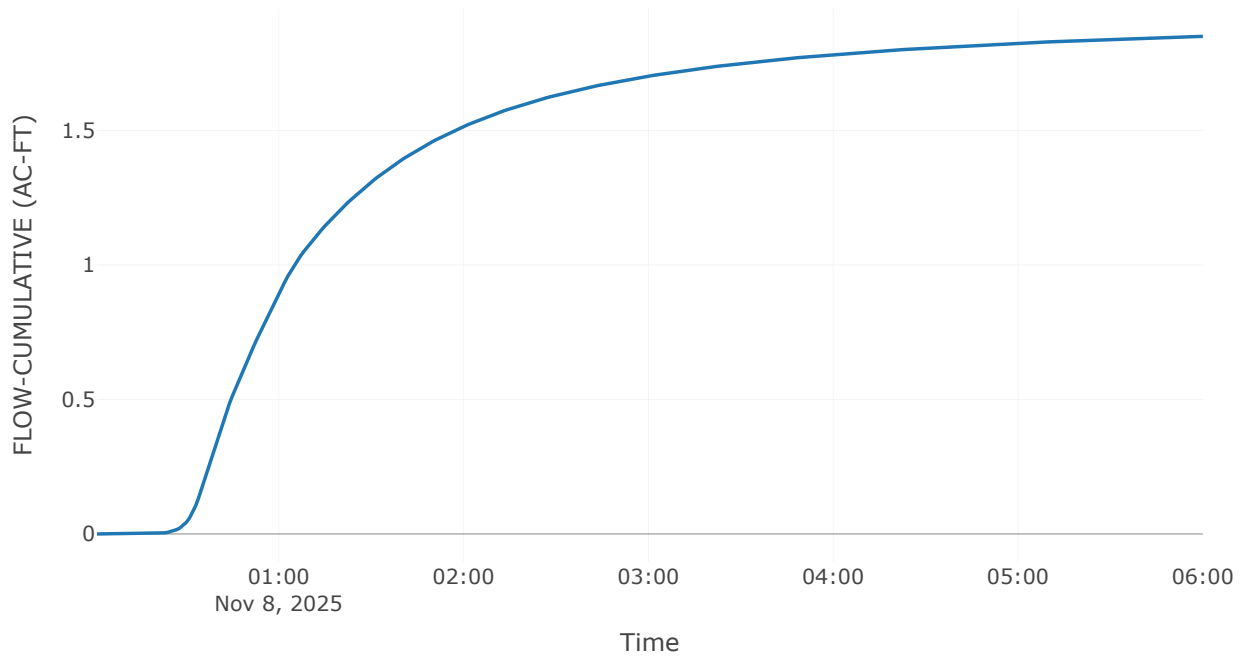
# Junction: Creek

| Results: Creek         |                  |
|------------------------|------------------|
| Peak Discharge (CFS)   | 28.31            |
| Time of Peak Discharge | 08Nov2025, 00:37 |
| Volume (IN)            | 2.58             |

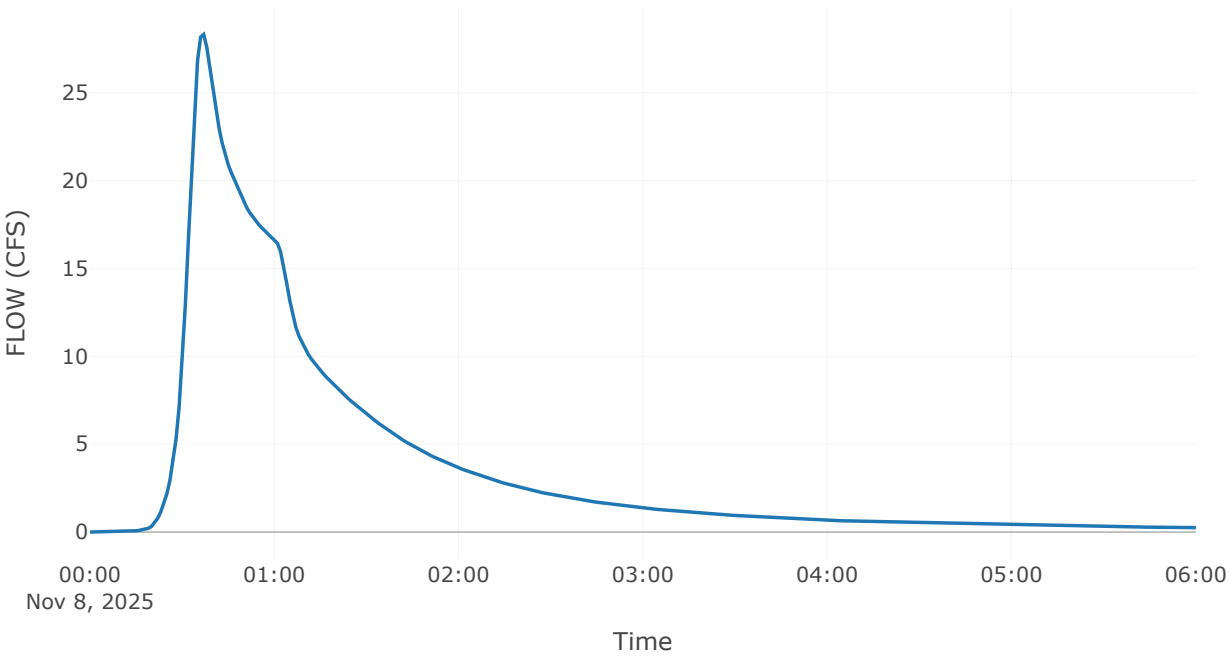
Combined Inflow



Cumulative Outflow



Outflow



Subbasin: DA-1

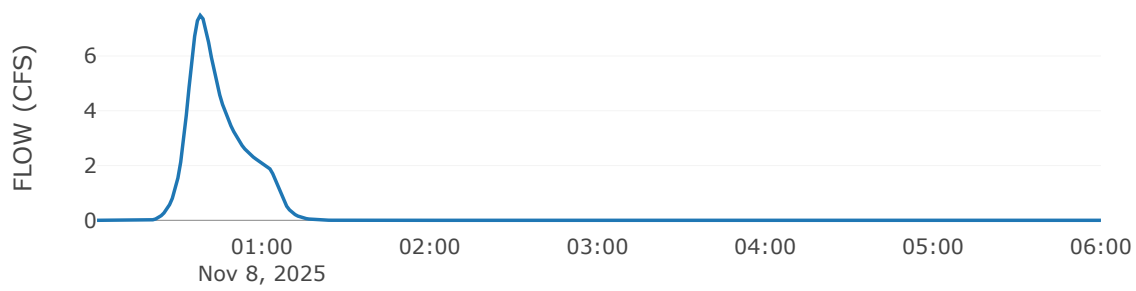
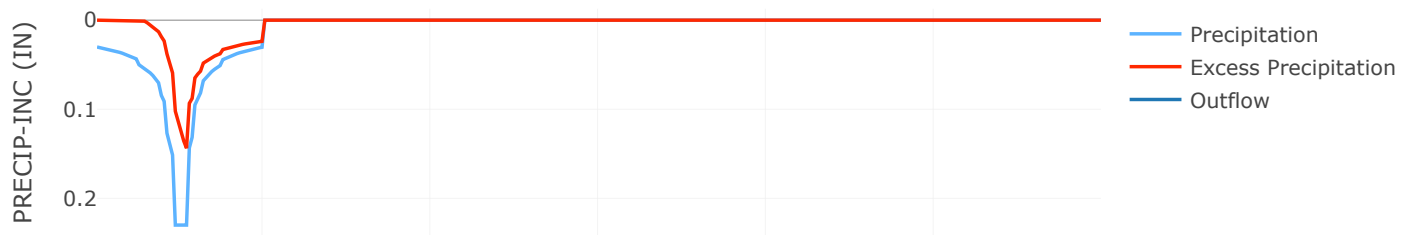
Area (MI<sup>2</sup>) : 0  
Downstream : Creek1

| Loss Rate: SCS          |    |
|-------------------------|----|
| Percent Impervious Area | 0  |
| Curve Number            | 76 |

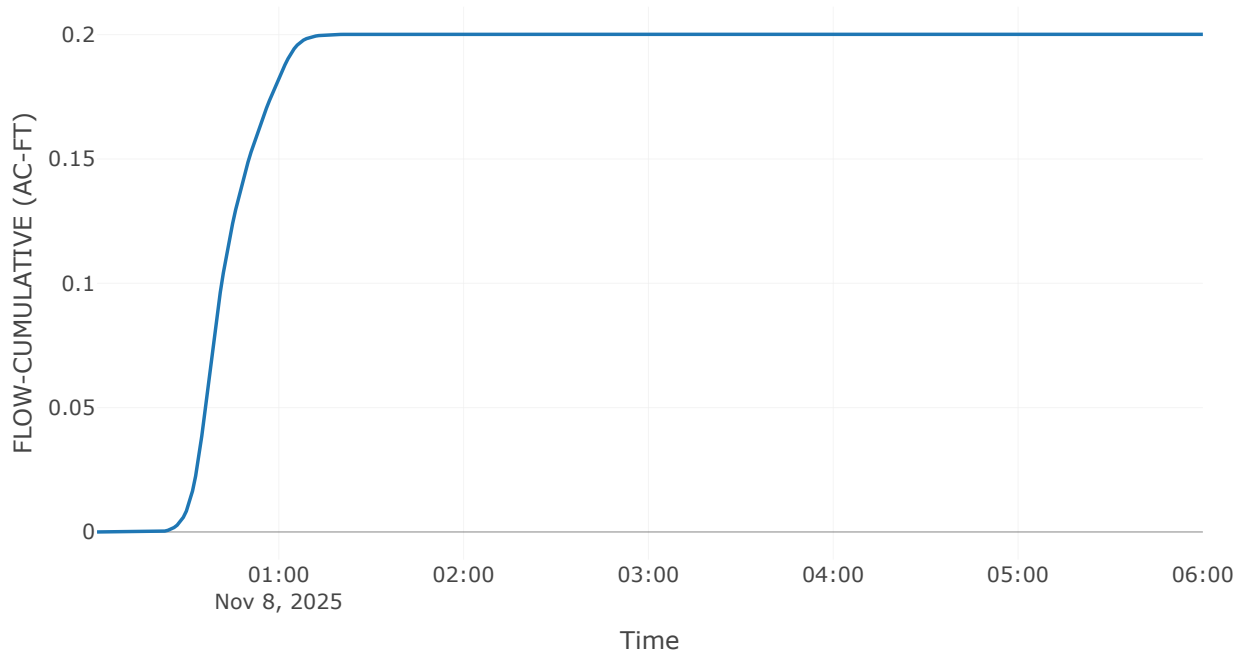
| Transform: SCS |          |
|----------------|----------|
| Lag            | 5        |
| Unitgraph Type | Standard |

| Results: DA-1                  |                  |
|--------------------------------|------------------|
| Peak Discharge (CFS)           | 7.48             |
| Time of Peak Discharge         | 08Nov2025, 00:37 |
| Volume (IN)                    | 1.92             |
| Precipitation Volume (AC - FT) | 0.44             |
| Loss Volume (AC - FT)          | 0.24             |
| Excess Volume (AC - FT)        | 0.2              |
| Direct Runoff Volume (AC - FT) | 0.2              |
| Baseflow Volume (AC - FT)      | 0                |

