FINAL DRAINAGE REPORT
FOR
PLATTE SELF STORAGE
COLORADO SPRINGS, COLORADO

NOVEMBER 2024

Prepared For:
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APPENDICIES

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DESIGN ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____ _____
Dane Frank, P.E. 50207 Date
On behalf of Terra Nova Engineering, Inc.

OWNER/DEVELOPER'S STATEMENT:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

_____ _____
Authorized Signature Date

_____
Printed Name, Title

_____
Business Name

_____
Address

EL PASO COUNTY:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

_____ _____
Joshua Palmer, P.E. Date
County Engineer / ECM Administrator

Conditions:

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PURPOSE

The purpose of this Final Drainage Report is to identify and analyze the proposed drainage patterns, determine proposed runoff quantities, size drainage structures for conveyance of developed runoff, and present solutions to drainage impacts on-site and off-site resulting from this development. The site has not previously been platted or studied.

GENERAL DESCRIPTION

This Final Drainage Report (FDR) is an analysis of approximately 17.22 acres of developed land located at 6001 E Platte Ave. The site is currently in use as and landscaping materials yard and is being developed as a mini storage facility. The site is in the northwest quarter of Section 18, Township 14 South, Range 65 West of the 6th Principal Meridian within El Paso County. The parcels are bounded to the north by Motel Road and E Platte Ave, to the east by two unplatted lots, to the south by an unplatted lot and LOT 2 COLORADO SPRINGS AIRPORT FIL NO 1B, and to the west by unplatted lots. (see vicinity map in appendix).

The site lies within the Sand Creek Basin, with storm runoff surface draining west across the site, before flowing onto the neighboring property where Sand Creek East Fork is located.

Soils for this project are delineated by the map in the appendix as Blakeland loamy sand (8), 1 to 9 percent slopes. Soils in the study area are shown as mapped by NRCS in the “Soils Survey of El Paso County Area” and contains soils of Hydrologic Group A.

The site is currently developed with mostly dirt surfaces, some gravel and asphalt areas, and minimal vegetation that is mostly native grasses around the perimeter. The site drains to the west, with an average slope of 6.6%.

EXISTING DRAINAGE CONDITIONS

There are multiple existing buildings, a weight scale, miles of retaining or freestanding walls being used to create material storage areas, and a pond (low area that doesn't drain) on the site. Most of the west side of the site has a berm before an embankment drops down, which results in little runoff leaving the site. The existing pond area is said to be largely paved (unconfirmed), so most runoff would leave the site by evaporation.

There are ten drainage basins, four of which are offsite. See attached Existing Drainage Map in the appendix.

Offsite Basins

Basin OS-Z consists of 6.34 acres of existing dirt and gravel roads (construction yard) located on the eastern adjacent property and its runoff (Q_5=6.1 cfs, Q_{100}=16.7 cfs) sheet flows west to Design Point Z on the eastern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin OS-Y consists of 8.15 acres of existing dirt and gravel roads (construction yard) and undeveloped native grasses located on the eastern adjacent property and its runoff (Q_5=3.6 cfs, Q_{100}=15.4 cfs) sheet flows southwest to Design Point Y on the eastern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin OS-X consists of 1.20 acres of undeveloped native grass area located on the southern adjacent property and its runoff (Q_5=0.4 cfs, Q_{100}=2.3 cfs) sheet flows north to Design Point X on the southern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin OS-W consists of 0.45 acres of undeveloped native grass area and asphalt pavement located on the northern adjacent property and its runoff (Q_5=0.5 cfs, Q_{100}=1.3 cfs) sheet flows southwest to Design Point W on the northern property line of the site. This basin is offsite and runoff flows into Basin EX-B (discussed below).

Onsite Basins

Basin EX-A consists of 0.3 acres of landscaping areas and buildings located at the north side of the site and its runoff (Q_5=0.2 cfs, Q_{100}=0.8 cfs) sheet flows west to Design Point A on the northern property line of the site. This basin is offsite and runoff flows into Basin EX-C (discussed below).

Basin EX-B consists of 0.64 acres of landscaping areas, buildings, some pavement, and a swale located on the north side of the site and its runoff (Q_5=1.1 cfs, Q_{100}=2.6 cfs) sheet flows west to Design Point B, a low point on the northern property line of the site. This basin is onsite and runoff flows into the low point at Design Point B. Once the basin overtops, excess runoff flows north and then west and into Sand Creek.

Basin EX-C consists of 15.4 acres of the bulk of the site and includes buildings, roads, storage areas, and parking areas located central to the site and its runoff (Q_5=29.0 cfs, Q_{100}=65.0 cfs) sheet flows west to Design Point C at the low point of the existing low area that doesn't drain on the west side of the site.

Basin EX-D consists of 1.05 acres of primarily dirt storage/stockpile area located on the south side of the property and its runoff (Q_5=0.3 cfs, Q_{100}=1.9 cfs) sheet flows northwest to Design Point D on the eastern property line of the site, indicating that the runoff enters Basin OS-X. The combined flow (Q_5=0.7 cfs, Q_{100}=4.2 cfs) sheet flows north and into Basin EX-C.

Basin EX-E consists of 0.16 acres of earth embankment located on the west side of the site and its runoff (Q_5=0.1 cfs, Q_{100}=0.5 cfs) sheet flows west to Design Point E on the western property line of the site. This basin is onsite and runoff flows into Sand Creek.

Basin EX-F consists of 0.23 acres of earth embankment located on the northwest side of the site and its runoff (Q_5=0.1 cfs, Q_{100}=0.7 cfs) sheet flows northwest to Design Point F on the northwest property line of the site. This basin is onsite and runoff flows into Sand Creek.

PROPOSED DRAINAGE CONDITIONS

Runoff in the developed conditions consists of 14 basins, four of which are offsite. Below is a description of the runoff in the developed conditions and how it will be safely routed, treated and detained. Basins on the west half of the site are proposed as undeveloped, but the proposed detention pond has been sized to account for their future commercial development.

Offsite Basins

Offsite Basins OS-Y, OS-X, & OS-W remain the same as in the existing condition. Offsite Basin OS-Z is broken down into 8 Basins in the proposed conditions. See below for discussions

Onsite Basins

Basin PR-1 consists of 0.07 acres of landscaping area located behind proposed Building B and its runoff (Q_5=0.0 cfs, Q_{100}=0.2 cfs) sheet flows west to Design Point 1 on the northern property line of the site. This basin is onsite and runoff flows into Basin OS-W and into a proposed public 18" RCP culvert under Motel Road, eventually entering Design Point W (discussed in Existing Drainage Conditions).

Basin PR-2 consists of 0.13 acres of landscaping area located behind proposed Build A and its runoff (Q_5=0.1 cfs, Q_{100}=0.4 cfs) sheet flows northwest to Design Point 2 on the northern property line of the site. This basin is onsite and runoff flows into Basin OS-W and eventually to Design Point W (discussed in Existing Drainage Conditions).

Basin OS-ZA consists of 0.44 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=0.4 cfs, Q_{100}=1.1 cfs) sheet flows west onto Basin PR-10A and is directed to Design Point 10A. Basin PR-10A consists of 0.06 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10A. The combined runoff (Q_5=0.4 cfs, Q_{100}=1.3 cfs) is captured in an 18" diameter dome inlet and routed south via Pipe Run #14 (Q_5=0.4 cfs, Q_{100}=1.3 cfs) a proposed private 12" HDPE storm pipe to Design Point 10B.

Basin OS-ZB consists of 0.22 acres of construction yard located on the eastern adjacent property

and its runoff (Q_5=0.2 cfs, Q_{100}=0.6 cfs) sheet flows west onto Basin PR-10B and is directed to Design Point 10B. Basin PR-10B consists of 0.03 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10B. The combined runoff (Q_5=0.2 cfs, Q_{100}=0.6 cfs) is captured in an 18" diameter dome inlet and routed south via Pipe Run #15 (Q_5=0.7 cfs, Q_{100}=1.9 cfs) a proposed private 15" HDPE storm pipe to Design Point 10C.

Basin OS-ZC consists of 0.23 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=0.2 cfs, Q_{100}=0.6 cfs) sheet flows west onto Basin PR-10C and is directed to Design Point 10C. Basin PR-10C consists of 0.04 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10C. The combined runoff (Q_5=0.2 cfs, Q_{100}=0.7 cfs) is captured in an 18" diameter dome inlet and routed south via Pipe Run #16 (Q_5=0.9 cfs, Q_{100}=2.6 cfs) a proposed private 15" HDPE storm pipe to Design Point 10D.

Basin OS-ZD consists of 0.86 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=0.8 cfs, Q_{100}=2.3 cfs) sheet flows west onto Basin PR-10D and is directed to Design Point 10D. Basin PR-10D consists of 0.04 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10D. The combined runoff (Q_5=0.8 cfs, Q_{100}=2.4 cfs) is captured in an 18" diameter dome inlet and routed south via Pipe Run #17 (Q_5=1.7 cfs, Q_{100}=5.0 cfs) a proposed private 18" HDPE storm pipe to Design Point 10E.

Basin OS-ZH consists of 1.24 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=1.2 cfs, Q_{100}=3.3 cfs) sheet flows west onto Basin PR-10H and is directed to Design Point 10H. Basin PR-10H consists of 0.06 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10H. The combined runoff (Q_5=1.2 cfs, Q_{100}=3.4 cfs) is captured in an 18" diameter dome inlet and routed north via Pipe Run #18 (Q_5=1.2 cfs, Q_{100}=3.4 cfs) a proposed private 12" HDPE storm pipe to Design Point 10G.

Basin OS-ZG consists of 0.85 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=0.8 cfs, Q_{100}=2.3 cfs) sheet flows west onto Basin PR-10G and is directed to Design Point 10G. Basin PR-10G consists of 0.05 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10G. The combined runoff (Q_5=0.8 cfs, Q_{100}=2.4 cfs) is captured in an 18" diameter dome inlet and routed north via Pipe Run #19 (Q_5=2.0 cfs, Q_{100}=5.8 cfs) a proposed private 15" HDPE storm pipe to Design Point 10F.

Basin OS-ZF consists of 0.56 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=0.5 cfs, Q_{100}=1.5 cfs) sheet flows west onto Basin PR-10F and is directed to Design Point 10F. Basin PR-10F consists of 0.04 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.1 cfs) is also directed to Design point 10F. The combined runoff (Q_5=0.6 cfs, Q_{100}=1.6 cfs) is captured in an 18" diameter dome inlet and routed north via Pipe Run #20 (Q_5=2.6 cfs, Q_{100}=7.4 cfs) a proposed private 15" HDPE storm pipe to Design Point 10E.

In case of failure in any of the inlets for Basins OS-ZA thru OS-ZH, runoff will overtop the high point and be directed to one of the other inlets in the adjacent Basin.

Basin OS-ZE consists of 1.94 acres of construction yard located on the eastern adjacent property and its runoff (Q_5=1.9 cfs, Q_{100}=5.1 cfs) sheet flows west onto Basin PR-10E and is directed to Design Point 10E. Basin PR-10E consists of 0.09 acres of landscape area along the eastern property line of the site and its runoff (Q_5=0.0 cfs, Q_{100}=0.2 cfs) is also directed to Design point 10E. The combined runoff (Q_5=1.9 cfs, Q_{100}=5.3 cfs) is captured in a Type "C" inlet. and routed north via Pipe Run #13 a proposed private 24" RCP storm pipe routes the combined flow (Q_5=6.2 cfs, Q_{100}=17.7 cfs) of Design Point 10E and Pipe runs #17 & #20 to Design Point 3A. In case of failure in the inlet, runoff will overtop the proposed retaining wall at the west side of the basin and follow drainage patterns as described in Basin PR-3.

Basin PR-3A consists of 1.10 acres consists almost entirely of buildings and pavement central to the site. The runoff (Q_5=5.0 cfs, Q_{100}=8.9 cfs) flows via concrete cross-pans from the north and south to the center drive aisle. At Design Point 3A, 2 private Type 13 inlets located in the proposed

4’ concrete crosspan captures (Q_5=2.5 cfs, Q_{100}=3.4 cfs), while the flow by (Q_5=2.5 cfs, Q_{100}=5.4 cfs) continues in the crosspan west to Design Point 3B. Pipe run PR#9 a private 24” RCP routes the combined flow (Q_5=8.7 cfs, Q_{100}=21.1 cfs) of the captured flow and Pipe Run #13’s flow toward Design Point 3B.

Basin PR-3B consists of 1.11 acres consists almost entirely of buildings and pavement central to the site. The runoff (Q_5=5.0 cfs, Q_{100}=8.9 cfs) flows via concrete cross-pans from the north and south to the center drive aisle. At Design Point 3B (Q_5=7.5 cfs, Q_{100}=14.4 cfs) the flow by from Design Point 3A and Basin PR-3B 3 private Type 13 inlets located in the proposed 4’ concrete crosspan captures (Q_5=4.0 cfs, Q_{100}=5.7 cfs), while the flow by (Q_5=4.0 cfs, Q_{100}=9.5 cfs) continues in the crosspan west to Design Point 3C. Pipe run PR#8 a private 30” RCP routes the combined flow (Q_5=12.5 cfs, Q_{100}=26.7 cfs) of the captured flow and Pipe Run #9’s flow toward Design Point 3C.

Basin PR-3C consists of 0.96 acres consists almost entirely of buildings and pavement central to the site. The runoff (Q_5=4.3 cfs, Q_{100}=7.8 cfs) flows via concrete cross-pans from the north and south to the center drive aisle. At Design Point 3C (Q_5=8.0 cfs, Q_{100}=16.6 cfs) the flow by from Design Point 3B and Basin PR-3C 3 private Type 13 inlets located in the proposed 4’ concrete crosspan captures (Q_5=4.1 cfs, Q_{100}=6.1 cfs), while the flow by (Q_5=4.3 cfs, Q_{100}=11.1 cfs) continues in the crosspan west to Design Point 3D. Pipe run PR#7 a private 30” RCP routes the combined flow (Q_5=16.5 cfs, Q_{100}=32.7 cfs) of the captured flow and Pipe Run #8’s flow toward Design Point 3C.

Basin PR-3D consists of 0.97 acres consists almost entirely of buildings and pavement central to the site. The runoff (Q_5=4.4 cfs, Q_{100}=7.8 cfs) flows via concrete cross-pans from the north and south to the center drive aisle. At Design Point 3D (Q_5=8.4 cfs, Q_{100}=18.4 cfs) the flow by from Design Point 3C and Basin PR-3D 3 private Type 13 inlets located in the proposed 4’ concrete crosspan captures (Q_5=4.2 cfs, Q_{100}=6.5 cfs), while the flow by (Q_5=4.5 cfs, Q_{100}=12.4 cfs) continues in the crosspan west to Design Point 3E. Pipe run PR#6 a private 30” RCP routes the combined flow (Q_5=20.6 cfs, Q_{100}=39.0 cfs) of the captured flow and Pipe Run #7’s flow toward a junction with PR#11 (see below for discussion) Design Point 3C.

Basin PR-4 consists of 3.66 acres gravel yard, with the two future canopies included in the drainage calcs, located on the south side of the site and its runoff (Q_5=8.2 cfs, Q_{100}=16.8 cfs) sheet flows northwest to either Design Point 4, inlet #9, a proposed private 16' D10-R sump inlet, located on the south-central side of the site, or into the concrete cross-pans at the north side of the basin, flows west, and eventually into ether Inlet #8, a proposed private CDOT Type 14 sump inlet or Inlet #9. The combined flow (Q_5=11.8 cfs, Q_{100}=32.2 cfs) from Basin PR-4 and the offsite Basin OS-Y is conveyed via Pipe Run 12, a proposed private 36" RCP, to an inlet junction at Inlet #8, a proposed private CDOT Type 13 inlet. The runoff is then conveyed north via Pipe Run 11, a proposed private 36" RCP, to an inlet junction at Inlet #3. From here the combined flow (Q_5=32.4 cfs, Q_{100}=71.2 cfs) of Pipe run #6 & #11 is routed west via Pipe Run #5 & #4 private 42" RCPs. If either of these inlets become clogged, runoff will overtop and be collected in the opposite inlet.

Basin PR-3E consists of 1.01 acres consists almost entirely of buildings and pavement central to the site. The runoff (Q_5=4.5 cfs, Q_{100}=8.1 cfs) flows via concrete cross-pans from the north and south to the center drive aisle. At Design Point 3E (Q_5=8.8 cfs, Q_{100}=20.2 cfs) the flow by from Design Point 3D and Basin PR-3E a private 20' Type R inlet located in the c&g captures the flow Pipe run PR#4 a private 42" RCP routes the combined flow (Q_5=32.4 cfs, Q_{100}=71.2 cfs) of the captured flow and Pipe Run #5's a proposed private 42" RCP, to an inlet junction at Inlet #1, a proposed private 20' D10-R sump inlet. The combined runoff (Q_5=41.2 cfs, Q_{100}=91.4 cfs) is then routed west via Pipe Runs #3 (proposed private 42" RCP), #2 (proposed private 48" RCP), and #1 (proposed private 48" RCP) to the proposed forebay for the proposed Pond 1 (discussed below). If any of these sump inlets become clogged, runoff will continue flowing in the concrete cross-pans until it is collected in the next downstream inlet. If the proposed 20' D10-R sump inlet becomes clogged, runoff will back-up downstream until it is captured in Inlet #2 (see proposed drainage map).

Basin PR-5 consists of 0.56 acres of native grasses and a grass swale located at the south-central side of the site and its runoff (Q_5=0.1 cfs, Q_{100}=0.9 cfs) is conveyed via grass swale to Design Point 4. This swale also collects flows from Basin OS-X (discussed in Existing Drainage Conditions) in the amount of Q_5=0.4 cfs and Q_{100}=2.3 cfs. The combined runoff (Q_5=0.5 cfs, Q_{100}=3.3 cfs) flows over a proposed 1' deep 10'x20' D_{50}=12" riprap pad and into an existing swale

just south of the south-central property line which eventually enters Sand Creek.

Basin PR-6 consists of 6.64 acres of the bulk of the western side of the site including the proposed private Pond 1 EDB (Design Point 6) and its runoff (Q_5=3.1 cfs, Q_{100}=13.1 cfs) sheet flows west and into the proposed pond. This pond also collects flow from the underground conveyance system from Pipe Run 1, a proposed private 48" RCP, in the amount of Q_5=41.2 cfs and Q_{100}=91.4 cfs. The combined runoff (Q_5=44.3 cfs, Q_{100}=104.5 cfs) enters the pond at Design Point 6 where it is treated for water quality and/or detained.

The following basins in the current design contribute flow to Design Point 6: OS-ZA thru OS-ZH, OS-Y, PR-3A thru PR-3E, PR-4, PR-6, & PR-10A thru PR-10H. However, the pond is sized assuming that in the future Basins PR-5, PR-9 & OS-X will be routed to the pond for detention and WQ treatment. Basins OS-Z & OS-Y used actual existing ground cover to calculate impervious area while Basins PR-3, PR-4, & PR-10 used an imperviousness based upon the site development for this SDP and CD's. Basins PR-6, PR-5, & PR-9 assumed an imperviousness of 30%, while offsite Basin OS-X was assumed to be 2%. The 32.68 acres tributary to the EDB have an imperviousness of 38%.

All The combined flow of the currently proposed development and future commercial development will be captured in a 2.283-acre-foot Extended Detention Basin. Runoff entering the pond through the storm sewer system will be routed into a 638 cu-ft concrete lined forebay with a 1.5 feet high concrete cutoff wall. A 3-inch notch in the wall drains the flow to a 2' concrete trickle channel, then the runoff is routed to the 3.0' deep micropool which has a 6" deep initial surcharge area. Based upon this we need a WQCV of 0.475 ac-ft, an EURV volume of 0.851 ac-ft and 100-year volume of 0.957 ac-ft for a total volume needed of 2.283 ac-ft. The bottom of the micropool elevation is at 6199.50 while the top of the ISV elevation is at 6202.50. The bottom of the pond is set at 6202.00 and the top is 6213.00. The WQCV orifice starts at 6202.00 with the first orifice hole having a 1-3/8" diameter. The second orifice hole is set at 6203.70 and is 1-3/16" diameter, and the third one is set 6205.40 with a 1-7/8" diameter hole. The WQCV release is 0.20 cfs with a height of 6206.23. The EURV release is 0.4 cfs and has an elevation of 6208.68. A 4'x4' outlet structure is set at 6210.00. An 18" HDPE storm pipe with no restrictor will release Q_5=0.4 cfs and

Q_{100}=21.6 cfs discharge to an 8' wide concrete stilling basin at the west property line. The 5-Year and 100-Year HWL are 6208.53 and 6210.86 respectively. The concentrated outflow will dissipate energy by using the standing water in the stilling basin. Runoff will then outfall onto the adjacent property from the stilling basin via sheet flow. This sheet flow matches the existing condition of the existing pond filling up overtopping and sheet flowing west offsite over the existing prairie. The 23' wide emergency spillway is set at 6211.00 and has a flow of 0.69' deep, thus giving a freeboard of 1.31'.

The estimated on-site discharge into Sand Creek in the existing condition is Q_5=30.8 cfs and Q_{100}=71.5 cfs. The estimated on-site discharge into Sand Creek in the proposed condition is Q_5=1.2 cfs and Q_{100}=26.7 cfs, indicating a decrease in the discharge rate into Sand Creek of $\%_5$=96.1% and $\%_{100}$=62.7%.

Basin PR-7 consists of 0.34 acres of earth embankment located on the northwest side of the site and its runoff (Q_5=0.2 cfs, Q_{100}=1.1 cfs) sheet flows northwest, off-site, to Design Point 7, indicating that the runoff flows into Sand Creek.

Basin PR-8 consists of 0.30 acres of earth embankment located at the west side of the site, west of the proposed private Pond 1 EDB and its runoff (Q_5=0.2 cfs, Q_{100}=1.0 cfs) sheet flows west, off-site, to Design Point 8, indicating that the runoff flows into Sand Creek.

Basin PR-9 consists of 0.59 acres of earth embankment and flatter area located at the southwest corner of the site and its runoff (Q_5=0.2 cfs, Q_{100}=1.5 cfs) sheet flows west, off-site, to Design Point 9, indicating that the runoff flows into Sand Creek.

There is one storm sewer system proposed on the site. This system collects runoff from the drain trench along the east property line and the two curb inlets in the mini-storage area and pipes the runoff to the detention pond. There are a series of area inlets along the storm pipe in the mini-storage area that are not required to capture runoff, but will lessen the surface flow along the central drive aisle. The storm pipes on the west side of the site have been sized to have some extra capacity so that the future commercial development can tie into them as well.

In an effort to protect receiving water and as part of the "four-step process to minimize adverse impacts of urbanization" this site was analyzed in the following manner:

1. Reduce Runoff- There is no runoff reduction in the proposed mini-storage area. The proposed parking area south of the mini-storage has been surfaced with gravel, which will reduce runoff. These items will reduce the volume of runoff using ponding and infiltration. The proposed Extended Detention Basin also significantly reduces the runoff that flows off-site.
2. Stabilize Drainageways- There are no existing or proposed drainageways onsite. The Sand Creek East Fork is located west of the site; however, channel improvements have previously been constructed there.
3. Provide Water Quality Capture Volume (WQCV)- The Extended Detention Basin has been sized and designed to sufficiently capture the required WQCV and slowly release it though the outlet structure, thereby allowing solids and contaminants to settle out. There are a few on-site basins whose runoff is not treated in the proposed EDB. These areas consist mostly of earthen embankment. The runoff from these areas sheet flow over grassed earth, treating the runoff for water quality before it reaches Sand Creek. These areas are excluded per the **ECM 1.7.1.B.7*, "sites with land disturbance to undeveloped land that will remain undeveloped"*** and ***ECM I.7.1.C.1 - the County may exclude up to 20 percent, not to exceed 1 ac., of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site.***
4. Consider Need for Industrial and Commercial BMPs- The proposed development is an indoor mini storage facility; therefore, no Industrial and Commercial BMPs have been proposed.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County Storm Drainage Design Criteria Manual - Volumes 1 & 2, latest editions. The Rational Method was used to estimate storm water runoff anticipated from design storms with 5-year and 100-year recurrence intervals. The Urban Drainage Criteria Manual was used to calculate the detention and water quality volume.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County Storm Drainage Design Criteria Manual – Volumes 1 & 2, latest editions. The pertinent data sheets are included in the appendix of this report.

A culvert is proposed at one of the site entrances. Design calculations have been included for the proposed culvert.

Street runoff capacity calculations for the onsite drive isles have been included.

FLOODPLAIN STATEMENT

No portion of this site is within a designated FEMA floodplain, as determined by FIRM Number 08041C0754 G, dated December 7, 2018 (see appendix).

WATER QUALITY

The proposed Pond 1 detention basin provides water quality treatment for nearly all of the proposed development.

Runoff from basins PR-1, PR-2, PR-5, PR-7, PR-8, and PR-9 are not captured by the proposed detention pond. Basins PR-1 and PR-2 are landscaping areas along the property line with no impervious area. Basin PR-5 is an undeveloped area with a swale that directs offsite flow back offsite, with no impervious area. Basins PR-7 and PR-8 are earth embankments on the downstream edge of the site that drop 10-15 feet in elevation, with no impervious area. Basin PR-9 is part flatter undeveloped area and part earth embankment on the downstream edge of the site that doesn't flow toward the detention pond, with no impervious area. The combined area of these basins is 2.40 acres, with zero impervious area. Exclusions for WQ treatment Basins OS-W and PR-5 are referencing Exemption ECM I.7.1.C.1 - the County may exclude up to 20 percent, not to exceed 1 ac., of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site. 1.00 ac can't drain to the pond due to location and grade impediment. Basins PR-1, PR-2, PR-5, PR-7, PR-8, and PR-9 are using the exclusion of Exemption ECM I.7.1.B.7 - land disturbance to undeveloped land that will remain undeveloped.

1.44 ac will not drain to pond due to location & grade impediments but will remain open & landscape areas. - See the Water Quality Treatment Summary Table & Water Quality Treatment Map for treatment area types and exclusions in the appendix.

CONSTRUCTION COST OPINION

Public Reimbursable

None

Public Non-Reimbursable

None

Private Non-Reimbursable

1. 48" RCP	260 LF	$ 245	$ 63,700
2. 42" RCP	80 LF	$ 201	$ 16,080
3. 36" RCP	385 LF	$ 151	$ 58,135
4. 30" RCP	170 LF	$ 123	$ 20,910
5. 24" RCP	115 LF	$ 98	$ 11,270
6. 18" HDPE	98 LF	$ 60	$ 5,880
7. 15" HDPE	320 LF	$ 50	$ 16,000
8. 12" HDPE	148 LF	$ 40	$ 5,920
9. 6' Manhole	1 EA	$ 15,130	$ 15,130
10. 7' Manhole	1 EA	$ 15,130	$ 15,130
9. CDOT Type C Area Inlet	9 EA	$ 6,037	$ 54,333
10. 16' D-10-R Curb Inlet	1 EA	$ 13,835	$ 13,835
11. 20' D-10-R Curb Inlet	1 EA	$ 20,000	$ 20,000
12. 18" Dia Dome Inlets	7 EA	$ 2,500	$ 17,500
<u>EDB (Pond 1)</u>			
13. Concrete Forebays	1 EA	$ 7,000	$ 7,000
14. Trickle Channel	73 LF	$ 80	$ 5,840
15. 4'x4' Outlet Structure	1 EA	$ 4,000	$ 4,000
16. Micropool	1 EA	$ 5,000	$ 5,000

16. Micropool	1 EA	$ 5,000	$ 5,000
17. Pond Earthworks	3,157 CY	$ 6	$ 18,942
18. Spillway	1 EA	$ 7,000	$ 7,000
19. Reseed/Stabilization	1 EA	$ 2,000	$ 2,000
20. Aggregate Base Course	306 CY	$ 66	$ 20,196
21. Stilling Basin	1 EA	$ 5,000	$ 5,000
		Total	**$ 408,801**

DRAINAGE FEES

This drainage report is part of a site development application; therefore, no drainage fees are due.

MAINTENANCE

The Extended Detention Basin is private and will be maintained by the property owner. The proposed storm sewers are private and will be maintained by the property owner.

SUMMARY

Development of this site will not adversely affect the surrounding development. Site runoff and storm drain appurtenances from the development will not adversely affect the downstream and surrounding developments and will be safely routed to the proposed extended detention basin reduced to the allowable pre-developed rates while slowly treating the water quality capture volume. Runoff from areas of disturbance with no development are being excluded per exemptions and sheet flow offsite in historic paths and rates.

PREPARED BY:
TERRA NOVA ENGINEERING, INC.

Dane Frank, P.E.
Project Engineer

Jobs/2419.00/Drainage/241900 FDR.doc

BIBLIOGRAPHY

"Urban Storm Drainage Criteria Manual Volume 1" Prepared by Mile High Flood Control District, Revised August 2018.

"Urban Storm Drainage Criteria Manual Volume 2" Prepared by Mile High Flood Control District, Revised September 2017.

"Urban Storm Drainage Criteria Manual Volume 3" Prepared by Mile High Flood Control District, Revised January 2021.

USDA NRCS Web Soil Survey.

FEMA Flood Insurance Rate Map Dated December 7, 2018.

