

PRELIMINARY DRAINAGE REPORT

FOR

CROSSROADS MIXED USE

EL PASO COUNTY, COLORADO

FEBRUARY 2021

Prepared for:
Crossroads Metropolitan District No. 2
Mr. Danny Mientka
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Prepared by:



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Project #18-003A
PCD Filing No.: SP-20-011

**PRELIMINARY
DRAINAGE REPORT
FOR
CROSSROADS MIXED USE**

DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

The attached drainage plan and report was 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 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.

Virgil A. Sanchez, P.E. #37160
For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

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

BY: _____
Danny Mientka –Owner

DATE: _____

ADDRESS: The Equity Group, LLC
90 South Cascade Avenue, Suite 1500
Colorado Springs, CO 80903

EL PASO COUNTY'S STATEMENT

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

BY: _____ DATE: _____
Jennifer Irvine, P.E.
County Engineer / ECM Administrator

CONDITIONS:

**PRELIMINARY DRAINAGE REPORT
FOR
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PRELIMINARY DRAINAGE REPORT FOR CROSSROADS MIXED USE

Purpose

This preliminary drainage report for Crossroads Mixed Use is in support of a Preliminary Plan and Rezone of the subject site. This report functions to identify the existing and proposed runoff patterns and recommend proposed drainage improvements which are intended to safely convey runoff through the proposed development, while minimizing impacts to downstream facilities and adjacent properties.

A Final Drainage Report for this site and Construction Drawings will be submitted concurrently with the Final Plat. Individual drainage letters and/or reports shall be required with the development of each lot not otherwise clearly analyzed by the aforementioned by this Final Drainage Report for Crossroads Mixed Use.

Project Location and Description

The subject site is located at 0 Meadowbrook Parkway in the southwestern quarter of Section 8, Township 14 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The 29.04 Acre site is currently undeveloped. The site is bound to the west by undeveloped Softball West Subdivision Filing No.2, to the north by Meadowbrook Crossing Subdivision and south by Highway 24 and to the east by Newt Drive.

The proposed site is will be developed into ten (10) commercial lots, one (1) multifamily residential and three tracts. The development will extend Meadowbrook Parkway to the west and will include a single lane roundabout to be constructed at the intersection of the Meadowbrook Parkway and Newt Drive. The property is within the commercial aviation district overlay. A concurrent rezone application has been submitted to rezone 12.695 acres from CR to the RM-30 Zone.

The majority of the existing site is covered with native grasses with fair to good cover, the exception being portions of the future Meadowbrook Parkway corridor where exposed soils are present. Known earthwork operations to “borrow material” have occurred over a small segment of the eastern portion of the site in early and mid 2019, but have since stabilized. A few dirt paths/trails are present along the far west end of the site, likely from recreational vehicles. Generally the site slopes from east to west at slightly greater than 1% with some localized depressions and general terrain undulations near the west boundary that have slopes ranging from 1- 20%. Some of these may be the results of previous earthwork activities. The site lies within the Sand Creek Drainage Basin. No existing drainage facilities or improvements exist onsite. No known irrigation or wells are present.

Soils

Soils in the project area have been determined to be Blakeland Loamy Sand (8) and Blendon Sandy Loam (10) which are characterized to be part of Hydrologic Soil Types "A" & "B" as determined from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) "Web Soils Survey". A soils map illustrating the site location and soil types is provided in the appendix of this report.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Nos. 08041C0754 G & 08041C0752 G, effective date December 7th, 2018; none of the site lies within a designated floodplain. A copy of these annotated maps can be found in the appendix. The Sand Creek East Fork Channel is located to the northwest of the adjacent Meadowbrook Crossing subdivision.

Previous Studies

The area which encompasses Crossroads Mixed Use has been previously studied. Below is a short outline of the assumptions regarding the lands of the subject site and those based upon the previously assembled and approved drainage reports and how the assumptions within them impact the subject site.

Sand Creek Drainage Basin Planning Study, Preliminary Design Report", prepared by Kiowa Engineering Corporation, dated January 1993, revised March 1996.

- Establishes that the subject site falls within the East Fork Sand Creek Drainage Basin a portion of the larger Sand Creek Watershed
- Establishes that there are no requirements for major infrastructure improvements and subsequently no drainage improvement related reimbursements with the development of this parcel
- Drainage fees shall be required to plat

"Claremont Business Park Filing No.2 prepared by Matrix Design Group, revised November 2006

- Establishes the drainage patterns of offsite Basins 0S4 and E2 which are to be conveyed within the Meadowbrook Rights of Way
- Established up-gradient offsite drainage to be directed under Meadowbrook north to offsite East Fork Sand Creek Channel, and away from the subject site

"Final Drainage Report, Lot 1 24/94 Business Park Filing No.1 prepared by Core Engineering Group, dated July 14, 2016

- The development of the 24/94 Business Park FDR shows future curb inlets along the future

Meadowbrook Parkway extension on the south and west corners of the intersection to capture runoff from up-gradient watersheds in addition to a proposed inlet which was to be located above the intersection at the northwest corner of the subject site.

- Establishes that flows from the parcel upstream of the convenience store (29/94 FDR Basin OS4) EX-B now to be collected by the extension of a 36" RCP along the south side of Meadowbrook Parkway. Runoff within the right of way/roadway separated out as Basin EXA2.
- Continues assumption that flows from Newt Drive be conveyed north to East Fork Sand Creek.
- Evaluated predevelopment drainage patterns for subject site. Including direct discharge flow rates to the CDOT rights of way of 1.9 and 14.5 cfs for the 5 and 100 year events respectively. (Basin EX-E).