## Precipitation and Outflow

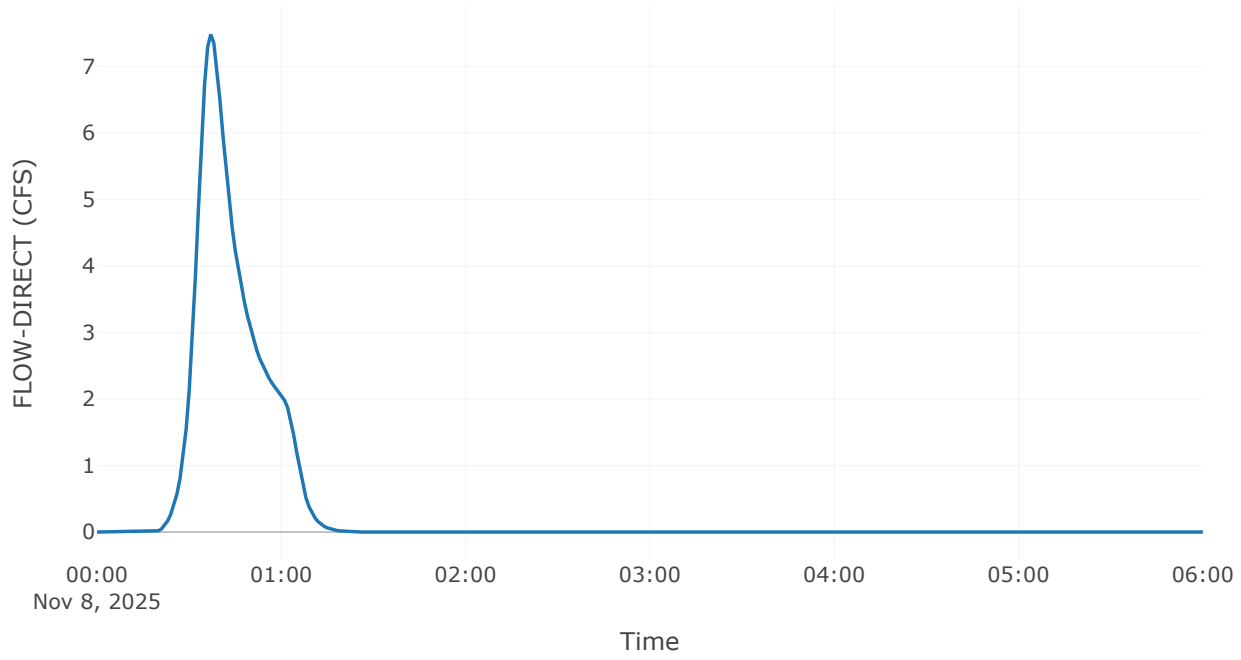


## Cumulative Outflow





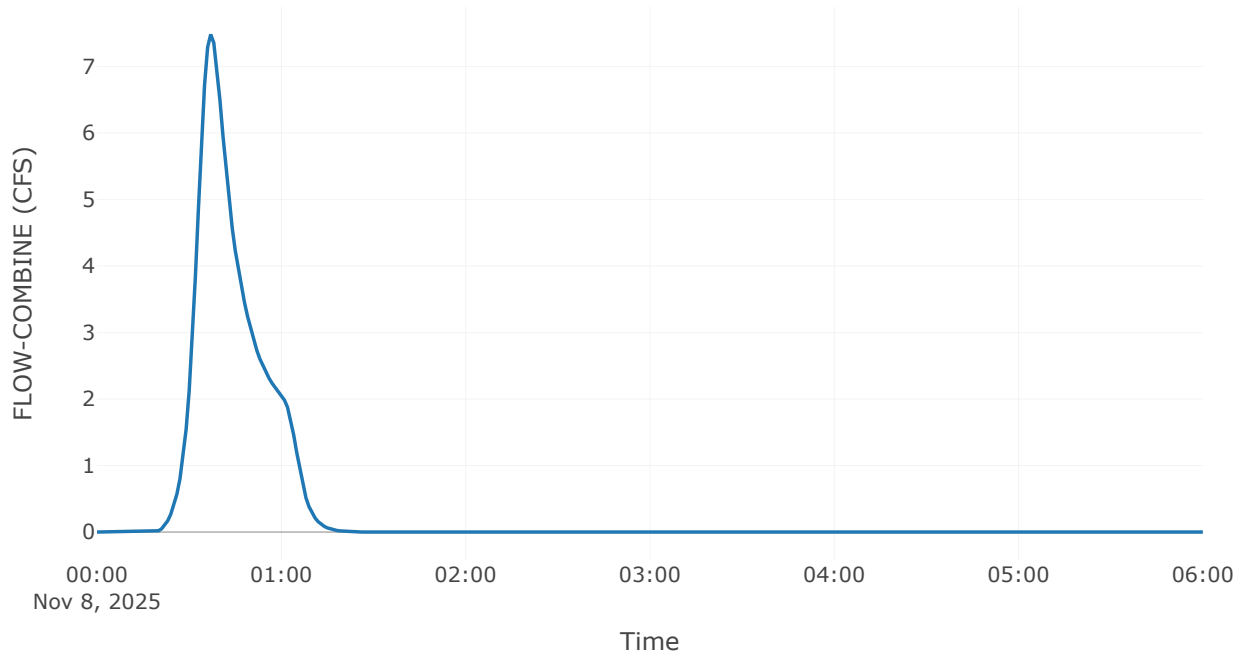
## Direct Runoff



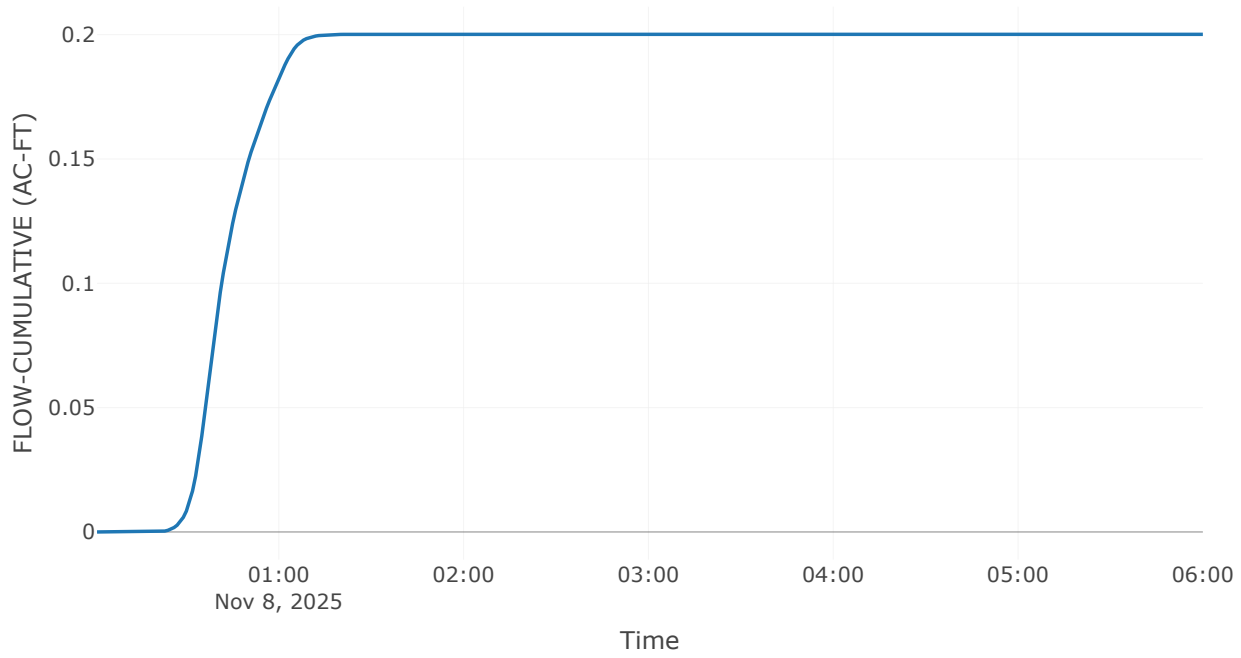
Junction: Creek1

| Results: Creek1        |                  |
|------------------------|------------------|
| Peak Discharge (CFS)   | 7.48             |
| Time of Peak Discharge | 08Nov2025, 00:37 |
| Volume (IN)            | 1.92             |

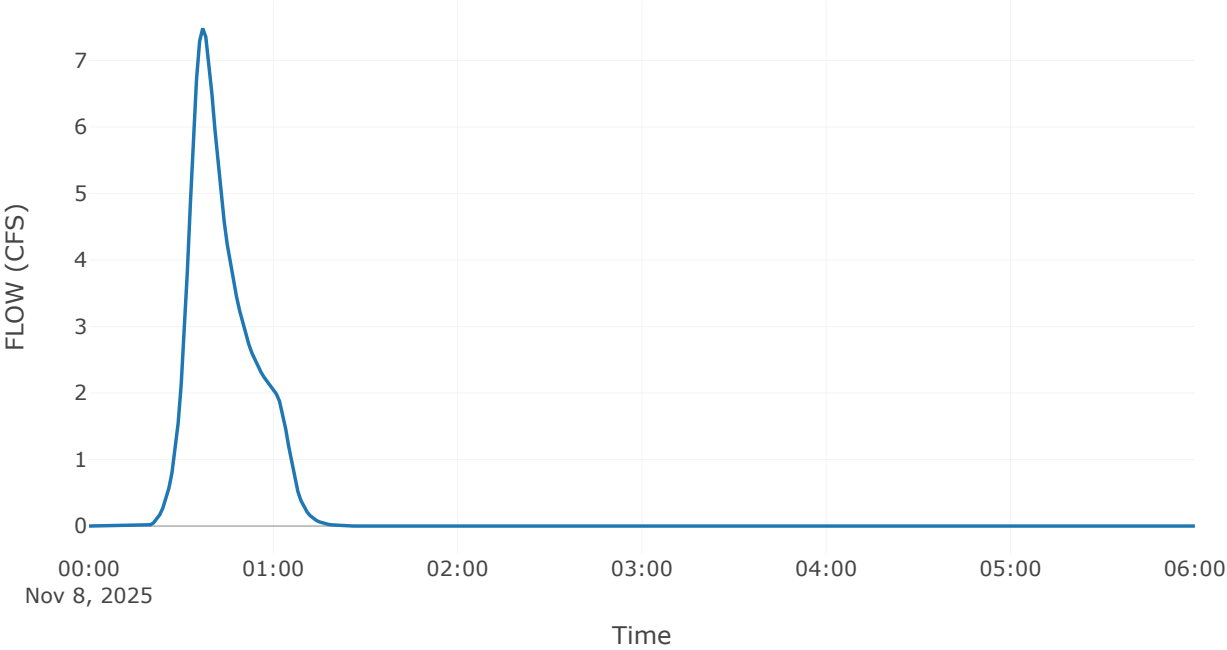
Combined Inflow



Cumulative Outflow



Outflow



Subbasin: DA-2

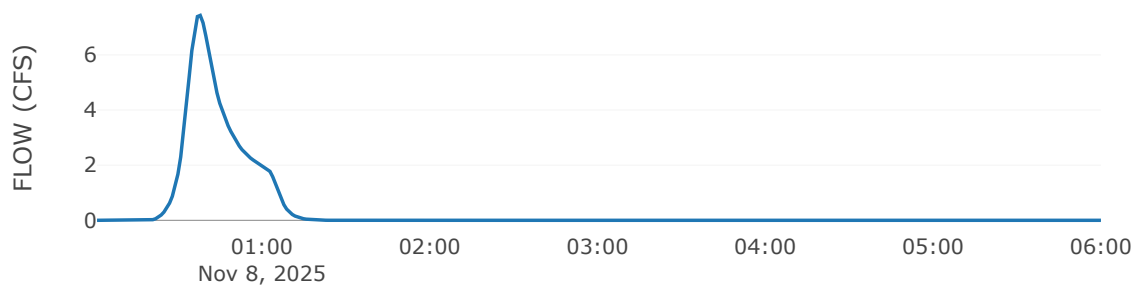
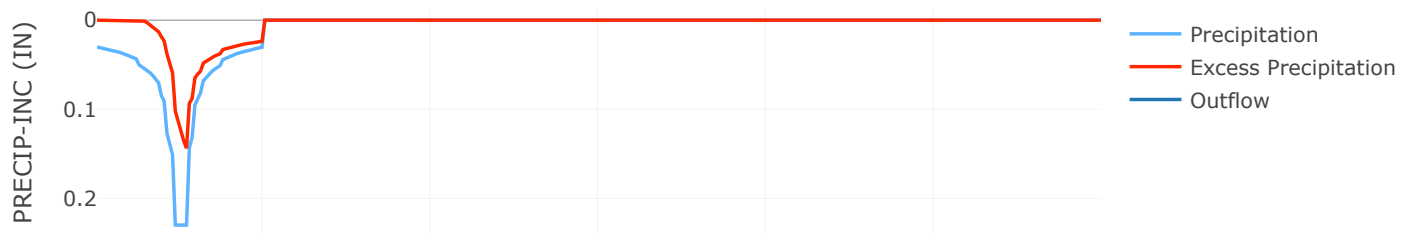
Area (MI<sup>2</sup>) : 0  
Downstream : Creek2

| Loss Rate: SCS          |    |
|-------------------------|----|
| Percent Impervious Area | 0  |
| Curve Number            | 76 |

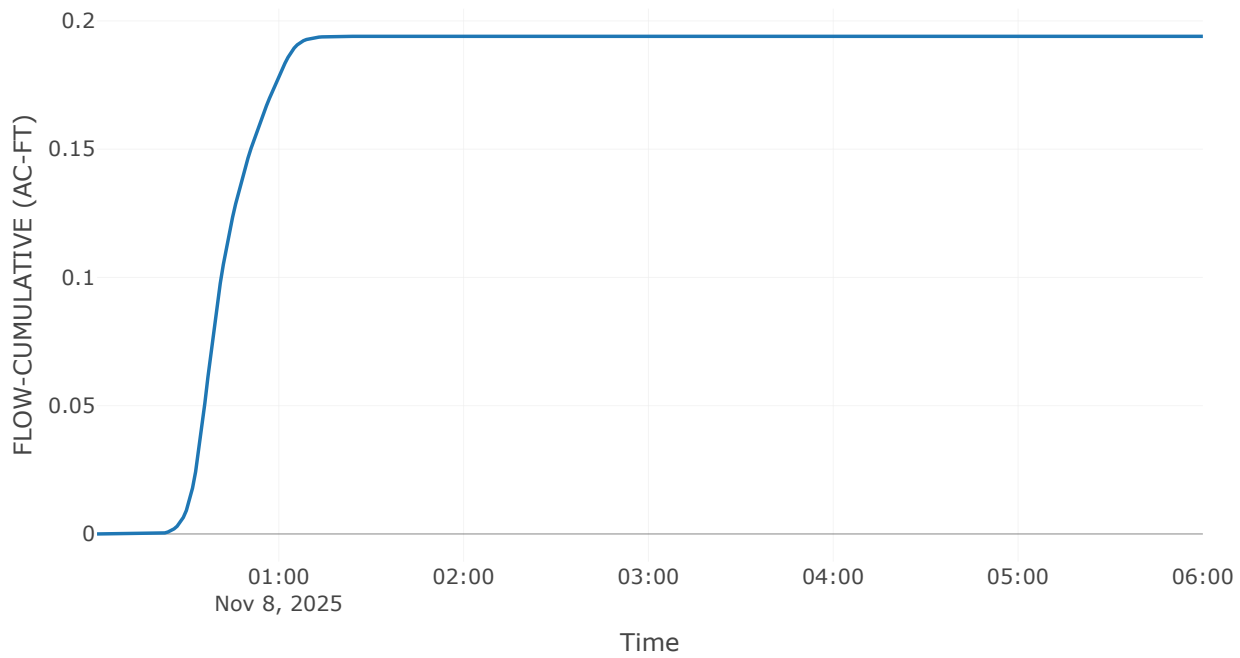
| Transform: SCS |          |
|----------------|----------|
| Lag            | 4.6      |
| Unitgraph Type | Standard |

| Results: DA-2                  |                  |
|--------------------------------|------------------|
| Peak Discharge (CFS)           | 7.43             |
| Time of Peak Discharge         | 08Nov2025, 00:37 |
| Volume (IN)                    | 1.92             |
| Precipitation Volume (AC - FT) | 0.43             |
| Loss Volume (AC - FT)          | 0.23             |
| Excess Volume (AC - FT)        | 0.19             |
| Direct Runoff Volume (AC - FT) | 0.19             |
| Baseflow Volume (AC - FT)      | 0                |