"Drainage Criteria Manual County of El Paso, Colorado Volume 1" approved October 2018 and prepared by El Paso County

"Drainage Criteria Manual County of El Paso, Colorado Volume 2" approved October 2018 and prepared by El Paso County

"Drainage Criteria Manual County of El Paso, Colorado Volume 1 update Chapter 6" approved October 2018 and prepared by El Paso County

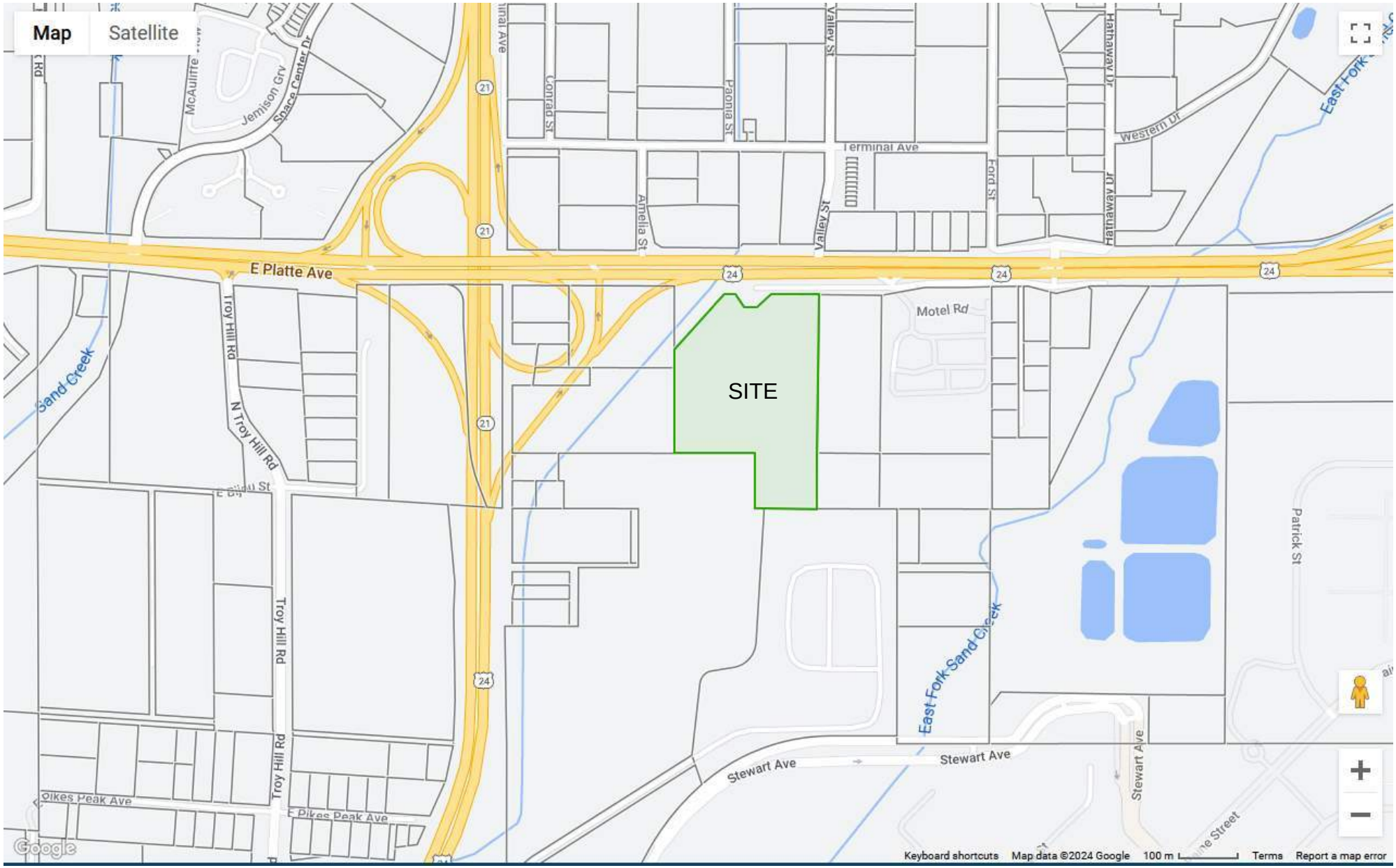
"El Paso County Stormwater Drainage Facilities Maintenance Policy" approved October 2018 and prepared by El Paso County

VICINITY MAP

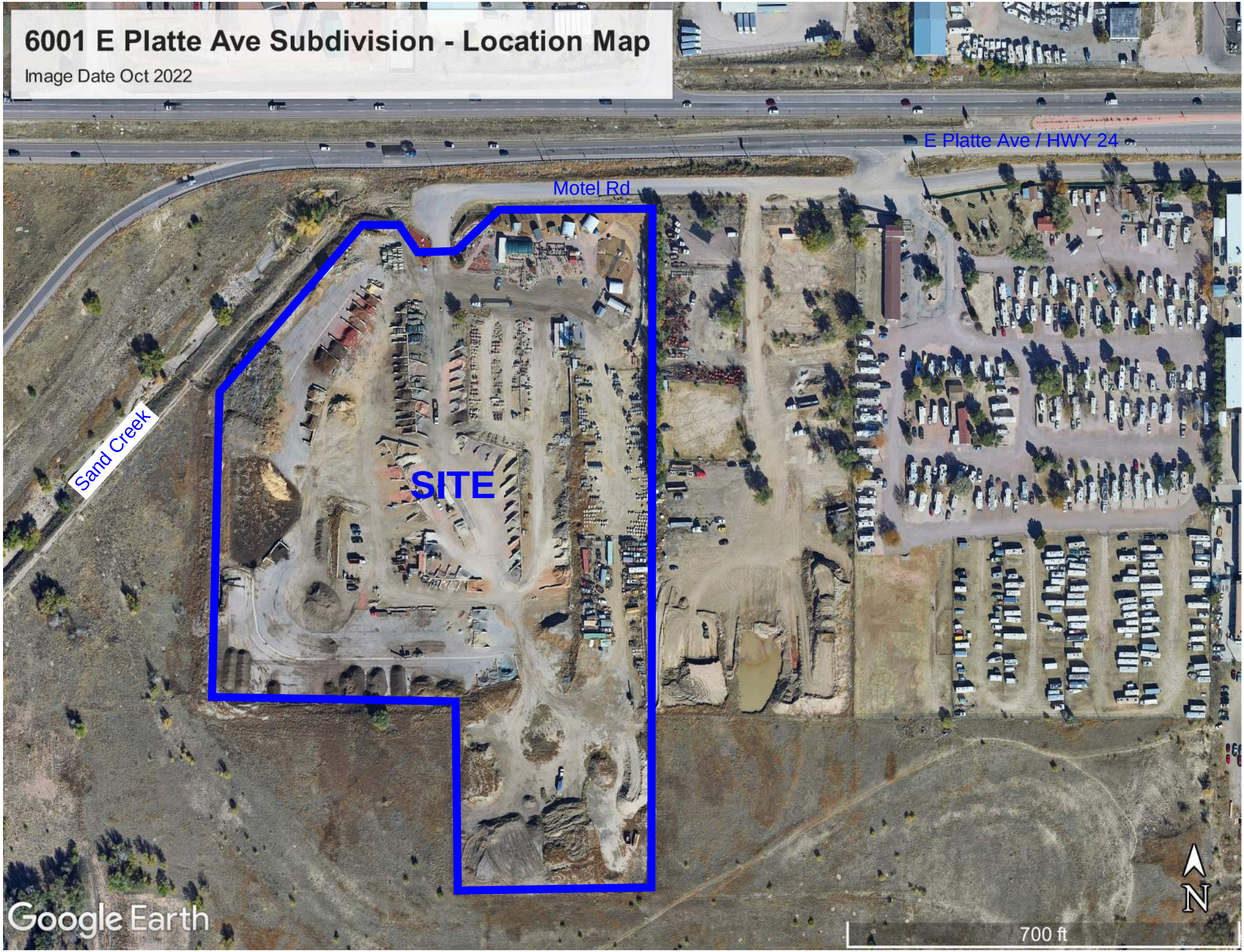
El Paso County - Community: Property Search

Schedule Number: 5418000075

PLATTE SELF STORAGE
Vicinity Map



North is up ^^^


6001 E Platte Ave Subdivision - Location Map
Image Date Oct 2022
E Platte Ave / HWY 24
Motel Rd
Sand Creek
SITE
N
700 ft
Google Earth

NRCS SOILS MAP

Map Scale: 1:2,120 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	16.5	100.0%
Totals for Area of Interest		**16.5**	**100.0%**

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

FEMA FIRM MAP

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

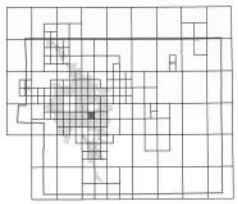
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

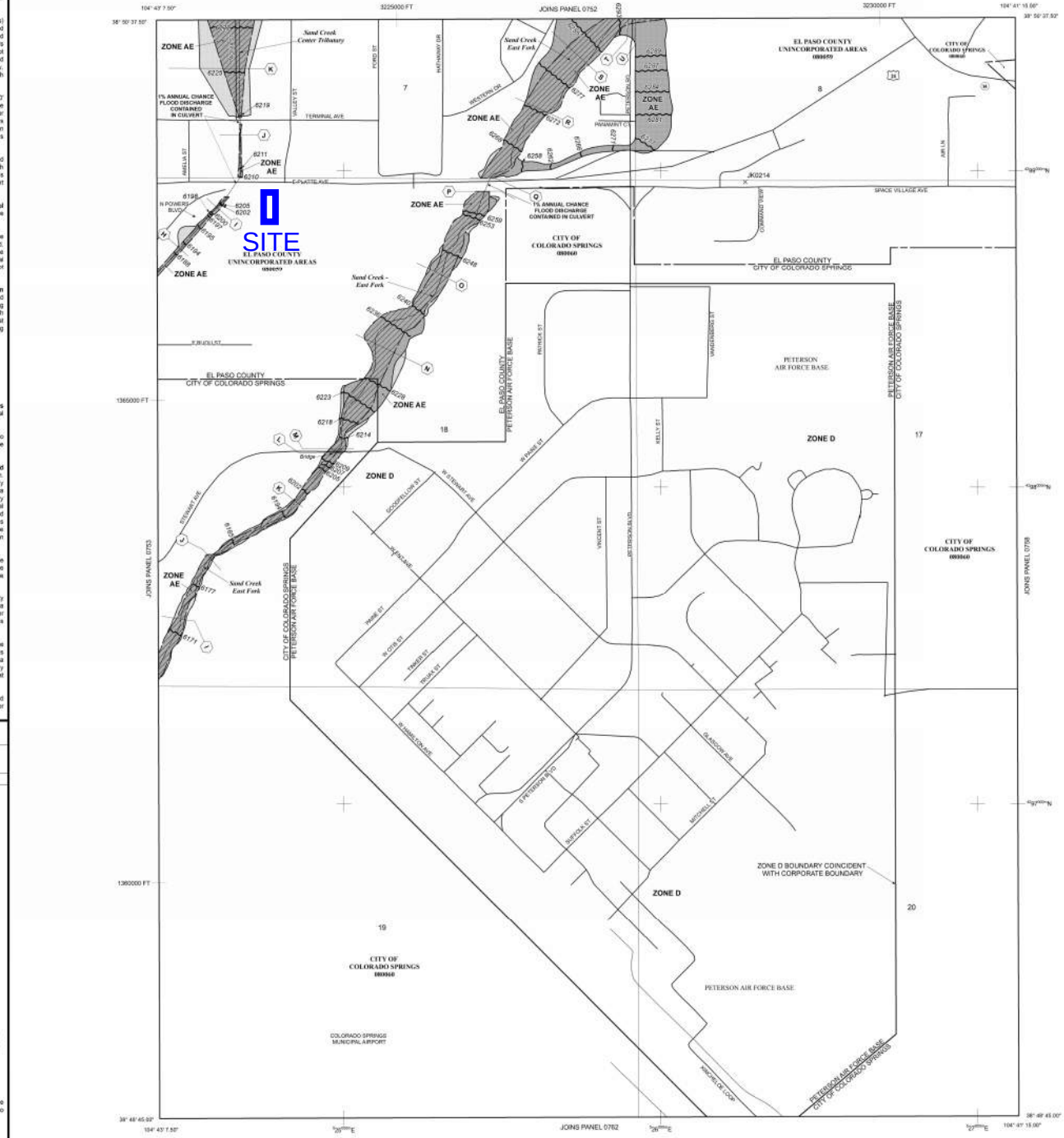
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A Cross section line
23 — 23 Transect line
97° 07' 30.00" / 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4319000mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0754G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 754 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0754	G
EL PASO COUNTY	080059	0754	G

Notice: This map was reissued on 05/10/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0754G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

PLATTE SELF STORAGE
AREA RUNOFF COEFFICIENT (C) SUMMARY

EXISTING

BASIN	TOTAL AREA *(Acres)*	*DEVELOPED / IMPERVIOUS*			*UNDEVELOPED / NON-IMPERVIOUS*			*WEIGHTED*		*WEIGHTED CA*	
		AREA *(Acres)*	C_5	C_{100}	AREA *(Acres)*	C_5	C_{100}	C_5	C_{100}	CA_5	CA_{100}
OS-Z	6.34	1.90	0.90	0.96	4.44	0.08	0.35	0.33	0.53	2.07	3.38
OS-Y	8.15	0.82	0.90	0.96	7.33	0.08	0.35	0.16	0.41	1.32	3.35
OS-X	1.20	0.02	0.90	0.96	1.18	0.08	0.35	0.09	0.36	0.11	0.43
OS-W	0.45	0.11	0.90	0.96	0.34	0.08	0.35	0.28	0.50	0.13	0.22
EX-A	0.30	0.05	0.90	0.96	0.25	0.08	0.35	0.22	0.45	0.07	0.14
EX-B	0.64	0.29	0.90	0.96	0.35	0.08	0.35	0.45	0.63	0.29	0.40
EX-C	15.4	7.70	0.90	0.96	7.70	0.08	0.35	0.49	0.66	7.55	10.09
EX-D	1.05	0.02	0.90	0.96	1.03	0.08	0.35	0.10	0.36	0.10	0.38
EX-E	0.16	0.00	0.90	0.96	0.16	0.08	0.35	0.08	0.35	0.01	0.06
EX-F	0.23	0.00	0.90	0.96	0.23	0.08	0.35	0.08	0.35	0.02	0.08
Total	33.92	10.91									

Calc:	DLF
Date:	11/8//2024
Checked:	JS

PLATTE SELF STORAGE
RUNOFF SUMMARY

EXISTING

BASIN	AREA TOTAL (Acres)	WEIGHTED C_5	WEIGHTED C_{100}	OVERLAND C_5	OVERLAND Length (ft)	OVERLAND Slope (ft/ft)	OVERLAND T_t (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW T_t (min)	T_C TOTAL (min)	INTENSITY I_5 (in/hr)	INTENSITY I_{100} (in/hr)	TOTAL FLOWS Q_5 (c.f.s.)	TOTAL FLOWS Q_{100} (c.f.s.)
		* For Calcs See Runoff Summary														
OS-Z	6.34	0.33	0.53	0.33	300	0.02	19.3	230	2.0%	1.4	2.7	22.0	2.9	4.9	6.1	16.7
OS-Y	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
OS-X	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
OS-W	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
EX-A	0.30	0.22	0.45	0.22	300	0.07	14.5	0	7.0%	2.6	0.0	14.5	3.6	6.0	0.2	0.8
EX-B	0.64	0.45	0.63	0.45	300	0.07	10.7	250	7.0%	2.6	1.6	12.2	3.8	6.4	1.1	2.6
EX-C	15.4	0.49	0.66	0.49	300	0.07	10.0	330	7.0%	2.6	2.1	12.1	3.8	6.4	29.0	65.0
EX-D	1.05	0.10	0.36	0.10	300	0.03	21.9	40	3.0%	1.7	0.4	22.2	2.9	4.9	0.3	1.9
EX-E	0.16	0.08	0.35	0.08	30	0.40	3.0	0	40.0%	6.3	0.0	5.0	5.2	8.7	0.1	0.5
EX-F	0.23	0.08	0.35	0.08	35	0.24	3.8	0	24.0%	4.9	0.0	5.0	5.2	8.7	0.1	0.7

Calc:	DLF
Date:	11/8//2024
Checked:	JS

PLATTE SELF STORAGE
SURFACE ROUTING SUMMARY

EXISTING

Design Point(s)	*Contributing Basins*	*Area (ac)*	*Flow (cfs)*	
			Q_5	Q_{100}
Z	**OS-Z**	6.34	6.1	16.7
Y	**OS-Y**	8.15	3.6	15.4
X	**OS-X & DP D**	2.25	0.7	4.2
W	**OS-W & DP A**	0.75	0.7	2.2
A	**EX-A**	0.30	0.2	0.8
B	**EX-B & DP W**	1.39	1.8	4.7
C	**EX-C, DP D, DP X, & DP Y**	26.85	33.6	86.5
D	**EX-D**	1.05	0.3	1.9
E	**EX-E**	0.16	0.1	0.5
F	**EX-F**	0.23	0.1	0.7

Calc:	DLF
Date:	11/8//2024
Checked:	JS

PLATTE SELF STORAGE
AREA RUNOFF COEFFICIENT (C) SUMMARY
PROPOSED

BASIN	TOTAL AREA *(Acres)*	*DEVELOPED / IMPERVIOUS*			*UNDEVELOPED / NON-IMPERVIOUS*			*WEIGHTED*		*WEIGHTED CA*	
		AREA *(Acres)*	C_5	C_{100}	AREA *(Acres)*	C_5	C_{100}	C_5	C_{100}	CA_5	CA_{100}
OS-ZA	0.44	0.13	0.90	0.96	0.30	0.08	0.35	0.33	0.53	0.14	0.23
OS-ZB	0.22	0.06	0.90	0.96	0.15	0.08	0.35	0.33	0.53	0.07	0.12
OS-ZC	0.23	0.07	0.90	0.96	0.16	0.08	0.35	0.33	0.53	0.07	0.12
OS-ZD	0.86	0.26	0.90	0.96	0.60	0.08	0.35	0.33	0.53	0.28	0.46
OS-ZE	1.94	0.58	0.90	0.96	1.36	0.08	0.35	0.33	0.53	0.63	1.03
OS-ZF	0.56	0.17	0.90	0.96	0.39	0.08	0.35	0.33	0.53	0.18	0.30
OS-ZG	0.85	0.26	0.90	0.96	0.60	0.08	0.35	0.33	0.53	0.28	0.46
OS-ZH	1.24	0.37	0.90	0.96	0.87	0.08	0.35	0.33	0.53	0.40	0.66
OS-Y	8.15	0.82	0.90	0.96	7.33	0.08	0.35	0.16	0.41	1.32	3.35
OS-X	1.20	0.02	0.90	0.96	1.18	0.08	0.35	0.09	0.36	0.11	0.43
OS-W	0.45	0.11	0.90	0.96	0.34	0.08	0.35	0.28	0.50	0.13	0.22
PR-1	0.07	0.00	0.90	0.96	0.07	0.08	0.35	0.08	0.35	0.01	0.02
PR-2	0.13	0.00	0.90	0.96	0.13	0.08	0.35	0.08	0.35	0.01	0.05
PR-3A	1.10	1.10	0.90	0.96	0.00	0.08	0.35	0.90	0.96	0.99	1.05
PR-3B	1.11	1.11	0.90	0.96	0.00	0.08	0.35	0.90	0.96	1.00	1.06
PR-3C	0.96	0.96	0.90	0.96	0.00	0.08	0.35	0.90	0.96	0.86	0.92
PR-3D	0.97	0.97	0.90	0.96	0.00	0.08	0.35	0.90	0.96	0.87	0.93
PR-3E	1.01	1.01	0.90	0.96	0.00	0.08	0.35	0.90	0.96	0.91	0.97
PR-4	3.66	2.38	0.90	0.96	1.28	0.08	0.35	0.61	0.75	2.24	2.73
PR-5	0.56	0.01	0.90	0.96	0.55	0.08	0.35	0.09	0.36	0.05	0.20
PR-6	6.64	0.66	0.90	0.96	5.98	0.08	0.35	0.16	0.41	1.07	2.73
PR-7	0.34	0.01	0.90	0.96	0.33	0.08	0.35	0.10	0.37	0.04	0.13
PR-8	0.30	0.01	0.90	0.96	0.29	0.08	0.35	0.11	0.37	0.03	0.11
PR-9	0.59	0.01	0.90	0.96	0.58	0.08	0.35	0.09	0.36	0.06	0.21
PR-10A	0.06	0.00	0.90	0.96	0.06	0.08	0.35	0.08	0.35	0.00	0.02
PR-10B	0.03	0.00	0.90	0.96	0.03	0.08	0.35	0.08	0.35	0.00	0.01
PR-10C	0.04	0.00	0.90	0.96	0.04	0.08	0.35	0.08	0.35	0.00	0.01
PR-10D	0.04	0.00	0.90	0.96	0.04	0.08	0.35	0.08	0.35	0.00	0.02
PR-10E	0.09	0.00	0.90	0.96	0.09	0.08	0.35	0.08	0.35	0.01	0.03
PR-10F	0.04	0.00	0.90	0.96	0.04	0.08	0.35	0.08	0.35	0.00	0.01
PR-10G	0.05	0.00	0.90	0.96	0.05	0.08	0.35	0.08	0.35	0.00	0.02
PR-10H	0.06	0.00	0.90	0.96	0.06	0.08	0.35	0.08	0.35	0.00	0.02
Total	33.97	11.07									

Calc:	DLF
Date:	11/8/2024
Checked:	JS

PLATTE SELF STORAGE
RUNOFF SUMMARY

PROPOSED

BASIN	AREA TOTAL (Acres)	WEIGHTED C_5	WEIGHTED C_{100}	OVERLAND C_5	OVERLAND Length (ft)	OVERLAND Slope (ft/ft)	OVERLAND T_t (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW T_t (min)	T_C TOTAL (min)	INTENSITY I_5 (in/hr)	INTENSITY I_{100} (in/hr)	TOTAL FLOWS Q_5 (c.f.s.)	TOTAL FLOWS Q_{100} (c.f.s.)
		* For Calcs See Runoff Summary														
OS-ZA	0.44	0.33	0.53	0.33	300	0.02	19.3	230	2.0%	1.4	2.7	22.0	2.9	4.9	0.4	1.1
OS-ZB	0.22	0.33	0.53	0.33	300	0.02	19.3	231	2.0%	1.4	2.7	22.0	2.9	4.9	0.2	0.6
OS-ZC	0.23	0.33	0.53	0.33	300	0.02	19.3	232	2.0%	1.4	2.7	22.0	2.9	4.9	0.2	0.6
OS-ZD	0.86	0.33	0.53	0.33	300	0.02	19.3	233	2.0%	1.4	2.7	22.0	2.9	4.9	0.8	2.3
OS-ZE	1.94	0.33	0.53	0.33	300	0.02	19.3	234	2.0%	1.4	2.8	22.0	2.9	4.9	1.9	5.1
OS-ZF	0.56	0.33	0.53	0.33	300	0.02	19.3	235	2.0%	1.4	2.8	22.0	2.9	4.9	0.5	1.5
OS-ZG	0.85	0.33	0.53	0.33	300	0.02	19.3	236	2.0%	1.4	2.8	22.0	2.9	4.9	0.8	2.3
OS-ZH	1.24	0.33	0.53	0.33	300	0.02	19.3	237	2.0%	1.4	2.8	22.0	2.9	4.9	1.2	3.3
OS-Y	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
OS-X	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
OS-W	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
PR-1	0.07	0.08	0.35	0.08	100	0.08	9.3	0	8.0%	2.8	0.0	9.3	4.2	7.1	0.0	0.2
PR-2	0.13	0.08	0.35	0.08	45	0.25	4.3	0	25.0%	5.0	0.0	5.0	5.2	8.7	0.1	0.4
PR-3A	1.10	0.90	0.96	0.90	100	0.02	2.9	450	2.0%	2.8	2.7	5.5	5.0	8.4	5.0	8.9
PR-3B	1.11	0.90	0.96	0.90	100	0.02	2.9	451	2.0%	2.8	2.7	5.5	5.0	8.4	5.0	8.9
PR-3C	0.96	0.90	0.96	0.90	100	0.02	2.9	452	2.0%	2.8	2.7	5.5	5.0	8.4	4.3	7.8
PR-3D	0.97	0.90	0.96	0.90	100	0.02	2.9	453	2.0%	2.8	2.7	5.5	5.0	8.4	4.4	7.8
PR-3E	1.01	0.90	0.96	0.90	100	0.02	2.9	454	2.0%	2.8	2.7	5.5	5.0	8.4	4.5	8.1
PR-4	3.66	0.61	0.75	0.61	100	0.02	7.0	400	2.0%	1.0	6.7	13.7	3.7	6.1	8.2	16.8
PR-5	0.56	0.09	0.36	0.09	300	0.02	25.0	0	2.0%	1.0	0.0	25.0	2.8	4.6	0.1	0.9
PR-6	6.64	0.16	0.41	0.16	300	0.02	23.3	0	2.0%	1.0	0.0	23.3	2.9	4.8	3.1	13.1
PR-7	0.34	0.10	0.37	0.10	25	0.33	2.8	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.1
PR-8	0.30	0.11	0.37	0.11	35	0.33	3.3	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.0
PR-9	0.59	0.09	0.36	0.09	100	0.06	10.1	0	6.0%	1.7	0.0	10.1	4.1	6.9	0.2	1.5
PR-10A	0.06	0.08	0.35	0.08	100	0.06	10.2	1	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10B	0.03	0.08	0.35	0.08	100	0.06	10.2	2	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10C	0.04	0.08	0.35	0.08	100	0.06	10.2	3	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10D	0.04	0.08	0.35	0.08	100	0.06	10.2	4	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10E	0.09	0.08	0.35	0.08	100	0.06	10.2	5	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.2
PR-10F	0.04	0.08	0.35	0.08	100	0.06	10.2	6	1.0%	1.7	0.1	10.3	4.1	6.9	0.0	0.1
PR-10G	0.05	0.08	0.35	0.08	100	0.06	10.2	7	1.0%	1.7	0.1	10.3	4.1	6.9	0.0	0.1
PR-10H	0.06	0.08	0.35	0.08	100	0.06	10.2	8	1.0%	1.7	0.1	10.3	4.1	6.9	0.0	0.1

Calc:	DLF
Date:	11/8/2024
Checked:	JS

PLATTE SELF STORAGE
SURFACE ROUTING SUMMARY

PROPOSED

Design Point(s)	*Contributing Basins*	*Area (ac)*	*Flow (cfs)*	
			Q_5	Q_{100}
1	**PR-1**	0.07	0.0	0.2
2	**PR-2**	0.13	0.1	0.4
3A	**PR-3A**	1.10	5.0	8.9
3B	**PR-3B & PR 3A FLOW BY**	1.11	7.5	14.4
3C	**PR-3C & PR 3B FLOW BY**	0.96	8.4	17.2
3D	**PR-3D & PR 3C FLOW BY**	0.97	8.6	18.9
3E	**PR-3E & PR 3D FLOW BY**	1.01	9.0	20.6
4	**PR-4 & DP Y**	11.81	11.8	32.2
5	**PR-5 & DP X**	1.76	0.5	3.3
6	**PR-6 & PR#1**	7.74	44.9	105.2
7	**PR-7**	0.34	0.2	1.1
8	**PR-8**	0.30	0.2	1.0
9	**PR-9**	0.59	0.2	1.5
10A	**PR-10A & OS-ZA**	0.49	0.4	1.3
10B	**PR-10B & DP ZB**	0.25	0.2	0.6
10C	**PR-10C & DP ZC**	0.27	0.2	0.7
10D	**PR-10D & DP ZD**	0.90	0.8	2.4
10E	**PR-10E & DP ZE**	2.03	1.9	5.3
10F	**PR-10F & DP ZF**	0.60	0.6	1.6
10G	**PR-10G & DP ZG**	0.90	0.8	2.4
10H	**PR-10H & DP ZH**	1.30	1.2	3.4
W	**OS-W, DP 1 & DP 2**	0.65	0.5	1.9
X	**OS-X**	1.20	0.4	2.3
Y	**OS-Y**	8.15	3.6	15.4