"Preliminary and Final Drainage Report Meadowbrook Crossing Filing No. 1 and Filing 2, El Paso County, Colorado prepared by Kiowa Engineering Corporation, dated July 25, 2017

- Proposed the installation of a future 10' Type R inlet at the southeast corner of Newt Drive and Meadowbrook Parkway with the extension of Meadowbrook Parkway to the west (along the northern boundary of the subject site). The inlet was to function to collect offsite runoff from a portion of the south half of Meadowbrook Parkway and Newt Drive north of Hwy 24. Intercepted runoff would be conveyed via a proposed 24" storm sewer to the existing storm sewer system within the Meadowbrook Crossings development.
- Proposed the installation of a 10' Type R inlet at the west end of future Meadowbrook Parkway. The inlet was to collect runoff from the north half of the future roadway. An 18" storm drain was proposed to convey collected runoff to the existing water quality pond located within the Meadowbrook Crossings Development. The report indicates a separate forebay or the modification of an existing forebay would be required.
- Shifted the location of the existing 10'ft Type R curb inlet to be installed upstream of the intersection of Newt Drive (as shown with the 24/94 Business Park FDR), flows in excess of the inlet capacity are to continue within the future Meadowbrook.

"Final Drainage Report for Meadowbrook Dirt Borrow Site, El Paso County Colorado, prepared by M&S Civil Consultants, November 2018.

- Evaluated onsite drainage patterns
- Excluded offsite runoff impacts from areas to the east of site.
- Allowed site to be utilized as a "borrow site" for offsite earthwork activities.

Hydrologic Calculations

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

Hydraulic Calculations

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report. Hydraulic grade line calculations shall be provided with the Final Drainage report.

Drainage Criteria

This drainage analysis has been prepared in accordance with current El Paso County Drainage Criteria Manual and where applicable the City of Colorado Springs and Mile High Flood District Criteria Manuals. Calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres. See Appendix for supporting calculations.

Historic (Pre-Grading) Drainage Characteristics

The historic drainage patterns discussed within this report reflect the site conditions prior to the approval of the 2018 Meadowbrook Dirt Borrow Site Grading and Erosion Control Plan. This 'historic condition' generally coincides with the existing condition analysis and mapping that accompanied that project's hydrologic analysis.

The following excerpt is from the existing Drainage Characteristics section of the Final Drainage Report for Meadowbrook Dirt Borrow Site, El Paso County, Colorado, by M&S Civil Consultants and adequately describes the general site characteristics prior to grading.

"Site vegetation is sparse, consisting primarily of native grasses and weeds. The parcel possesses a ridgeline that bisects the parcel, directing runoff to the south and west boundaries, with slopes varying from 1% to 20%. A few small depressions are located on site, near the west boundary. For the purposes of hydrologic analysis, the small depressions are not considered to detain runoff."

Given the increase in breadth and scope of this study, significant consideration of the impacts of offsite drainage from the adjacent developments will be evaluated. This includes drainage from a small portion of Hwy 24 which combines with flows within existing from portions of Newt Drive. Runoff from this offsite area combines with by-pass flows from two inlets located within existing Meadowbrook Drive, prior to entering the site at its northeast corner. Runoff from these locations ultimately combines with onsite flows within the proposed Meadowbrook Parkway corridor, before discharging to downstream properties.

The detailed description of the historic (pre-grading) condition is as follows. Please refer to the historic conditions drainage map which is provided within the appendix of this report.

Historic Conditions - Detailed Drainage Discussion

Design Point 1

Basin E2 (Claremont Business Park Filing No.2) consists of a reported 3.86 developed acres of Development located along the southeastern half of existing Meadowbrook Parkway some 1200' northeast of the subject site. Runoff produced by the offsite development (CBPF2 Lot 46) is conveyed to Meadowbrook Parkway at flow rates of $Q_5=15.1$, $Q_{100}=28.6$ cfs in the 5 and 100-year storm events respectively. The collected flows combines with runoff from **Basin EX-A2 (Lot 1 24/94 Business Park Filing No.1)** ($Q_5=2.5$, $Q_{100}=4.5$ cfs) which consist of 0.59 acres of the southeastern half of Meadowbrook Parkway located immediately east of existing Newt Drive. The collected flows from the two basins culminate at **Design Point 1** at peak rates of $Q_5=14.2$ and $Q_{100}=26.5$ cfs. An existing 10' CDOT Type R at-grade inlet (**Inlet 1**) intercepts flows of $Q_5=8.4$ and $Q_{100}=11.1$ cfs, with subsequent by-pass flows of 5.8 and 15.4 cfs in the 5 and 100 year events. Surface flows continue west within the south half of existing Meadowbrook Parkway.

Design Point 2

Basin OS-A (Meadowbrook Crossing Filing 1 and 2) consists of 1.29 acres of the northern half of existing Meadowbrook Parkway located immediately east of Newt Drive. Runoff produced within this basin totals $Q_5=3.1$ and $Q_{100}=6.0$ cfs. An existing 10' CDOT Type R at grade inlet (**Inlet 2**) collects runoff of $Q_5=3.1$ and $Q_{100}=5.3$ cfs, with subsequent by-pass flows in only the 100 year event of 0.7 cfs. Runoff leaving the design point continuing west within the north half of existing Meadowbrook Parkway.

Design Point 3

Basin OS-1 consists of approximately 1.28 developed acres of existing Newt Drive located along the eastern boundary of the site. Runoff produced within the basin ($Q_5=5.8$ cfs, $Q_{100}=10.5$ cfs) combine with flow-by from **DP1** in the intersection at peak flow rates of 9.8 cfs, and 22.5 cfs in the 5 and 100-year storm events.