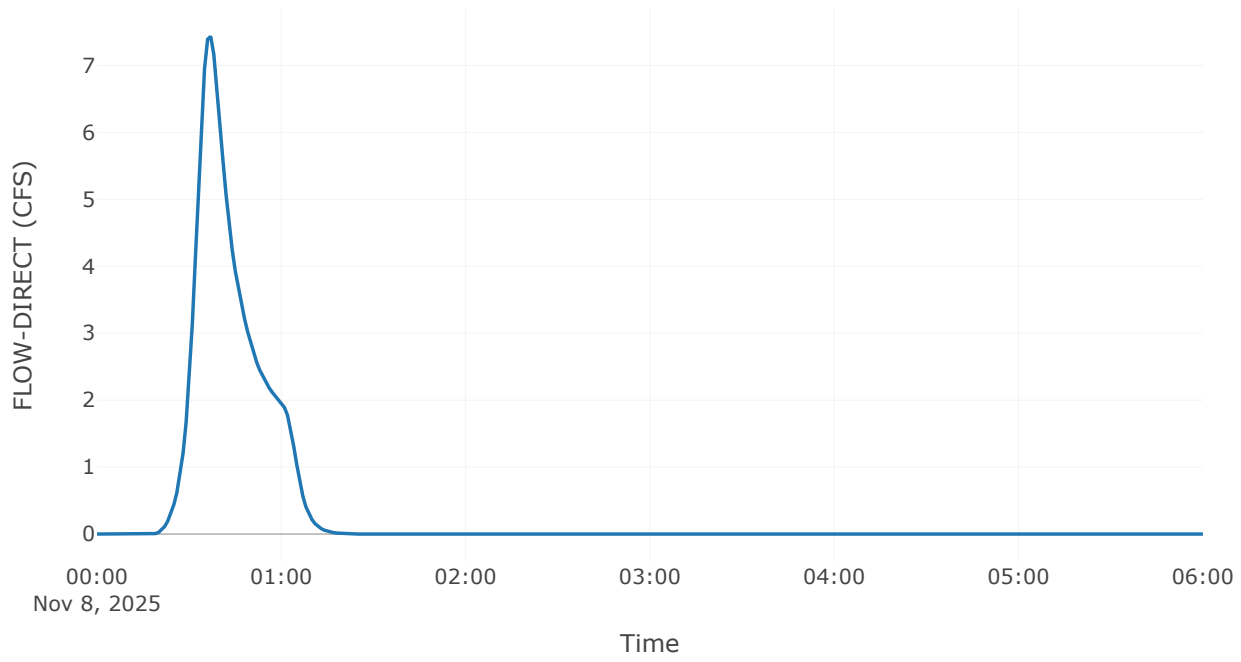
## Precipitation and Outflow



## Cumulative Outflow



## Direct Runoff

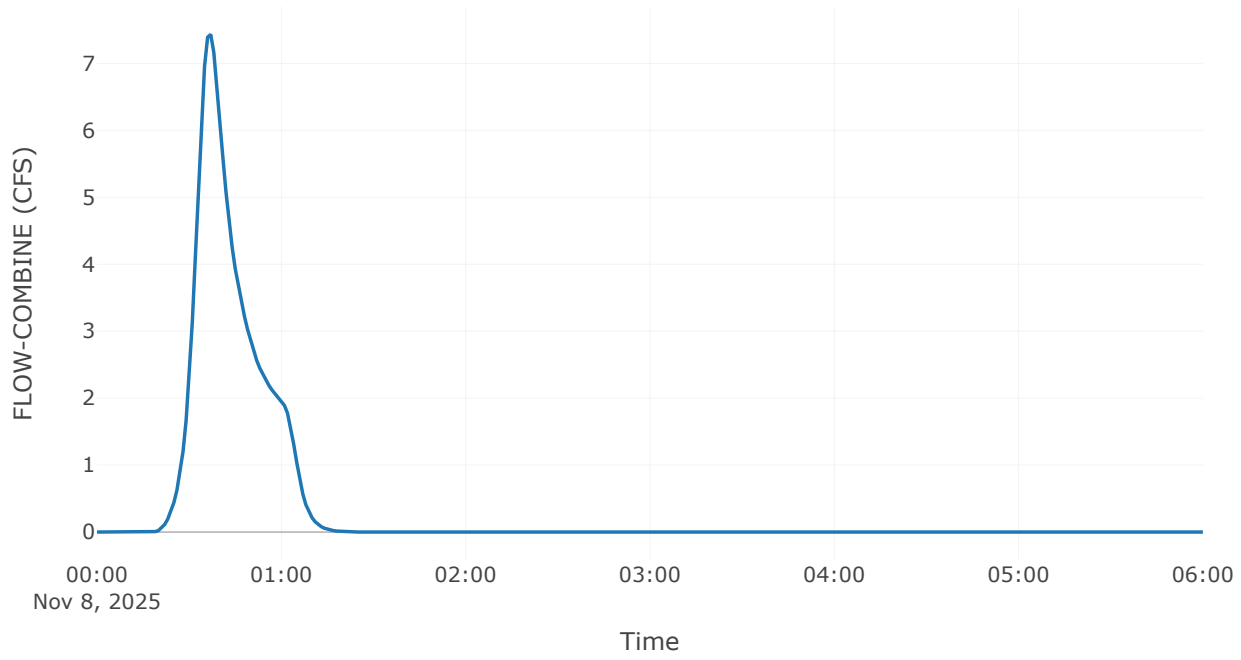


# Junction: Creek2

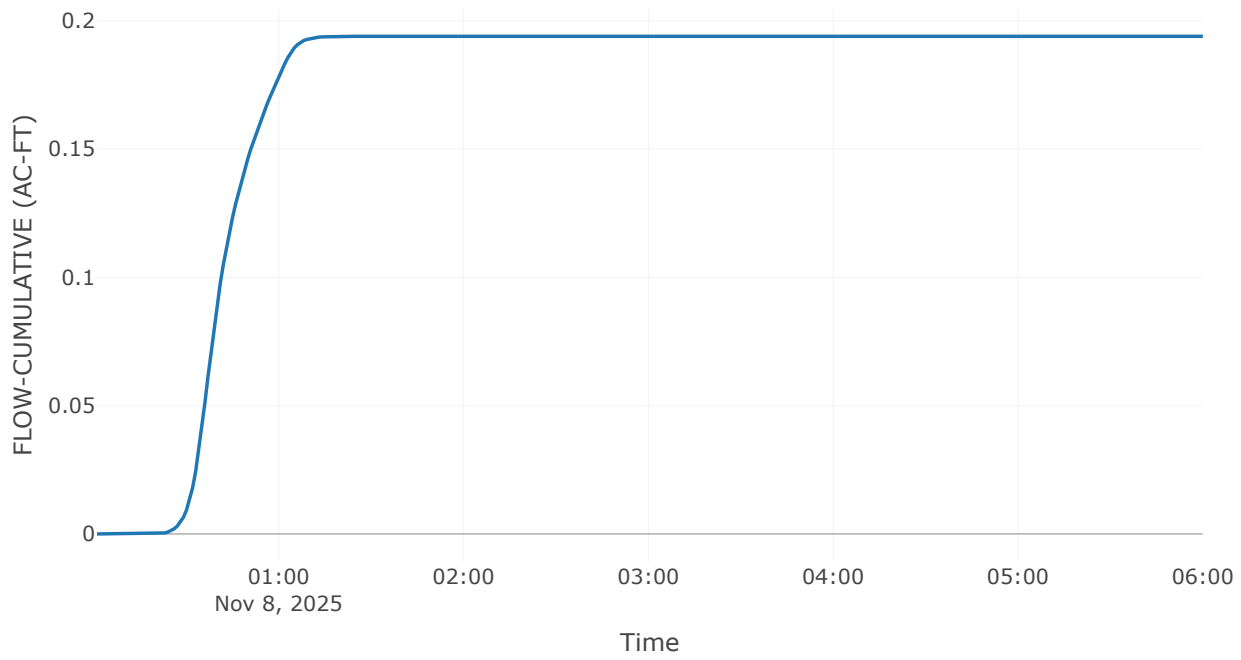
| Results: Creek2        |                  |
|------------------------|------------------|
| Peak Discharge (CFS)   | 7.43             |
| Time of Peak Discharge | 08Nov2025, 00:37 |
| Volume (IN)            | 1.92             |



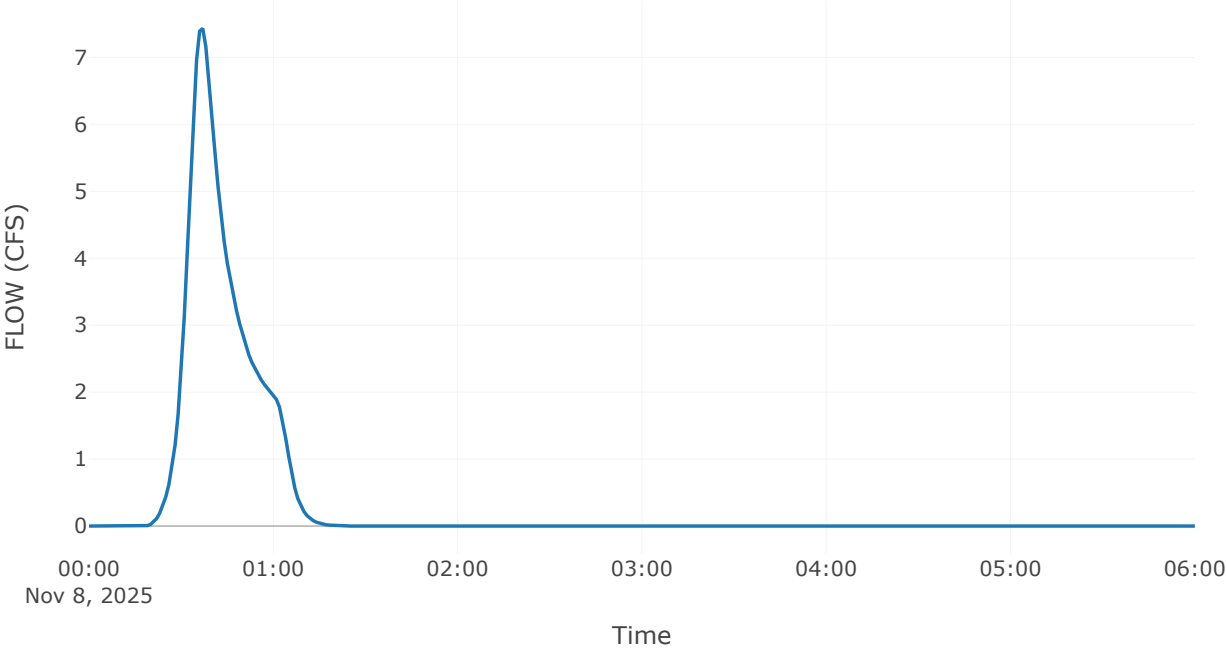
Combined Inflow



Cumulative Outflow



Outflow



## Appendix F – Time of Concentration

Existing Conditions Time of Concentration Computations

| SubBasin | Flow Type | Surface Condition   | Surface Coefficient | US Elev (ft) | DS Elev (ft) | Length (ft) | Slope (ft/ft) | V (fps) | Tt (min) | Tsc (min) | Tch (min) | Σ Tt (min) | 0.6Tc |
|----------|-----------|---------------------|---------------------|--------------|--------------|-------------|---------------|---------|----------|-----------|-----------|------------|-------|
| DA-1     | Sheet     | Short Grass Prairie | 0.15                | 809.83       | 807.83       | 100         | 0.020         | 0.21    | 7.85     |           |           | 7.85       |       |
|          | Shallow   | Grassed Waterways   | 16.13               | 807.83       | 780.77       | 197         | 0.137         | 5.98    |          | 0.55      |           | 0.55       |       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 8.40       | 5.04  |
| DA-2     | Sheet     | Short Grass Prairie | 0.15                | 808.44       | 804.72       | 100         | 0.037         | 0.27    | 6.13     |           |           | 6.13       |       |
|          | Shallow   | Grassed Waterways   | 16.13               | 804.72       | 779.38       | 393         | 0.064         | 4.10    |          | 1.60      |           | 1.60       |       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 7.73       | 4.64  |
| DA-3A    | Sheet     | Short Grass Prairie | 0.15                | 812.43       | 810.03       | 100         | 0.024         | 0.23    | 7.30     |           |           | 7.30       |       |
|          | Shallow   | Grassed Waterways   | 16.13               | 810.03       | 794.21       | 679         | 0.023         | 2.46    |          | 4.60      |           | 4.60       |       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 11.90      | 7.14  |
| DA-3B    | Sheet     | Short Grass Prairie | 0.15                | 794.21       | 789.04       | 100         | 0.052         | 0.31    | 5.37     |           |           | 5.37       |       |
|          | Channel   | Natural             | 0.04                | 789.04       | 763.86       | 270         | 0.093         | 5.43    |          |           | 0.41      | 0.41       |       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 5.78       | 3.47  |