Calc:	DLF
Date:	11/8/2024
Checked:	JS

PLATTE SELF STORAGE
PIPE ROUTING SUMMARY

Pipe Run	*Inlet #*	*Contributing Flow Sources*	*5 Year Flow (cfs)*	*100 Year Flow (cfs)*	*Slope*	*Pipe Size & Type*	**Owner**
PR#1	***-***	PR#2	41.2	91.4	2.7%	48" RCP	PVT
PR#2	***-***	PR#3	41.2	91.4	2.2%	48" RCP	PVT
PR#3	***#1***	DP 3E & PR#4	41.2	91.4	2.2%	42" RCP	PVT
PR#4	***#2***	PR#5	32.4	71.2	1.7%	42" RCP	PVT
PR#5	***#3***	PR#6 & PR#11	32.4	71.2	2.1%	42" RCP	PVT
PR#6	***#4***	DP 3D & PR#7	20.6	39.0	5.0%	30" RCP	PVT
PR#7	***#5***	DP 3C & PR#8	16.5	32.7	1.9%	30" RCP	PVT
PR#8	***#6***	DP 3B & PR#9	12.5	26.7	1.9%	30" RCP	PVT
PR#9	***#7***	DP3A & PR#13	8.7	21.1	1.9%	24" RCP	PVT
PR#10	***#10***	PR#13	6.2	17.7	1.7%	24" RCP	PVT
PR#11	***#8***	PR#12	11.8	32.2	1.0%	36" RCP	PVT
PR#12	***#9***	DP 4	11.8	32.2	1.0%	36" RCP	PVT
PR#13	***#11***	DP 10E & PR#17 & 20	6.2	17.7	1.0%	24" RCP	PVT
PR#14	***#12***	DP 10A	0.4	1.3	1.0%	12" HDPE	PVT
PR#15	***#13***	DP 10B & PR#14	0.7	1.9	1.0%	15" HDPE	PVT
PR#16	***#14***	DP 10C & PR#15	0.9	2.6	1.0%	15" HDPE	PVT
PR#17	***#15***	DP 10D & PR#16	1.7	5.0	1.0%	18" HDPE	PVT
PR#18	***#16***	DP 10H	1.2	3.4	1.0%	12" HDPE	PVT
PR#19	***#17***	DP 10G & PR#18	2.0	5.8	1.0%	15" HDPE	PVT
PR#20	***#18***	DP 10F & PR#19	2.6	7.4	1.0%	15" HDPE	PVT
PR#90	***-***	Pond outlet	0.5	11.3	1.4%	18" HDPE	PVT

Calc:	DLF
Date:	11/8/2024
Checked:	JS

PLATTE SELF STORAGE
SURFACE ROUTING SUMMARY

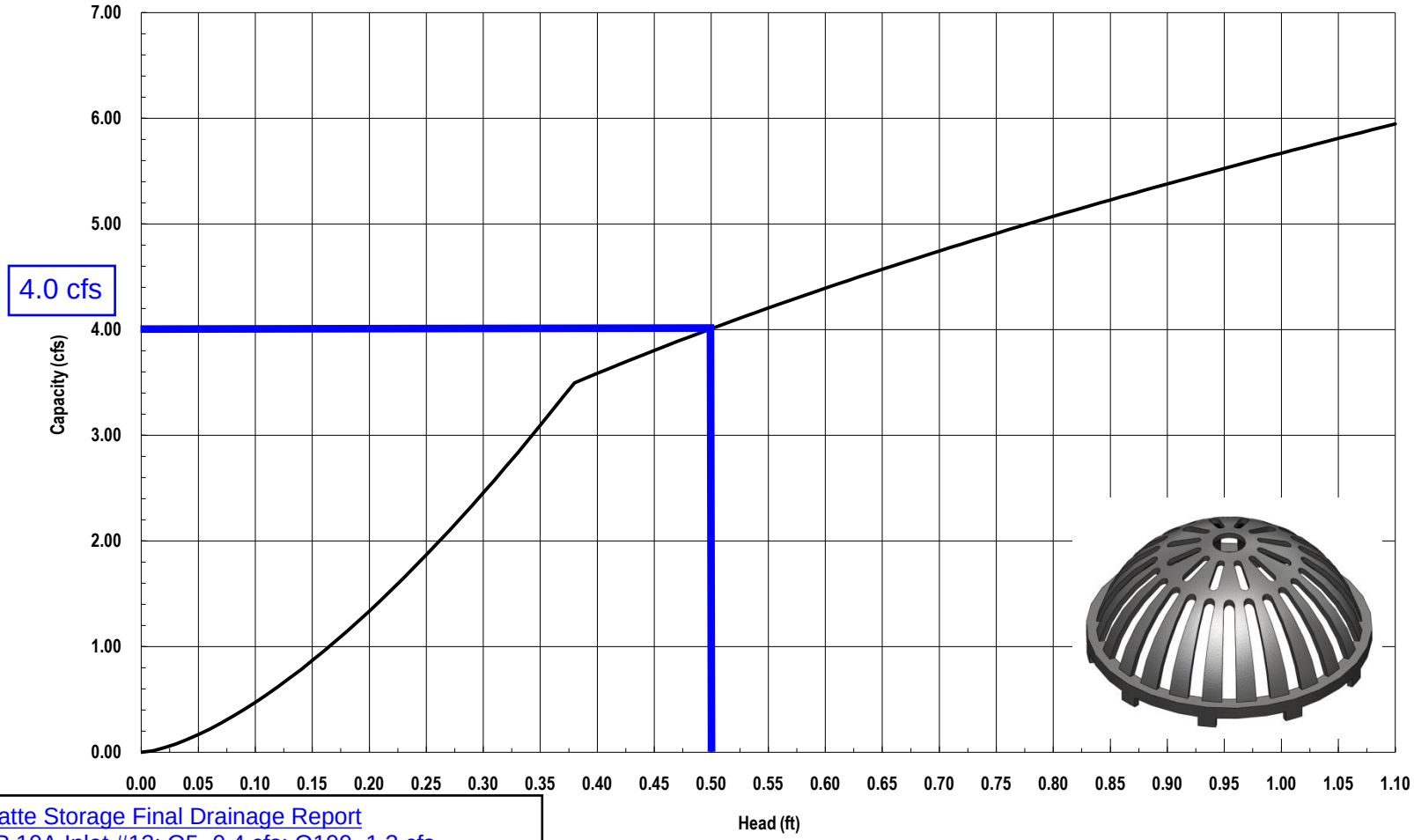
Water Quality Treatment Summary Table

Basin ID	*Total Area*	*Total Proposed Disturbed Area*	*Area Trib to Pond 1*	*Disturbed Area Treated via Runoff Reduction*	*Disturbed Area Excluded from WQ per ECM App I.7.1.C.1*	*Disturbed Area Excluded from WQ per ECM App I.7.1.B.#*	*Applicable WQ Exclusions (App I.7.1.B.#)*
	(ac)	*(ac)*	*(ac)*	*(ac)*	*(ac)*	*(ac)*	
OS-ZA	**0.44**	-	0.44	-	-	-	-
OS-ZB	**0.22**	-	0.22	-	-	-	-
OS-ZC	**0.23**	-	0.23	-	-	-	-
OS-ZD	**0.86**	-	0.86	-	-	-	-
OS-ZE	**1.94**	-	1.94	-	-	-	-
OS-ZF	**0.56**	-	0.56	-	-	-	-
OS-ZG	**0.85**	-	0.85	-	-	-	-
OS-ZH	**1.24**	-	1.24	-	-	-	-
OS-Y	**8.15**	-	8.15	-	-	-	-
OS-X	**1.20**	-	-	-	-	-	-
OS-W	**0.45**	0.45	-	-	0.45	-	-
PR-1	**0.07**	0.07	-	-	-	0.07	I.7.1.B.7
PR-2	**0.13**	0.13	-	-	-	0.13	I.7.1.B.7
PR-3A	**1.10**	1.10	1.10	-	-	-	-
PR-3B	**1.11**	1.11	1.11	-	-	-	-
PR-3C	**0.96**	0.96	0.96	-	-	-	-
PR-3D	**0.97**	0.97	0.97	-	-	-	-
PR-3E	**1.01**	1.01	1.01	-	-	-	-
PR-4	**3.66**	3.66	3.66	-	-	-	-
PR-5	**0.56**	0.56	-	-	0.55	0.01	I.7.1.B.7
PR-6	**6.64**	6.64	6.64	-	-	-	-
PR-7	**0.34**	0.34	-	-	-	0.34	I.7.1.B.7
PR-8	**0.30**	0.30	-	-	-	0.30	I.7.1.B.7
PR-9	**0.59**	0.59	-	-	-	0.59	I.7.1.B.7
PR-10A	**0.06**	0.06	0.06	-	-	-	-
PR-10B	**0.03**	0.03	0.03	-	-	-	-
PR-10C	**0.04**	0.04	0.04	-	-	-	-
PR-10D	**0.04**	0.04	0.04	-	-	-	-
PR-10E	**0.09**	0.09	0.09	-	-	-	-
PR-10F	**0.04**	0.04	0.04	-	-	-	-
PR-10G	**0.05**	0.05	0.05	-	-	-	-
PR-10H	**0.06**	0.06	0.06	-	-	-	-
		TOTALS	30.33		1.00	1.44	
		BASINS TRIB TO POND IN FUTURE PR-5, PR-9 & OS-X	2.35			**Calc:**	DLF
						Date:	11/8/2024
		AREA TRIB FOR POND DESIGN	**32.68**			**Checked:**	JS

HYDRAULIC CALCULATIONS

INLETS

Nyloplast 18" Dome Grate Inlet Capacity Chart



Platte Storage Final Drainage Report
DP 10A Inlet #12: Q5=0.4 cfs; Q100=1.3 cfs
DP 10B Inlet #13: Q5=0.2 cfs; Q100=0.6 cfs
DP 10C Inlet #14: Q5=0.2 cfs; Q100=0.7cfs
DP 10D Inlet #15: Q5=0.8 cfs; Q100=2.4 cfs
DP 10F Inlet #12: Q5=0.6 cfs; Q100=1.6 cfs
DP 10G Inlet #12: Q5=0.8 cfs; Q100=2.4 cfs
DP 10H Inlet #12: Q5=1.2 cfs; Q100=3.4 cfs
Inlet capacity=4.0 cfs
Thus, each inlet has sufficient capacity.

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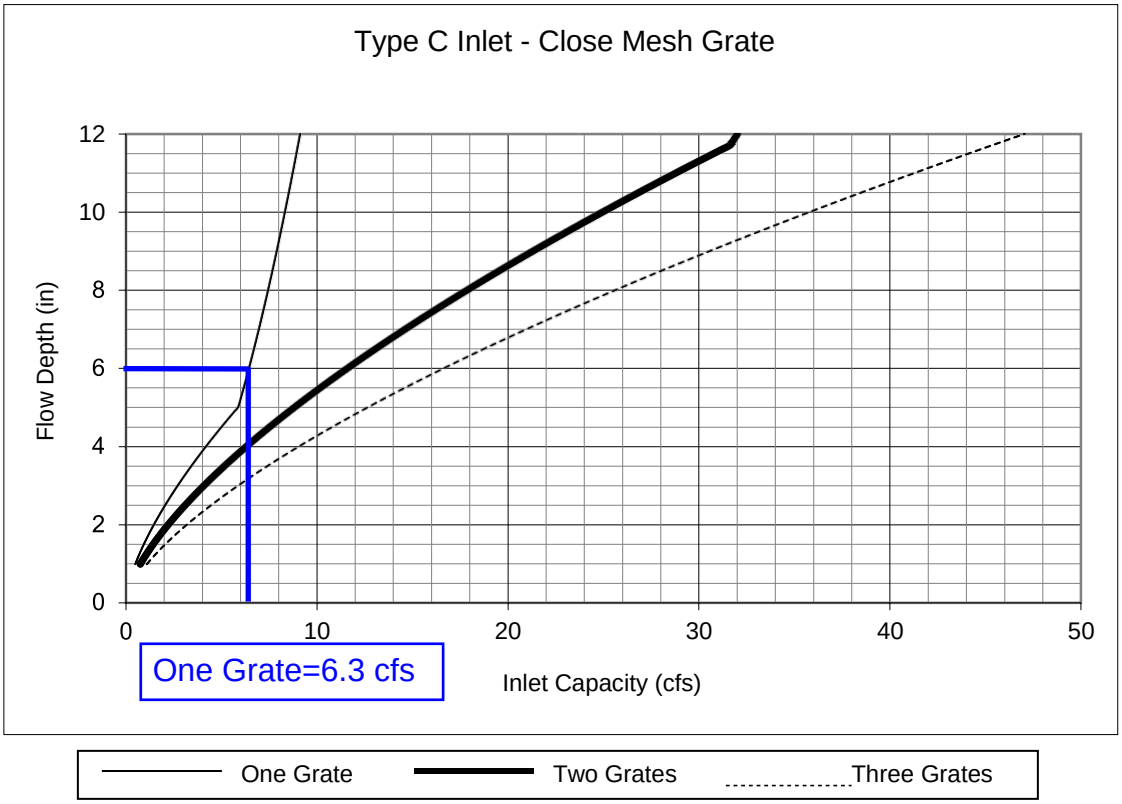
Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet

Platte Storage Final Drainage Report

DP 10E Inlet #11: Q5=1.9 cfs; Q100=5.3 cfs
Single-grate inlet capacity=6.3 cfs

Thus, inlet has sufficient capacity.



Notes:
1. The standard inlet parameters must apply to use these charts.

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP 3A Inlet #7	DP 3B Inlet #6	DP 3C Inlet #5
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	AREA	AREA	AREA
Hydraulic Condition	Swale	Swale	Swale
Inlet Type	User-Defined	User-Defined	User-Defined

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	5.0	7.5	8.0
Major Q_{Known} (cfs)	8.9	14.4	16.6

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**5.0**	**7.5**	**8.0**
Major Total Design Peak Flow, Q (cfs)	**8.9**	**14.4**	**16.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	2.5	3.6	4.0
Major Flow Bypassed Downstream, Q_b (cfs)	5.4	8.8	10.6

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP 3D Inlet #4
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	AREA
Hydraulic Condition	Swale
Inlet Type	User-Defined

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	8.4
Major Q_{Known} (cfs)	18.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0

Watershed Characteristics

Subcatchment Area (acres)	
Percent Impervious	
NRCS Soil Type	

Watershed Profile

Overland Slope (ft/ft)	
Overland Length (ft)	
Channel Slope (ft/ft)	
Channel Length (ft)	

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

Major Storm Rainfall Input

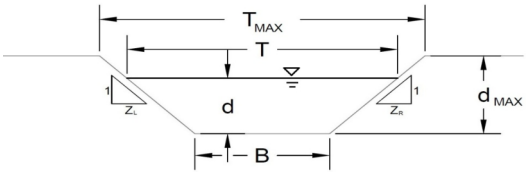
Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**8.4**
Major Total Design Peak Flow, Q (cfs)	**18.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	4.3
Major Flow Bypassed Downstream, Q_b (cfs)	12.0

AREA INLET IN A SWALE

DP 3A Inlet #7



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.013	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	24.00	ft/ft
Right Side Sloe	Z2 =	24.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**40.00**	**40.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**0.50**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**38.6**	**38.6**	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**0.50**	**0.50**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**5.0**	**8.9**	cfs
Water Depth	d =	**0.23**	**0.29**	ft

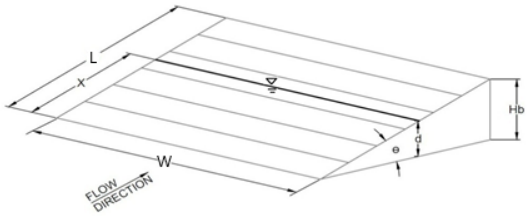
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

DP 3A Inlet #7

Inlet Design Information (Input)

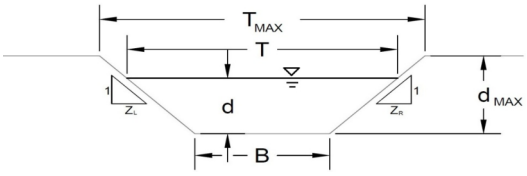
Type of Inlet	User-Defined	Inlet Type =	User-Defined	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	4.00	ft
Length of Grate		L =	3.33	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	N/A	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.23	0.29	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.5**	**3.4**	**cfs**
Bypassed Flow	**Q_b =**	**2.5**	**5.4**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**50**	**39**	**%**

AREA INLET IN A SWALE

DP 3B Inlet #6



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.013	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	24.00	ft/ft
Right Side Sloe	Z2 =	24.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**40.00**	**40.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**0.50**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**38.6**	**38.6**	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**0.50**	**0.50**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**7.5**	**14.4**	cfs
Water Depth	d =	**0.27**	**0.35**	ft

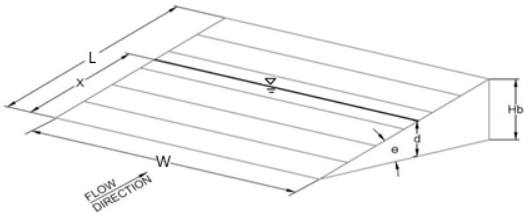
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

DP 3B Inlet #6

Inlet Design Information (Input)

Type of Inlet: User-Defined — Inlet Type = User-Defined

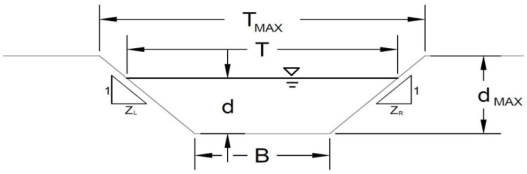


Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	6.00	ft
Length of Grate	L =	3.33	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	N/A	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.27	0.35	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.8**	**5.5**	**cfs**
Bypassed Flow	**Q_b =**	**3.6**	**8.8**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**51**	**39**	**%**

AREA INLET IN A SWALE

DP 3C Inlet #5



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.013	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	24.00	ft/ft
Right Side Sloe	Z2 =	24.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**40.00**	**40.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**0.50**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**38.6**	**38.6**	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**0.50**	**0.50**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**8.0**	**16.6**	cfs
Water Depth	d =	**0.28**	**0.36**	ft

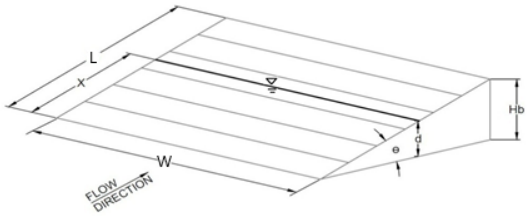
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

DP 3C Inlet #5

Inlet Design Information (Input)

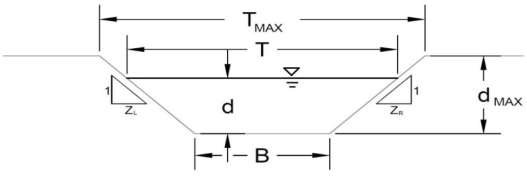
Type of Inlet	User-Defined	Inlet Type =	User-Defined	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	6.00	ft
Length of Grate		L =	3.33	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	N/A	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.28	0.36	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.0**	**6.0**	**cfs**
Bypassed Flow	**Q_b =**	**4.0**	**10.6**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**50**	**36**	**%**

AREA INLET IN A SWALE

DP 3D Inlet #4



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.013	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	24.00	ft/ft
Right Side Sloe	Z2 =	24.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**40.00**	**40.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**0.50**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**38.6**	**38.6**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**0.50**	**0.50**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**8.4**	**18.4**	**cfs**
Water Depth	d =	**0.28**	**0.38**	**ft**

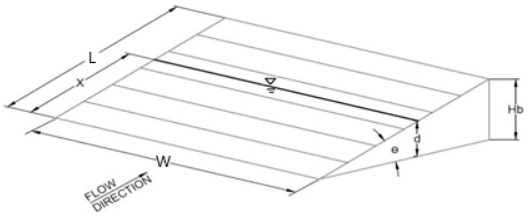
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

DP 3D Inlet #4

Inlet Design Information (Input)

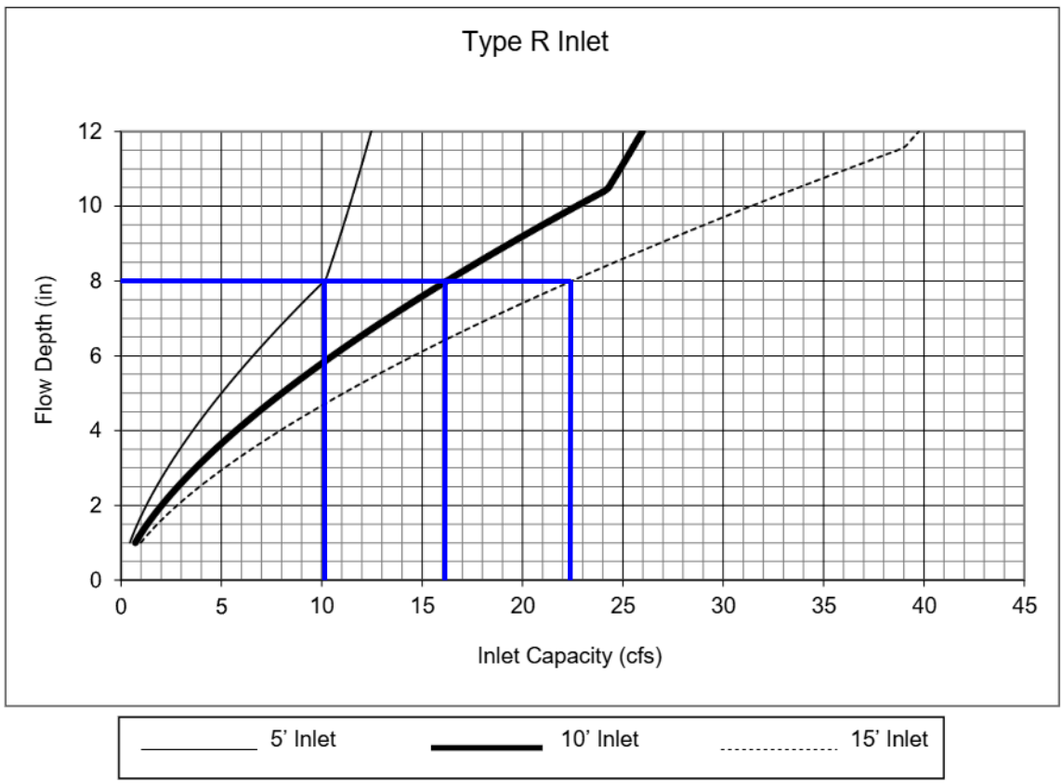
Type of Inlet: User-Defined — Inlet Type = User-Defined



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	6.00	ft
Length of Grate	L =	3.33	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	N/A	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.28	0.38	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.1**	**6.4**	**cfs**
Bypassed Flow	**Q_b =**	**4.3**	**12.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**49**	**35**	**%**

Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet



- A 5' inlet has a capacity of 10.1 cfs.
- A 10' inlet has a capacity of 16.0 cfs.
- A 15' inlet has a capacity of 22.5 cfs.
- Combining 5' and 15' inlets would give a capacity of 32.6 cfs for a 20' inlet.

DP 3E (BASIN PR-3E) Q5=8.8 cfs, Q100=20.2 cfs
20' Type R capacity: 32.6 cfs -> Thus, inlet has sufficient capacity.
DP 4 Q5=11.8 cfs, Q100=32.2 cfs
20' Type R capacity: 32.6 cfs -> Thus, inlet has sufficient capacity.

Notes:
1. The standard inlet parameters must apply to use this chart.

SWALES

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project: **Platte Self Storage** Location: Drive Aisles S1 in Basins 3A-3E

By: John F Date: 11/6/2024

Chk By: Date: version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

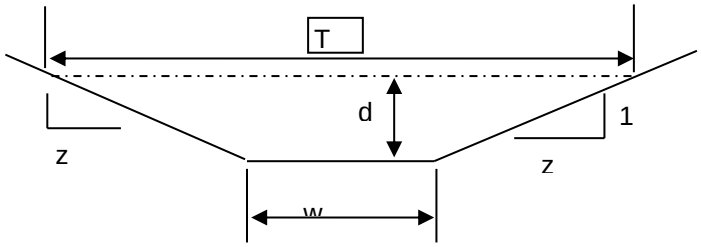
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	14.3
z (sideslope)=	16
b (btm width, ft)=	0
d (depth, ft)=	0.35
S (slope, ft/ft)	0.01
n_{low} =	0.013
n_{high} =	0.013

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.35	1.86	10.63	0.17	3.570899	6.62714	3.570899	6.62714	T =	10.605
								Dm =	0.175
				Sc low =	0.0044	Sc high =	0.0044		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0031	0.0057	0.0031	0.0057		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

Basins 3A thru 3E flow is split between north of and south of Design Points 3A thru 3E.
Basin 3A Q100=8.9 cfs split =4.5 cfs < 6.63 cfs
Basin 3B Q100=8.9 cfs split =4.5 cfs < 6.63 cfs
Basin 3C Q100=7.8 cfs split =3.9 cfs < 6.63 cfs
Basin 3D Q100=7.8 cfs split =3.9 cfs < 6.63 cfs
Basin 3E Q100=8.1 cfs split =4.1 cfs < 6.63 cfs

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project: **Platte Self Storage** Location: Drive Aisles S2 in Basins PR-3 and PR-4

By: John F Date: 11/6/2024

Chk By: Date: version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

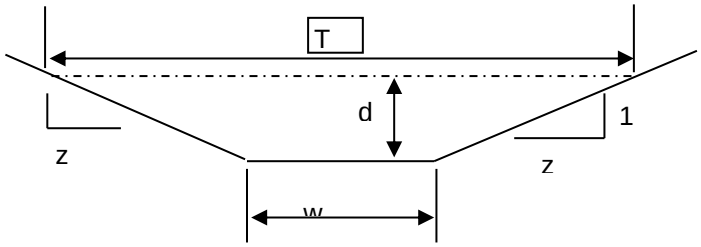
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	50
z (sideslope)=	50
b (btm width, ft)=	0
d (depth, ft)=	0.35
S (slope, ft/ft)	0.02
n_{low} =	0.013
n_{high} =	0.013

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.35	6.13	35.01	0.17	5.05668645	30.9722	5.056686	30.9722	T =	35
								Dm =	0.175
				Sc low =	0.0044	Sc high =	0.0044		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0031	0.0057	0.0031	0.0057		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

Basin 3 Q100=20.2 cfs < 30.97 cfs

Basin 4 Q100=16.8 cfs < 30.97 cfs

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Platte Self Storage**		Location:	Swale S3 in Basin OS-W	
By:	John F	Date:	11/6/2024		
Chk By:		Date:			version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

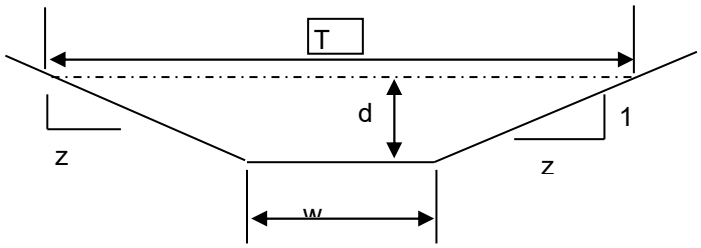
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	8
z (sideslope)=	6
b (btm width, ft)=	0
d (depth, ft)=	0.3
S (slope, ft/ft)	0.076
n_{low} =	0.02
n_{high} =	0.03

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.3	0.63	4.24	0.15	5.7426429	3.61787	3.828429	2.41191	T =	4.2
								Dm =	0.150
				Sc low =	0.0111	Sc high =	0.0250		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0078	0.0144	0.0175	0.0325		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

Design Point W Q100=1.9 cfs < 2.4 cfs

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Platte Self Storage**	Location:	Swale S4 in Basin PR-5	
By:	John F	Date:	11/6/2024	
Chk By:		Date:		version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

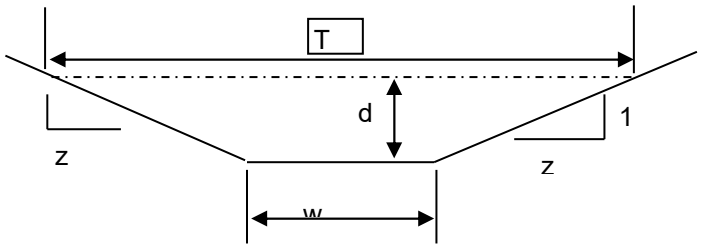
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	4
z (sideslope)=	4
b (btm width, ft)=	0
d (depth, ft)=	0.55
S (slope, ft/ft)	0.02
n_{low} =	0.02
n_{high} =	0.03

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.55	1.21	4.54	0.27	4.3544185	5.26885	2.902946	3.51256	T =	4.4
								Dm =	0.275
				Sc low =	0.0093	Sc high =	0.0210		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0065	0.0121	0.0147	0.0273		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