Surface runoff and by-pass flows from both **DP2** and **DP3** entering **Basin A**, and the undeveloped rights of way of future Meadowbrook Parkway, at the northeast corner of the site.

Design Point 4

Basin A consists of 12.88 undeveloped acres located along the northern boundary that drain from east to west across the subject site. Runoff produced by this basin ($Q_5=1.9$ cfs, $Q_{100}=14.2$ cfs) combine with flows from **DP2** and **DP3**. The cumulative runoff at **DP4** of $Q_5=7.4$ cfs, $Q_{100}=27.7$ cfs discharges onto the adjacent property (Lot 1, Softball West Subdivision 2) along the western boundary of the site, approximately 250' to south of the northern property line.

Design Point 5

Basin B consists of 13.63 undeveloped acres located along the western side of the subject site. Runoff produced by the basin generally flows from northeast to southwest discharging onto the adjacent property (Lot 2, Softball West Subdivision 2) approximately 200' north of the southern property line. Runoff reaching the boundary at **DP5**, is estimated at 8.3 cfs and 18.2 cfs in the 5 year and 100 year events respectively.

Design Point 6

Basin C currently consists of 5.89 undeveloped acres located along the southern boundary of the site. Runoff produced within the basin travels east to west as sheet flow before eventually discharging into the existing barrow ditch which travels along the US HWY 24 CDOT right of way. Peak runoff rates reaching the subdivision boundary at this location are calculated at 1.2 cfs and 8.5 cfs in the 5 year and 100 year events respectively.

Design Point 7

Basin OS-2 consists of 4.98 acres of a portion of the northern half of the US HWY 24 roadway and adjoining native grass lined barrow ditch. Runoff produced within the basin combines with runoff from the subject site (**DP6**) at cumulative peak runoff rates of 10.4. and 31.9 cfs in the 5 and 100 year storm events at **DP7**. A modeled hydraulic cross section of the ditch section at **DP7** calculates flow depths of 0.76 feet traveling at a velocity of approximately 3.54 feet per second. Input parameters for this analysis can be found in the Hydraulics section of the Appendix below.

Runoff from **Design Points 4 and 5** ultimately combine with the flows from **DP7** within the barrow ditch of US Hwy 24 several hundred feet downstream of the subject site. An existing 36" RCP culvert located at the interchange of HWY 24 and Peterson Road aids in conveying a portion of the runoff from the subject site and adjacent offsite areas under the roadway. Flows in excess of the culverts carrying capacity, overtop the roadway before rejoining within a subsequent drainage swale that parallels the west bound HWY 24 on-ramp. Ultimately flows discharge into the East Fork of the Sand Creek via an existing riprap rundown. Site visits conducted by M&S Civil at the time of the writing of this report, found no significant signs of erosion or deposition along the aforementioned corridor.

A Drainageway Exhibit in the appendix of this report provides and aerial illustration the aforementioned conveyance route to the channel, which will also serve to function as the emergency overflow path for the proposed site development.

Existing Drainage Characteristics

The subject site has been utilized as a "borrow site" to provide surplus earthwork to offsite developments in the area. This recent grading effort occurred during the spring and summer of 2019. At the request of El Paso County, an existing condition drainage analysis has been provided to show the changes to the topography and drainage pattern as a result of this effort. As the only changes between the two conditions are onsite, the offsite drainage patterns calculations and assumptions determined with the historical analysis will remain the same. It should be noted that

the subject site was not disturbed to the full extent of the approved plan, with limited excavation primarily occurring within the eastern side of the subject site.

In the existing condition, vegetation remains sparse, consisting primarily of native grasses and weeds with good to fair cover. Areas disturbed by grading activities were reseeded and have since stabilized. In regarding to historic versus existing drainage basin delineation, the bisecting parcel ridgeline has been relocated further to the south, which results in redirecting more of the runoff to the southwestern part of the site and less to the CDOT rights of way. The few small depressions remain on site, near the west boundary. For the purposes of hydrologic analysis, these small depressions will continue to not be evaluated for their ability to detain runoff. Ultimately, all runoff from the parcel is conveyed to the west toward to existing drainage facilities located under Peterson Road and ultimately the East Fork of Sand Creek as in the historic condition.

This section only discusses the changes in basin geometry and drainage pattern and provides a direct comparison the historic versus existing conditions utilizing the same outfall (design) points, which have remained undisturbed.

Design Point 4

Basin A currently consists of 11.02 acres which continues to drain from east to west eventually discharging along the western boundary of the site, approximately 250' south of the northern property line. Peak runoff, post grading, is lower at an estimated 7.1 cfs and 25.5 cfs (**Design Point 2**) as compared to the historic condition flow rates of 7.4 cfs and 27.7 cfs in the 5-year and 100-year events respectively

Design Point 5

Basin C currently consists of 7.84 acres that drain from northeast to southwest eventually discharging along the western boundary of the site, approximately 200' north of the southern property line. Peak runoff rates at this location, are also than lower than the historic conditions with post grading flows of 5.0 cfs and 14.5 cfs at **Design Point 3** as compared to 8.3 cfs and 18.2 cfs in the 5-year and 100-year events respectively. Despite the basin currently being larger in area than in the historic condition, a decrease occurs in the peak flow rates as a result of a longer flow path to the given design point.