Notes:  
-P2 = 3.96 inches based on precipitation area zone (PA) 3  
-Channel velocities calculated using Manning's equation and assuming full bank flow

Proposed Conditions Time of Concentration Computations

| SubBasin | Flow Type | Surface Condition   | Surface Coefficient | US Elev (ft) | DS Elev (ft) | Length (ft) | Slope (ft/ft) | V (fps) | Tt (min) | Tsc (min) | Tch (min) | Σ Tt (min) |
|----------|-----------|---------------------|---------------------|--------------|--------------|-------------|---------------|---------|----------|-----------|-----------|------------|
| DA-1     | Sheet     | Short Grass Prairie | 0.15                | 809.83       | 807.83       | 100         | 0.020         | 0.21    | 7.85     |           |           | 7.85       |
|          | Shallow   | Grassed Waterways   | 16.13               | 807.83       | 780.77       | 197         | 0.137         | 5.98    |          | 0.55      |           | 0.55       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 8.40       |
| DA-2     | Sheet     | Short Grass Prairie | 0.15                | 808.44       | 804.72       | 100         | 0.037         | 0.27    | 6.13     |           |           | 6.13       |
|          | Shallow   | Grassed Waterways   | 16.13               | 804.72       | 779.38       | 393         | 0.064         | 4.10    |          | 1.60      |           | 1.60       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 7.73       |
| DA-3A    | Sheet     | Short Grass Prairie | 0.15                | 812.43       | 810.03       | 100         | 0.024         | 0.23    | 7.30     |           |           | 7.30       |
|          | Channel   | Bermuda Grass       | 0.41                | 810.03       | 797.00       | 535         | 0.024         | 5.38    |          |           | 0.80      | 0.80       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 8.10       |
| DA-3B    | Sheet     | Short Grass Prairie | 0.15                | 794.21       | 789.04       | 100         | 0.052         | 0.31    | 5.37     |           |           | 5.37       |
|          | Channel   | Natural             | 0.04                | 789.04       | 763.86       | 270         | 0.093         | 5.43    |          |           | 0.41      | 0.41       |
|          |           |                     |                     |              |              |             |               |         |          |           |           | 5.78       |

Notes:  
-P2 = 3.96 inches based on precipitation area zone (PA) 3  
-Channel velocities calculated using Manning's equation and assuming full bank flow

## Appendix G – Utilities Calculations

# LEON VALLEY BAPTIST CHURCH - RECREATIONAL CENTER



FN042-4 REV A 8/19



## San Antonio Water System Infrastructure Planning Equivalent Dwelling Unit (EDU) Calculation Sheet

Subdivision Name: LEON VALLEY Plat I.D. # 18086-006-0620

The estimated Average Sewer Flows or Equivalent Dwelling Units that are shown on the SAWS Infrastructure Planning Application for Subdivision Plat Review has been calculated by one of the following methods:

- ☒ Equivalent Dwelling Units (EDU) calculation sheet.  
☐ Engineering Study using actual consumption data from similar facilities based on twelve month data also submitted for review.  
☐ Calculate estimated sewer discharge utilizing accepted SAWS referenced material.  
☐ Unknown land use will be calculated at four (4) EDU's per acre.

SAWS has established recommended guidelines to be employed for future discharge calculations which are shown next to the referenced facility. The numbers shown, for each type of development, are based on flow rate table measurements from TCEQ regulations, ASCE Manuals on Engineering Practice, EPA Technology Transfer Manuals, Uniform Plumbing Code fixture unit count and other Wastewater Engineering texts. All applicants will use these guidelines to calculate average daily flows or EDU's.

SAWS will accept sewage flow calculations for any proposed development which is derived through an engineering study of actual measured sewer flows for similar facilities in lieu of the above criteria to determine the total estimated average daily flow or EDU's for the proposed development. The undersigned acknowledges that these EDU calculations represent the intended use of the plat.

**Types of Development:** Identify all types of development that will be part of the proposed project and complete the related information listed for each to calculate as Estimated Average Daily Flow (EADF) or Equivalent Dwelling Units (EDU's). Note: One (1) EDU equals 200 gallons per day as average sewage flow and 250 gallons per day for average water flow. (Circle type of units used - EADF or EDU's)

Single Family Homes (1 EDU/Lot) [ ] Manufactured Homes (1 EDU/Pad) [ ] Number Lots \_\_\_\_\_ Number Pads \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Apartments [ ] Duplexes [ ] Town Homes [ ] Condominiums [ ] (0.5 EDU/Unit) Total Number of Units \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Schools: Elementary [ ] (5 gal/student) [ ] Middle (8 gal/student) [ ] High School (10 gal/student) [ ] University/College/Other (10gal/student)

Number of Students \_\_\_\_\_ Number of Faculty & Staff \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Hotel [ ] (100 gal/room) Motel [ ] (50 gal/room) Number of Rooms \_\_\_\_\_ Number of Staff \_\_\_\_\_ Swimming Pool \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Hospital (250 gal/bed) [ ] Nursing Home (100 gal/bed) [ ] other \_\_\_\_\_ Number of Beds \_\_\_\_\_ Number of Staff \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Commercial [ ] Industrial [ ] TBOBE Type of Product \_\_\_\_\_ Water Consumption \_\_\_\_\_ Effluent Discharged \_\_\_\_\_

Number of Employees \_\_\_\_\_ Number of Fixtures \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Contact SAWS Wastewater Compliance Division if a portion of the flow is industrial wastewater. Phone 233-3557

Office Building [ ] (0.035 gal/sf) Building Square Footage \_\_\_\_\_ Number of employees \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Storage [ ] Climate Control (1 EDU) [ ] Office Space less than 2,500 Sq. Ft. (1 EDU) \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Warehouse Building Office Space Sq. Ft. \_\_\_\_\_ (0.07 gal/sf) Storage Space Sq. Ft. \_\_\_\_\_ (0.007 gal/sf)

Number of Employees \_\_\_\_\_ (25 gal/employee) \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Medical Building [ ] (0.15 gal/sf) Building Square Footage \_\_\_\_\_ Number of employees \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Restaurant [ ] Cafeteria [ ] (20 gal/seat) Number of Seats \_\_\_\_\_ Business Hours \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Fast Food [ ] (5 EDU's per facility) Type of Food Served \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Health Club [ ] Recreational Facility [X] TBOBE Building Square Footage 26,250 Customers per day 225

Swimming Pool Size X Seats in Snack Bar X Number of Restrooms 10 Number of Showers 2 (EADF or EDU's 7875)

Department Store/Retail Store (0.07 gal/sf) Type of Store \_\_\_\_\_ Building Sq. Ft. \_\_\_\_\_ Number of Customers \_\_\_\_\_ (5gpd/customer)

Number of Employees \_\_\_\_\_ (25 gpd/employee) Number of Customers per day \_\_\_\_\_ (5 gpd/customer) \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Grocery Store [ ] Food Store [ ] Convenience Stores [ ] TBOBE Building Square Footage \_\_\_\_\_ Number of Employees \_\_\_\_\_

Business Hours \_\_\_\_\_ Number of Customer \_\_\_\_\_ Fuel Service \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Laundries Number of Machines \_\_\_\_\_ (200 gal/machine) Business Hours \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Churches [ ] Auditoriums [ ] Seating Capacity \_\_\_\_\_ (5 gal/seat) Number Rest Rooms \_\_\_\_\_ Number of Fixtures \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Car Wash [ ] TBOBE [ ] Number of Bays \_\_\_\_\_ (1.5 EDU's per Bay) Number Cars per Day \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Automated Car Wash [ ] TBOBE Gal per wash \_\_\_\_\_ Effluent discharged per wash \_\_\_\_\_ Number Cars per Day \_\_\_\_\_

(Specifications Required) \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Service stations [ ] 1 EDU Gas Station [ ] 2 EDU's Grocery/Takeout Food [ ] 15 EDU's Car Wash \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Theatre (1.5 gal/seat) Number of seats \_\_\_\_\_ Number of Employees \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

Other Type of Development Proposed Land Use \_\_\_\_\_ Building Square Footage \_\_\_\_\_ Number of Employees \_\_\_\_\_

Number of Customers \_\_\_\_\_ Number of seats \_\_\_\_\_ Number of Fixtures \_\_\_\_\_ Business Hours \_\_\_\_\_ EADF or EDU's \_\_\_\_\_

**Calculation work space:** (Please type or print in ink). **Calculation sheet must be signed and sealed by a Professional Engineer if other form of calculation not shown on this sheet is utilized.**

26,250 Sf ÷ 50 sf/person = 525 person/day ⇒ IBC Table 1004.5  
 (15 gpd/person) (525 people) = 7875 gpd ⇒ Assigns 50 sf/person  
 7875 ÷ 200 = 39.4 ⇒ 40 EDU ⇒ TCEQ Chapter 217 § 217.32  
 ⇒ 6" Sewer lateral ⇒ Assigns 15 gpd/person

Additional Information: \_\_\_\_\_

If additional space is needed add a separate sheet on letterhead, and attach it to this sheet at time of submittal. This form must be completely filled out and submitted with an original signature. No other form will be accepted.

Applicant or Applicant's Agent Signature \_\_\_\_\_

OCT 30 2025  
 Date

FIRE LINE SIZING:

⇒ IFC Appendix B & NFPA 24

⇒ A single 6" is minimum sizing unless flow is under 1000 gpm.

⇒ Building is 26250 SF → 1500 gpm @ 20 psi  
(IFC 8105.1)

6" FIRE LINE IS CORRECT & MINIMUM SIZE

DOMESTIC SERVICE

• IPC TABLE E103.3(2) & E103.3(3)

• TCEQ § 290.44 (d) requires minimum 20 psi at all fixtures under peak flow.

⇒ IPC TABLE E103.3 (2) & (3)

10 toilets x 10 FU = 100 FU

10 lavs x 2 FU = 20 FU

8 Showers x 4 FU = 32 FU

FU<sub>TOTAL</sub> = 152 WSFU

Per IPC TABLE:

152 FU ⇒ Q = 55-60 gpm ⇒ Q = 57 gpm

A) 1" Domestic

$$h_f = 4.52(670) \cdot \frac{57^{1.85}}{150^{1.85} (1.31)^{4.77}} = 400.5 \text{ psi loss}$$

Fail

B) 1.5" Domestic

$$h_f = 4.52(670) \cdot \frac{57^{1.85}}{150^{1.85} (1.610)^{4.77}} = 49.72 \text{ psi loss}$$

Fail

C) 2" Domestic

$$h_f = 4.52(670) \cdot \frac{57^{1.85}}{150^{1.85} (2.067)^{4.77}} = 14.73 \text{ psi loss}$$

OK ✓

| SIZE | Flow (gpm) | Length (ft) | Head loss (psi) |
|------|------------|-------------|-----------------|
| 1"   | 57         | 670         | 400.5 psi       |
| 1.5" | 57         | 670         | 49.72 psi       |
| 2"   | 57         | 670         | 14.73 psi       |

2" DOMESTIC



## IRRIGATION SERVICE

- SAWS IRRIGATION DESIGN GUIDANCE: Limit velocity  $\leq 5$  ft/s
- TCEQ § 290.44(d): system must maintain  $\geq 20$  psi @ all equipment.

PIPE length to site: ~670 ft

Q = 60 as conservative design flow

$$h_f = 4.52 \cdot L \cdot \frac{Q^{1.85}}{C^{1.85} d^{4.87}}$$

| NOMINAL | ID (in) |
|---------|---------|
| 1.5"    | 1.610"  |
| 2.0"    | 2.067"  |

60 gpm was selected based on manufacturer specifications for commercial rotor irrigation heads, which typically operate @ 2-3 gpm per head, with 18-24 heads per zone, resulting in peak flow of 45-60 gpm.