Design Point 5 Q100=3.3 cfs < 3.5 cfs

SWALE S4 RIP RAP CALCS

Figure 13-12c. Emergency Spillway Protection

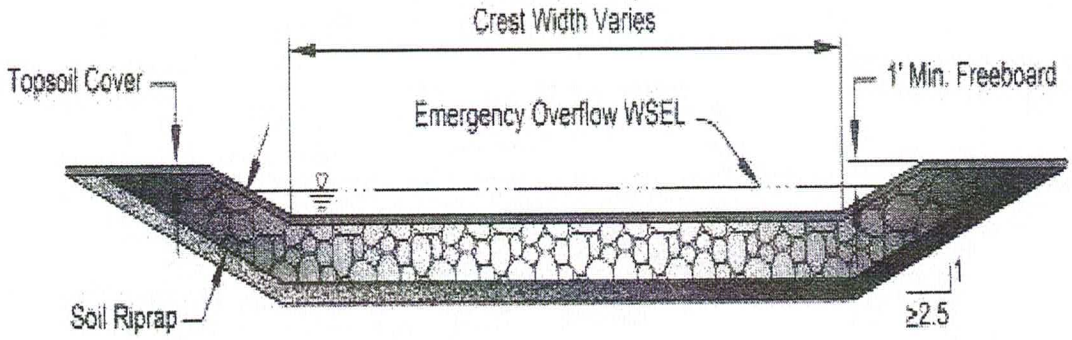
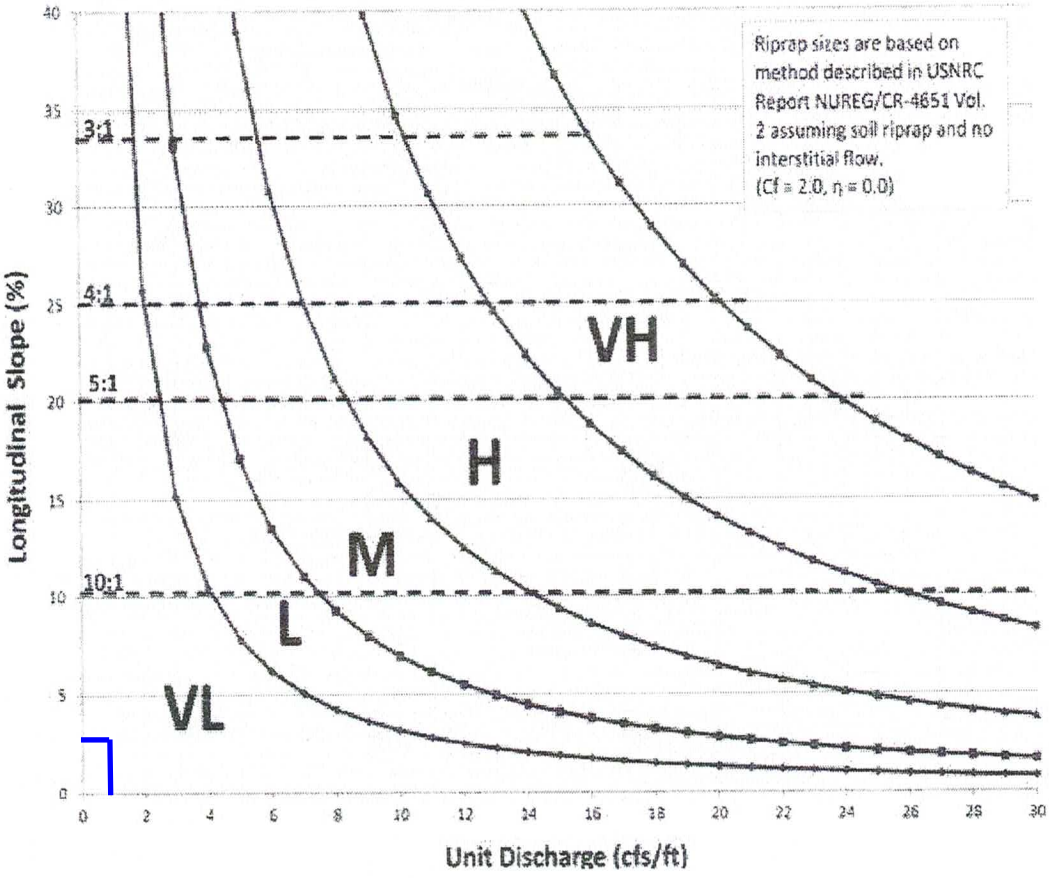


Figure 13-12d. Riprap Types for Emergency Spillway Protection

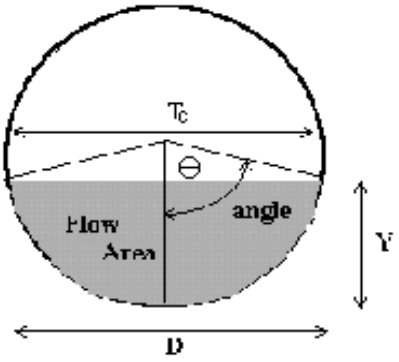


Q100=3.3 CFS
L=4.4 FT
UNIT DISCHARGE=0.75
USE TYPE VL D50=6" 8' W x 10' L

CULVERT

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: Humprey Self Storage
Pipe ID: 18" RCP Culvert



Design Information (Input)			
Pipe Invert Slope	So =	0.0220	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**1.30**	**cfs**

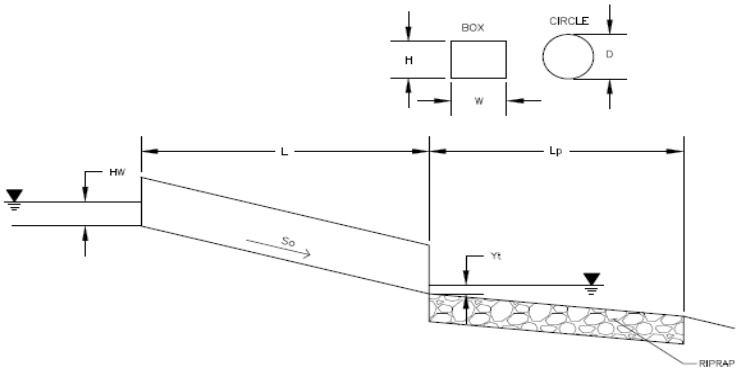
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	15.62	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	0.91	radians
Flow area	An =	0.24	sq ft
Top width	Tn =	1.19	ft
Wetted perimeter	Pn =	1.37	ft
Flow depth	Yn =	0.29	ft
Flow velocity	Vn =	5.36	fps
Discharge	Qn =	1.30	cfs
Percent Full Flow	Flow =	8.3%	of full flow
Normal Depth Froude Number	Fr_n =	2.09	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.13	radians
Critical flow area	Ac =	0.41	sq ft
Critical top width	Tc =	1.35	ft
Critical flow depth	Yc =	0.43	ft
Critical flow velocity	Vc =	3.14	fps
Critical Depth Froude Number	Fr_c =	1.00	

Determination of Culvert Headwater and Outlet Protection

Project: Humphrey Self Storage
Basin ID: 18" RCP Culvert



Soil Type:
Choose One:
- ○ Sandy
- ◉ Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

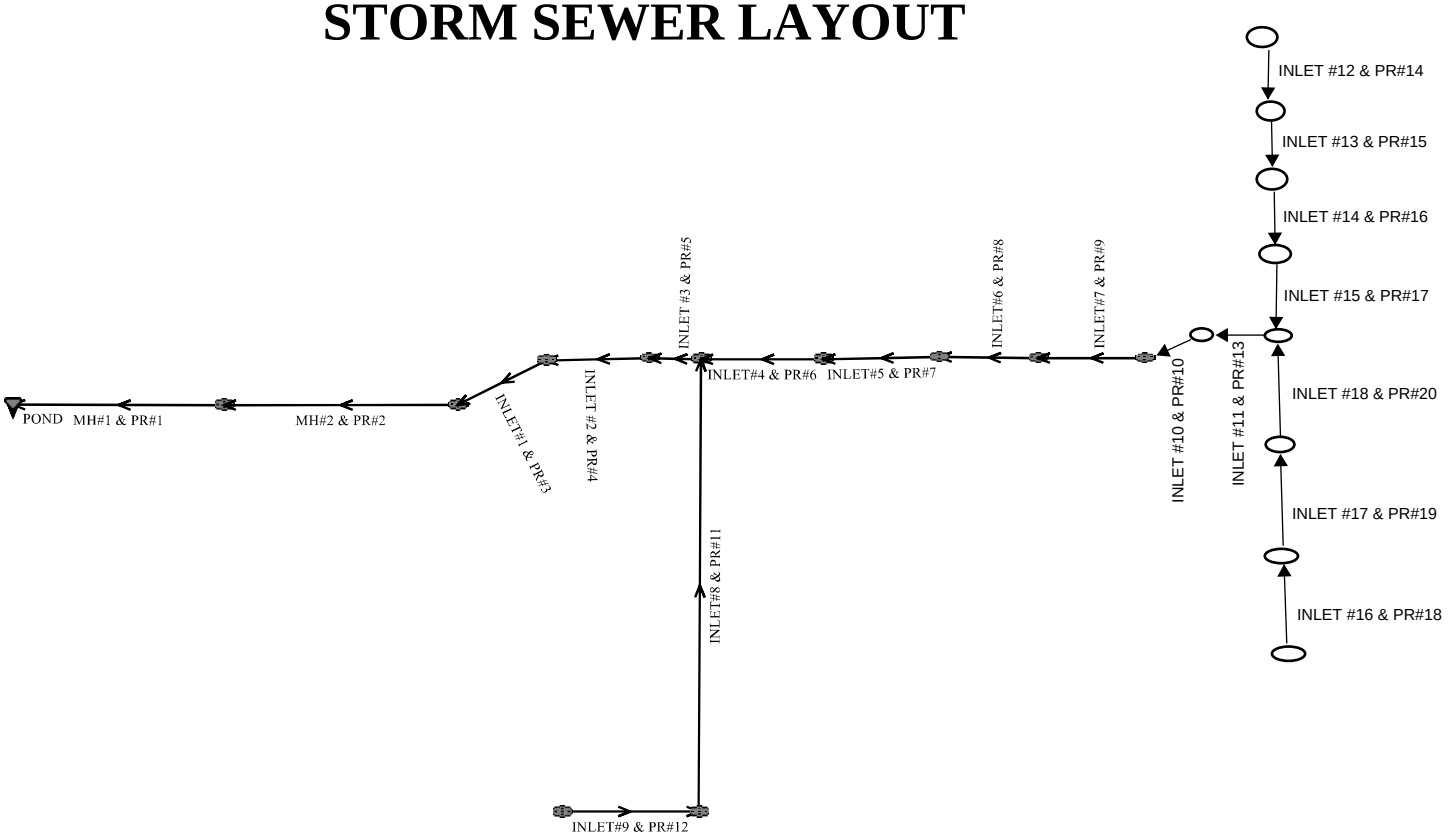
	Design Discharge	Q =	1.3	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	18	inches
	Inlet Edge Type (Choose from pull-down list)		Grooved End with Headwall	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	6240	ft
	Outlet Elevation **OR** Slope	Elev OUT =	6239	ft
	Culvert Length	L =	46	ft
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	7	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.60	ft
Flow Area at Max Channel Velocity	A_t =	0.19	ft^2
Culvert Cross Sectional Area Available	A =	1.77	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.83	
Sum of All Losses Coefficients	k_s =	2.03	ft
Culvert Normal Depth	Y_n =	0.29	ft
Culvert Critical Depth	Y_c =	0.43	ft
Tailwater Depth for Design	d =	0.96	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	0.90	ft
Expansion Factor	1/(2*tan(Θ)) =	6.70	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	0.47	$ft^{0.5}/s$
Froude Number	Fr =	2.08	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.67	
Inlet Control Headwater	HW_I =	0.57	ft
Outlet Control Headwater	HW_O =	-0.02	
Design Headwater Elevation	**HW =**	**6,240.57**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**0.38**	
Minimum Theoretical Riprap Size	d_{50} =	1	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	**VL**	
Length of Protection	**L_p =**	**5**	**ft**
Width of Protection	**T =**	**3**	**ft**

HGL CALCULATIONS

STORM SEWER LAYOUT



Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 11/7/2024 2:59:57 PM

UDSewer Results Summary

Project Title: 6001 E Platte Storage - 5 Year
Project Description: East System

5-YEAR

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in): 1.50
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 300
Maximum Urban Overland Len. (ft): 100
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 6.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 3.0

Backwater Calculations:

Tailwater Elevation (ft): 6208.12

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
POND	6211.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH#1 & PR#1	6220.00	41.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MH#2 & PR#2	6223.50	41.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#1 & PR#3	6233.50	41.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #2 & PR#4	6234.00	32.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #3 & PR#5	6234.40	32.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#8 & PR#11	6237.45	11.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#9 & PR#12	6236.85	11.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#4 & PR#6	6235.60	20.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#5 & PR#7	6236.80	16.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#6 & PR#8	6238.10	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#7 & PR#9	6239.30	8.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#10 & PR#10	6239.85	6.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #11 & PR#13	6250.50	6.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #18 & PR#20	6251.50	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #17 & PR#19	6252.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #16 & PR#18	6252.50	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #15 & PR#17	6251.50	1.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #14 & PR#16	6252.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #13 & PR#15	6252.50	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #12 & PR#14	6253.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution	Total Design Flow	

Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
POND	0.00	0.00	0.00	0.00	0.00	5.96	6.92	0.15	41.20	
MH#1 & PR#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.20	
MH#2 & PR#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.20	
INLET#1 & PR#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.20	
INLET #2 & PR#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.40	
INLET #3 & PR#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.40	
INLET#8 & PR#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.80	
INLET#9 & PR#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.80	
INLET#4 & PR#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.60	
INLET#5 & PR#7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.50	
INLET#6 & PR#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.50	
INLET#7 & PR#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.70	
INLET#10 & PR#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.20	
INLET #11 & PR#13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.20	
INLET #18 & PR#20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60	
INLET #17 & PR#19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	
INLET #16 & PR#18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	
INLET #15 & PR#17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.70	
INLET #14 & PR#16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	
INLET #13 & PR#15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	
INLET #12 & PR#14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
MH#1 & PR#1	29.50	6205.00	2.7	6205.80	0.013	0.03	0.00	CIRCULAR	48.00 in	48.00 in
MH#2 & PR#2	222.50	6211.11	2.2	6216.00	0.013	0.05	0.00	CIRCULAR	48.00 in	48.00 in
INLET#1 & PR#3	45.00	6216.81	2.2	6217.80	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #2 & PR#4	24.00	6225.49	1.7	6225.90	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #3 & PR#5	7.00	6227.00	2.1	6227.15	0.013	0.05	0.00	CIRCULAR	42.00 in	42.00 in
INLET#8 & PR#11	352.00	6227.73	1.0	6231.25	0.013	1.00	0.25	CIRCULAR	36.00 in	36.00 in
INLET#9 & PR#12	31.00	6231.54	1.0	6231.85	0.013	1.00	0.00	CIRCULAR	36.00 in	36.00 in
INLET#4 & PR#6	47.00	6228.15	5.0	6230.50	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#5 & PR#7	57.00	6230.62	1.9	6231.70	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#6 & PR#8	62.00	6231.82	1.9	6233.00	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#7 & PR#9	57.00	6233.62	1.9	6234.70	0.013	0.05	0.00	CIRCULAR	24.00 in	24.00 in
INLET#10 & PR#10	24.00	6234.99	1.7	6235.40	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in

INLET #11 & PR#13	32.00	6235.69	1.9	6236.30	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in
INLET #18 & PR#20	98.00	6246.72	1.0	6247.70	0.012	1.00	0.00	CIRCULAR	15.00 in	15.00 in
INLET #17 & PR#19	74.00	6247.86	1.0	6248.60	0.012	0.05	0.00	CIRCULAR	15.00 in	15.00 in
INLET #16 & PR#18	74.00	6248.76	1.0	6249.50	0.012	0.05	0.00	CIRCULAR	12.00 in	12.00 in
INLET #15 & PR#17	98.00	6246.32	1.0	6247.30	0.012	1.00	0.00	CIRCULAR	18.00 in	18.00 in
INLET #14 & PR#16	74.00	6247.46	1.0	6248.20	0.012	0.05	0.00	CIRCULAR	15.00 in	15.00 in
INLET #13 & PR#15	74.00	6248.36	1.0	6249.10	0.012	0.05	0.00	CIRCULAR	15.00 in	15.00 in
INLET #12 & PR#14	74.00	6249.26	1.0	6250.00	0.012	0.05	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
MH#1 & PR#1	236.67	18.83	23.00	6.92	13.55	14.14	2.77	Supercritical	41.20	0.00	
MH#2 & PR#2	213.63	17.00	23.00	6.92	14.29	13.14	2.50	Supercritical	41.20	0.00	
INLET#1 & PR#3	149.63	15.55	23.97	7.26	15.06	13.28	2.43	Supercritical	41.20	0.00	
INLET #2 & PR#4	131.53	13.67	21.14	6.68	14.20	11.32	2.15	Supercritical	32.40	0.00	
INLET #3 & PR#5	146.19	15.19	21.14	6.68	13.44	12.21	2.39	Supercritical	32.40	0.00	
INLET#8 & PR#11	66.88	9.46	13.08	5.09	10.24	7.13	1.61	Supercritical	11.80	0.00	
INLET#9 & PR#12	66.88	9.46	13.08	5.09	10.24	7.13	1.61	Supercritical	11.80	0.00	
INLET#4 & PR#6	91.96	18.73	18.50	6.49	9.65	15.10	3.48	Supercritical	20.60	0.00	
INLET#5 & PR#7	56.69	11.55	16.47	5.98	11.08	10.01	2.14	Supercritical	16.50	0.00	
INLET#6 & PR#8	56.69	11.55	14.24	5.44	9.57	9.27	2.15	Supercritical	12.50	0.00	
INLET#7 & PR#9	31.27	9.95	12.62	5.20	8.66	8.52	2.06	Supercritical	8.70	0.00	
INLET#10 & PR#10	29.58	9.41	10.57	4.65	7.46	7.45	1.96	Supercritical	6.20	0.00	

INLET #11 & PR#13	31.27	9.95	10.57	4.65	7.25	7.75	2.07	Supercritical	6.20	0.00	
INLET #18 & PR#20	7.02	5.72	7.75	4.06	6.32	5.29	1.48	Supercritical	2.60	0.00	
INLET #17 & PR#19	7.02	5.72	6.76	3.73	5.48	4.93	1.50	Supercritical	2.00	0.00	
INLET #16 & PR#18	3.87	4.93	5.54	3.38	4.59	4.35	1.44	Supercritical	1.20	0.00	
INLET #15 & PR#17	11.41	6.46	5.88	3.39	4.70	4.64	1.55	Supercritical	1.70	0.00	
INLET #14 & PR#16	7.02	5.72	4.47	2.94	3.63	3.93	1.50	Supercritical	0.90	0.00	
INLET #13 & PR#15	7.02	5.72	3.92	2.74	3.20	3.65	1.49	Supercritical	0.70	0.00	
INLET #12 & PR#14	3.87	4.93	3.14	2.45	2.61	3.18	1.44	Supercritical	0.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
MH#1 & PR#1	41.20	CIRCULAR	48.00 in	48.00 in	27.00 in	27.00 in	48.00 in	48.00 in	12.57	
MH#2 & PR#2	41.20	CIRCULAR	48.00 in	48.00 in	27.00 in	27.00 in	48.00 in	48.00 in	12.57	
INLET#1 & PR#3	41.20	CIRCULAR	42.00 in	42.00 in	27.00 in	27.00 in	42.00 in	42.00 in	9.62	
INLET #2 & PR#4	32.40	CIRCULAR	42.00 in	42.00 in	27.00 in	27.00 in	42.00 in	42.00 in	9.62	
INLET #3 & PR#5	32.40	CIRCULAR	42.00 in	42.00 in	24.00 in	24.00 in	42.00 in	42.00 in	9.62	
INLET#8 & PR#11	11.80	CIRCULAR	36.00 in	36.00 in	21.00 in	21.00 in	36.00 in	36.00 in	7.07	
INLET#9 & PR#12	11.80	CIRCULAR	36.00 in	36.00 in	21.00 in	21.00 in	36.00 in	36.00 in	7.07	
INLET#4 & PR#6	20.60	CIRCULAR	30.00 in	30.00 in	18.00 in	18.00 in	30.00 in	30.00 in	4.91	
INLET#5 & PR#7	16.50	CIRCULAR	30.00 in	30.00 in	21.00 in	21.00 in	30.00 in	30.00 in	4.91	
INLET#6 & PR#8	12.50	CIRCULAR	30.00 in	30.00 in	18.00 in	18.00 in	30.00 in	30.00 in	4.91	
INLET#7 & PR#9	8.70	CIRCULAR	24.00 in	24.00 in	15.00 in	15.00 in	24.00 in	24.00 in	3.14	
INLET#10 & PR#10	6.20	CIRCULAR	24.00 in	24.00 in	15.00 in	15.00 in	24.00 in	24.00 in	3.14	
INLET #11 & PR#13	6.20	CIRCULAR	24.00 in	24.00 in	15.00 in	15.00 in	24.00 in	24.00 in	3.14	
INLET #18 & PR#20	2.60	CIRCULAR	15.00 in	15.00 in	12.00 in	12.00 in	15.00 in	15.00 in	1.23	
INLET #17 & PR#19	2.00	CIRCULAR	15.00 in	15.00 in	12.00 in	12.00 in	15.00 in	15.00 in	1.23	
INLET #16 & PR#18	1.20	CIRCULAR	12.00 in	12.00 in	9.00 in	9.00 in	12.00 in	12.00 in	0.79	
INLET #15 & PR#17	1.70	CIRCULAR	18.00 in	18.00 in	9.00 in	9.00 in	18.00 in	18.00 in	1.77	
INLET #14 & PR#16	0.90	CIRCULAR	15.00 in	15.00 in	9.00 in	9.00 in	15.00 in	15.00 in	1.23	
INLET #13 & PR#15	0.70	CIRCULAR	15.00 in	15.00 in	9.00 in	9.00 in	15.00 in	15.00 in	1.23	

INLET #12 & PR#14	0.40	CIRCULAR	12.00 in	12.00 in	6.00 in	6.00 in	12.00 in	12.00 in	0.79	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6208.12

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
MH#1 & PR#1	6205.00	6205.80	0.00	0.00	6208.12	6209.01	6209.24	0.00	6209.24
MH#2 & PR#2	6211.11	6216.00	0.01	0.00	6212.30	6217.92	6214.98	3.69	6218.66
INLET#1 & PR#3	6216.81	6217.80	0.07	0.00	6218.24	6219.80	6220.16	0.45	6220.62
INLET #2 & PR#4	6225.49	6225.90	0.04	0.00	6226.88	6227.66	6228.18	0.18	6228.35
INLET #3 & PR#5	6227.00	6227.15	0.01	0.00	6228.12	6230.24	6230.44	0.00	6230.44
INLET#8 & PR#11	6227.73	6231.25	0.04	0.17	6230.60	6232.34	6230.65	2.09	6232.74
INLET#9 & PR#12	6231.54	6231.85	0.04	0.00	6232.39	6232.94	6233.18	0.16	6233.34
INLET#4 & PR#6	6228.15	6230.50	0.01	0.00	6230.25	6232.04	6232.50	0.20	6232.69
INLET#5 & PR#7	6230.62	6231.70	0.01	0.00	6232.05	6233.07	6233.10	0.53	6233.63
INLET#6 & PR#8	6231.82	6233.00	0.01	0.00	6233.08	6234.19	6233.95	0.69	6234.65
INLET#7 & PR#9	6233.62	6234.70	0.01	0.00	6234.34	6235.75	6235.47	0.70	6236.17
INLET#10 & PR#10	6234.99	6235.40	0.01	0.00	6235.76	6236.28	6236.48	0.14	6236.62
INLET #11 & PR#13	6235.69	6236.30	0.01	0.00	6236.30	6237.18	6237.23	0.29	6237.52
INLET #18 & PR#20	6246.72	6247.70	0.07	0.00	6247.25	6248.35	6247.68	0.92	6248.60
INLET #17 & PR#19	6247.86	6248.60	0.00	0.00	6248.35	6249.16	6248.69	0.69	6249.38
INLET #16 & PR#18	6248.76	6249.50	0.00	0.00	6249.17	6249.96	6249.44	0.70	6250.14

INLET #15 & PR#17	6246.32	6247.30	0.01	0.00	6246.71	6247.79	6247.04	0.92	6247.97
INLET #14 & PR#16	6247.46	6248.20	0.00	0.00	6247.79	6248.57	6248.00	0.70	6248.71
INLET #13 & PR#15	6248.36	6249.10	0.00	0.00	6248.63	6249.43	6248.83	0.71	6249.54
INLET #12 & PR#14	6249.26	6250.00	0.00	0.00	6249.48	6250.26	6249.63	0.72	6250.35

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 1.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
MH#1 & PR#1	29.50	5.00	6.00	7.83	8.99	6.91	1.58	25.40	15.12	9.78	136.60	
MH#2 & PR#2	222.50	5.00	6.00	7.83	14.79	9.81	4.48	12.00	8.42	3.08	656.08	
INLET#1 & PR#3	45.00	4.50	6.00	7.25	10.88	7.57	2.82	28.90	16.58	11.83	246.24	
INLET #2 & PR#4	24.00	4.50	6.00	7.25	13.52	8.88	4.13	13.70	8.98	4.23	66.53	
INLET #3 & PR#5	7.00	4.50	6.00	7.25	11.49	7.87	3.12	12.00	8.13	3.38	16.35	
INLET#8 & PR#11	352.00	4.00	6.00	6.67	11.34	7.50	3.34	10.40	7.03	2.87	690.02	
INLET#9 & PR#12	31.00	4.00	6.00	6.67	9.82	6.74	2.58	8.00	5.83	1.67	49.82	
INLET#4 & PR#6	47.00	3.50	6.00	6.08	11.00	7.04	3.46	8.70	5.89	2.31	75.23	
INLET#5 & PR#7	57.00	3.50	6.00	6.08	8.47	5.77	2.19	8.70	5.89	2.31	78.22	
INLET#6 & PR#8	62.00	3.50	6.00	6.08	8.46	5.77	2.19	8.70	5.89	2.31	85.03	
INLET#7 & PR#9	57.00	3.00	4.00	5.50	7.97	5.07	2.23	8.20	5.18	2.35	63.03	
INLET#10 & PR#10	24.00	3.00	4.00	5.50	7.62	4.89	2.06	7.90	5.03	2.20	25.40	
INLET #11 & PR#13	32.00	3.00	4.00	5.50	7.32	4.74	1.91	27.40	14.78	11.95	135.18	
INLET #18 & PR#20	98.00	2.25	4.00	4.63	7.31	4.30	2.34	7.35	4.32	2.36	79.01	
INLET #17 & PR#19	74.00	2.25	4.00	4.63	7.03	4.16	2.20	6.55	3.92	1.96	54.47	
INLET #16 & PR#18	74.00	2.00	4.00	4.33	6.48	3.74	2.07	6.00	3.50	1.83	45.52	
INLET #15 & PR#17	98.00	2.50	4.00	4.92	7.86	4.72	2.47	7.90	4.74	2.49	92.41	

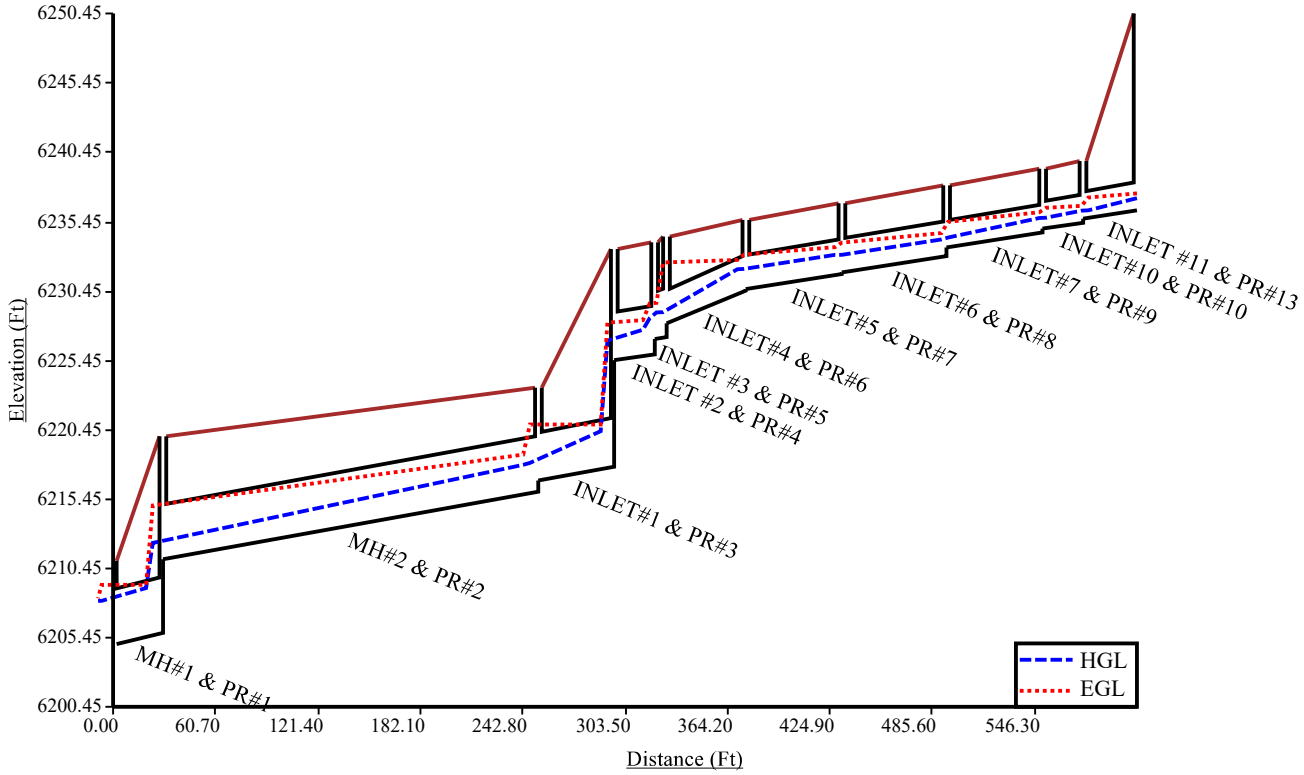
INLET #14 & PR#16	74.00	2.25	4.00	4.63	7.83	4.56	2.60	7.35	4.32	2.36	62.35	
INLET #13 & PR#15	74.00	2.25	4.00	4.63	7.03	4.16	2.20	6.55	3.92	1.96	54.47	
INLET #12 & PR#14	74.00	2.00	4.00	4.33	6.48	3.74	2.07	6.00	3.50	1.83	45.52	

Total earth volume for sewer trenches = 2757 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.