Design Point 6

Basin A consists of 3.99 undeveloped acres that drains from east to west into the US HWY 24 Right of Way at the southern boundary of the site. Peak runoff at this location is lower than the historic condition at an estimated 0.9 cfs and 6.3 cfs (**DP 6**), as compared to 1.2 cfs and 8.5 cf in the 5-year and 100-year events respectively.

Design Point 7

Basin OS-2 consists of 4.98 acres of the northern half of the US HWY 24 roadway and adjoining native grass lined barrow ditch. Runoff produced within the basin combines with runoff from the subject site (**DP6**) at a lower cumulative peak runoff rates of 9.9 and 28.0 cfs in the 5 and 100-year storm events at **DP7**.

Four Step Process

Step 1 Employ Runoff Reduction Practices – Approx. 2.54 acres of the proposed development is being set aside for a Full Spectrum Detention (FSD) Pond. Whenever possible, runoff produced within developable area containing impervious surfaces will be routed through landscaped areas or earthen swales (grass-lined where slope exceeds 2%) to minimize direct connection of impervious surfaces. In the interim, runoff will be reduced through the use of (4) temporary sediments ponds until the ground has been stabilized with vegetation or permanently developed.

Step 2 Provide Water Quality Capture Volume – A Full Spectrum Detention Pond is proposed to reduce peak discharge rates and provide water quality treatment. In the interim stage, four (4) temporary Sedimentation Ponds are provided to collect sediment for the disturbed area this will function to maintain existing water quality levels during construction, and prior to permanent development.

Step 3 Stabilize Drainageways – The site will use a Full Spectrum Detention (FSD) Pond to control developed runoff that is discharging into an existing CDOT ROW roadside ditch and ultimately into Sand Creek. The FSD outlet structure will be designed to drain the water quality event storm in 40 hours, while reducing the 100 year peak discharge to approximately 90% of the predevelopment conditions. As the flow is discharged offsite, it continues southwest in CDOT's manmade roadside ditch until it reaches Peterson Road. From here, it is conveyed to the other side of the road, into a similar earthen channel, via a 36" CMP culvert. The drainage continues southwest in the right of way, until it reaches the East Fork Sand Creek Channel. Rip Rap barriers are lined throughout this portion of the pathway approximately every 90-100 feet to the channel. The Drainageway Exhibit provided in the Drainage Maps section of the Appendix provides a better visual representation of this information.

The development of this site is not anticipated to have negative effects on downstream drainage ways since flows released will be below historic rates. In the interim, the site proposes four temporary sedimentation ponds, before discharging at the southwest property corner of the site and onto an adjacent undeveloped property via riprap-lined spillways. This ensures that in this stage of the development negative effects on the downstream drainage ways will be avoided.

Step 4 Consider Need for Industrial and Commercial BMP's – The proposed development will implement a Stormwater Management Plan including property housekeeping practices and spill containment procedures.

Proposed Drainage Characteristics

The proposed site is will be developed into ten (10) commercial lots, one (1) multifamily residential and three tracts. The proposed development will extend Meadowbrook Parkway to the west and will include a single lane roundabout to be constructed at the intersection of the Meadowbrook Parkway and Newt Drive to aid in traffic control. A proposed private looped roadway, Crossroad Heights, will extend into the site to provide access and a utility corridor to both the commercial and

residential developments. At this time, it is anticipated that the development and design of Lot 11 (by others) is planned to occur concurrently with the construction of the proposed utilities and infrastructure provided by this plan. Coordination is ongoing, as such; the routing of storm sewer main line thru the site and the planned outfall locations will be formalized with the Final Drainage Report. A separate drainage letter or report will be required for that portion of the development.

The following summary generalizes the proposed drainage patterns and drainage improvements required to safely route developed runoff to downstream facilities.

A storm sewer pipe and inlet will be constructed at the southwest corner of the newly constructed roundabout to aid in collecting runoff reaching the site from offsite watersheds. These facilities will connect to the existing system located inside the existing Meadowbrook Subdivision. Bypassed flows and developed flows within the newly constructed Meadowbrook Parkway will be collected by a pair of sump inlets located at the west end of the roadway. The drainage facilities located with the rights of way will be public all remaining onsite storm sewer and drainage improvements shall be private. A private looped roadway will provide access and utility corridors for development. Private storm sewer mains, stubs, and inlets will be extended along these corridors to serve the development. The extension of these facilities beyond what is shown by this plan is likely with future development. Runoff collected by the infrastructure will be conveyed to a single full spectrum detention pond located in the southwest corner of the subdivision. The proposed outfall from the pond is planned to discharge to the existing barrow ditch located with the north half of the existing CDOT Right of Way. A drainage easement will be required from CDOT for the outfall and slope protection facilities that fall within the corridor. It should be noted that the storm outfall will be shaped into the existing hillside and any soil riprap protection will be buried. Runoff leaving the site and entering the CDOT corridor will discharge at less than historic rates. The previous discharge points along the west boundary of the subject site which also previously contributed to the barrow ditch will be virtually eliminated, further reducing the peak flow rates to downstream facilities.