A) 1.5" irrigation line

$$h_f = 4.52(670) \cdot \frac{60^{1.85}}{150^{1.85} (1.610^{4.87})} = 20.8 \text{ psi loss}$$

fail

velocity (1.5")

$$v = \frac{0.321(60)}{1.610^2} = 7.43 \text{ ft/s}$$

Fail

B) 2" irrigation line

$$h_f = 4.52(670) \cdot \frac{2153}{150^{1.85} (2.067^{4.87})} = 5.3 \text{ psi loss}$$

Oh ✓

velocity (2")

$$v = \frac{0.321(60)}{2.067^2} = 4.5 \text{ ft/s}$$

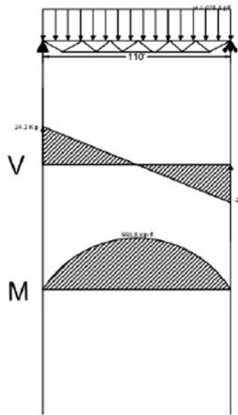
Oh ✓

2" irrigation line

## Appendix H – Shear Moment diagrams

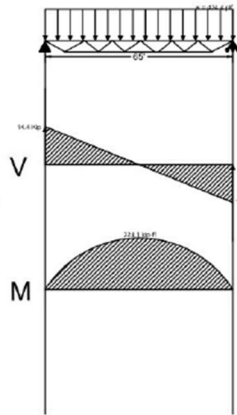
# Shear-Moment Diagram

TYP. GYM TRUSS



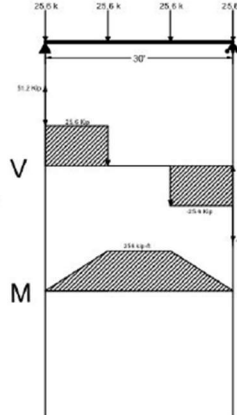
Notes:  
 $w = 1.20 \times 1.65 \text{ k/ft}$ ;  $D = 16.3 \text{ k/ft}$ ;  $S = 14.3 \text{ k/ft}$  (ASCE 7-22)  
 Consider truss span of 110' and tributary width of 10' O.C.  
 Truss self weight not considered in diagram, must be included in determining acceptable truss with factor of 1.2  
 Truss shall be designed using SJI  
 Per SJI 361H09 shall satisfy loads with  $\frac{1}{160}$  deflection over span, truss type shall be top chord pitched two-way underslung with a 1:96 pitch

TYP. LOBBY TRUSS



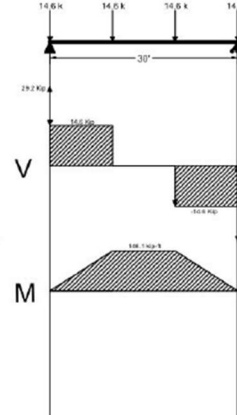
Notes:  
 $w = 1.20 \times 1.65 \text{ k/ft}$ ;  $D = 16.3 \text{ k/ft}$ ;  $S = 14.3 \text{ k/ft}$  (ASCE 7-22)  
 Consider truss span of 65' and tributary width of 10' O.C.  
 Truss self weight not considered in diagram, must be included in determining acceptable truss with factor of 1.2  
 Truss shall be designed using SJI  
 Per SJI 361H09 shall satisfy loads with  $\frac{1}{160}$  deflection over span, truss type shall be top chord pitched one-way underslung with a 1:96 pitch

TYP. GYM GIRDER



Notes:  
 $P = (424.4 \times 1.2(34)) \times 110(2) = 25.6 \text{ k}$  (Point load due to truss)  
 Consider girder span of 30' and Pinned connections  
 Beam self weight not considered in diagram, must be included in determining acceptable truss with factor of 1.2  
 Girder shall be designed using AISI 360  
 Per AISI 360 W18 x 65 shall satisfy loads with L/360 deflections  
 Deflections Considered using factored Live load of  $P = 10.56 \text{ k}$   
 Girder shall be AISI 360 steel  
 Girder shall satisfy Shear and Moment needed

TYP. LOBBY GIRDER



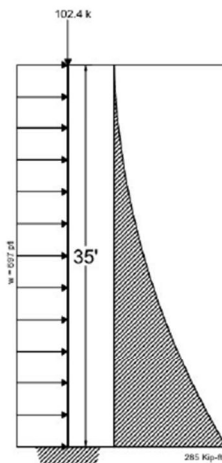
Notes:  
 $P = (424.4 \times 1.2(21)) \times 10(2) = 14.6 \text{ k}$  (Point load due to truss)  
 Consider girder span of 30' and Pinned connections  
 Beam self weight not considered in diagram, must be included in determining acceptable truss with factor of 1.2  
 Girder shall be designed using AISI 360  
 Per AISI 360 W18 x 60 shall satisfy loads with L/250 deflections  
 Deflections Considered using factored Live load of  $P = 10.56 \text{ k}$   
 Girder shall be AISI 360 steel  
 Girder shall satisfy Shear and Moment needed

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APPENDIX HORIZONTAL MEMBERS

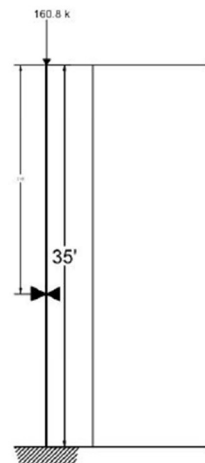
# Moment Diagram

TYP. GYM EXT. COLUMN



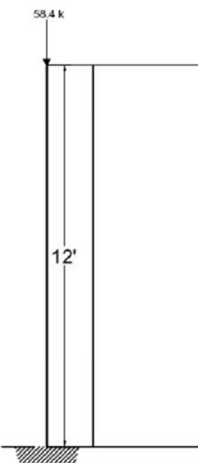
Notes:  
 $M_u = Wd/2 = 285 \text{ k-ft}$ ;  $P_u = 2(51.2)$  (Load due to girders) and wind pressure  
 Consider Column unbraced span of 35.5' Fixed base  
 Column shall be designed using AISI 360  
 Per AISI 360 W14 x 90 shall satisfy loads with L/360 deflections  
 Deflections Considered using wind load of  $w = 0.997 \text{ k/ft}$   
 Column shall be AISI 360 steel  
 Girder shall satisfy combined axial and Moment loading

TYP. GYM INT. COLUMN



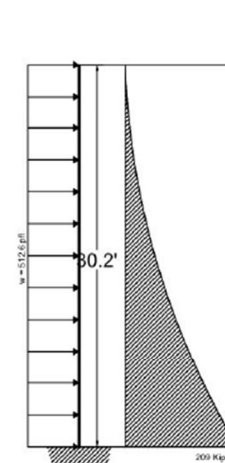
Notes:  
 $P_u = 2(51.2) + 2(29.2) = 160.8$  (Load due to girders)  
 Consider Column unbraced span of 35.5' Fixed base  
 Column shall be designed using AISI 360  
 Per AISI 360 W14 x 48 shall satisfy loads with L/360 deflections  
 Column shall be AISI 360 steel  
 Girder shall satisfy combined axial loadings

TYP. LOBBY EXT. COLUMN



Notes:  
 $P_u = 2(29.2) = 58.4$  (Load due to girders)  
 Consider Column unbraced span of 12.5' Fixed base  
 Column shall be designed using AISI 360  
 Per AISI 360 W18 x 20 shall satisfy loads with L/360 deflections  
 Column shall be AISI 360 steel  
 Girder shall satisfy axial loading

TYP. NLB EXT. COLUMN



Notes:  
 $M_u = Wd/2 = 209 \text{ k-ft}$  (Load due to Wind pressure)  
 Consider Column unbraced span of 30.2' Fixed base  
 Column shall be designed using AISI 360  
 Per AISI 360 W14 x 90 shall satisfy loads with L/360 deflections  
 Deflections Considered using wind load of  $w = 0.997 \text{ k/ft}$   
 Column shall be AISI 360 steel  
 Girder shall satisfy combined axial and Moment loading

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APPENDIX VERTICAL MEMBERS

## Appendix I – Structural Design Calculations

**STEEL MEMBERS**

Determine Load Combinations (2.3.1):

Gym roof Load: **\*\*NOT INCLUDING SELF WEIGHT**

$1.4D = 22.82\text{psf}$ ;  $1.2D+0.5L_r=25.56\text{psf}$ ;  $1.2D+1.6L_r+0.5W=26.21\text{psf}$   *$1.4D = 22.82\text{psf}$ ;  $1.2D+0.5L_r=25.56\text{psf}$ ;  $1.2D+1.6L_r+0.5W=26.21\text{psf}$*

$1.2D+1.6S=42.44$  (control)

Lobby roof Load: **\*\*NOT INCLUDING SELF WEIGHT**

$1.4D = 22.82\text{psf}$ ;  $1.2D+0.5L_r=25.56\text{psf}$ ;  $1.2D+1.6L_r+0.5W=28.06\text{psf}$   *$1.4D = 22.82\text{psf}$ ;  $1.2D+0.5L_r=25.56\text{psf}$ ;  $1.2D+1.6L_r+0.5W=28.06\text{psf}$*

$1.2D+1.6S=42.44$ (control)

**TRUSSES**

- GYM JOIST
  - Top chord pitched two-ways underslung Pitch 1:96, 64DLH13
  - Design capability = 497.7 plf, unfactored Live roof = 120plf; self-weight 34 plf
  - $M_u = 668.5 + 1.2(.034)(110)^2/8 = 730.2 \text{ kip-ft}$
  - purlins shall run perpendicular at 5' on center.
  - DESIGN BRACING
- LOBBY JOIST
  - Top chord pitched one-way underslung Pitch 1:96, 36LH09
  - Design capability = 499 plf, unfactored Live roof = 120plf; self weight 21 plf
  - $M_u = 224.1 + 1.2(.021)(65)^2/8 = 237.4 \text{ kip-ft}$
  - purlins shall run perpendicular at 5' on center.
  - DESIGN BRACING

**GRIDERS ( $\phi = 0.9$ ) (A992)**

- GYM 1<sup>st</sup> Attempt
  - TRY W18 x 65 (A992 Gr50) ( $Z_x = 133$ ,  $S_x = 117$ )
  - $M_u = 256 + \frac{1.2(0.065)(30^2)}{8} = 265 \text{ kip-ft}$
  - $\phi M_n = 0.9(50)(133) = 498 \text{ kip-ft}$
  - $L_b = 30' > L_r = 18.8' > L_p = 5.97'$  CHECK
  - $\phi M_n = \phi M_r = \phi F_{cr} S_x = 182 \text{ kip-ft NG}$

- $F_{cr} = \frac{C_b \pi^2 E}{\left(\frac{L_b}{r_{ts}}\right)^2} \sqrt{\left(1 + 0.078 \left(\frac{J_c}{S_x h_o}\right) \left(\frac{L_b}{r_{ts}}\right)^2\right)} = 18.7 \text{ ksi}$
  - $\frac{b}{2t_f} = 5.06 < 0.38 \sqrt{\left(\frac{E}{F_y}\right)}; \frac{h}{t_w} = 35.7 < 3.76 \sqrt{\left(\frac{E}{F_y}\right)}$
  - $\phi V_n = \phi F_y A_w C_{v1} = (1)(50)(18.4)(0.45)(1) = 414 \text{ kip GO}$
  - $I_x = 1070 \text{ in}^4; \Delta_{max} = \frac{L}{360} \Rightarrow I_{req} = \frac{23Pl^3}{684E\Delta} = 571 \text{ in}^4 \text{ GO}$
- Gym 2<sup>nd</sup> Attempt
  - Try W18 x 65 With a Kicker Bracing
  - $L_b = 20' > L_r = 18.8' > L_p = 5.97'$
  - $F_{cr} = \frac{C_b \pi^2 E}{\left(\frac{L_b}{r_{ts}}\right)^2} \sqrt{\left(1 + 0.078 \left(\frac{J_c}{S_x h_o}\right) \left(\frac{L_b}{r_{ts}}\right)^2\right)} = 36.3 \text{ ksi}$
  - $\phi M_n = \phi M_r = \phi F_{cr} S_x = 318.8 \text{ kip} - \text{ft GO}$
  - Shear and Deflections still satisfied
  - MUST DESIGN KICKER BRACES
- LOBBY
  - TRY W18 x 50 (A992 Gr50) ( $Z_x = 101, S_x = 88.9, I_x = 800$ )
  - $M_u = 146.1 + \frac{1.2(0.05)(30^2)}{8} = 153 \text{ kip} - \text{ft}$
  - $\phi M_n = 0.9(50)(101) = 378 \text{ kip} - \text{ft}$
  - $L_b = 30' > L_r = 16.9' > L_p = 5.83' \text{ CHECK}$
  - $F_{cr} = \frac{C_b \pi^2 E}{\left(\frac{L_b}{r_{ts}}\right)^2} \sqrt{\left(1 + 0.078 \left(\frac{J_c}{S_x h_o}\right) \left(\frac{L_b}{r_{ts}}\right)^2\right)} = 17.2 \text{ ksi}$
  - $\phi M_n = \phi M_r = \phi F_{cr} S_x = 114 \text{ kip} - \text{ft NG}$
- LOBBY 2<sup>nd</sup> Attempt
  - TRY W18 x 35 With kicker bracing
  - $L_b = 20' > L_r = 16.9' > L_p = 5.83' \text{ CHECK}$
  - $F_{cr} = \frac{C_b \pi^2 E}{\left(\frac{L_b}{r_{ts}}\right)^2} \sqrt{\left(1 + 0.078 \left(\frac{J_c}{S_x h_o}\right) \left(\frac{L_b}{r_{ts}}\right)^2\right)} = 30.6 \text{ ksi}$
  - $\phi M_n = \phi M_r = \phi F_{cr} S_x = 204.4 \text{ kip} - \text{ft GO}$
  - $\frac{b}{2t_f} = 6.57 < 0.38 \sqrt{\left(\frac{E}{F_y}\right)}; \frac{h}{t_w} = 45.2 < 3.76 \sqrt{\left(\frac{E}{F_y}\right)} \text{ GO}$
  - $\phi V_n = \phi F_y A_w C_{v1} = (1)(50)(18.0)(0.355)(1) = 319.5 \text{ kip GO}$
  - $I_x = 800 \text{ in}^4; \Delta_{max} = \frac{L}{360} \Rightarrow I_{req} = \frac{23Pl^3}{684E\Delta} = 572 \text{ in}^4 \text{ GO}$
  - MUST DESIGN KICKER BRACES