5-YEAR

PR 1-13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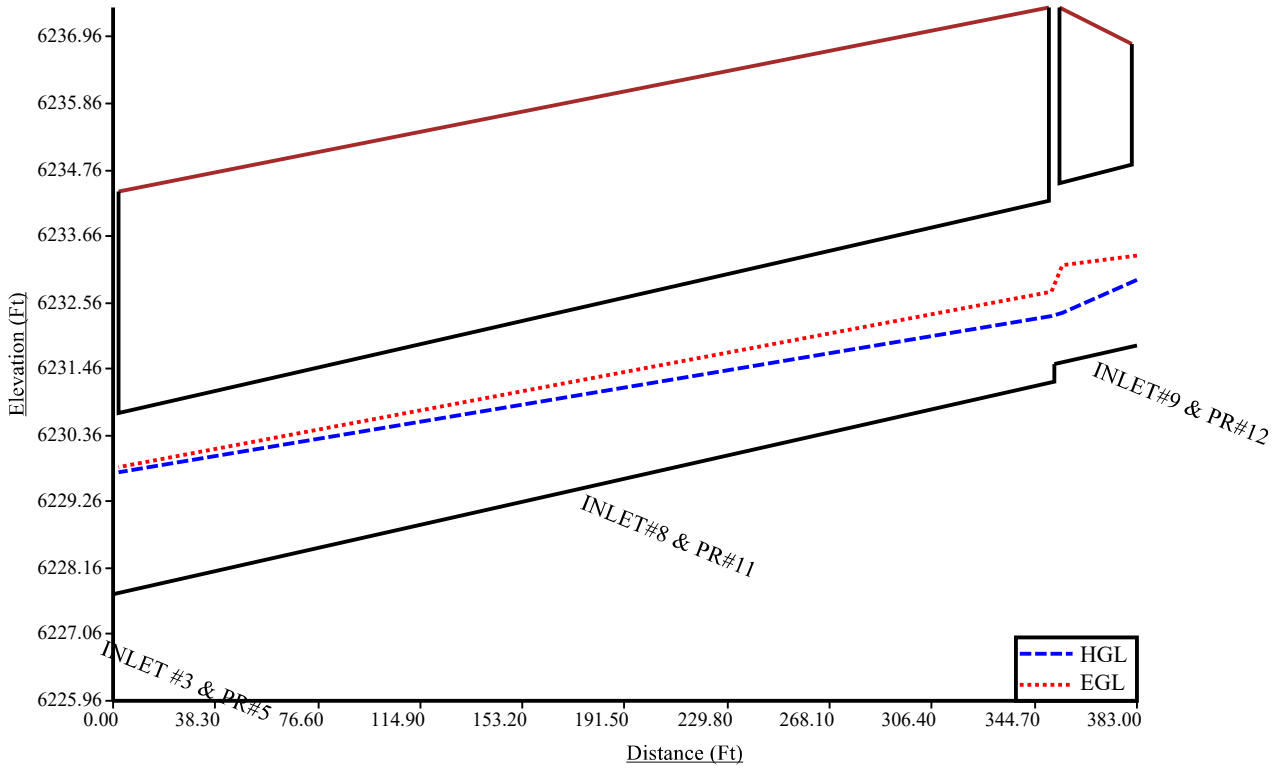
6245.45
6240.45
6235.45
6230.45
6225.45
6220.45
6215.45
6210.45
6205.45
6200.45
Elevation (Ft)
0.00
60.70
121.40
182.10
242.80
303.50
364.20
424.90
485.60
546.30
Distance (Ft)
MH#1 & PR#1
MH#2 & PR#2
INLET#1 & PR#3
INLET #2 & PR#4
INLET #3 & PR#5
INLET#4 & PR#6
INLET#5 & PR#7
INLET#6 & PR#8
INLET#7 & PR#9
INLET#10 & PR#10
INLET #11 & PR#13
HGL
EGL

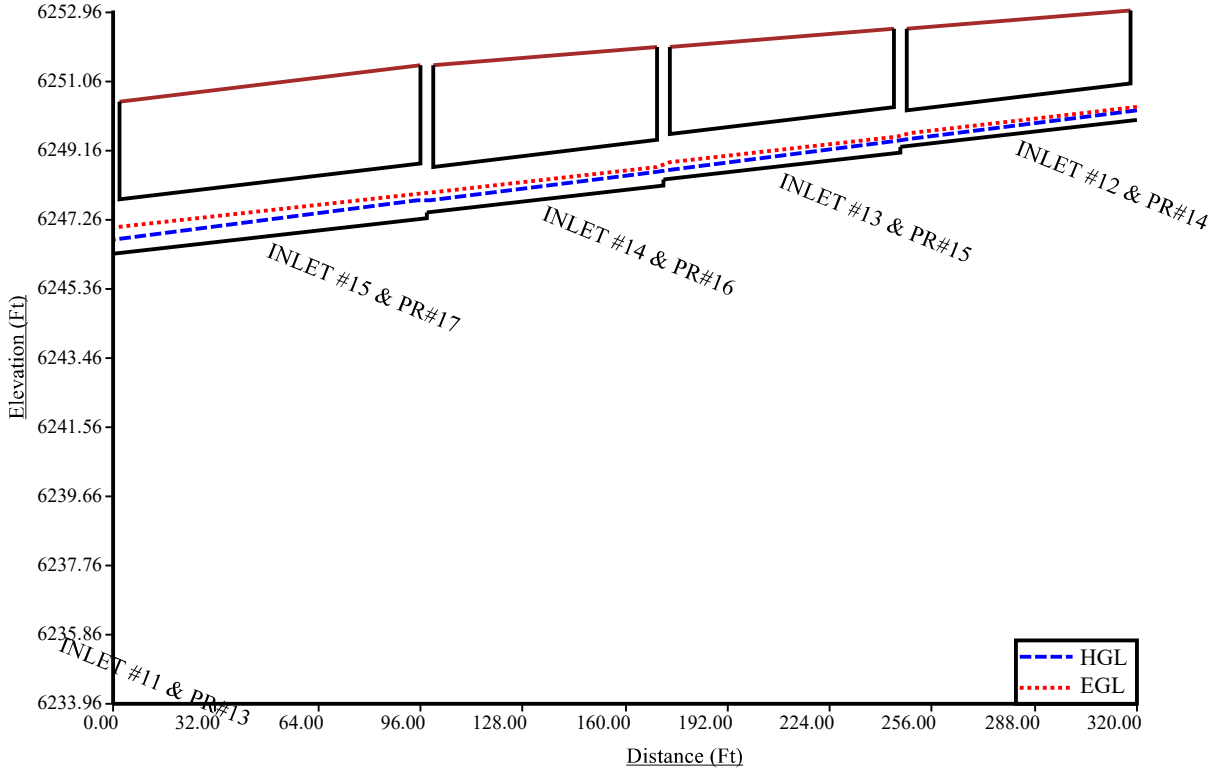
5-YEAR

PR 11-12



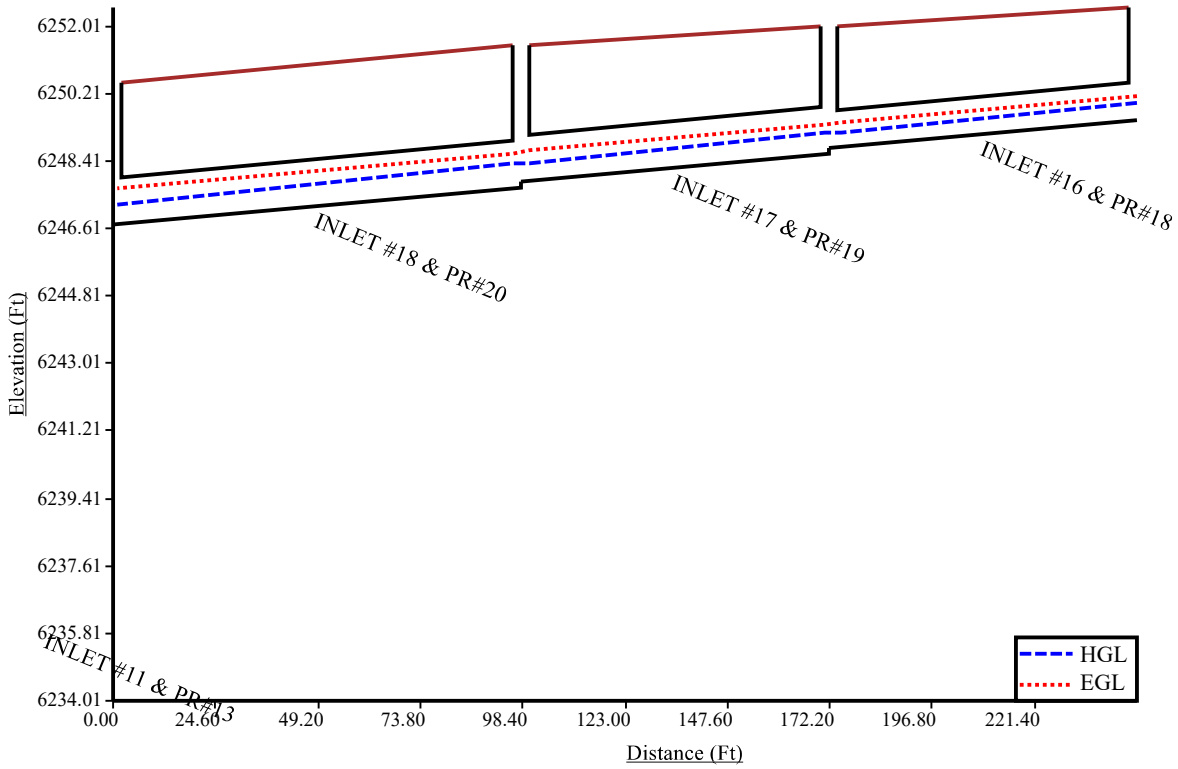
5-YEAR

PR 14-17



5-YEAR

PR 18-20



Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 11/7/2024 2:57:55 PM

UDSewer Results Summary

Project Title: 6001 E Platte Storage - 100 Year
Project Description: East System

100-YEAR

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 2.52
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 300
Maximum Urban Overland Len. (ft): 100
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 6.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 3.0

Backwater Calculations:

Tailwater Elevation (ft): 6210.54

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
POND	6211.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH#1 & PR#1	6220.00	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MH#2 & PR#2	6223.50	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#1 & PR#3	6233.50	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #2 & PR#4	6234.00	71.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #3 & PR#5	6234.40	71.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#8 & PR#11	6237.45	32.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#9 & PR#12	6236.85	32.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#4 & PR#6	6235.60	39.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#5 & PR#7	6236.80	32.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#6 & PR#8	6238.10	26.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#7 & PR#9	6239.30	21.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET#10 & PR#10	6239.85	17.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #11 & PR#13	6250.50	17.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #18 & PR#20	6251.50	7.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #17 & PR#19	6252.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #16 & PR#18	6252.50	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #15 & PR#17	6251.50	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #14 & PR#16	6252.00	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #13 & PR#15	6252.50	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INLET #12 & PR#14	6253.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution	Total Design Flow	

Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
POND	0.00	0.00	0.00	0.00	0.00	7.82	11.69	0.07	91.40	
MH#1 & PR#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.40	
MH#2 & PR#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.40	
INLET#1 & PR#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.40	
INLET #2 & PR#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.20	
INLET #3 & PR#5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.20	
INLET#8 & PR#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.20	
INLET#9 & PR#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.20	
INLET#4 & PR#6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.00	
INLET#5 & PR#7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.70	
INLET#6 & PR#8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.70	
INLET#7 & PR#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.10	
INLET#10 & PR#10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.70	
INLET #11 & PR#13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.70	
INLET #18 & PR#20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.40	
INLET #17 & PR#19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	
INLET #16 & PR#18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	
INLET #15 & PR#17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	
INLET #14 & PR#16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60	
INLET #13 & PR#15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.90	
INLET #12 & PR#14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
MH#1 & PR#1	29.50	6205.00	2.7	6205.80	0.013	0.03	0.00	CIRCULAR	48.00 in	48.00 in
MH#2 & PR#2	222.50	6211.11	2.2	6216.00	0.013	0.05	0.00	CIRCULAR	48.00 in	48.00 in
INLET#1 & PR#3	45.00	6216.81	2.2	6217.80	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #2 & PR#4	24.00	6225.49	1.7	6225.90	0.013	0.24	0.00	CIRCULAR	42.00 in	42.00 in
INLET #3 & PR#5	7.00	6227.00	2.1	6227.15	0.013	0.05	0.00	CIRCULAR	42.00 in	42.00 in
INLET#8 & PR#11	352.00	6227.73	1.0	6231.25	0.013	1.00	0.25	CIRCULAR	36.00 in	36.00 in
INLET#9 & PR#12	31.00	6231.54	1.0	6231.85	0.013	1.00	0.00	CIRCULAR	36.00 in	36.00 in
INLET#4 & PR#6	47.00	6228.15	5.0	6230.50	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#5 & PR#7	57.00	6230.62	1.9	6231.70	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#6 & PR#8	62.00	6231.82	1.9	6233.00	0.013	0.05	0.00	CIRCULAR	30.00 in	30.00 in
INLET#7 & PR#9	57.00	6233.62	1.9	6234.70	0.013	0.05	0.00	CIRCULAR	24.00 in	24.00 in
INLET#10 & PR#10	24.00	6234.99	1.7	6235.40	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in

INLET #11 & PR#13	32.00	6235.69	1.9	6236.30	0.013	0.11	0.00	CIRCULAR	24.00 in	24.00 in
INLET #18 & PR#20	98.00	6246.72	1.0	6247.70	0.012	1.00	0.00	CIRCULAR	15.00 in	15.00 in
INLET #17 & PR#19	74.00	6247.86	1.0	6248.60	0.012	0.05	0.00	CIRCULAR	15.00 in	15.00 in
INLET #16 & PR#18	74.00	6248.76	1.0	6249.50	0.012	0.05	0.00	CIRCULAR	12.00 in	12.00 in
INLET #15 & PR#17	98.00	6246.32	1.0	6247.30	0.012	1.00	0.00	CIRCULAR	18.00 in	18.00 in
INLET #14 & PR#16	74.00	6247.46	1.0	6248.20	0.012	0.05	0.00	CIRCULAR	15.00 in	15.00 in
INLET #13 & PR#15	74.00	6248.36	1.0	6249.10	0.012	0.05	0.00	CIRCULAR	15.00 in	15.00 in
INLET #12 & PR#14	74.00	6249.26	1.0	6250.00	0.012	0.05	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
MH#1 & PR#1	236.67	18.83	34.78	9.37	20.70	17.62	2.71	Pressurized	91.40	29.50	
MH#2 & PR#2	213.63	17.00	34.78	9.37	21.93	16.34	2.43	Supercritical	91.40	0.00	
INLET#1 & PR#3	149.63	15.55	35.55	10.52	23.71	16.32	2.26	Supercritical	91.40	0.00	
INLET #2 & PR#4	131.53	13.67	31.72	9.13	22.02	13.94	2.03	Supercritical	71.20	0.00	
INLET #3 & PR#5	146.19	15.19	31.72	9.13	20.68	15.09	2.29	Supercritical	71.20	0.00	
INLET#8 & PR#11	66.88	9.46	22.09	7.08	17.61	9.37	1.54	Supercritical Jump	32.20	299.96	
INLET#9 & PR#12	66.88	9.46	22.09	7.08	17.61	9.37	1.54	Supercritical	32.20	0.00	
INLET#4 & PR#6	91.96	18.73	25.28	8.84	13.64	17.96	3.39	Supercritical Jump	39.00	19.82	
INLET#5 & PR#7	56.69	11.55	23.36	7.97	16.35	11.96	2.01	Supercritical	32.70	0.00	
INLET#6 & PR#8	56.69	11.55	21.14	7.22	14.48	11.38	2.07	Supercritical	26.70	0.00	
INLET#7 & PR#9	31.27	9.95	19.74	7.63	14.44	10.68	1.87	Supercritical	21.10	0.00	
INLET#10 & PR#10	29.58	9.41	18.19	6.93	13.38	9.83	1.82	Supercritical	17.70	0.00	

INLET #11 & PR#13	31.27	9.95	18.19	6.93	12.93	10.26	1.94	Supercritical	17.70	0.00	
INLET #18 & PR#20	7.02	5.72	15.00	6.03	15.00	6.03	0.00	Pressurized	7.40	98.00	
INLET #17 & PR#19	7.02	5.72	11.70	5.65	10.40	6.39	1.27	Supercritical Jump	5.80	58.43	
INLET #16 & PR#18	3.87	4.93	9.46	5.12	8.72	5.56	1.18	Supercritical Jump	3.40	14.81	
INLET #15 & PR#17	11.41	6.46	10.32	4.77	8.34	6.24	1.50	Supercritical	5.00	0.00	
INLET #14 & PR#16	7.02	5.72	7.75	4.06	6.32	5.29	1.48	Supercritical	2.60	0.00	
INLET #13 & PR#15	7.02	5.72	6.58	3.67	5.33	4.86	1.50	Supercritical	1.90	0.00	
INLET #12 & PR#14	3.87	4.93	5.78	3.47	4.79	4.44	1.43	Supercritical	1.30	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
MH#1 & PR#1	91.40	CIRCULAR	48.00 in	48.00 in	36.00 in	36.00 in	48.00 in	48.00 in	12.57	
MH#2 & PR#2	91.40	CIRCULAR	48.00 in	48.00 in	36.00 in	36.00 in	48.00 in	48.00 in	12.57	
INLET#1 & PR#3	91.40	CIRCULAR	42.00 in	42.00 in	36.00 in	36.00 in	42.00 in	42.00 in	9.62	
INLET #2 & PR#4	71.20	CIRCULAR	42.00 in	42.00 in	36.00 in	36.00 in	42.00 in	42.00 in	9.62	
INLET #3 & PR#5	71.20	CIRCULAR	42.00 in	42.00 in	33.00 in	33.00 in	42.00 in	42.00 in	9.62	
INLET#8 & PR#11	32.20	CIRCULAR	36.00 in	36.00 in	30.00 in	30.00 in	36.00 in	36.00 in	7.07	
INLET#9 & PR#12	32.20	CIRCULAR	36.00 in	36.00 in	30.00 in	30.00 in	36.00 in	36.00 in	7.07	
INLET#4 & PR#6	39.00	CIRCULAR	30.00 in	30.00 in	24.00 in	24.00 in	30.00 in	30.00 in	4.91	
INLET#5 & PR#7	32.70	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	
INLET#6 & PR#8	26.70	CIRCULAR	30.00 in	30.00 in	24.00 in	24.00 in	30.00 in	30.00 in	4.91	
INLET#7 & PR#9	21.10	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	

INLET#10 & PR#10	17.70	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
INLET #11 & PR#13	17.70	CIRCULAR	24.00 in	24.00 in	21.00 in	21.00 in	24.00 in	24.00 in	3.14	
INLET #18 & PR#20	7.40	CIRCULAR	15.00 in	15.00 in	18.00 in	18.00 in	15.00 in	15.00 in	1.23	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
INLET #17 & PR#19	5.80	CIRCULAR	15.00 in	15.00 in	15.00 in	15.00 in	15.00 in	15.00 in	1.23	
INLET #16 & PR#18	3.40	CIRCULAR	12.00 in	12.00 in	12.00 in	12.00 in	12.00 in	12.00 in	0.79	
INLET #15 & PR#17	5.00	CIRCULAR	18.00 in	18.00 in	15.00 in	15.00 in	18.00 in	18.00 in	1.77	
INLET #14 & PR#16	2.60	CIRCULAR	15.00 in	15.00 in	12.00 in	12.00 in	15.00 in	15.00 in	1.23	
INLET #13 & PR#15	1.90	CIRCULAR	15.00 in	15.00 in	12.00 in	12.00 in	15.00 in	15.00 in	1.23	
INLET #12 & PR#14	1.30	CIRCULAR	12.00 in	12.00 in	9.00 in	9.00 in	12.00 in	12.00 in	0.79	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6210.54

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
MH#1 & PR#1	6205.00	6205.80	0.00	0.00	6210.54	6210.66	6211.36	0.12	6211.48
MH#2 & PR#2	6211.11	6216.00	0.04	0.00	6212.93	6218.90	6217.08	3.18	6220.26
INLET#1 & PR#3	6216.81	6217.80	0.34	0.00	6219.23	6221.52	6222.92	0.00	6222.92
INLET #2 & PR#4	6225.49	6225.90	0.20	0.00	6227.33	6229.49	6230.34	0.00	6230.34

INLET #3 & PR#5	6227.00	6227.15	0.04	0.00	6229.54	6231.41	6232.26	0.00	6232.26
INLET#8 & PR#11	6227.73	6231.25	0.32	0.77	6233.03	6233.59	6233.36	0.70	6234.05
INLET#9 & PR#12	6231.54	6231.85	0.32	0.00	6233.93	6233.93	6234.37	0.15	6234.52
INLET#4 & PR#6	6228.15	6230.50	0.05	0.00	6231.46	6232.61	6232.44	1.38	6233.82
INLET#5 & PR#7	6230.62	6231.70	0.03	0.00	6232.64	6233.65	6234.20	0.43	6234.63
INLET#6 & PR#8	6231.82	6233.00	0.02	0.00	6233.67	6234.76	6235.04	0.53	6235.57
INLET#7 & PR#9	6233.62	6234.70	0.04	0.00	6234.82	6236.34	6236.59	0.66	6237.25
INLET#10 & PR#10	6234.99	6235.40	0.05	0.00	6236.40	6236.92	6237.61	0.05	6237.66
INLET #11 & PR#13	6235.69	6236.30	0.05	0.00	6236.97	6237.82	6238.40	0.16	6238.56
INLET #18 & PR#20	6246.72	6247.70	0.56	0.00	6247.97	6249.06	6248.53	1.09	6249.62
INLET #17 & PR#19	6247.86	6248.60	0.02	0.00	6249.30	6249.57	6249.64	0.43	6250.07
INLET #16 & PR#18	6248.76	6249.50	0.01	0.00	6249.79	6250.29	6250.08	0.61	6250.70
INLET #15 & PR#17	6246.32	6247.30	0.12	0.00	6247.01	6248.16	6247.62	0.89	6248.51
INLET #14 & PR#16	6247.46	6248.20	0.00	0.00	6248.41	6248.85	6248.52	0.59	6249.10
INLET #13 & PR#15	6248.36	6249.10	0.00	0.00	6248.85	6249.65	6249.17	0.69	6249.86
INLET #12 & PR#14	6249.26	6250.00	0.00	0.00	6249.66	6250.48	6249.97	0.70	6250.67

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 1.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
MH#1 & PR#1	29.50	5.00	6.00	7.83	8.99	6.91	1.58	25.40	15.12	9.78	136.60	

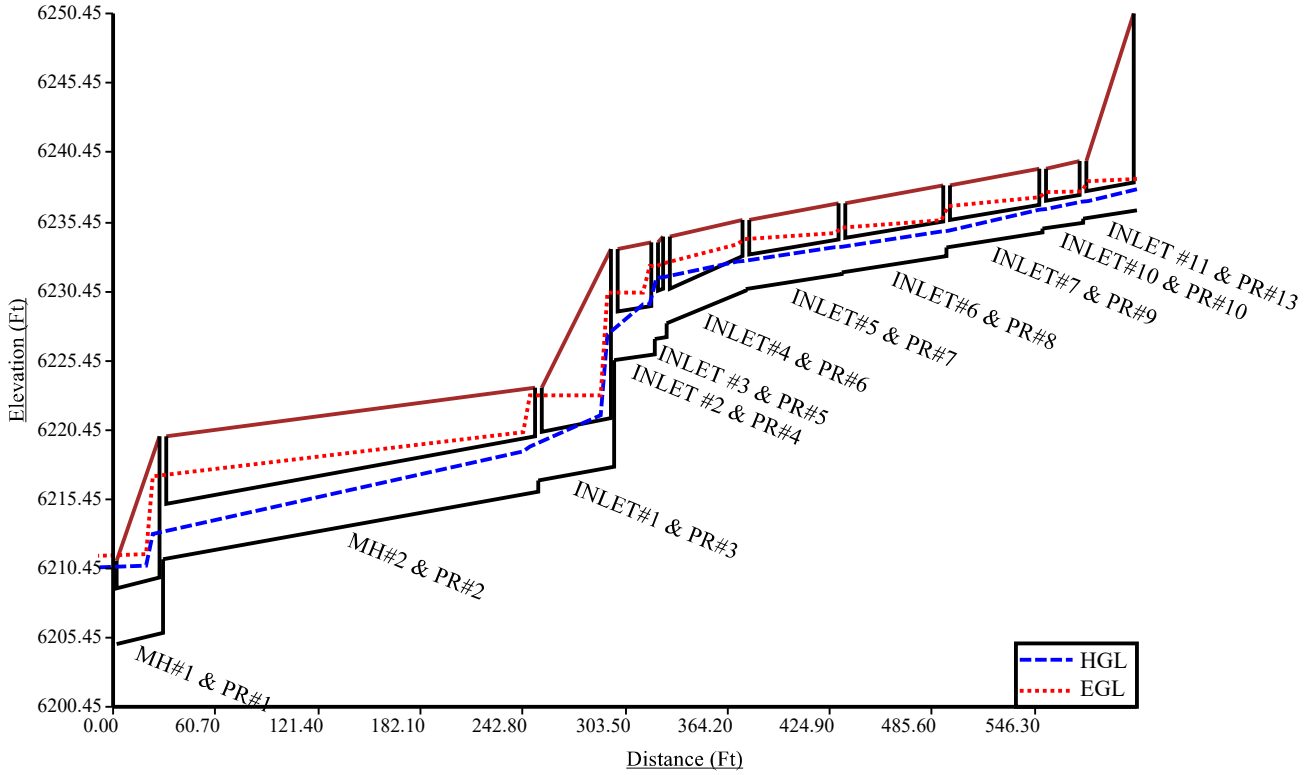
MH#2 & PR#2	222.50	5.00	6.00	7.83	14.79	9.81	4.48	12.00	8.42	3.08	656.08	
INLET#1 & PR#3	45.00	4.50	6.00	7.25	10.88	7.57	2.82	28.90	16.58	11.83	246.24	
INLET #2 & PR#4	24.00	4.50	6.00	7.25	13.52	8.88	4.13	13.70	8.98	4.23	66.53	
INLET #3 & PR#5	7.00	4.50	6.00	7.25	11.49	7.87	3.12	12.00	8.13	3.38	16.35	
INLET#8 & PR#11	352.00	4.00	6.00	6.67	11.34	7.50	3.34	10.40	7.03	2.87	690.02	
INLET#9 & PR#12	31.00	4.00	6.00	6.67	9.82	6.74	2.58	8.00	5.83	1.67	49.82	
INLET#4 & PR#6	47.00	3.50	6.00	6.08	11.00	7.04	3.46	8.70	5.89	2.31	75.23	
INLET#5 & PR#7	57.00	3.50	6.00	6.08	8.47	5.77	2.19	8.70	5.89	2.31	78.22	
INLET#6 & PR#8	62.00	3.50	6.00	6.08	8.46	5.77	2.19	8.70	5.89	2.31	85.03	
INLET#7 & PR#9	57.00	3.00	4.00	5.50	7.97	5.07	2.23	8.20	5.18	2.35	63.03	
INLET#10 & PR#10	24.00	3.00	4.00	5.50	7.62	4.89	2.06	7.90	5.03	2.20	25.40	
INLET #11 & PR#13	32.00	3.00	4.00	5.50	7.32	4.74	1.91	27.40	14.78	11.95	135.18	
INLET #18 & PR#20	98.00	2.25	4.00	4.63	7.31	4.30	2.34	7.35	4.32	2.36	79.01	
INLET #17 & PR#19	74.00	2.25	4.00	4.63	7.03	4.16	2.20	6.55	3.92	1.96	54.47	
INLET #16 & PR#18	74.00	2.00	4.00	4.33	6.48	3.74	2.07	6.00	3.50	1.83	45.52	
INLET #15 & PR#17	98.00	2.50	4.00	4.92	7.86	4.72	2.47	7.90	4.74	2.49	92.41	
INLET #14 & PR#16	74.00	2.25	4.00	4.63	7.83	4.56	2.60	7.35	4.32	2.36	62.35	
INLET #13 & PR#15	74.00	2.25	4.00	4.63	7.03	4.16	2.20	6.55	3.92	1.96	54.47	
INLET #12 & PR#14	74.00	2.00	4.00	4.33	6.48	3.74	2.07	6.00	3.50	1.83	45.52	

Total earth volume for sewer trenches = 2757 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