Proposed Detailed Drainage Discussion

Design Point 1

Basin E2 (Claremont Business Park Filing No.2) consists of a reported 3.86 developed acres of Development located along the southeastern half of existing Meadowbrook Parkway some 1200' northeast of the subject site. Runoff produced by the offsite development (CBPF2 Lot 46) is conveyed to Meadowbrook Parkway at flow rates of $Q_5=15.1$, $Q_{100}=28.6$ cfs in the 5 and 100-year storm events respectively. The collected flows combines with runoff from **Basin EX-A2 (Lot 1 24/94 Business Park Filing No.1)** ($Q_5=2.5$, $Q_{100}=4.5$ cfs) which consist of 0.59 acres of the southeastern half of Meadowbrook Parkway located immediately east of existing Newt Drive. The collected flows from the two basins culminate at **Design Point 1** at peak rates of $Q_5=14.2$ and $Q_{100}=26.5$. An existing 10' CDOT Type R at-grade inlet (**Inlet 1**) intercepts flows of $Q_5=8.4$ and $Q_{100}=11.1$, with subsequent by-pass flows of 5.8 and 15.4 cfs in the 5 and 100 year events. Surface flows continue west within the south half of existing Meadowbrook Parkway.

Design Point 2

Basin OS-A (Meadowbrook Crossing Filing 1 and 2) consists of 1.29 acres of the northern half of existing Meadowbrook Parkway located immediately east of Newt Drive. Runoff produced within this basin totals $Q5=3.1$ and $Q100=6.0$ cfs. An existing 10' CDOT Type R at grade inlet (**Inlet 2**) collects runoff of $Q5=3.1$ and $Q100=5.3$ cfs, with subsequent by-pass flows in only the 100 year event of 0.7 cfs. Runoff leaving the design point continuing west within the north half of existing Meadowbrook Parkway.

Design Point 3

Basin OS-1 consists of approximately 1.40 acres of existing Newt Drive that will be retrofitted with new raised median as part of an intersection conversion to a roundabout. Runoff produced within the basin ($Q5=6.5$, $Q100=11.6$ cfs) will combine with flow-by from **DP1** at a proposed public 10'-a-grade inlet located at DP3. A proposed public 24 storm sewer (**PR1**) will convey water across the intersection to the existing 42" storm sewer with Meadowbrook Crossings in accordance with that subdivisions drainage report. A new larger manhole may be required to make the connection to the existing line. It is important to note that this connection remains feasible as the roundabout is not anticipated to significantly increase the overall imperviousness of the area above that of the existing condition. Runoff in excess of the inlet capacity ($Q5=3.5$ and $Q100=13.5$ cfs) will continue westward via the curb and gutter of Proposed Meadowbrook Parkway.

FLOWBY FLOWRATES IDENTIFIED HERE

identify the flow-by flow rate.

Design Point 4

Basin A consists of 1.68 acres of the north half of proposed Meadowbrook. Runoff within this basin ($Q5=6.5$, $Q100=11.6$ cfs) combines with minor flow by from **DP2**. A proposed 10' sump inlet located at west end of the roadway will prevent developed flows from leaving the roadway corridor. The inlet will convey intercept runoff of 6.5 and 19.1 (split 100 yr flows with DP5) underneath the roadway via a public 24" RCP (**PR2**).

Design Point 5

Basin B consists of 1.49 acres of the south half of proposed Meadowbrook Parkway. Runoff produced within this basin ($Q5=5.8$, $Q100=10.4$ cfs) combines with flow-by leaving **DP3**. A proposed public 10' sump inlet located at west end of the roadway will prevent developed flows from leaving exiting the roadway corridor. The intercepted runoff of 9.9 cfs and 19.1 cfs in the 5 and 100 year events respectively will combine with **PR2** flows in a 36" Private storm sewer system (**PR3**). Combined flows within the proposed system are calculated to peak at 16.4 and 38.2 cfs.

Design Point 6

Basin C consists of 4.61 acres of commercial lots (1-5 and portions of lot 6) located along the east side of the site. A private 36" storm drain (**PR4-PR6**) is provided to collect flows of $Q5=5.8$ and $Q100=10.4$ cfs at **DP6** in the 5 and 100 years respectively. Intercepted flows are conveyed west underground within a public access and utility easement.

Design Point 7

Basin D consists of 2.22 acres of commercial lots located between Meadowbrook Parkway and the looped roadway. **Basin D** which includes portions of lot 9 and 10 will require a private 24" storm drain (**PR7**) to collect flows of $Q_5=9.3$ and $Q_{100}=17.0$ cfs in the 5 and 100 year storm event.

Design Points 8 and 9

Basin E consists of 2.71 acres of commercial lots and roadway located in the central portion of the site. Two private 10' CDOT Type R at-grade inlets (**Inlets 7 and 8**) located on the north and south will each collect flows approximately 4.8 and 6.9 cfs in the minor and major storm events. Runoff collected from the inlets will be conveyed to the south side of the planned roadway via private 24" (**PR8**) and 30" (**PR9**) storm drains. A proposed 36" storm sewer (**PR10**) will convey flows to the west underground a peak flow rates of 35.0 and 60.5 cfs in the 5 and 100 year events. A drainage easement storm sewer easement may need to be provided along this portion of the alignment depending upon the building setback requirements.

Design Point 10 and 11

Basin G consists of 0.94 acres of commercial lots and roadway located in the central portion of the site. Two private 10' CDOT Type R sump inlets (**Inlets 7 and 8**) located on the east and west side of the street function to collect the runoff from basin G as well as any by pass flows from Design DP8 and 9. Pipe Run 14 a 42" private storm sewer will direct runoff south underground at peak flow rates of 39.9 cfs and 78.1 cfs in the minor and major storm event.