**COLUMNS ( $\phi = 0.9$ ) (A992)**

- Exterior GYM Cross-section
  - TRY W14 x 90
  - $\frac{b}{2t_f} = 10.2 < 1 \sqrt{\left(\frac{E}{F_y}\right)}$ ;  $\frac{h}{t_w} = 25.9 < 3.76 \sqrt{\left(\frac{E}{F_y}\right)}$  NONCOMPACT
  - Strong axis:  $\left(\frac{KL}{r_x}\right) = \frac{33.5(12)}{6.14} = 65.5$
  - Weak axis:  $\left(\frac{KL}{r_y}\right) = \frac{33.5(12)}{3.70} = 108.6$  CONTROL
  - $\lambda_c = \pi \sqrt{\left(\frac{2E}{F_y}\right)} = 107$ ;  $F_e = \frac{\pi^2 E}{108.6^2}$ ;  $F_{cr} = 0.877 F_e = 21 \text{ ksi}$
  - $\phi P_n = \phi F_{cr} A = 507 \text{ kip}$ ;  $\frac{P_u}{\phi P_n} = 0.2$  GO
  - $\phi M_p = \phi F_y Z_x = 0.9(50)(157) = 589 \text{ kip-ft} = \phi M_p$
  - $\frac{M_u}{\phi M_n} = 0.5$ ;  $\frac{P_n}{\phi P_n} + \frac{8}{9} \frac{M_u}{\phi M_n} < 1.0$  GO
  - $\phi V_n = \phi 0.6 F_y t_w d = (0.9)(0.6)(50)(14)(0.44) = 166.3 \text{ kip}$  GO
- Exterior GYM Cross Section 2<sup>nd</sup>
  - TRY W14 x 82
  - $\frac{b}{2t_f} = 5.92 < 0.38 \sqrt{\left(\frac{E}{F_y}\right)}$ ;  $\frac{h}{t_w} = 22.4 < 3.76 \sqrt{\left(\frac{E}{F_y}\right)}$  COMPACT
  - Strong axis:  $\left(\frac{KL}{r_x}\right) = \frac{33.5(12)}{6.05} = 66.4$
  - Weak axis:  $\left(\frac{KL}{r_y}\right) = \frac{33.5(12)}{2.48} = 162.1$  CONTROL
  - $F_e = \frac{\pi^2 E}{162.1^2}$ ;  $F_{cr} = 0.877 F_e = 9.55 \text{ ksi}$
  - $\phi P_n = \phi F_{cr} A = 206 \text{ kip}$ ;  $\frac{P_u}{\phi P_n} = 0.5$
  - $\phi M_p = \phi F_y Z_x = 0.9(50)(139) = 521 \text{ kip-ft} = \phi M_p$
  - $\frac{M_u}{\phi M_n} = 0.55$ ;  $\frac{P_n}{\phi P_n} + \frac{8}{9} \frac{M_u}{\phi M_n} = 0.99 < 1.0$  TOO CLOSE
- Exterior Lobby Cross-section
  - TRY W6 x 16 ( $A = 4.74 \text{ ry} = 0.967 \text{ Lb} = 10.5'$ )
  - $\frac{KL}{r_y} = \frac{(10.5)(12)}{0.967} = 130.3$
  - $F_e = \frac{\pi^2 E}{130.3^2}$ ;  $F_{cr} = 0.877 F_e = 14.7 \text{ ksi}$
  - $\phi P_n = \phi F_{cr} A = 63.0 \text{ kip}$ ;  $\frac{P_u}{\phi P_n} = 0.93$  CLOSE
  - Use since W6 x 20 is oversized, and columns are supported by standard framing to assist in loading.
- Interior Gym/Lobby Cross- section

- TRY W12 x 50 ( $A = 14.6$ ,  $r_y = 1.96$ ,  $L_b = 21.5'$ )
- $\frac{KL}{r_y} = \frac{(21.5)(12)}{1.92} = 131.6$ ;  $\frac{KL}{r} > 4.71 \sqrt{\frac{E}{F_y}}$
- $F_e = \frac{\pi^2 E}{135.1^2}$ ;  $F_{cr} = 0.877 F_e = 14.4 \text{ ksi}$
- $\phi P_n = \phi F_{cr} A = 190.3 \text{ kip}$ ;  $\frac{P_u}{\phi P_n} = 0.84 \text{ OK}$
- Non-Loadbearing Exterior Cross-section
  - Use W14 x 38 ( $Z_x = 61.5$ )
  - $M_u = \frac{Wl}{3} = 209.3 \text{ kip-ft}$
  - $M_u < \phi M_n = \phi F_y Z_x \rightarrow Z_{x, req} = \frac{M_u}{\phi F_y} = 55.82 \text{ in}^3$
  - $\phi M_n = \phi F_y Z_x = 230.6 \text{ kip-ft}$ ;  $\frac{M_u}{\phi M_n} = 0.91 \text{ OK}$
  - Can also use W14 x 43 if too close
  - $I_x = 385 \text{ in}^4$ ;  $\Delta_{max} = \frac{L}{360} = 1 \Rightarrow I_{req} = \frac{Wl^4}{8E\Delta}$
  - $\phi V_n = \phi 0.6 F_y t_w d = (0.9)(0.6)(50)(0.31)(14.1) = 118 \text{ kip GO}$
- Non-Loadbearing Interior Cross-section
  - Use W8 x 18 ( $Z_x = 17$ )
  - $M_u = \frac{Wl}{3} = \frac{.110(35^2)}{3} = 45 \text{ kip-ft}$
  - $M_u < \phi M_n = \phi F_y Z_x = 63.75 \text{ kip-ft}$
  - $\phi V_n = \phi 0.6 F_y t_w d = (0.9)(0.6)(50)(8.14)(0.23) = 50.5 \text{ kip GO}$
  - $I_x = 61.9 \text{ in}^4$ ;  $\Delta_{max} = \frac{L}{360} = 1 \Rightarrow I_{req} = \frac{Wl^4}{8E\Delta}$

**BRACING ( $\phi = 0.9$ )**

- GYM TRUSS BRACES
  - $C = \frac{M_u}{d} = \frac{730.2}{5.33} = 136.9 \text{ kip}$ ;  $F = 0.02C = 2.74 \text{ kip (TOP)}$
  - $C = \frac{M_u}{d} = \frac{0.344(110^2)}{(8)5.33} = 97.6 \text{ kip}$ ;  $F = 0.02C = 1.95 \text{ kip (BTM - uplift)}$
  - Top bracing satisfied using perkins
  - BTM use L1 ½ x 1 ½ x 1/8 with 22' spacing
  - Every 4 joists between .4L and .6L add diagonal brace of same angle size
- LOBBY TRUSS BRACES
  - $C = \frac{M_u}{d} = \frac{237}{5.33} = 79 \text{ kip}$ ;  $F = 0.02C = 1.58 \text{ kip (TOP)}$
  - $C = \frac{M_u}{d} = \frac{0.293(65^2)}{(8)3} = 51.6 \text{ kip}$ ;  $F = 0.02C = 1.03 \text{ kip (BTM - uplift)}$
  - Top bracing satisfied using purlins
  - BTM use L1 ½ x 1 ½ x 1/8 with 16'3" spacing



- Every 4 joists between .25L and .5L add diagonal brace of same angle size
- GYM GIRDER BRACING
  - $C = \frac{M_u}{\frac{d}{2}} = \frac{265(12)}{\frac{18.4}{2}} = 345.7; F = \frac{0.02C}{\sin 45} = 9.8 \text{ kip}$
  - $\frac{KL}{r_x} = \frac{(7.1)(12)}{0.764} = 111.5$
  - $F_e = \frac{\pi^2 E}{111.5^2}; F_{cr} = \left(0.658^{\frac{F_y}{F_e}}\right) F_y = 18.7 \text{ ksi}$
  - $\phi P_n = \phi F_{cr} A = 20.0 \text{ kip}; \frac{P_u}{\phi P_n} = 0.49 \text{ OK}$
  - USE L2 ½ X 2 ½ X ¼
- LOBBY GIRDER BRACING
  - $C = \frac{M_u}{\frac{d}{2}} = \frac{153(12)}{\frac{17.7}{2}} = 207.5; F = \frac{0.02C}{\sin 45} = 5.9 \text{ kip}$
  - $\frac{KL}{r_x} = \frac{(7.1)(12)}{0.605} = 140.3$
  - $F_e = \frac{\pi^2 E}{140.3^2}; F_{cr} = 0.877 F_e = 12.7 \text{ ksi}$
  - $\phi P_n = \phi F_{cr} A = 10.8 \text{ kip}; \frac{P_u}{\phi P_n} = 0.54 \text{ OK}$
  - USE L2 X 2 X ¼
- Purlins
  - $w = 42.4(5) = 212 \text{ plf}; M = \frac{0.212(10^2)}{8} = 2.65 \text{ kip} - ft$
  - $\phi M_n = \frac{\phi F_y Z_x}{12} = \frac{0.9(36)(2.29)}{12} = 6.2 \text{ kip} - ft$
  - $R_u = \frac{wl}{2} = \frac{.212(10)}{2} = 1.06 \text{ k}$
  - Use C4 x 5.4
- Wall Girt (30' spacing)
  - $w = 23.5(5) = 116.5 \text{ plf}; M = \frac{0.1165(30^2)}{8} = 13.1 \text{ kip} - ft$
  - $\phi M_n = \frac{\phi F_y Z_x}{12} = \frac{0.9(36)(9.63)}{12} = 36.1 \text{ kip} - ft$
  - $R_u = \frac{wl}{2}; \Delta_{max} = \frac{5wl^4}{384EI}$
  - Use C8 x 11.5
- Wall Girt (22' spacing EXT.)
  - $w = 23.5(5) = 116.5 \text{ plf}; M = \frac{0.1165(22^2)}{8} = 7.05 \text{ kip} - ft$
  - $\phi M_n = \frac{\phi F_y Z_x}{12} = \frac{0.9(36)(6.18)}{12} = 23.2 \text{ kip} - ft$
  - $R_u = \frac{wl}{2}; \Delta_{max} = \frac{5wl^4}{384EI}$
  - Use C6 x 10.5
- Wall Girt (22' spacing INT.)