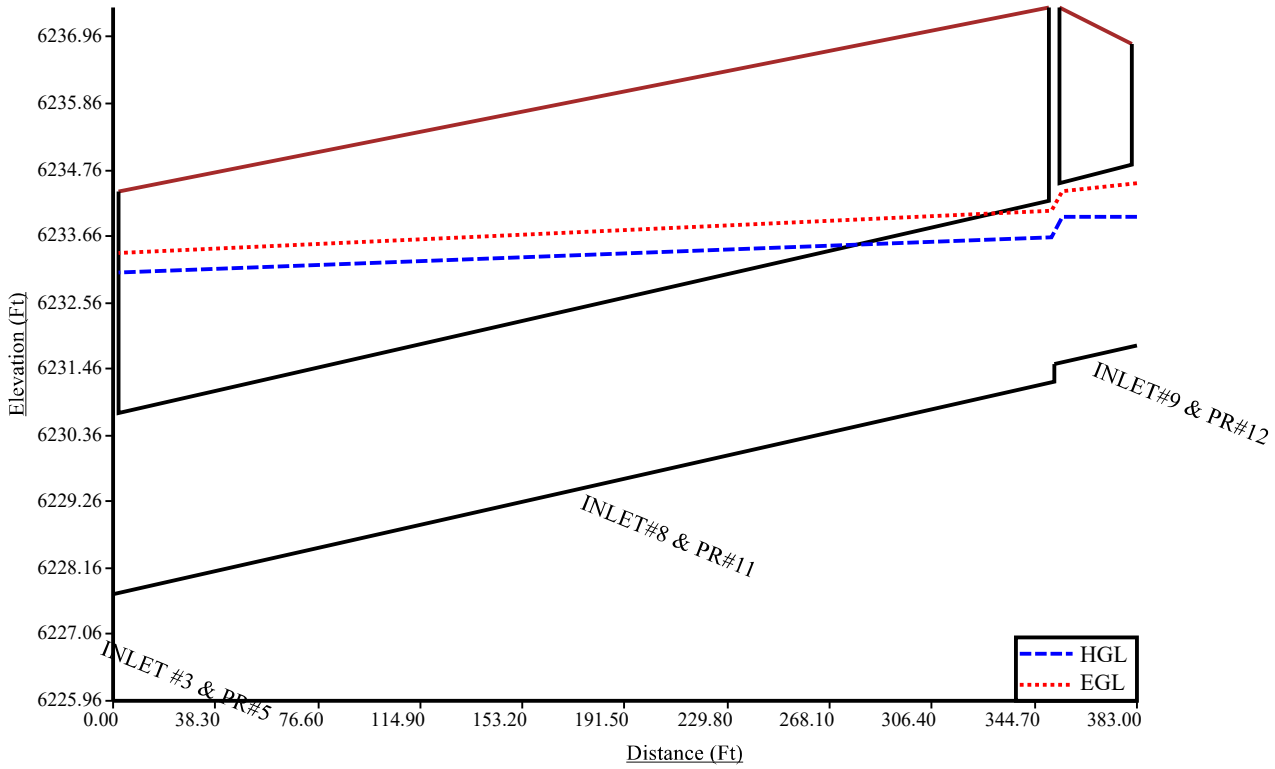
100-YEAR

PR 1 - PR 13



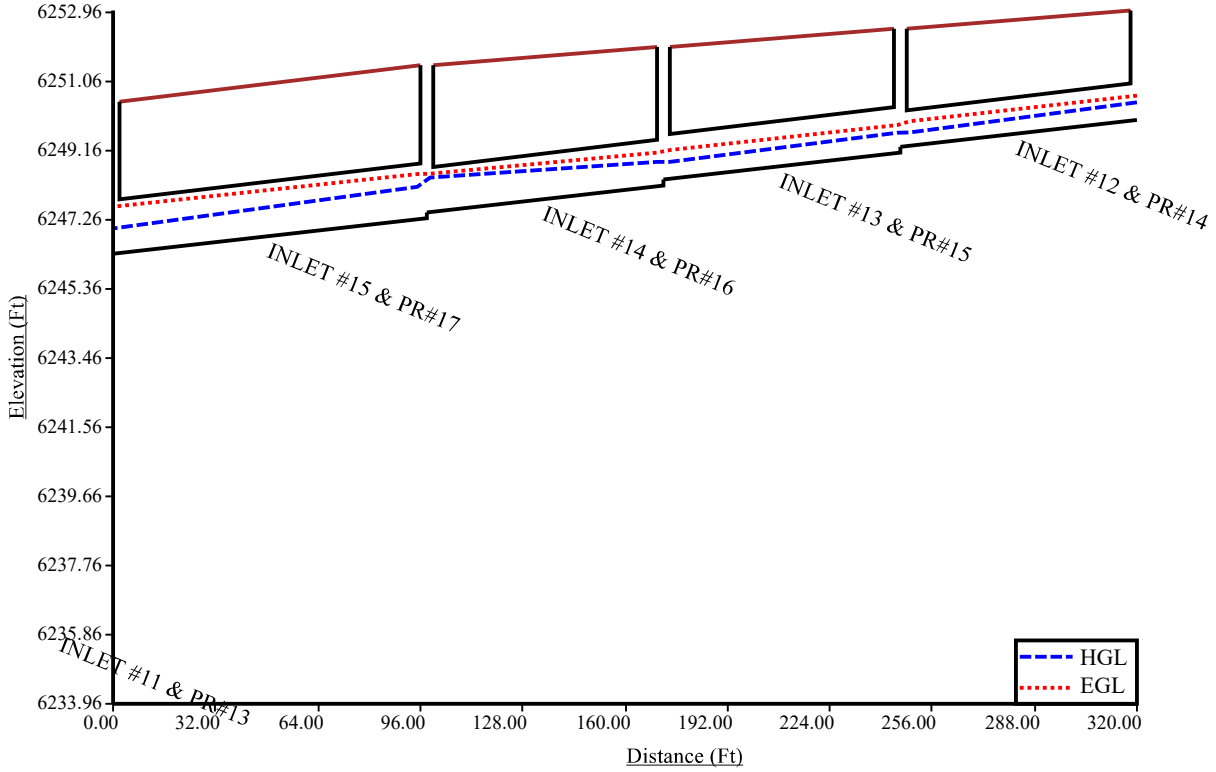
100-YEAR

PR 11-12



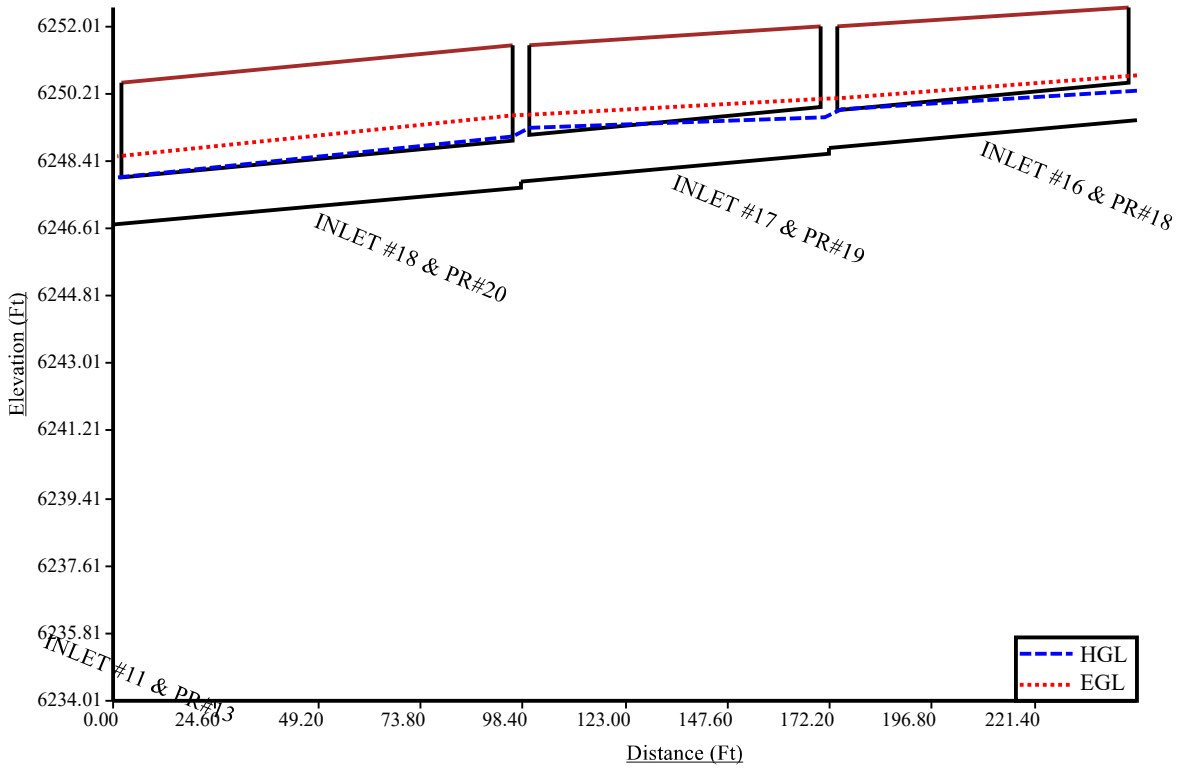
100-YEAR

PR 14-17



100-YEAR

PR 18-20



POND OUTLET

Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 11/7/2024 9:53:20 AM

UDSewer Results Summary

Project Title: 6001 E Platte Storage - 5 Year
Project Description: Pond Outlet System

5-YEAR

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in): 1.50
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 300
Maximum Urban Overland Len. (ft): 100
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 6.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 3.0

Backwater Calculations:

Tailwater Elevation (ft): 6202.50

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
STILLING BASIN	6201.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

POND OUTLET & PR#90	6209.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
STILLING BASIN	0.00	0.00	0.00	0.00	0.00	0.11	6.22	1.63	0.70	Surface Water Present (Upstream)
POND OUTLET & PR#90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	Surface Water Present (Downstream)

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	**Sewer Length (ft)**	**Downstream Invert (ft)**	**Slope (%)**	**Upstream Invert (ft)**	**Mannings n**	**Bend Loss**	**Lateral Loss**	**Cross Section**	**Rise (ft or in)**	**Span (ft or in)**
POND OUTLET & PR#90	38.63	6201.00	1.3	6201.50	0.012	0.03	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
POND OUTLET & PR#90	13.01	7.36	3.73	2.65	2.84	3.92	1.71	Supercritical Jump	0.70	0.17	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
POND OUTLET & PR#90	0.70	CIRCULAR	18.00 in	18.00 in	9.00 in	9.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6202.50

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
POND OUTLET & PR#90	6201.00	6201.50	0.00	0.00	6202.50	6202.50	6202.50	0.00	6202.50

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 1.00 ft

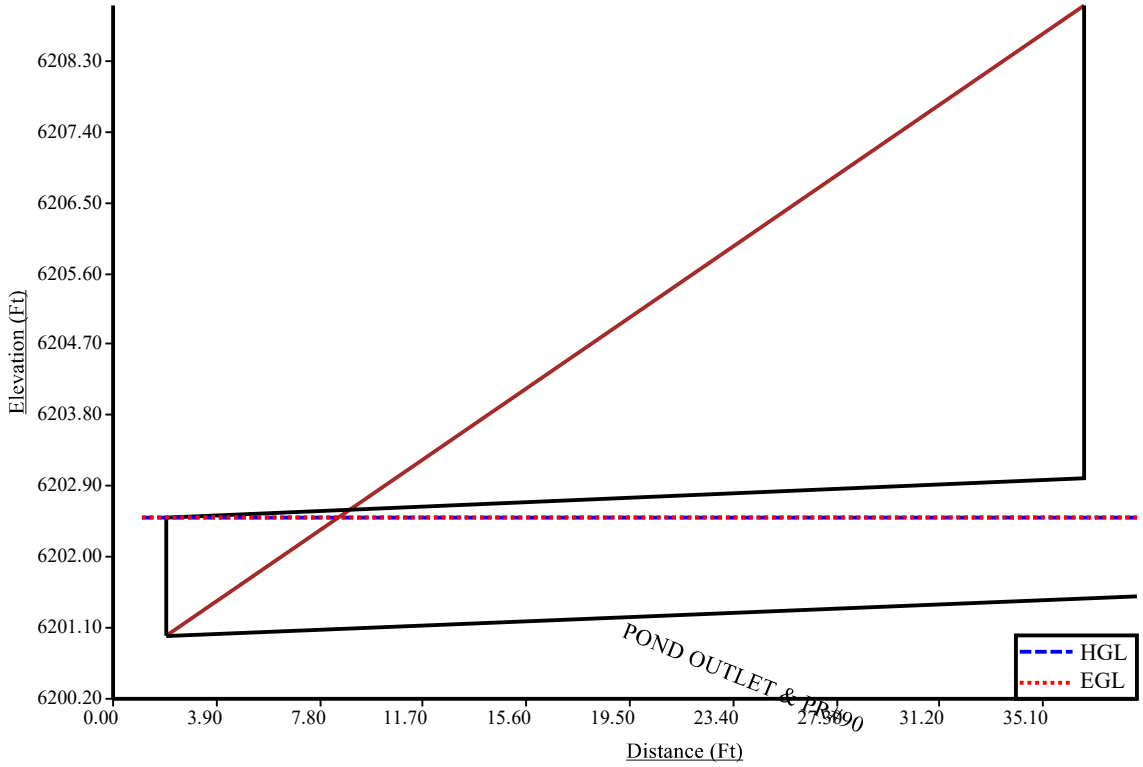
					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
POND OUTLET & PR#90	38.63	2.50	4.00	4.92	0.00	0.54	0.00	14.50	8.04	5.79	46.62	Sewer Too Shallow

Total earth volume for sewer trenches = 47 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

5-YEAR

Pond Outlet



Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 11/7/2024 9:57:43 AM

UDSewer Results Summary

Project Title: 6001 E Platte Storage - 100 Year
Project Description: Pond Outlet System

100-YEAR

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 2.52
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 300
Maximum Urban Overland Len. (ft): 100
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 6.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 3.0

Backwater Calculations:

Tailwater Elevation (ft): 6202.50

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
STILLING BASIN	6201.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

POND OUTLET & PR#90	6209.00	21.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
STILLING BASIN	0.00	0.00	0.00	0.00	0.00	1.85	11.71	0.05	21.60	Surface Water Present (Upstream)
POND OUTLET & PR#90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.60	Surface Water Present (Downstream)

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	**Sewer Length (ft)**	**Downstream Invert (ft)**	**Slope (%)**	**Upstream Invert (ft)**	**Mannings n**	**Bend Loss**	**Lateral Loss**	**Cross Section**	**Rise (ft or in)**	**Span (ft or in)**
POND OUTLET & PR#90	38.63	6201.00	1.3	6201.50	0.012	0.03	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
POND OUTLET & PR#90	13.01	7.36	18.00	12.22	18.00	12.22	0.00	Pressurized	21.60	38.63	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**

POND OUTLET & PR#90	21.60	CIRCULAR	18.00 in	18.00 in	24.00 in	24.00 in	18.00 in	18.00 in	1.77	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6202.50

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
POND OUTLET & PR#90	6201.00	6201.50	0.00	0.00	6202.50	6203.88	6204.82	1.38	6206.20

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 1.00 ft

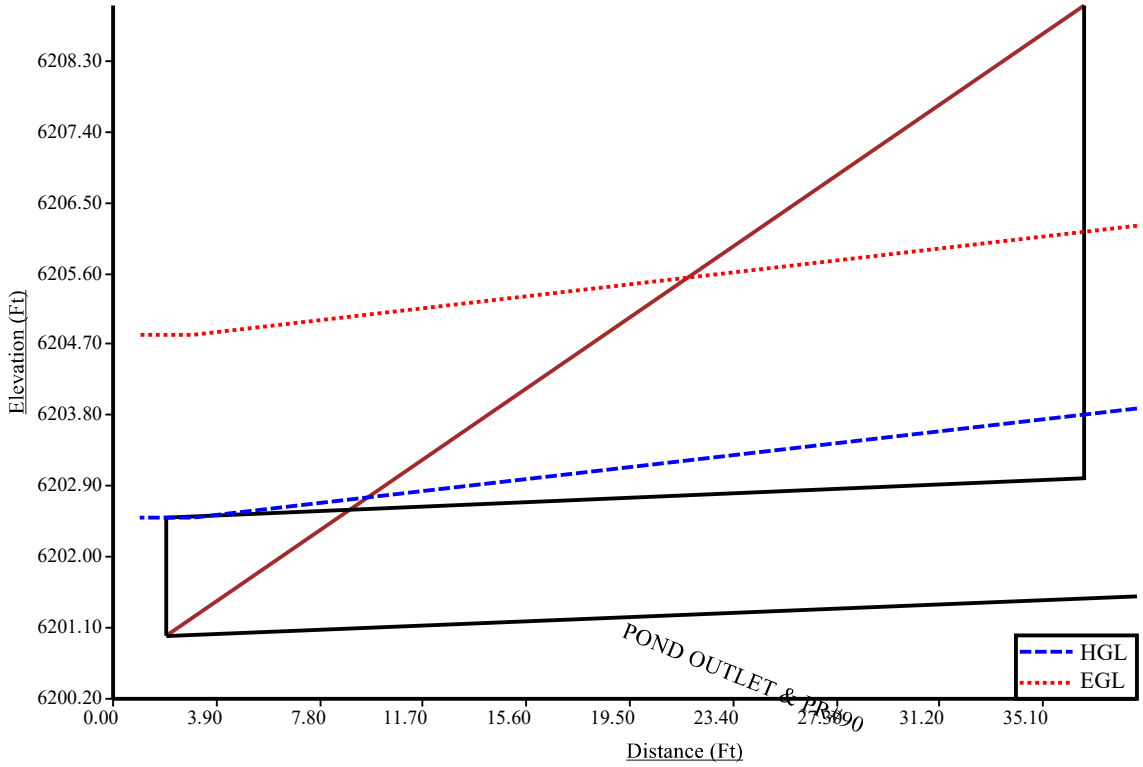
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
POND OUTLET & PR#90	38.63	2.50	4.00	4.92	0.00	0.54	0.00	14.50	8.04	5.79	46.62	Sewer Too Shallow

Total earth volume for sewer trenches = 47 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.

100-YEAR

Pond Outlet



DETENTION CALCULATIONS

PLATTE SELF STORAGE
SURFACE ROUTING SUMMARY

Water Quality Treatment Summary Table

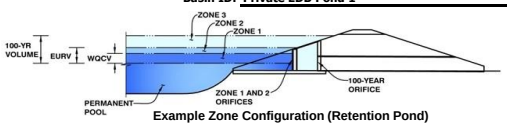
Basin ID	*Total Area*	*Total Proposed Disturbed Area*	*Area Trib to Pond 1*	*Disturbed Area Treated via Runoff Reduction*	*Disturbed Area Excluded from WQ per ECM App I.7.1.C.1*	*Disturbed Area Excluded from WQ per ECM App I.7.1.B.#*	*Applicable WQ Exclusions (App I.7.1.B.#)*
	(ac)	*(ac)*	*(ac)*	*(ac)*	*(ac)*	*(ac)*	
OS-ZA	**0.44**	-	0.44	-	-	-	-
OS-ZB	**0.22**	-	0.22	-	-	-	-
OS-ZC	**0.23**	-	0.23	-	-	-	-
OS-ZD	**0.86**	-	0.86	-	-	-	-
OS-ZE	**1.94**	-	1.94	-	-	-	-
OS-ZF	**0.56**	-	0.56	-	-	-	-
OS-ZG	**0.85**	-	0.85	-	-	-	-
OS-ZH	**1.24**	-	1.24	-	-	-	-
OS-Y	**8.15**	-	8.15	-	-	-	-
OS-X	**1.20**	-	-	-	-	-	-
OS-W	**0.45**	0.45	-	-	0.45	-	-
PR-1	**0.07**	0.07	-	-	-	0.07	I.7.1.B.7
PR-2	**0.13**	0.13	-	-	-	0.13	I.7.1.B.7
PR-3A	**1.10**	1.10	1.10	-	-	-	-
PR-3B	**1.11**	1.11	1.11	-	-	-	-
PR-3C	**0.96**	0.96	0.96	-	-	-	-
PR-3D	**0.97**	0.97	0.97	-	-	-	-
PR-3E	**1.01**	1.01	1.01	-	-	-	-
PR-4	**3.66**	3.66	3.66	-	-	-	-
PR-5	**0.56**	0.56	-	-	0.55	0.01	I.7.1.B.7
PR-6	**6.64**	6.64	6.64	-	-	-	-
PR-7	**0.34**	0.34	-	-	-	0.34	I.7.1.B.7
PR-8	**0.30**	0.30	-	-	-	0.30	I.7.1.B.7
PR-9	**0.59**	0.59	-	-	-	0.59	I.7.1.B.7
PR-10A	**0.06**	0.06	0.06	-	-	-	-
PR-10B	**0.03**	0.03	0.03	-	-	-	-
PR-10C	**0.04**	0.04	0.04	-	-	-	-
PR-10D	**0.04**	0.04	0.04	-	-	-	-
PR-10E	**0.09**	0.09	0.09	-	-	-	-
PR-10F	**0.04**	0.04	0.04	-	-	-	-
PR-10G	**0.05**	0.05	0.05	-	-	-	-
PR-10H	**0.06**	0.06	0.06	-	-	-	-
		TOTALS	30.33		1.00	1.44	
		BASINS TRIB TO POND IN FUTURE PR-5, PR-9 & OS-X	2.35			**Calc:**	DLF
						Date:	11/8/2024
		AREA TRIB FOR POND DESIGN	**32.68**			**Checked:**	JS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Platte Self Storage

Basin ID: Private EDB Pond 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	32.68	acres
Watershed Length =	1,610	ft
Watershed Length to Centroid =	730	ft
Watershed Slope =	0.035	ft/ft
Watershed Imperviousness =	38.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.475	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.326	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.986	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.333	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.608	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.161	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.693	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.393	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3 in.) =	4.538	acre-feet	3.00	inches
Approximate 2-yr Detention Volume =	0.842	acre-feet		
Approximate 5-yr Detention Volume =	1.117	acre-feet		
Approximate 10-yr Detention Volume =	1.381	acre-feet		
Approximate 25-yr Detention Volume =	1.719	acre-feet		
Approximate 50-yr Detention Volume =	1.951	acre-feet		
Approximate 100-yr Detention Volume =	2.283	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.475	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.851	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.957	acre-feet
Total Detention Basin Volume =	2.283	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

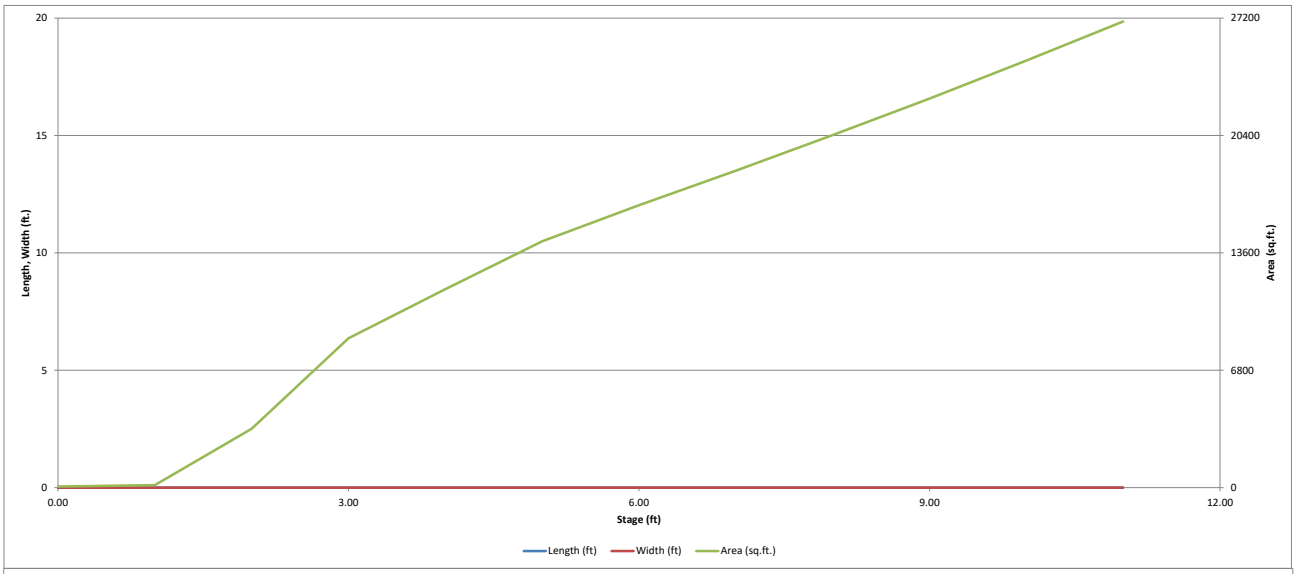
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

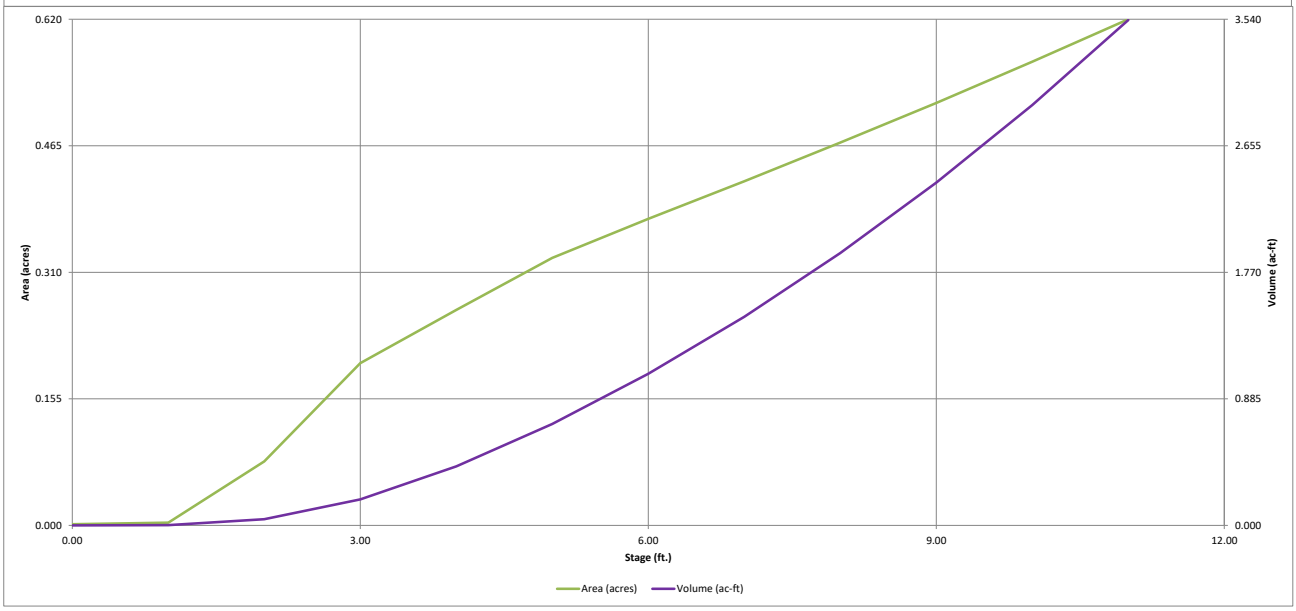
Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	63	0.001		
6203	--	1.00	--	--	--	148	0.003	105	0.002
6204	--	2.00	--	--	--	3,413	0.078	1,886	0.043
6205	--	3.00	--	--	--	8,656	0.199	7,920	0.182
6206	--	4.00	--	--	--	11,501	0.264	17,998	0.413
6207	--	5.00	--	--	--	14,272	0.328	30,884	0.709
6208	--	6.00	--	--	--	16,360	0.376	46,200	1.061
6209	--	7.00	--	--	--	18,366	0.422	63,563	1.459
6210	--	8.00	--	--	--	20,424	0.469	82,958	1.904
6211	--	9.00	--	--	--	22,541	0.517	104,440	2.398
6212	--	10.00	--	--	--	24,740	0.568	128,081	2.940
6213	--	11.00	--	--	--	27,005	0.620	153,953	3.534

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



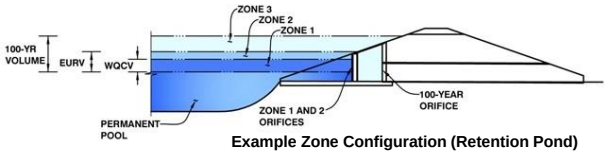


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **Platte Self Storage**

Basin ID: **Private EDB Pond 1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.23	0.475	Orifice Plate
Zone 2 (EURV)	6.68	0.851	Orifice Plate
Zone 3 (100-year)	8.78	0.957	Weir&Pipe (Restrict)
Total (all zones)		2.283	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	6.71	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.70	3.40					
Orifice Area (sq. inches)	1.50	1.10	2.75					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.00	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.16	N/A	
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	12.66	N/A	ft^2
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	6.33	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A	feet
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.69 feet
Spillway Crest Length =	23.00	feet	Stage at Top of Freeboard =	10.69 feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.60 acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.34 acre-ft