Design Point 12

Basin F consists of 2.57 acres of commercial lots (lot 8 and portions of lot 7) located along the southern boundary of the site. A private 24" storm drain (**PR15**) is provided to collect flows of $Q_5=10.8$ and $Q_{100}=19.6$ cfs at **DP12** in the 5 and 100 years respectively. Intercepted flows are conveyed west underground to the main line. **Pipe Runs 16 and 17** (private 42" storm sewer) direct the collected runoff to the concrete forebay located within the east end of a proposed full spectrum detention pond at peak flow rates of $Q_5=49.7$ and $Q_{100}=96.0$ cfs

Delete duplicate

Design Point 12

DUPLICATE DELETED

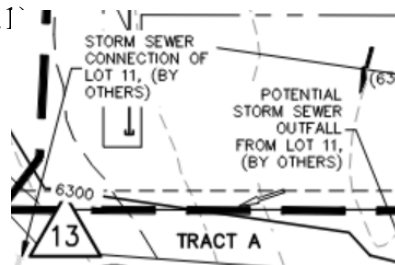
Basin F consists of 2.57 acres of commercial lots (lot 8 and portions of lot 7) located along the southern boundary of the site. A private 24" storm drain (**PR15**) is provided to collect flows of $Q_5=10.8$ and $Q_{100}=19.6$ cfs at **DP12** in the 5 and 100 years respectively. Intercepted flows are conveyed west underground to the main line. **Pipe Runs 16 and 17** (private 42" storm sewer) direct the collected runoff to the concrete forebay located within the east end of a proposed full spectrum detention pond at peak flow rates of $Q_5=49.7$ and $Q_{100}=96.0$ cfs

Design Points 13

Basin H consists of 11.07 acres of proposed apartment site (Lot 11). Runoff produced within this basin ($Q_5=26.2$, $Q_{100}=53.8$ cfs) flows from northeast to southwest until it reaches the proposed public 42" RCP storm sewer at the design point. The cumulative flows at **Design Point 13** are $Q_5=26.2$ and $Q_{100}=53.8$ cfs and will be routed to the full spectrum detention pond at **Design Point 15** via **Pipe Run 18** ($Q_5=42.1$, $Q_{100}=91.1$)

NARRATIVE INCLUDED

include a narrative regarding the following notes on the drainage map.



REVISED

Include a narrative regarding the swale and lot 11 site plan



Design Points 14

Basin I consists of 1.60 acres of proposed apartment site (Lot 11). Runoff produced within this basin ($Q_5=3.8$, $Q_{100}=7.8$ cfs) flows from north to south and collects in the proposed, grass-lined swale. The cumulative flows at **Design Point 14** are $Q_5=3.8$ and $Q_{100}=7.8$ cfs and will be routed to the full spectrum detention pond at **Design Point 15**.

Design Points 15

Basin J consists of 3.21 acres of the proposed full spectrum detention pond. Runoff produced within this basin ($Q_5=2.3$, $Q_{100}=10.0$ cfs) flows from northeast to southwest, combining with flows from **Design Point 14**, **Pipe Run 17**, and **Pipe Run 18**. This combination of runoff collects in the proposed outlet structure of the pond. The cumulative flows at **Design Point 14** are $Q_5=95.3$ and $Q_{100}=199.8$ cfs, and will be routed to the existing 5' bottom earthen swale in CDOT's Right of Way at **Design Point 16** via **Pipe Run 19** ($Q_5=1.9$, $Q_{100}=8.2$).

Design Points 16

Basin OS-2 consists of 4.98 acres. Approximately half of this basin is comprised of the paved surface of U.S. Highway 24, while the other half is comprised of the 5 foot bottom earthen swale in CDOT's Right of Way. Runoff produced within this basin ($Q_5=8.7$, $Q_{100}=19.6$ cfs) flows from northeast to southwest, combining with flows from **Design Point 15**. This combination of runoff collects in the existing swale in the right of way. The cumulative flows at **Design Point 16** are $Q_5=9.9$ and $Q_{100}=27.7$ cfs, which are lower than the historic rates. Flows from this design point continue to downstream infrastructure. A rip rap pad is located at the terminus of the storm sewer.

This should be under DP3

REVISED

In accordance with the assumptions outlined within the Meadowbrook Subdivision Final Drainage Report an offsite public storm sewer pipe and inlet will be constructed at the southwest corner of the newly constructed roundabout to aid in collecting runoff from the a portion of the offsite watersheds located to the east of the site. A new manhole may be required to connect the outfall to the existing pipe located inside the existing Meadowbrook Subdivision. As the area is already paved increases to the imperviousness of this area are not anticipated and thus should not initiate the need for

Water Quality Provisions and Maintenance

The proposed full spectrum detention (FSD) pond functions to provide detention and water quality for the proposed development. This full spectrum detention pond will function to treat approximately 32.10 acres of tributary area by providing 0.857 acre-feet of storage for the water quality event, 3306 acre feet of storage at the EURV storm event, and 4.729 acre-feet of storage in the 100-year event. The 25' wide emergency spillway is designed with a foot of freeboard in the 100-year event. This spillway safely conveys flows to CDOT's Right of Way in the event of outlet clogging or failure, and will be armored with permanent erosion control fabric. The results show that the FSD pond remains functional in the 100-year event and the outlet structure is able to

update. Missing decimal point.

REVISED

discharge flows to the to an existing swale and ultimately to Sand Creek. The sizing for the full spectrum detention facility has been determined using the guidelines set forth in the Urban Drainage and Flood Control District Criteria Manual. Refer to the UDFCD MHFD-Detention, Version 4.03, Excel Workbook located within the appendix of this report for calculations.

The proposed FSD pond will be privately owned and maintained by the property owner or the metropolitan district. Access to the pond shall be granted to the owner/district and El Paso County for access and maintenance of the private facility. A private maintenance agreement document shall accompany this report submittal.