- $w = 5(5) = 25plf$ ;  $M = \frac{0.025(22^2)}{8} = 1.51 \text{ kip-ft}$
- $\phi M_n = \frac{\phi F_y Z_x}{12} = \frac{0.9(36)(2.29)}{12} = 6.2 \text{ kip-ft}$
- $R_u = \frac{wl}{2}$ ;  $\Delta_{max} = \frac{5wl^4}{384EI}$
- C4 x 5.4

#### Connections (for connections most cases $\phi = 0.75$ )

PL – A572 Gr50; L – A36

##### • PURLINS CONNECTION

- Use L2 x L2 x 3/16 angle clip
- Use 1 - 1/2" dia A325 bolt to purlin
- Use 3/16 fillet weld 2" min on both sides to joist
- BOLT -  $\phi R_n = \phi 0.48 F_u A_b = 0.75(0.48)(120)(.196) = 8.5k$  OK
- Bearing -  $\phi R_n = \phi 1.2 L_c t F_u \rightarrow web = 16.1k$ ;  $angle = 16.4k$
- WELD -  $t_w = 0.133$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 4.16 k \times 2 = 8.3k$  OK

##### • GYM TRUSS-GIRDER CONNECTION

- $R_u = \frac{.4244(110)}{2} + \frac{1.2(0.034)(110)}{2} = 25.6k$
- Use 2 – L3 x 3 x 1/4 6" long angles
- $\phi P_n = \phi F_y A_g = 64.8 \times 2 = 129.6k$
- $\phi P_n = \phi F_u A_e = 71.9 \times 2 = 143.8k$
- Use 1/4 fillet weld 6" on leg to girder seat
- Use 1/4 fillet weld 6" on leg to truss
- $t_w = 0.177$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 33.4 k$
- Use PL 3/4 x 14" x 14" with 1/4 fillet perimeter weld for girder seat and column cap
- \*for the W12x50 column use PL 3/4 x 12" x 12" instead

##### • LOBBY TRUSS-GIRDER CONNECTION

- $R_u = \frac{.4244(65)}{2} + \frac{1.2(0.021)(65)}{2} = 14.6k$
- Use 2 – L3 x 3 x 1/4 6" long angles
- $\phi P_n = \phi F_y A_g = 64.8 \times 2 = 129.6k$
- $\phi P_n = \phi F_u A_e = 71.9 \times 2 = 143.8k$
- Use 1/4 fillet weld 6" on leg to girder seat
- Use 1/4 fillet weld 6" on leg to truss
- $t_w = 0.177$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 33.4 k$
- Use PL 3/4 x 7" x 7" with 1/4 fillet perimeter weld for girder seat and column cap

- For connecting to column create seat plate use PL  $\frac{3}{4}$ " x 8" x 6" and have two angles under for support with 3/16 fillet perimeter weld
- TRUSS BRACING CONNECTION
  - Weld PL 3/16" x 3" x 4" to truss bottom chord with 3/16" fillet weld 2" min on both sides
  - $t_w = 0.133$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 8.3k \times 2 = 16.7k$  min
  - Use 1 -  $\frac{1}{2}$ " A325 bolt to connect brace to gusset
  - BOLT -  $\phi R_n = \phi 0.48 F_u A_b = 0.75(0.48)(120)(.196) = 8.5k$
- GYM GIRDER BRACING CONNECTION
  - Weld PL 3/8 X 6" X 8" gusset plate to both webs
  - Weld with 3/16 fillet weld 8" on both sides
  - $t_w = 0.133$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 33.5 k$
  - Use L2  $\frac{1}{2}$  X 2  $\frac{1}{2}$  X  $\frac{1}{4}$
  - $\phi P_n = \phi F_y A_g = 53.5k$
  - $\phi P_n = \phi F_u A_e = 59.4k$
  - 2 - 3/4 A325 bolt(s) to connect brace to plates
  - Bolt -  $\phi R_n = 2 \times 17.9k = 35.8k$
- LOBBY GIRDER BRACING CONNECTIONS
  - Weld PL 3/8 X 6" X 8" gusset plate to both webs
  - Weld with 3/16 fillet weld 8" on both sides
  - $t_w = 0.133$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 33.5 k$
  - Use L2 X 2 X  $\frac{1}{4}$
  - $\phi P_n = \phi F_y A_g = 44.7k$
  - $\phi P_n = \phi F_u A_e = 49.6k$
  - 2 -  $\frac{1}{2}$  A325 bolt to connect brace to plates
  - $\phi R_n = \phi 0.48 F_u A_b = 0.75(0.48)(120)(.196) \times 2 = 17k$
- GYM GIRDER-COLUMN CONNECTION
  - $R_u = 51.2 + \frac{.065(30)}{2} = 52.2 kip$
  - Try  $\frac{3}{4}$ " dia A325 Bolts
  - $n \geq \frac{R_u}{\phi R_n} = \frac{52.2}{35.8} = 1.458 \rightarrow$  use 2 -  $\frac{3}{4}$ " dia A325N bolts
  - Try PL 3/8" x 10" x 10" (3 bolts, 3" vertical spacing, 2" edge distance)
  - $V_{u, pl} = \frac{V_u}{2} = 26.1k$ ;  $V_{bolt} = \frac{26.1k}{2} = 13.05 k$
  - PL -  $\phi R_n = \phi 1.2 L_c t F_u = \phi 1.2(1.5)(0.375)(65) = 32.9 \frac{k}{bolt} GO$
  - WEB -  $\phi R_n = \phi 1.2 L_c t F_u = \phi 1.2(1.5)(0.45)(65) = 39.5 \frac{k}{bolt} GO$
  - PL -  $A_{vn} = t_p L_v = 2.25$ ;  $A_{nt} = 0.75$ ;  $\phi R_n = \phi (0.6 F_y A_{vn} + F_u A_{nt}) = 87.2 k G$
  - WEB -  $A_w = d_w t_w = 7.2$ ;  $\phi V_n = \phi 0.6 F_y A_w = 194k GO$

- WEB -  $\phi V_n = \phi 0.6 F_u A_w = 211k$  OK
  - USE 5/16" FILLET WELD 10" (E70)
  - WELD -  $t_w = 0.221$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 69.6 k$  OK
  - For W12 x 50 use PL 3/8 x 10" x 7"
- LOBBY GIRDER-COLUMN CONNECTION
  - $R_u = 29.2 + \frac{.035(30)}{2} = 29.8 kip$
  - Try 3/4" dia A325 Bolts
  - $n \geq \frac{R_u}{\phi R_n} = \frac{29.9}{35.8} = 0.84 \rightarrow 1$  but use 2 - 3/4" dia A325N bolts
  - Try PL 3/8" x 6" x 6" (2 bolts, 4" vertical spacing, 2" edge distance)
  - $V_{u,pl} = \frac{V_u}{2} = 15k$ ;  $V_{bolt} = \frac{15k}{2} = 7.5 k$
  - PL -  $\phi R_n = \phi 1.2 L_c t F_u = \phi 1.2 (1.5) (0.375) (65) = 32.9 \frac{k}{bolt}$  OK
  - WEB -  $\phi R_n = \phi 1.2 L_c t F_u = \phi 1.2 (1.5) (0.3) (65) = 26.3 \frac{k}{bolt}$  OK
  - PL -  $A_{vn} = t_p L_v = 2.25$ ;  $A_{nt} = 0.75$ ;  $\phi R_n = \phi (0.6 F_y A_{vn} + F_u A_{nt}) = 87.2 k$  G
  - WEB -  $A_w = d_w t_w = 4.8$ ;  $\phi V_n = \phi 0.6 F_y A_w = 129.9k$  OK
  - WEB -  $\phi V_n = \phi 0.6 F_u A_w = 140.8k$  OK
  - USE 5/16" FILLET WELD 6" (E70)
  - WELD -  $t_w = 0.221$ ;  $\phi R_n = \phi 0.6 F_{EXX} t_w L_w = 41.8 k$  OK
  - For W12 x 50 use PL 3/8 x 7" x 7" (2.5 edge distance)
- WALL GIRT CONNECTION
  - Use 2 - 3/4" dia A325 bolts connect girt web to column flange
  - BOLT -  $\phi R_n = 2 \times 17.9k = 35.8k$
- GYM EXT COLUMN BASE CONNECTION
  - Use base plate PL 1 1/2" x 30" x 30"
  - 3/8" fillet weld flanges and web both sides
  - $q = \frac{P_u}{A_p}$ ;  $w = qb_f$ ;  $M = \frac{w(s)^2}{2} = 10k - in$  per in
  - $S = \frac{t^2}{6}$ ;  $f_b = \frac{M}{S} = \phi f_y \rightarrow t \geq 1.16$  OK
  - $e = \frac{M_u}{P_u} = 33.4in \gg \frac{N}{6}$ , so base in tension
  - Place 2 anchor rods on tension side 2 on compression side
  - $T = \frac{M_u}{z} = 171k$ ;  $T_{rod} = \frac{171}{2} = 85.5$ ; for 4  $\rightarrow 40.8 k$
  - Use 1 1/4" dia anchor rods
  - $\phi T_n = \phi 0.9 F_y A_g = 45.6k$  OK
  - Add stiffener PL 3/4" x 8" x 12" to center of Column web
  - 3/8" Fillet weld 8" to base plate both sides
- GYM-LOBBY INT COLUMN BASE CONNECTION



- Use base plate PL 1" x 20" x 20"
- $q = \frac{P_u}{A_p}; t \geq 5 \sqrt{\left(\frac{2q}{\phi F_y}\right)} = 0.75 \text{ OK}$
- Use 4 - 3/4" dia Anchor rods
- $\phi T_n = \phi 0.9 F_y A_g = 16.4k \text{ OK}$
- 1/4" fillet weld column perimeter to plate
- $t_w = 0.177; \phi R_n = \phi 0.6 F_{EXX} t_w = 5.57 \frac{k}{in}$
- LOBBY EXT BASE CONNECTION
  - Use base plate PL 1/2" x 16" x 16"
  - $q = \frac{P_u}{A_p}; t \geq 3 \sqrt{\left(\frac{2q}{\phi F_y}\right)} = 0.4$
  - Use 4 - 5/8" dia Anchor rods
  - $\phi T_n = \phi 0.9 F_y A_g = 11.4k$
  - 1/4" fillet weld column perimeter to plate
  - $t_w = 0.177; \phi R_n = \phi 0.6 F_{EXX} t_w = 5.57 \frac{k}{in}$
- NON-LOADBEARING EXT BASE CONNECTION
  - Use base plate PL 1" x 22" x 22"
  - $q = \frac{P_u}{A_p}; t \geq 6 \sqrt{\left(\frac{2q}{\phi F_y}\right)} = 0.9$
  - $T = \frac{M_u}{z} = 139.3k; T_{rod} = \frac{139.3}{4} = 34.8$
  - Use 4 - 1 1/4" dia Anchor rods
  - $\phi T_n = \phi 0.9 F_y A_g = 45.6k$
  - 3/8" fillet weld flanges and web both sides
- NON-LOADBEARING INT BASE CONNECTION
  - Use base plate PL 5/8" x 14" x 14"
  - $q = \frac{P_u}{A_p}; t \geq 4 \sqrt{\left(\frac{2q}{\phi F_y}\right)} = 0.6$
  - $T = \frac{M_u}{z} = 40.2k; T_{rod} = \frac{40.2}{2} = 20.1$
  - Use 4 - 7/8" dia anchor rods
  - $\phi T_n = \phi 0.9 F_y A_g = 22.3 \frac{k}{rod}$
  - 1/4" fillet weld column perimeter to plate
  - $t_w = 0.177; \phi R_n = \phi 0.6 F_{EXX} t_w = 5.57 \frac{k}{in}$

## Appendix J – TIA Worksheet

| Traffic Impact Analysis (TIA) Threshold Worksheet                                                                                                                                                                                                                                                                                                                                                                                    |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Complete this form as an aid to determine if your project requires a Traffic Impact Analysis Study in accordance with UDC 35-502(b)(2), ITE 11th Edition.                                                                                                                                                                                                                                                                            |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Project Name: Leon Valley Baptist Recreational Center                                                                                                                                                                                                                                                                                                                                                                                |                             |                                                                  | Worksheet Prepared by: Conrad Montes                                                                                                                                   |                                                                                                  |                                                                                  |
| Project Location: 7980 Grissom Road, San Antonio TX                                                                                                                                                                                                                                                                                                                                                                                  |                             |                                                                  | Company: Lone Star Engineering                                                                                                                                         |                                                                                                  | <input type="checkbox"/> Owner <input checked="" type="checkbox"/> Owner's Agent |
| Email: lonestarengineering@lonestar.com                                                                                                                                                                                                                                                                                                                                                                                              |                             |                                                                  | Address: 1234 UTSA Boulevard                                                                                                                                           |                                                                                                  | Date:                                                                            |
| Jurisdiction: <input checked="" type="checkbox"/> COSA ICL <input type="checkbox"/> COSA ETJ <input type="checkbox"/> Other:                                                                                                                                                                                                                                                                                                         |                             |                                                                  | Associated Record Type: <input type="checkbox"/> Zoning <input type="checkbox"/> MDP <input type="checkbox"/> Plat <input checked="" type="checkbox"/> Building Permit |                                                                                                  |                                                                                  |
| TIA Record Number (if applicable):                                                                                                                                                                                                                                                                                                                                                                                                   |                             |                                                                  | Associated Record Number:                                                                                                                                              |                                                                                                  |                                                                                  |
| Proposed Type of Development:                                                                                                                                                                                                                                                                                                                                                                                                        |                             |                                                                  | Critical Peak Hour: PM <input type="checkbox"/> Peak Hour Override: PM                                                                                                 |                                                                                                  |                                                                                  |
| Land Use                                                                                                                                                                                                                                                                                                                                                                                                                             | ITE Code                    | Project Size                                                     | Unit                                                                                                                                                                   | Peak Hour Trip Rate                                                                              | Peak Hour Trips (PHT)                                                            |
| Recreational Community Center                                                                                                                                                                                                                                                                                                                                                                                                        | 495                         | 26.25                                                            | 1,000 SF GFA                                                                                                                                                           | 2.5                                                                                              | 66                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Previous Development on Site:                                                                                                                                                                                                                                                                                                                                                                                                        |                             |                                                                  | Critical Peak Hour: <input type="checkbox"/> Peak Hour Override:                                                                                                       |                                                                                                  |                                                                                  |
| Land Use                                                                                                                                                                                                                                                                                                                                                                                                                             | ITE Code                    | Project Size                                                     | Unit                                                                                                                                                                   | Peak Hour Trip Rate                                                                              | Peak Hour Trips (PHT)                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| <div style="float: right; border: 1px solid black; padding: 5px; width: 200px;">           The rates and critical peak hour are automatically calculated in this section based on the linear rates of ITE 11th edition. To change the automatic peak hour calculator, check the Peak Hour Override box and input the correct peak hour. For custom or additional fields, please use the second page of the worksheet.         </div> |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Total Trips: Please ensure land uses for all lots/parcels are included in the above sections.                                                                                                                                                                                                                                                                                                                                        |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Proposed Development                                                                                                                                                                                                                                                                                                                                                                                                                 | Previous Development        | Difference in PHT                                                |                                                                                                                                                                        | If there is an increase of 76 PHT and an increase of 10% of the total PHT, a new TIA is required |                                                                                  |
| 66                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             | 66                                                               | 100%                                                                                                                                                                   |                                                                                                  |                                                                                  |
| Previous TIA Report (if property has a TIA on file)                                                                                                                                                                                                                                                                                                                                                                                  |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Proposed Development                                                                                                                                                                                                                                                                                                                                                                                                                 | Approved TIA PHTs           | Difference in PHT                                                |                                                                                                                                                                        | TIA Number:                                                                                      |                                                                                  |
| 66                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |                                                                  |                                                                                                                                                                        | TIA Name:                                                                                        |                                                                                  |
| *** ITEMS BELOW THIS LINE ARE FOR OFFICIAL USE ONLY. DO NOT WRITE BELOW THIS LINE. ***                                                                                                                                                                                                                                                                                                                                               |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Turn Lane Requirements for Developments with Less than 76 PHT per UDC 35-502(e)(2) (For more than 76 PHT, this analysis will be included in the TIA)                                                                                                                                                                                                                                                                                 |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| Right Turn Lanes Required                                                                                                                                                                                                                                                                                                                                                                                                            | <input type="checkbox"/> at |                                                                  |                                                                                                                                                                        | Left Turn Lanes Required                                                                         | <input type="checkbox"/> at                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> at |                                                                  |                                                                                                                                                                        |                                                                                                  | <input type="checkbox"/> at                                                      |
| Comments:                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| <input type="checkbox"/> This development is located on a TxDOT roadway. TxDOT review of ROW and access is required. Please submit the plat and other associated documents (site plan etc.) to TxDOT for review and approval.                                                                                                                                                                                                        |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                  |                                                                                                                                                                        |                                                                                                  |                                                                                  |
| <input type="checkbox"/> A TIA Report is Required.                                                                                                                                                                                                                                                                                                                                                                                   |                             | <input checked="" type="checkbox"/> A TIA Report is Not Required |                                                                                                                                                                        | Worksheet Last Updated 4/1/2024                                                                  |                                                                                  |
| <input type="checkbox"/> A TIA Update is Required                                                                                                                                                                                                                                                                                                                                                                                    |                             | <input type="checkbox"/> A Circulation Study is Required         |                                                                                                                                                                        |                                                                                                  |                                                                                  |