Calculated Parameters for Spillway

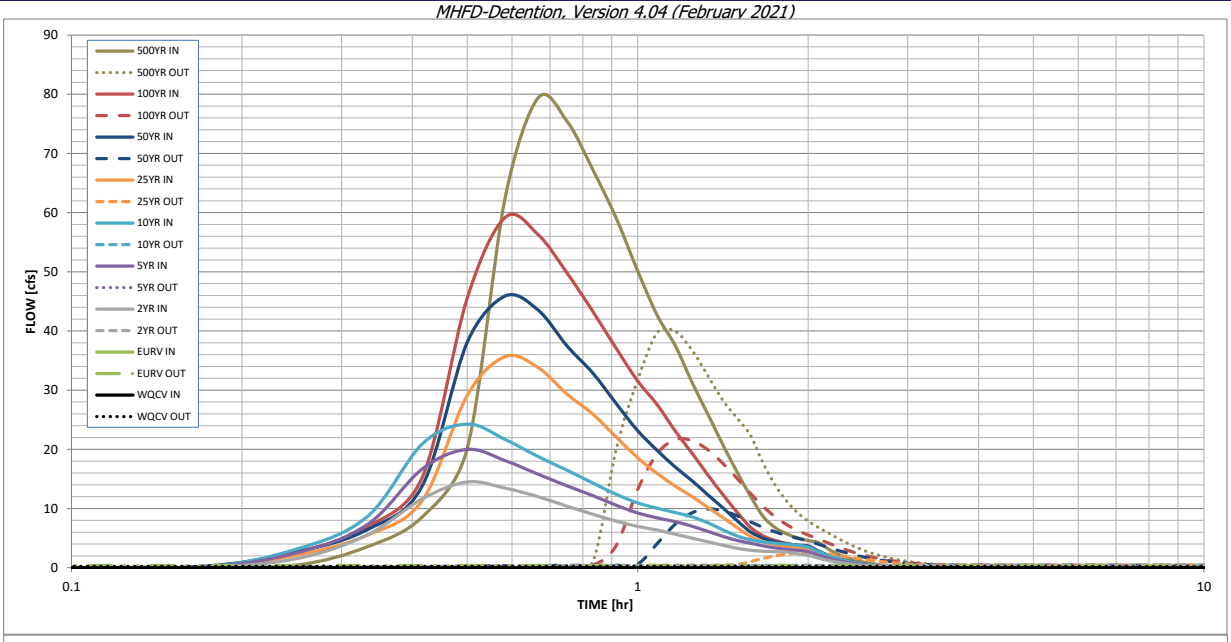
Routed Hydrograph Results

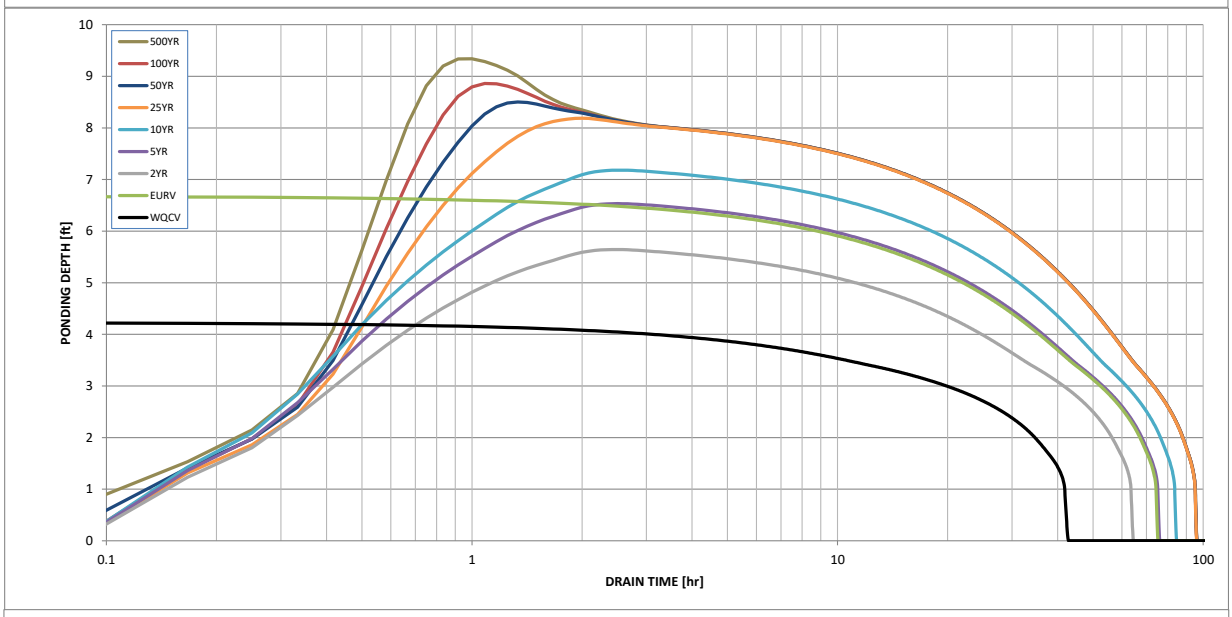
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

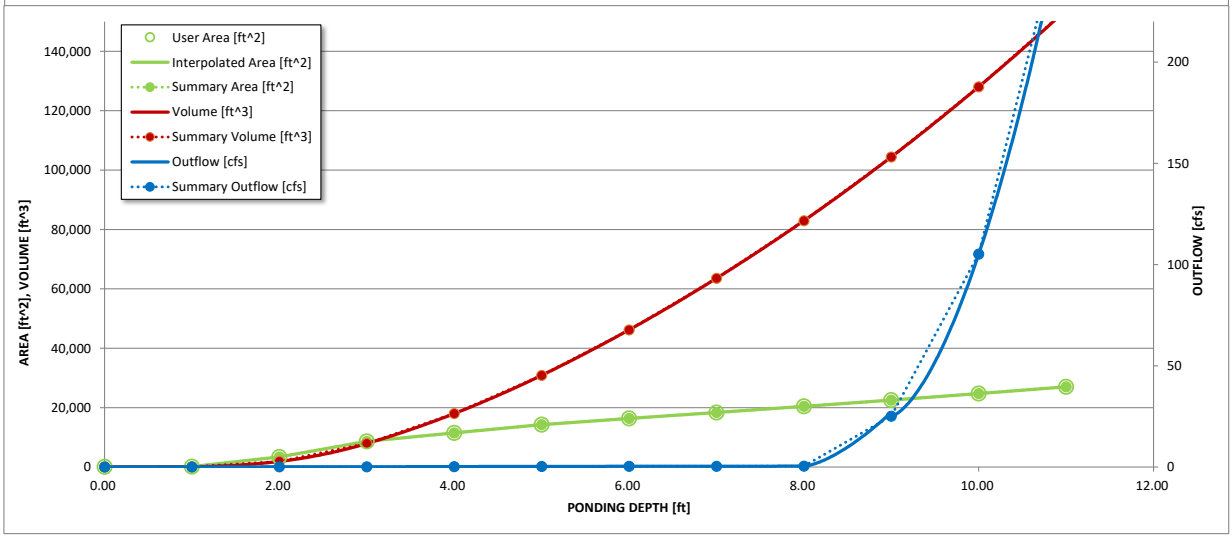
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	0.475	1.326	0.986	1.333	1.608	2.161	2.693	3.393	4.538
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.986	1.333	1.608	2.161	2.693	3.393	4.538
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	0.8	7.3	14.4	23.6	37.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.02	0.22	0.44	0.72	1.15
Peak Inflow Q (cfs) =	N/A	N/A	14.5	20.0	24.3	35.7	45.9	59.2	79.4
Peak Outflow Q (cfs) =	0.2	0.4	0.3	0.4	0.4	2.6	9.9	21.6	39.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.5	0.4	0.7	0.9	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.7	1.7	2.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	58	69	76	85	84	81	78
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	62	73	81	91	90	89	88
Maximum Ponding Depth (ft) =	4.23	6.68	5.64	6.53	7.18	8.19	8.50	8.86	9.34
Area at Maximum Ponding Depth (acres) =	0.28	0.41	0.36	0.40	0.43	0.48	0.49	0.51	0.53
Maximum Volume Stored (acre-ft) =	0.476	1.327	0.929	1.266	1.536	1.990	2.145	2.321	2.571

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.02	0.46
	0:15:00	0.00	0.00	1.56	2.53	3.16	2.14	2.69	2.64	3.55
	0:20:00	0.00	0.00	5.57	7.31	8.67	5.51	6.45	6.93	8.60
	0:25:00	0.00	0.00	11.66	16.72	20.93	11.39	13.87	15.32	20.12
	0:30:00	0.00	0.00	14.49	19.99	24.26	29.11	38.08	45.54	62.47
	0:35:00	0.00	0.00	13.45	18.09	21.67	35.66	45.91	59.18	79.36
	0:40:00	0.00	0.00	12.00	15.81	18.79	33.83	43.55	56.30	75.46
	0:45:00	0.00	0.00	10.40	13.83	16.48	29.34	37.49	49.82	67.25
	0:50:00	0.00	0.00	9.03	12.18	14.31	25.95	32.89	43.31	59.03
	0:55:00	0.00	0.00	7.87	10.55	12.40	22.06	27.72	37.04	50.16
	1:00:00	0.00	0.00	6.97	9.25	10.95	18.57	23.16	31.56	42.59
	1:05:00	0.00	0.00	6.37	8.42	10.04	15.92	19.79	27.51	37.43
	1:10:00	0.00	0.00	5.65	7.77	9.30	13.75	16.97	23.02	31.14
	1:15:00	0.00	0.00	4.98	6.98	8.57	11.98	14.63	19.24	25.77
	1:20:00	0.00	0.00	4.36	6.10	7.55	10.12	12.24	15.55	20.63
	1:25:00	0.00	0.00	3.78	5.28	6.36	8.43	10.06	12.27	16.10
	1:30:00	0.00	0.00	3.29	4.60	5.35	6.74	7.90	9.33	12.04
	1:35:00	0.00	0.00	2.95	4.13	4.71	5.28	6.04	6.81	8.64
	1:40:00	0.00	0.00	2.78	3.68	4.37	4.38	4.97	5.36	6.77
	1:45:00	0.00	0.00	2.70	3.35	4.14	3.88	4.39	4.60	5.72
	1:50:00	0.00	0.00	2.65	3.12	3.98	3.59	4.05	4.11	5.04
	1:55:00	0.00	0.00	2.36	2.94	3.79	3.39	3.82	3.78	4.59
	2:00:00	0.00	0.00	2.10	2.73	3.48	3.26	3.67	3.55	4.27
	2:05:00	0.00	0.00	1.64	2.14	2.71	2.54	2.85	2.70	3.22
	2:10:00	0.00	0.00	1.25	1.62	2.05	1.91	2.13	1.99	2.35
	2:15:00	0.00	0.00	0.95	1.23	1.55	1.44	1.60	1.49	1.76
	2:20:00	0.00	0.00	0.72	0.93	1.16	1.08	1.20	1.12	1.32
	2:25:00	0.00	0.00	0.54	0.69	0.86	0.80	0.88	0.83	0.98
	2:30:00	0.00	0.00	0.40	0.50	0.63	0.58	0.64	0.61	0.71
	2:35:00	0.00	0.00	0.29	0.36	0.46	0.42	0.47	0.44	0.52
	2:40:00	0.00	0.00	0.20	0.26	0.33	0.31	0.34	0.32	0.37
	2:45:00	0.00	0.00	0.13	0.17	0.22	0.21	0.23	0.21	0.24
	2:50:00	0.00	0.00	0.08	0.11	0.13	0.13	0.14	0.13	0.15
	2:55:00	0.00	0.00	0.04	0.06	0.07	0.07	0.07	0.06	0.07
	3:00:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.02	0.02
	3:05:00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	63	0.001	0	0.000	0.00
	1.00	148	0.003	105	0.002	0.05
	2.00	3,413	0.078	1,886	0.043	0.09
	3.00	8,656	0.199	7,920	0.182	0.13
	4.00	11,501	0.264	17,998	0.413	0.23
	5.00	14,272	0.328	30,884	0.709	0.30
	6.00	16,360	0.376	46,200	1.061	0.35
	7.00	18,366	0.422	63,563	1.459	0.39
	8.00	20,424	0.469	82,958	1.904	0.43
	9.00	22,541	0.517	104,440	2.398	25.17
	10.00	24,740	0.568	128,081	2.940	105.17
	11.00	27,005	0.620	153,953	3.534	277.37

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected Worksheet Protected

Stormwater Facility Name: Platte Self Storage EDB

Facility Location & Jurisdiction: 6001 E Platte Ave, El Paso County

User Input: Watershed Characteristics

Watershed Slope =	0.035	ft/ft
Watershed Length =	1610	ft
Watershed Area =	32.68	acres
Watershed Imperviousness =	38.0%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent

Location for 1-hr Rainfall Depths (use dropdown): User Input

WQCV Treatment Method = Extended Detention

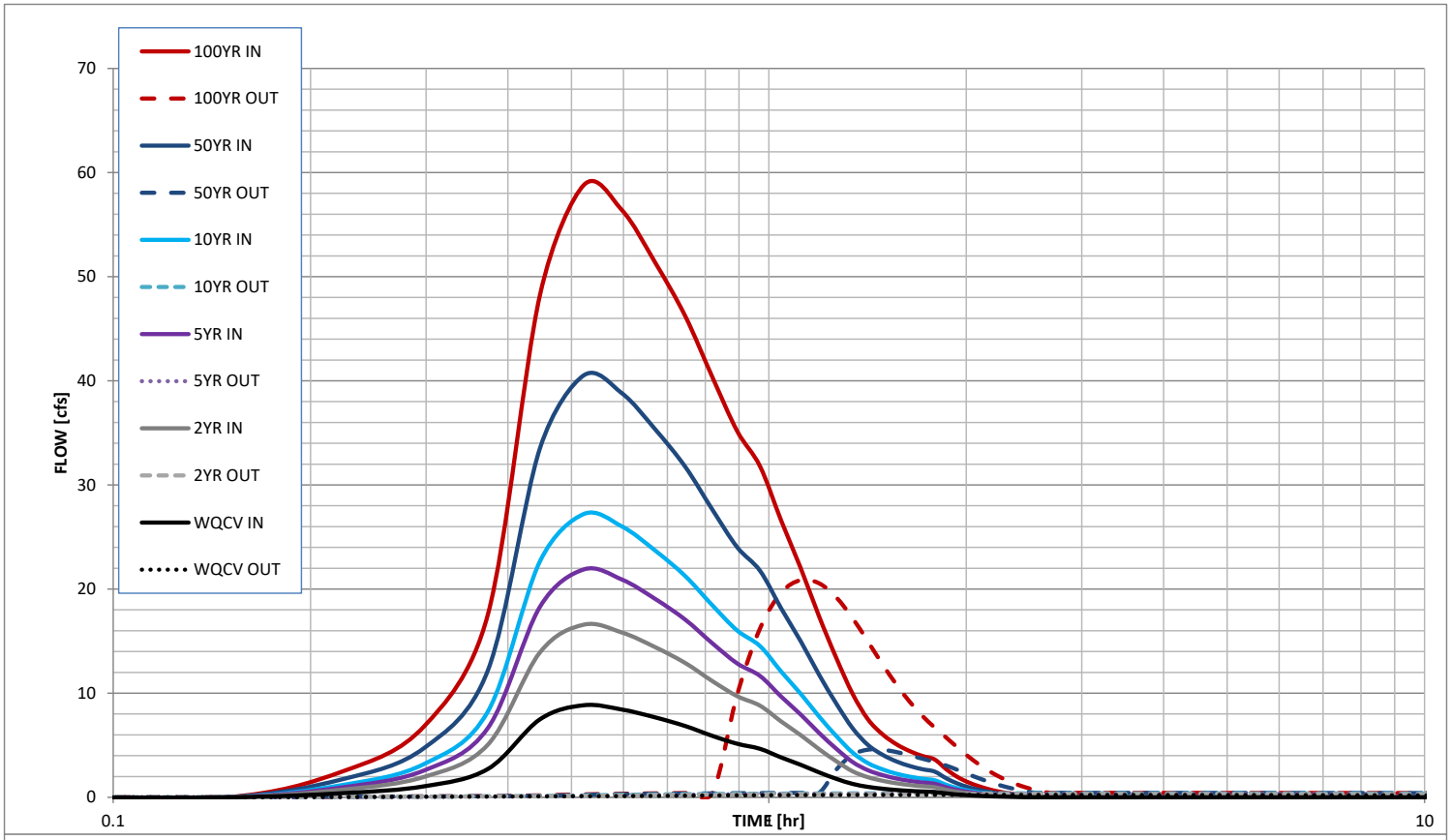
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	63	0.00	0.00
1.00	148	1.00	0.05
2.00	3,413	2.00	0.09
3.00	8,656	3.00	0.13
4.00	11,501	4.00	0.23
5.00	14,272	5.00	0.30
6.00	16,360	6.00	0.35
7.00	18,366	7.00	0.39
8.00	20,424	8.00	0.43
9.00	22,541	9.00	25.17
10.00	24,740	10.00	105.17
11.00	27,005	11.00	277.37

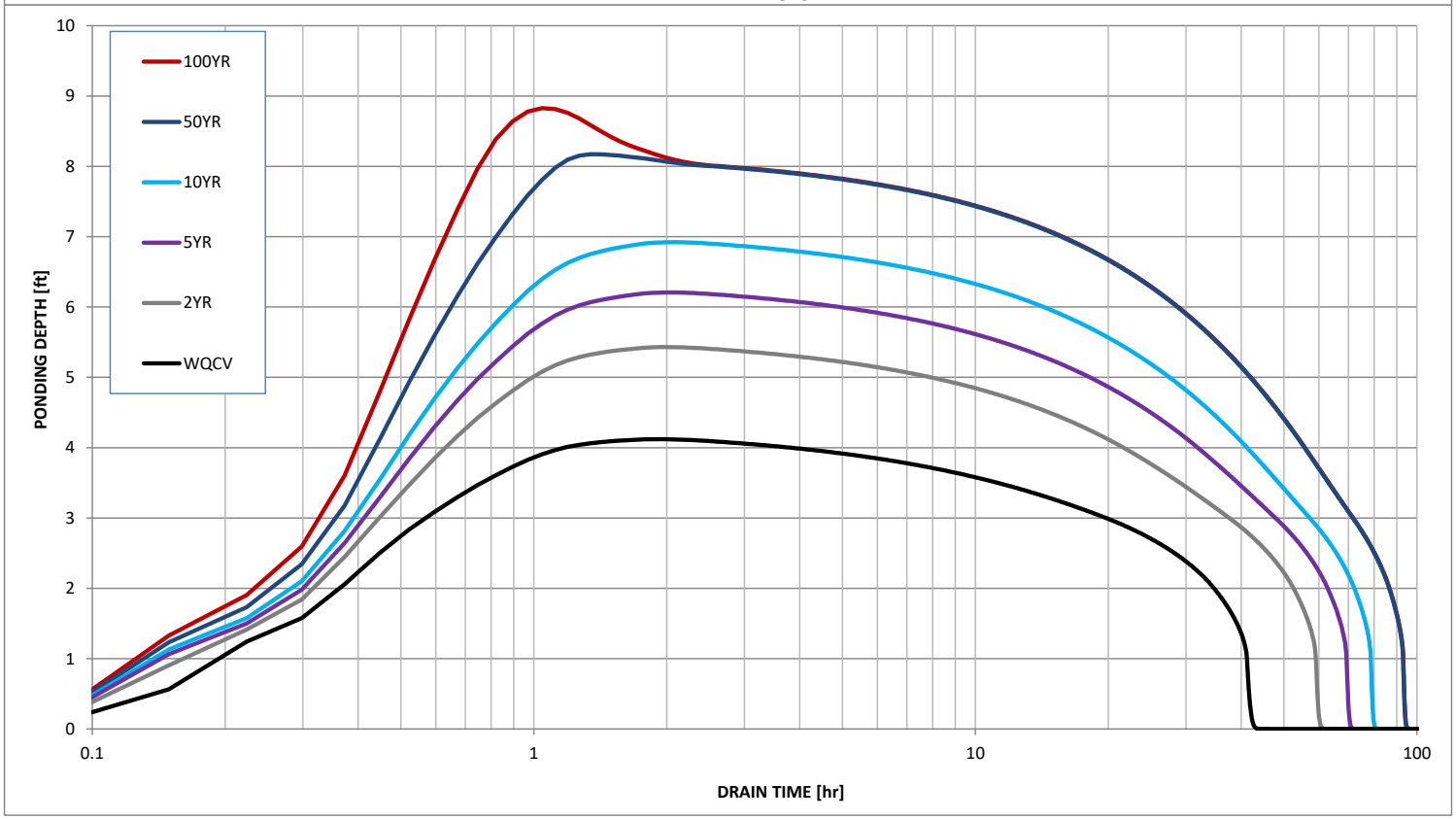
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.00	2.52	in
Calculated Runoff Volume =	0.475	0.897	1.188	1.480	2.217	3.233	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.475	0.896	1.187	1.480	2.216	3.232	acre-ft
Time to Drain 97% of Inflow Volume =	39.0	54.8	**63.8**	71.9	83.6	80.2	hours
Time to Drain 99% of Inflow Volume =	40.8	57.8	67.5	76.3	89.5	**88.2**	hours
Maximum Ponding Depth =	4.12	5.43	6.21	6.92	8.17	8.83	ft
Maximum Ponded Area =	0.27	0.35	0.38	0.42	0.48	**0.51**	acres
Maximum Volume Stored =	0.444	0.851	1.136	1.422	1.980	2.304	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





PLATTE SELF STORAGE

PROPOSED FORBAY DESIGN VOLUME

ELEV (FT + 6000)	*AREA (SF)*	*AREA AVG. (SF)*	*DELTA ELEV. (FT)*	*VOLUME (CF)*	*VOLUME TOTAL (CF)*
204.00	425				
		425	1.5	638	
206.00	425				638

205.5 684

End Area Method: **638** C.F.
0.015 A.F.

3% of WQCV = 626.33 cu-ft

TOTAL= ***637.50*** ***>*** **626.33**

PROPOSED MICROPOOL VOLUME

ELEV (FT + 6000)	*AREA (SF)*	*AREA AVG. (SF)*	*DELTA ELEV. (FT)*	*VOLUME (CF)*	*VOLUME TOTAL (CF)*
199.50	63				
		63	2.5	158	
202.00	63				158

End Area Method: 158 C.F.
0.004 A.F.

Forebay Wall Notch

Notch to releae 2% of the undetained 100-year peak discharge.

100-y peak discharge	=	**21.6**	cfs
2.0%	=	**0.43**	cfs

The general form of the equation for horizontal crested weirs is Q = CLH3/2 where:

Q = Weir flow discharge (cfs)	**0.43**	
C = Weir flow coefficient	3.4	
H = Depth of flow over the weir (ft)	1.50	Opening Height
L = Length of the weir (ft)	**0.07**	Length
L = Length of the weir (in)	**0.8**	

Minimim notch length is 3" per standards

Notch to releae 2% of the undetained 100-year peak discharge is 3" wide by 18" high (min allowed)

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Platte Self Storage**		Location:	2' TRICKEL CHANNEL	
By:	JS	Date:	4/29/2024		
Chk By:	DF	Date:	4/29/2024		version 12-2004

Mannings Formula

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

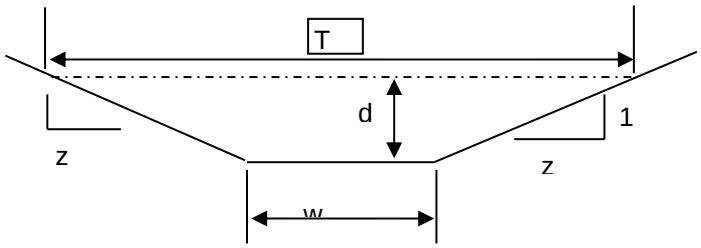
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	0
z (sideslope)=	0
b (btm width, ft)=	2
d (depth, ft)=	0.5
S (slope, ft/ft)	0.01
n_{low} =	0.013
n_{high} =	0.013

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	1.00	3.00	0.33	5.49513943	5.49514	5.495139	5.49514	T =	2
								Dm =	0.500
				Sc low =	0.0053	Sc high =	0.0053		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0037	0.0069	0.0037	0.0069		

s_c = critical slope ft / ft

T = top width of the stream

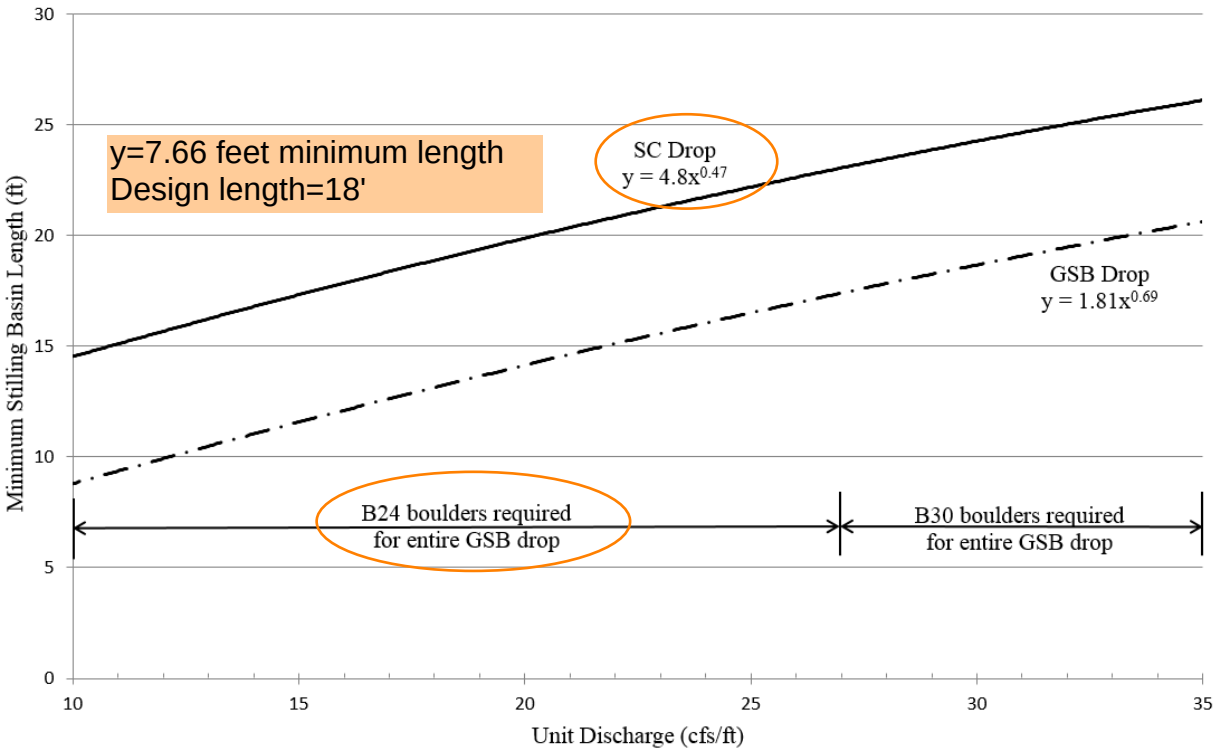
d_m = a/T = mean depth of flow

Created by: Mike O'Shea

STILLING BASIN CALCULATIONS

PLATTE SELF-STORAGE
Calc: JS; Checked: DLF; Date: 11/11/2024

In non-cohesive soil channels and channels where future degradation is expected, especially where there is no drop structure immediately downstream, it is generally recommended that the stilling basin be eliminated and the sloping face extended five feet below the downstream future channel invert elevation (after accounting for future streambed degradation). A scour hole will form naturally downstream of a structure in non-cohesive soils and construction of a hard basin is an unnecessary cost. Additionally, a hard basin would be at risk for undermining. See Figure 9-12 for the profile of the GSB and Figure 9-17 for that of an SC in this configuration. In some cases, the structure may have a net drop height of zero immediately after construction, but is designed with a long-term net height of 3 to 5 feet to accommodate future lowering of the channel invert.



100-year peak outflow = 21.6 cfs; Stilling basin width = 8'
Unit discharge = 2.7 cfs/ft

Figure 9-1. Stilling basin length based on unit discharge (for simplified design procedure)

2.2.6 Seepage Analysis and Cutoff Wall Design

The simplified drop structure design only applies to drops with cutoffs located in cohesive soils. Therefore, it is necessary to determine surface and subsurface soil conditions in the vicinity of a proposed drop structure prior to being able to use the simplified approach for cutoff design. For a drop structure constructed in cohesive soils meeting all requirements of a simplified design, the cutoff wall must be a minimum of six feet deep for concrete and ten feet deep for sheet pile.

If a proposed drop structure meets the requirements of the simplified approach, but is located in non-cohesive soils, guidance on determining the required cutoff wall depth is described in Section 2.4.

DRAINAGE MAPS

Note: The County wouldn’t allow EDB Plans to be included in this report.

PLATTE SELF STORAGE
SITE DEVELOPMENT PLAN
EXISTING DRAINAGE MAP
NOVEMBER 2024

LEGEND

- P-7 / 12.22 / 85 %imp — BASIN DESIGNATION, AREA IN BASIN (AC), PERCENT IMPERVIOUS
- D — DESIGN POINT
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
- GROUND SURFACE FLOW DIRECTION
- ROAD AND DITCH FLOW DIRECTION
- TIME OF CONCENTRATION PATH

NOTES

1. BROWN GROUND SURFACE CONTOURS ARE LIDAR DATA DOWNLOADED FROM THE COLORADO HAZARD MAPPING & RISK MAP PORTAL, DATA SET: 2018 3DEP EAST CO EL PASO. THIS DATA IS APPROXIMATE. LIDAR DATA IS FROM 2018 AND AT 2' INTERVALS.