Erosion Control

It is the policy of the El Paso County that M&S Civil Consultants submit a grading and erosion control plan with the drainage report since pre-development grading is being requested. The plan includes proposed silt fence, vehicle traffic control and (4) temporary sediment basins as proposed as erosion control measures. The plan also includes provisions for stockpiling and staging. A stormwater management plan is provided to accompany the plans.

| | | | | | |
|----------|----------------|-------|-----------------|----------|---------|
| FOFO3600 | Fountain Creek | 1991* | Fisher's Canyon | \$19,752 | \$0 |
| FOFO4000 | Fountain Creek | 1996 | Sand Creek | \$20,387 | \$8,339 |
| FOFO4200 | Fountain Creek | 1977 | Spring Creek | \$10,244 | \$0 |
| FOFO4600 | Fountain Creek | 1994* | Southwest Area | \$40,750 | \$0 |

2021 Drainage & Bridge Fees:

Update. The unit cost are incorrect for Sand Creek.

$$\begin{array}{rcl}
 \times 77.4\% \$ & 13,775.00 & = \$ 309,513.51 \\
 \times 77.4\% \$ & 819.00 & = \$ 18,402.29 \\
 \text{Total} & & \$ 327,915.80
 \end{array}$$

REVISED

Drainage fees shall be paid at the time of platting.

Construction Cost Estimate (Non-Reimbursable)

| Item | Amount | Unit | Unit Cost | Total Cost |
|-----------------------|--------|------|--------------|-------------------|
| 10' CDOT Type R Inlet | 5 | EA | \$ 9,890.00 | \$ 49,450.00 |
| 15' CDOT Type R Inlet | 2 | EA | \$ 13,002.00 | \$ 26,004.00 |
| Type II MH | 8 | EA | \$ 6,000.00 | \$ 48,000.00 |
| 18" RCP | 181 | LF | \$ 69.00 | \$ 12,489.00 |
| 24" RCP | 184 | LF | \$ 107.00 | \$ 19,688.00 |
| 30" RCP | 33 | LF | \$ 170.00 | \$ 5,610.00 |
| 42" RCP | 746 | LF | \$ 306.00 | \$ 228,276.00 |
| Total Cost: | | | \$ | 389,517.00 |

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2020.

REVISED

revise to 2021

Summary:

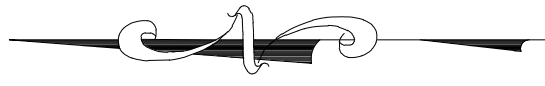
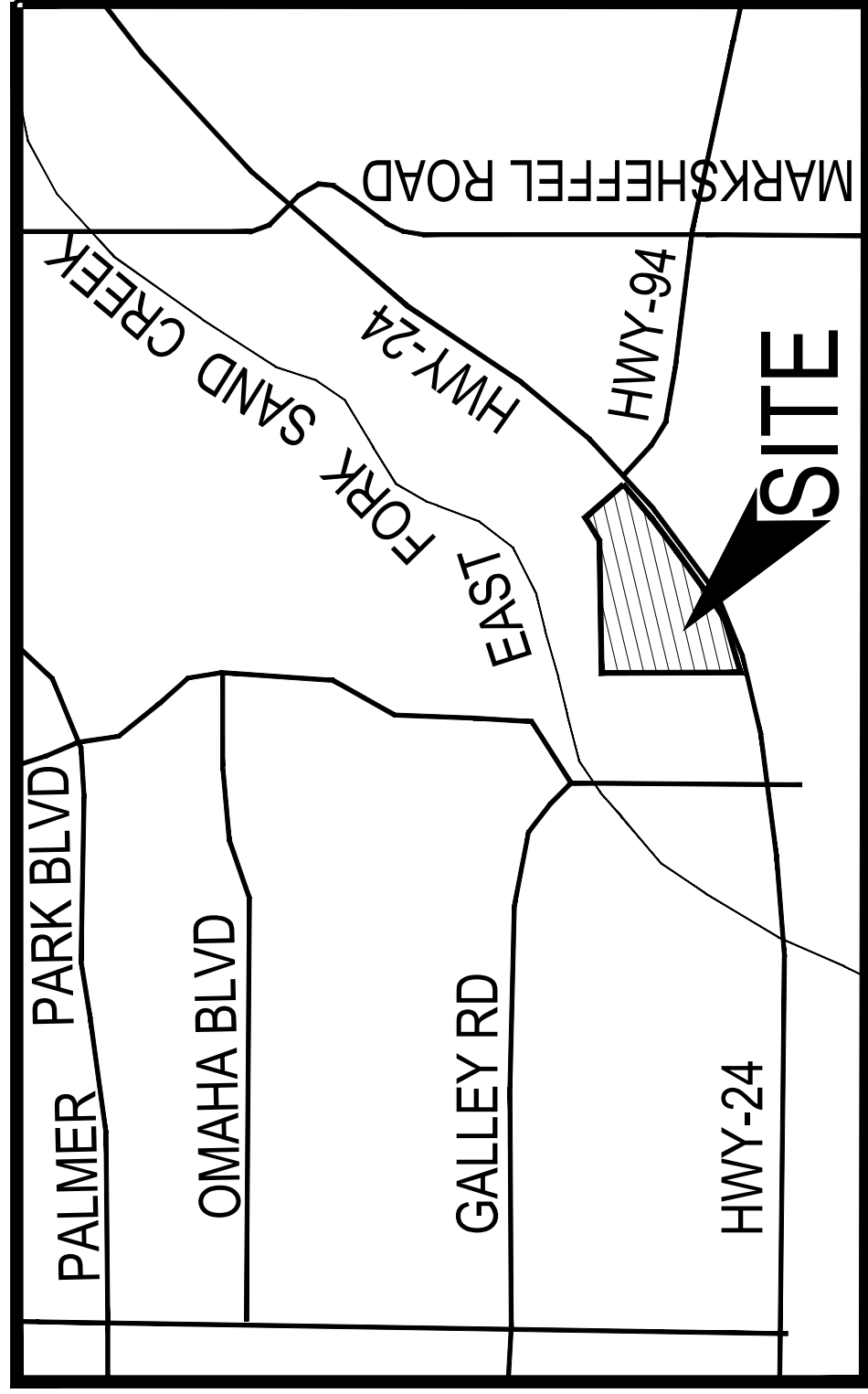
The construction of this site is for the purposes of creating commercial lots and an apartment site. Currently, no impervious surfaces are being constructed. The site will be graded and all disturbed areas will be seeded and mulched. Post construction runoff will be discharged to downstream property at rates that are below historic discharge rates. In the historic condition, the total flows leaving the site that reach the East Fork Sand Creek Channel are 19.0 cfs and 68.1 cfs in the 5 year and 100 year storm events, respectively. Through the strategic design and placement of storm sewer infrastructure components, this overall rate is reduced to approximately 50% of historic rates at 9.9 and 27.7 cfs in the proposed condition. Erosion control measures will be implemented to prevent sediment migration. The construction of Crossroads Mixed Use shall not adversely affect adjacent or downstream property. Subsequent drainage reports will be required if and when the site is developed behind the uses defined within this report.