## Appendix K – Rough Proportionality Worksheet





**DEVELOPMENT SERVICES**

**City of San Antonio, Texas**  
**Rough Proportionality Worksheet**

Development Name: Leon Valley Baptist Recreational Center

Applicant: Conrad Montes

Legal Description (Lot, Block): 18086 BLK 6 LOT 2 Leon Valley Baptist Church Subd

Case / Plat Number: \_\_\_\_\_ Date: October 23, 2025

Worksheet Last Updated: 11/15/2024

**DEMAND - Traffic Generated by Proposed Development:**

Land Use Type: Recreational Community Center

Development Unit: 1,000 SF GFA

Intensity: 26.25

Peak Hour Trip Rate: 2.50

Internal Capture Rate: 0%

Trip Length: (miles) 1.50

Demand: (vehicle-miles) 98.44

Impact of Development: (\$) \$420,273

Peak Period to Analyze: ☐ AM Peak ☒ PM Peak

This row allows for the entry of unique or uncommon land uses not included within the current ITE Trip Generation; or when circumstances require manual entry of the development unit and/or trip rate. It shall only be used when (a) sufficient data is available to support an alternative calculation; and (b) it is agreed to by the City during the TIA scoping meeting.

| Land Use Type | Development Unit | Intensity | Peak Hour Trip Rate | Internal Capture Rate | Trip Length: (miles) | Demand: (vehicle-miles) | Impact of Development: (\$) |
|---------------|------------------|-----------|---------------------|-----------------------|----------------------|-------------------------|-----------------------------|
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |
|               |                  |           |                     |                       |                      |                         |                             |

**IMPACT OF DEMAND PLACED ON THOROUGHFARE SYSTEM:**

98.44

**\$420,273**

Estimated Average Cost Per Vehicle-Mile: **\$ 4,269.44**

**Roadway Supply- Off-Site Roads to be Built or Funded by the Applicant:**

| Roadway Name: | Classification: | Roadway Length: (feet) | Supply Cost Estimate: (\$) | Cost Estimate: (\$) |
|---------------|-----------------|------------------------|----------------------------|---------------------|
|               |                 |                        |                            |                     |
|               |                 |                        |                            |                     |
|               |                 |                        |                            |                     |
|               |                 |                        |                            |                     |
|               |                 |                        |                            |                     |

**ROADWAY SUPPLY ADDED TO SYSTEM SUBTOTAL: \$0**

**Intersection Improvements - Specific Improvements to be Built or Funded by the Applicant:**

| Intersection: | Description of Improvement: | Estimated Cost <sup>12</sup> : (\$) |
|---------------|-----------------------------|-------------------------------------|
|               |                             |                                     |
|               |                             |                                     |
|               |                             |                                     |
|               |                             |                                     |
|               |                             |                                     |

**INTERSECTION IMPROVEMENTS ADDED TO SYSTEM SUBTOTAL: \$0**

**Right-of-Way Dedication - ROW to be dedicated by the Applicant:**

| ROW Dedication: | General Description of ROW Dedication: | Estimated Cost <sup>13</sup> : (\$) |
|-----------------|----------------------------------------|-------------------------------------|
|                 |                                        |                                     |
|                 |                                        |                                     |
|                 |                                        |                                     |
|                 |                                        |                                     |
|                 |                                        |                                     |

**RIGHT-OF-WAY DEDICATION SUPPLY ADDED TO SYSTEM SUBTOTAL:**

**\$0**

**TOTAL VALUE OF SUPPLY ADDED TO THOROUGHFARE SYSTEM: \$0**

Notes: <sup>1</sup> Based on an estimated cost to provide the roadway supply (construction and engineering) based on the classification; <sup>2</sup> Revised cost estimate, if available, for construction and engineering based on more detailed preliminary engineering and/or design; <sup>3</sup> Estimated intersection improvement costs; <sup>12</sup> Cost of right-of-way should be estimated using Appraisal District values (number of square feet of dedication multiplied by the unimproved land value).

**SUPPLY / DEMAND COMPARISON:**

A comparison of the capacity provided by a development against the traffic impacts of the proposed development.

|                                                                | Cost      | Comparison |
|----------------------------------------------------------------|-----------|------------|
| TOTAL IMPACT OF DEMAND PLACED ON THOROUGHFARE SYSTEM:          | \$420,273 |            |
| TOTAL VALUE OF CAPACITY (SUPPLY) ADDED TO THOROUGHFARE SYSTEM: | \$0       |            |

Note: Minimum Standards for access to and from a development may supersede the results of this analysis.

## Appendix L – Budget

## Engineering Design Fee

|                                       | PM &<br>Transportation | Structural<br>Engineer | H & H Engineer     | Geo & Foun<br>Engineer | Util.<br>Engineer  | Land dev. &<br>Env. |
|---------------------------------------|------------------------|------------------------|--------------------|------------------------|--------------------|---------------------|
| Billing Rate per hour                 | \$125.00               | \$100.00               | \$90.00            | \$95.00                | \$90.00            | \$80.00             |
| <b>30% Milestone</b>                  | <b>\$62,500.00</b>     | <b>\$58,600.00</b>     | <b>\$36,000.00</b> | <b>\$55,100.00</b>     | <b>\$40,050.00</b> | <b>\$32,000.00</b>  |
| Site Visit and Assesment              | 80                     | 80                     | 120                | 100                    | 80                 | 160                 |
| Data Collection and Research          | 80                     | 136                    | 100                | 80                     | 60                 | 60                  |
| Structural Design                     | 80                     | 140                    | 0                  | 180                    | 100                | 0                   |
| Permit Accumulation                   | 60                     | 60                     | 80                 | 60                     | 125                | 100                 |
| Utility Planning                      | 0                      | 80                     | 100                | 160                    | 80                 | 80                  |
| Overseeing                            | 200                    | 90                     | 0                  | 0                      | 0                  | 0                   |
| Total Hours                           | 500                    | 586                    | 400                | 580                    | 445                | 400                 |
| <b>60 % Milestone</b>                 | <b>\$65,500.00</b>     | <b>\$64,500.00</b>     | <b>\$48,600.00</b> | <b>\$47,975.00</b>     | <b>\$50,850.00</b> | <b>\$40,000.00</b>  |
| Comprehensive Grading                 | 0                      | 80                     | 120                | 0                      | 100                | 160                 |
| Floor Plan for Facility               | 0                      | 105                    | 0                  | 105                    | 0                  | 0                   |
| Comprehensive Structural Design       | 100                    | 100                    | 0                  | 160                    | 100                | 0                   |
| Fire Safety                           | 0                      | 80                     | 0                  | 80                     | 40                 | 40                  |
| Sewer Design                          | 0                      | 0                      | 80                 | 0                      | 40                 | 40                  |
| Comprehensive Utility                 | 100                    | 60                     | 90                 | 100                    | 80                 | 80                  |
| Pavement Design                       | 0                      | 60                     | 170                | 0                      | 80                 | 80                  |
| Permit Accumulation                   | 60                     | 80                     | 80                 | 60                     | 125                | 100                 |
| Overseeing                            | 264                    | 80                     | 0                  | 0                      | 0                  | 0                   |
| Total Hours                           | 524                    | 645                    | 540                | 505                    | 565                | 500                 |
| <b>100% Milestone</b>                 | <b>\$57,875.00</b>     | <b>\$58,000.00</b>     | <b>\$41,400.00</b> | <b>\$50,350.00</b>     | <b>\$48,600.00</b> | <b>\$30,400.00</b>  |
| Finalized Grading                     | 0                      | 80                     | 100                | 0                      | 100                | 160                 |
| Finalized Structural Design           | 80                     | 120                    | 0                  | 220                    | 120                | 0                   |
| Finalized Fire plan                   | 0                      | 80                     | 0                  | 80                     | 60                 | 0                   |
| Fianlized Sewer Design                | 0                      | 0                      | 0                  | 0                      | 60                 | 60                  |
| Finalized Utilities                   | 60                     | 80                     | 100                | 170                    | 100                | 100                 |
| Finalized Pavement                    | 0                      | 0                      | 180                | 0                      | 60                 | 60                  |
| Finalized Permits                     | 60                     | 80                     | 80                 | 60                     | 40                 | 0                   |
| Overseeing                            | 263                    | 140                    | 0                  | 0                      | 0                  | 0                   |
| Total Hours                           | 463                    | 580                    | 460                | 530                    | 540                | 380                 |
| <b>Subtotal</b>                       | <b>\$185,875</b>       | <b>\$181,100</b>       | <b>\$126,000</b>   | <b>\$153,425</b>       | <b>\$139,500</b>   | <b>\$102,400</b>    |
| <b>Total Engineering Project Cost</b> | <b>\$888,300</b>       |                        |                    |                        |                    |                     |

## Cost Breakout

| Category                       | Subcategory                      | Cost (\$)              |
|--------------------------------|----------------------------------|------------------------|
| Facility Building Cost         | Main Building Structure          | \$ 3,000,000.00        |
| Facility Building Cost         | Interior Build-Out               | \$ 750,000.00          |
| Facility Building Cost         | MEP Systems                      | \$ 500,000.00          |
| Construction Materials         | Concrete & Rebar                 | \$ 250,000.00          |
| Construction Materials         | Structural Steel                 | \$ 225,000.00          |
| Construction Materials         | Roofing & Envelope Materials     | \$ 200,000.00          |
| Construction Materials         | Finishes & Fixtures              | \$ 208,000.00          |
| Site Work                      | Earthwork & Grading              | \$ 200,000.00          |
| Site Work                      | Paving & Parking                 | \$ 175,000.00          |
| Site Work                      | Utilities (Water/Sewer/Electric) | \$ 125,000.00          |
| Site Work                      | Landscaping                      | \$ 50,000.00           |
| Structural Components          | Foundations                      | \$ 140,000.00          |
| Structural Components          | Slab-on-Grade                    | \$ 100,000.00          |
| Structural Components          | Beams/Columns/Girders            | \$ 80,000.00           |
| Misc. Construction Items       | General Conditions               | \$ 70,000.00           |
| Misc. Construction Items       | Safety & Temporary Facilities    | \$ 48,700.00           |
| Mobilization, Insurance & Bond | Mobilization                     | \$ 600,000.00          |
| Mobilization, Insurance & Bond | Insurance & Bonding              | \$ 600,000.00          |
| Construction Contingency       | Allowances                       | \$ 1,280,000.00        |
| Engineering & Design Fees      | Architectural                    | \$ 388,300.00          |
| Engineering & Design Fees      | Civil/Structural/MEP             | \$ 500,000.00          |
| Testing, Permitting, Admin     | Permits                          | \$ 5,000.00            |
| Testing, Permitting, Admin     | Testing & Inspections            | \$ 5,000.00            |
|                                |                                  | <b>\$ 9,500,000.00</b> |