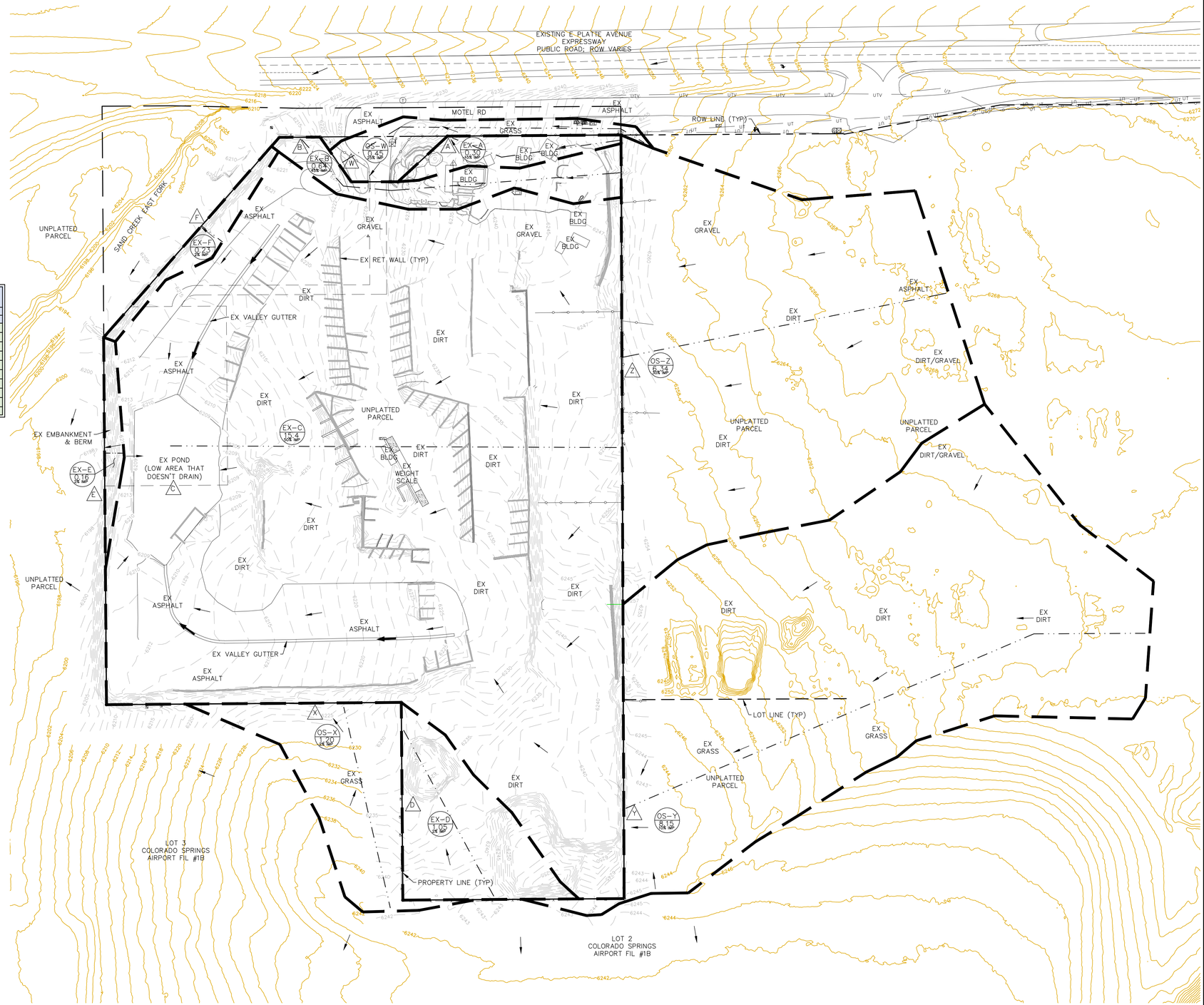
2. THE EXISTING SITE IS A LANDSCAPING MATERIALS YARD. GROUND SURFACES ARE DIRT, GRAVEL, AND ASPHALT. THE EDGE OF ASPHALT IS OFTEN COVERED BY DIRT/GRAVEL AND IT'S EXTENTS ARE ONLY ROUGHLY KNOWN.

BASIN SUMMARY

BASIN	AREA TOTAL	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				TC	INTENSITY		TOTAL FLOWS	
		C5	C100	C5	Length	Slope	Ti	Length	Slope	Velocity	Tt	TOTAL	I5	I100	Q5	Q100
	(Acres)				(ft)	(ft/ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	(c.f.s.)	(c.f.s.)
OS-Z	6.34	0.33	0.53	0.33	300	0.02	19.3	230	2.0%	1.4	2.7	22.0	2.9	4.9	6.1	16.7
OS-Y	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
OS-X	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
OS-W	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
EX-A	0.30	0.22	0.45	0.22	300	0.07	14.5	0	7.0%	2.6	0.0	14.5	3.6	6.0	0.2	0.8
EX-B	0.64	0.45	0.63	0.45	300	0.07	10.7	250	7.0%	2.6	1.6	12.2	3.8	6.4	1.1	2.6
EX-C	15.4	0.49	0.66	0.49	300	0.07	10.0	330	7.0%	2.6	2.1	12.1	3.8	6.4	29.0	65.0
EX-D	1.05	0.10	0.36	0.10	300	0.03	21.9	40	3.0%	1.7	0.4	22.2	2.9	4.9	0.3	1.9
EX-E	0.16	0.08	0.35	0.08	30	0.40	3.0	0	40.0%	6.3	0.0	5.0	5.2	8.7	0.1	0.5
EX-F	0.23	0.08	0.35	0.08	35	0.24	3.8	0	24.0%	4.9	0.0	5.0	5.2	8.7	0.1	0.7

DESIGN POINT SUMMARY

Design Point(s)	Contributing Basins	Area	Flow (cfs)	
		(ac)	Q5	Q100
Z	OS-Z	6.34	6.1	16.7
Y	OS-Y	8.15	3.6	15.4
X	OS-X & DP D	2.25	0.7	4.2
W	OS-W & DP A	0.75	0.7	2.2
A	EX-A	0.30	0.2	0.8
B	EX-B & DP W	1.39	1.8	4.7
C	EX-C, DP D, DP X, & DP Y	26.85	33.6	86.5
D	EX-D	1.05	0.3	1.9
E	EX-E	0.16	0.1	0.5
F	EX-F	0.23	0.1	0.7



NO.	DESCRIPTION	DATE
	REVISIONS	

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, TERRA NOVA ENGINEERING, INC. APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR:
RMG–ROCKY MOUNTAIN GROUP
ATTN:
5085 LIST DR. #200
COLORADO SPRINGS, CO 80919
719.548.0600

Terra Nova Engineering, Inc.
Creative Civil Engineering Solutions
721 S. 23RD STREET
COLORADO SPRINGS, CO 80904
OFFICE: 719-635-6422
FAX: 719-635-6426
www.tnesinc.com

PLATTE SELF STORAGE

EXISTING DRAINAGE MAP

DESIGNED BY DLF
DRAWN BY DLF
CHECKED BY LD
H-SCALE AS SHOWN
V-SCALE N/A
JOB NO. 2419.00
DATE ISSUED 11/8/24
SHEET NO. 1 OF 3

PLATTE SELF STORAGE
SITE DEVELOPMENT PLAN
PROPOSED DRAINAGE MAP
NOVEMBER 2024

LEGEND

- BASIN DESIGNATION (P-7), AREA IN BASIN (AC) (12.22), PERCENT IMPERVIOUS (#% IMP)
- DESIGN POINT (D)
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
- PROPOSED CONTOURS – 1' (6231)
- EXISTING PROPERTY LINE
- PROPOSED FENCE
- PROPOSED RETAINING WALL
- PROPOSED RIPRAP
- GROUND SURFACE FLOW DIRECTION
- ROAD AND DITCH FLOW DIRECTION
- TIME OF CONCENTRATION PATH
- SWALE IDENTIFIER (S#)

NOTES

1. BROWN GROUND SURFACE CONTOURS ARE LIDAR DATA DOWNLOADED FROM THE COLORADO HAZARD MAPPING & RISK MAP PORTAL, DATA SET: 2018 3DEP EAST CO EL PASO. THIS DATA IS APPROXIMATE. LIDAR DATA IS FROM 2018 AND AT 2' INTERVALS.

PIPE RUN SUMMARY

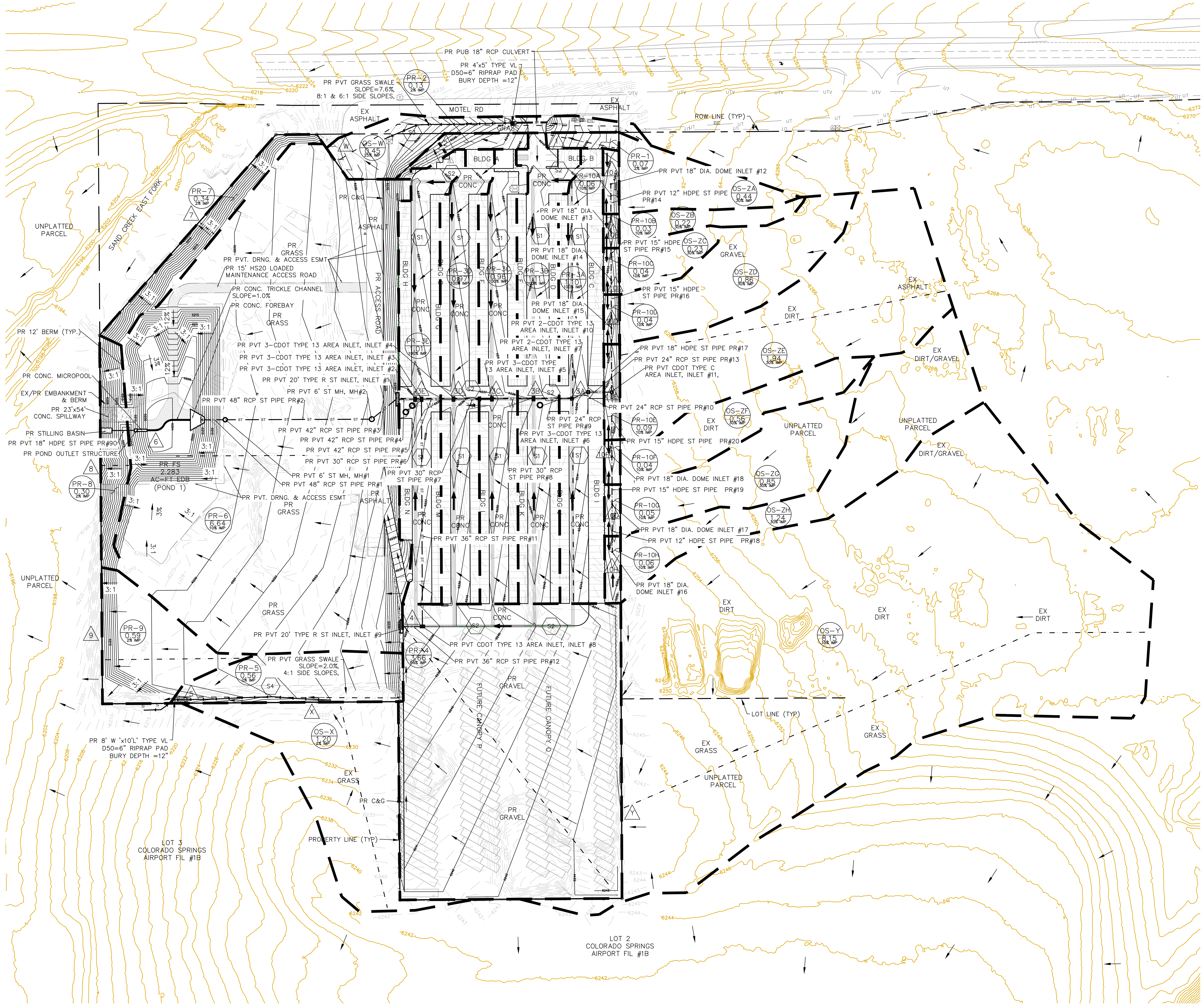
Pipe Run	Inlet #	Contributing Flow Sources	5 Year Flow (cfs)	100 Year Flow (cfs)	Slope	Pipe Size & Type	Owner
PR#1	-	PR#2	41.2	91.4	2.7%	48" RCP	PVT
PR#2	-	PR#3	41.2	91.4	2.2%	48" RCP	PVT
PR#3	#1	DP 3E & PR#4	41.2	91.4	2.2%	42" RCP	PVT
PR#4	#2	PR#5	32.4	71.2	1.7%	42" RCP	PVT
PR#5	#3	PR#6 & PR#11	32.4	71.2	2.1%	42" RCP	PVT
PR#6	#4	DP 3D & PR#7	20.6	39.0	5.0%	30" RCP	PVT
PR#7	#5	DP 3C & PR#8	16.5	32.7	1.9%	30" RCP	PVT
PR#8	#6	DP 3B & PR#9	12.5	26.7	1.9%	30" RCP	PVT
PR#9	#7	DP3A & PR#13	8.7	21.1	1.9%	24" RCP	PVT
PR#10	#10	PR#13	6.2	17.7	1.7%	24" RCP	PVT
PR#11	#8	PR#12	11.8	32.2	1.0%	36" RCP	PVT
PR#12	#9	DP 4	11.8	32.2	1.0%	36" RCP	PVT
PR#13	#11	DP 10E & PR#17 & 20	6.2	17.7	1.0%	24" RCP	PVT
PR#14	#12	DP 10A	0.4	1.3	1.0%	12" HDPE	PVT
PR#15	#13	DP 10B & PR#14	0.7	1.9	1.0%	15" HDPE	PVT
PR#16	#14	DP 10C & PR#15	0.9	2.6	1.0%	15" HDPE	PVT
PR#17	#15	DP 10D & PR#16	1.7	5.0	1.0%	18" HDPE	PVT
PR#18	#16	DP 10H	1.2	3.4	1.0%	12" HDPE	PVT
PR#19	#17	DP 10G & PR#18	2.0	5.8	1.0%	15" HDPE	PVT
PR#20	#18	DP 10F & PR#19	2.6	7.4	1.0%	15" HDPE	PVT
PR#90	-	Pond outlet	0.5	11.3	1.4%	18" HDPE	PVT

BASIN SUMMARY

BASIN	AREA TOTAL (Acres)	WEIGHTED C_5	WEIGHTED C_{100}	OVERLAND C_5	OVERLAND Length (ft)	OVERLAND Slope (ft/ft)	OVERLAND T_t (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW T_t (min)	T_c TOTAL (min)	INTENSITY I_5 (in/hr)	INTENSITY I_{100} (in/hr)	TOTAL FLOWS Q_5 (c.f.s.)	TOTAL FLOWS Q_{100} (c.f.s.)
OS-ZA	0.44	0.33	0.53	0.33	300	0.02	19.3	230	2.0%	1.4	2.7	22.0	2.9	4.9	0.4	1.1
OS-ZB	0.22	0.33	0.53	0.33	300	0.02	19.3	231	2.0%	1.4	2.7	22.0	2.9	4.9	0.2	0.6
OS-ZC	0.23	0.33	0.53	0.33	300	0.02	19.3	232	2.0%	1.4	2.7	22.0	2.9	4.9	0.2	0.6
OS-ZD	0.86	0.33	0.53	0.33	300	0.02	19.3	233	2.0%	1.4	2.7	22.0	2.9	4.9	0.8	2.3
OS-ZE	1.94	0.33	0.53	0.33	300	0.02	19.3	234	2.0%	1.4	2.8	22.0	2.9	4.9	1.9	5.1
OS-ZF	0.56	0.33	0.53	0.33	300	0.02	19.3	235	2.0%	1.4	2.8	22.0	2.9	4.9	0.5	1.5
OS-ZG	0.85	0.33	0.53	0.33	300	0.02	19.3	236	2.0%	1.4	2.8	22.0	2.9	4.9	0.8	2.3
OS-ZH	1.24	0.33	0.53	0.33	300	0.02	19.3	237	2.0%	1.4	2.8	22.0	2.9	4.9	1.2	3.3
OS-Y	8.15	0.16	0.41	0.16	300	0.03	20.4	505	3.0%	1.7	4.9	25.3	2.7	4.6	3.6	15.4
OS-X	1.20	0.09	0.36	0.09	300	0.05	18.5	0	5.0%	2.2	0.0	18.5	3.2	5.4	0.4	2.3
OS-W	0.45	0.28	0.50	0.28	300	0.07	13.5	160	7.0%	2.6	1.0	14.5	3.6	6.0	0.5	1.3
PR-1	0.07	0.08	0.35	0.08	100	0.08	9.3	0	8.0%	2.8	0.0	9.3	4.2	7.1	0.0	0.2
PR-2	0.13	0.08	0.35	0.08	45	0.25	4.3	0	25.0%	5.0	0.0	5.0	5.2	8.7	0.1	0.4
PR-3A	1.10	0.90	0.96	0.90	100	0.02	2.9	450	2.0%	2.8	2.7	5.5	5.0	8.4	5.0	8.9
PR-3B	1.11	0.90	0.96	0.90	100	0.02	2.9	451	2.0%	2.8	2.7	5.5	5.0	8.4	5.0	8.9
PR-3C	0.96	0.90	0.96	0.90	100	0.02	2.9	452	2.0%	2.8	2.7	5.5	5.0	8.4	4.3	7.8
PR-3D	0.97	0.90	0.96	0.90	100	0.02	2.9	453	2.0%	2.8	2.7	5.5	5.0	8.4	4.4	7.8
PR-3E	1.01	0.90	0.96	0.90	100	0.02	2.9	454	2.0%	2.8	2.7	5.5	5.0	8.4	4.5	8.1
PR-4	3.66	0.61	0.75	0.61	100	0.02	7.0	400	2.0%	1.0	6.7	13.7	3.7	6.1	8.2	16.8
PR-5	0.56	0.09	0.36	0.09	300	0.02	25.0	0	2.0%	1.0	0.0	25.0	2.8	4.6	0.1	0.9
PR-6	6.64	0.16	0.41	0.16	300	0.02	23.3	0	2.0%	1.0	0.0	23.3	2.9	4.8	3.1	13.1
PR-7	0.34	0.10	0.37	0.10	25	0.33	2.8	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.1
PR-8	0.30	0.11	0.37	0.11	35	0.33	3.3	0	33.0%	4.0	0.0	5.0	5.2	8.7	0.2	1.0
PR-9	0.59	0.09	0.36	0.09	100	0.06	10.1	0	6.0%	1.7	0.0	10.1	4.1	6.9	0.2	1.5
PR-10A	0.06	0.08	0.35	0.08	100	0.06	10.2	1	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10B	0.03	0.08	0.35	0.08	100	0.06	10.2	2	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10C	0.04	0.08	0.35	0.08	100	0.06	10.2	3	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10D	0.04	0.08	0.35	0.08	100	0.06	10.2	4	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.1
PR-10E	0.09	0.08	0.35	0.08	100	0.06	10.2	5	1.0%	1.7	0.0	10.2	4.1	6.9	0.0	0.2
PR-10F	0.04	0.08	0.35	0.08	100	0.06	10.2	6	1.0%	1.7	0.1	10.3	4.1	6.9	0.0	0.1
PR-10G	0.05	0.08	0.35	0.08	100	0.06	10.2	7	1.0%	1.7	0.1	10.3	4.1	6.9	0.0	0.1
PR-10H	0.06	0.08	0.35	0.08	100	0.06	10.2	8	1.0%	1.7	0.1	10.3	4.1	6.9	0.0	0.1

DESIGN POINT SUMMARY

Design Point(s)	Contributing Basins	Area (ac)	Flow (cfs) Q_5	Flow (cfs) Q_{100}
1	PR-1	0.07	0.0	0.2
2	PR-2	0.13	0.1	0.4
3A	PR-3A	1.10	5.0	8.9
3B	PR-3B & PR 3A FLOW BY	1.11	7.5	14.4
3C	PR-3C & PR 3B FLOW BY	0.96	8.0	16.6
3D	PR-3D & PR 3C FLOW BY	0.97	8.4	18.4
3E	PR-3E & PR 3D FLOW BY	1.01	8.8	20.2
4	PR-4 & DP Y	11.81	11.8	32.2
5	PR-5 & DP X	1.76	0.5	3.3
6	PR-6 & PR#1	7.74	44.3	104.5
7	PR-7	0.34	0.2	1.1
8	PR-8	0.30	0.2	1.0
9	PR-9	0.59	0.2	1.5
10A	PR-10A & OS-ZA	0.49	0.4	1.3
10B	PR-10B & DP ZB	0.25	0.2	0.6
10C	PR-10C & DP ZC	0.27	0.2	0.7
10D	PR-10D & DP ZD	0.90	0.8	2.4
10E	PR-10E & DP ZE	2.03	1.9	5.3
10F	PR-10F & DP ZF	0.60	0.6	1.6
10G	PR-10G & DP ZG	0.90	0.8	2.4
10H	PR-10H & DP ZH	1.30	1.2	3.4
W	OS-W, DP 1 & DP 2	0.65	0.5	1.9
X	OS-X	1.20	0.4	2.3
Y	OS-Y	8.15	3.6	15.4



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REVISIONS NO.	DESCRIPTION	DATE

PREPARED FOR:
RMG–ROCKY MOUNTAIN GROUP
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COLORADO SPRINGS, CO 80919
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PLATTE SELF STORAGE

PROPOSED DRAINAGE MAP

DESIGNED BY	DLF
DRAWN BY	DLF
CHECKED BY	LD
H-SCALE	AS SHOWN
V-SCALE	N/A
JOB NO.	2419.00
DATE ISSUED	11/8/24
SHEET NO.	2 OF 3

PLATTE SELF STORAGE

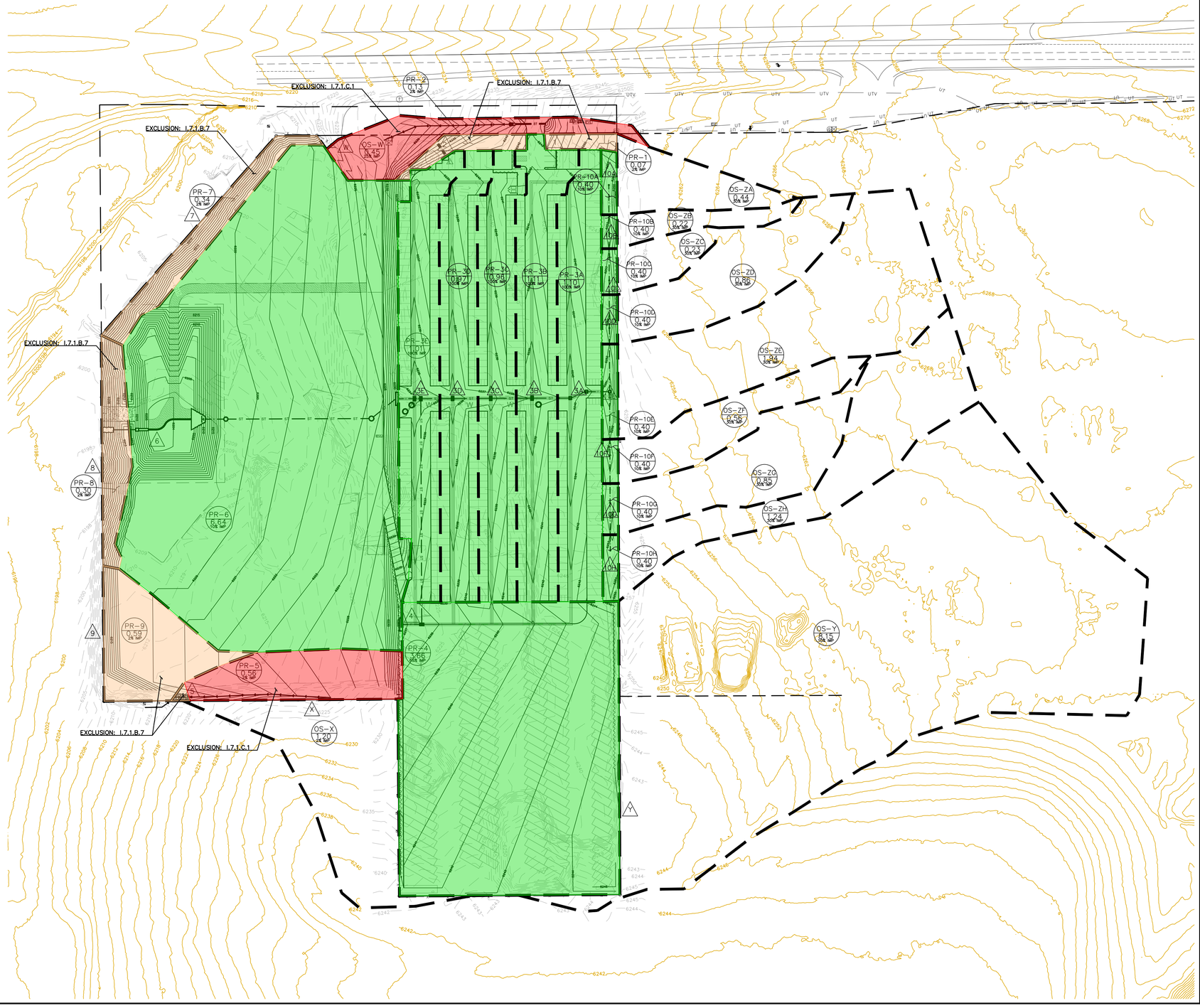
SITE DEVELOPMENT PLAN

WQ TREATMENT MAP

NOVEMBER 2024

LEGEND

- P-7 / 1.22 / 45 IMP — BASIN DESIGNATION, AREA IN BASIN (AC), PERCENT IMPERVIOUS
- D — DESIGN POINT
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
- 6231 — PROPOSED CONTOURS – 1'
- EXISTING PROPERTY LINE
- PROPOSED FENCE
- PROPOSED RETAINING WALL
- PROPOSED RIPRAP
- GROUND SURFACE FLOW DIRECTION
- ROAD AND DITCH FLOW DIRECTION
- TIME OF CONCENTRATION PATH
- S# — SWALE IDENTIFIER



NOTES

1. BROWN GROUND SURFACE CONTOURS ARE LIDAR DATA DOWNLOADED FROM THE COLORADO HAZARD MAPPING & RISK MAP PORTAL, DATA SET: 2018 3DEP EAST CO EL PASO. THIS DATA IS APPROXIMATE. LIDAR DATA IS FROM 2018 AND AT 2' INTERVALS.

WQ TREATMENT SUMMARY

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond 1 (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
OS-ZA	0.44	-	0.44	-	-	-	-
OS-ZB	0.22	-	0.22	-	-	-	-
OS-ZC	0.23	-	0.23	-	-	-	-
OS-ZD	0.86	-	0.86	-	-	-	-
OS-ZE	1.94	-	1.94	-	-	-	-
OS-ZF	0.56	-	0.56	-	-	-	-
OS-ZG	0.85	-	0.85	-	-	-	-
OS-ZH	1.24	-	1.24	-	-	-	-
OS-Y	8.15	-	8.15	-	-	-	-
OS-X	1.20	-	-	-	-	-	-
OS-W	0.45	0.45	-	-	0.45	-	-
PR-1	0.07	0.07	-	-	-	0.07	I.7.1.B.7
PR-2	0.13	0.13	-	-	-	0.13	I.7.1.B.7
PR-3A	1.10	1.10	1.10	-	-	-	-
PR-3B	1.11	1.11	1.11	-	-	-	-
PR-3C	0.96	0.96	0.96	-	-	-	-
PR-3D	0.97	0.97	0.97	-	-	-	-
PR-3E	1.01	1.01	1.01	-	-	-	-
PR-4	3.66	3.66	3.66	-	-	-	-
PR-5	0.56	0.56	-	-	0.55	0.01	I.7.1.B.7
PR-6	6.64	6.64	6.64	-	-	-	-
PR-7	0.34	0.34	-	-	-	0.34	I.7.1.B.7
PR-8	0.30	0.30	-	-	-	0.30	I.7.1.B.7
PR-9	0.59	0.59	-	-	-	0.59	I.7.1.B.7
PR-10A	0.06	0.06	0.06	-	-	-	-
PR-10B	0.03	0.03	0.03	-	-	-	-
PR-10C	0.04	0.04	0.04	-	-	-	-
PR-10D	0.04	0.04	0.04	-	-	-	-
PR-10E	0.09	0.09	0.09	-	-	-	-
PR-10F	0.04	0.04	0.04	-	-	-	-
PR-10G	0.05	0.05	0.05	-	-	-	-
PR-10H	0.06	0.06	0.06	-	-	-	-
TOTALS			30.33		1.00	1.44	
BASINS TRIB TO POND IN FUTURE PR-5, PR-9 & OS-X			2.35				
AREA TRIB FOR POND DESIGN			32.68				

Calc:	DLF
Date:	11/8/2024
Checked:	JS

REVISIONS

NO.	DESCRIPTION	DATE

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PLATTE SELF STORAGE

WATER QUALITY TREATMENT MAP

DESIGNED BY DLF
DRAWN BY JS
CHECKED BY LD
H–SCALE AS SHOWN
V–SCALE N/A
JOB NO. 2419.00
DATE ISSUED 11/8/24
SHEET NO. 3 OF 3