References:

- 1.) "El Paso County and City of Colorado Springs Drainage Criteria Manual".
- 2.) "Urban Storm Drainage Criteria Manual"
- 3.) SCS Soils Map for El Paso County.
- 4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Revised date December 7th, 2018.
- 5.) "Final Drainage Report for Claremont Business Park Filing No. 2", dated November 2006, by Matrix Design Group, Inc.
- 6.) "Preliminary and Final Drainage Report Meadowbrook Crossing Filing 1 and Filing 2", dated July 25, 2017, by Kiowa Engineering Corporation.
- 7.) "Final Drainage Report Lot 1 24/94 Business Park Filing No. 1 on Platte Avenue and Meadowbrook Parkway", dated April 28, 2016 and revised July 14, 2016, by Core Engineering Group, LLC.
- 8.) "Final Drainage Report for Meadowbrook Dirt Borrow Site ", dated November 2018, by M&S Civil Consultants, Inc.
- 9.) "Sand Creek Drainage Basin Planning Study", revised March 1996, by Kiowa Engineering Corporation.

APPENDIX

VICINITY MAP



VICINITY MAP

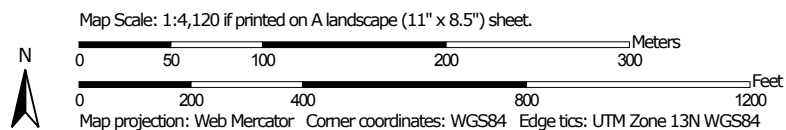
N.T.S.

SOILS MAP

Soil Map—El Paso County Area, Colorado



Soil Map may not be valid at this scale.




**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey


9/20/2018
Page 1 of 3


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 15, Oct 10, 2017

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

Date(s) aerial images were photographed: Jun 3, 2014—Jun 17, 2014

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 | 35.2 | 95.4% |
| 10 | Blendon sandy loam, 0 to 3 percent slopes | 1.7 | 4.6% |
| Totals for Area of Interest | | 36.9 | 100.0% |

FIRM PANELS

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.

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NGS Information Services
NOAA, NIMS12
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, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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.

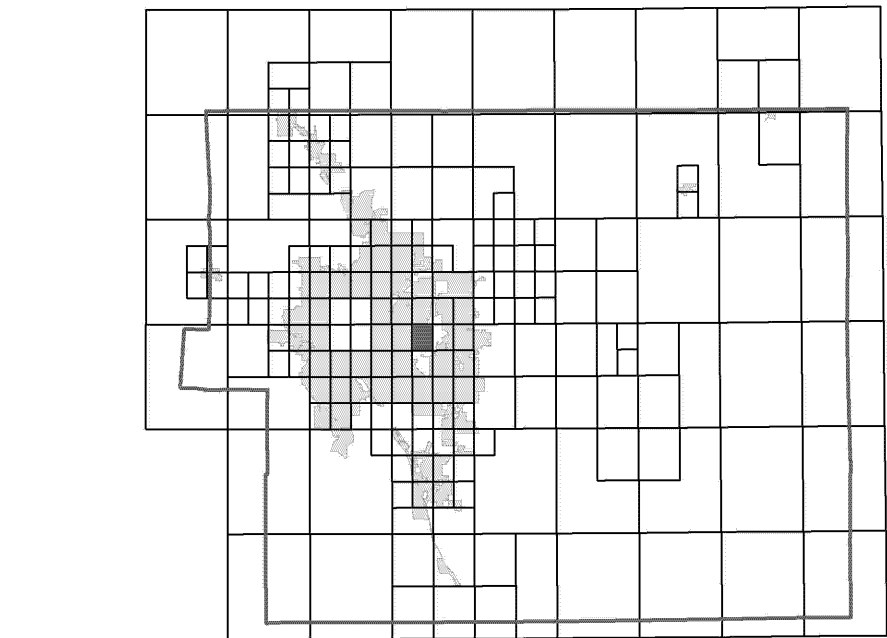
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If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.

| 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 | |

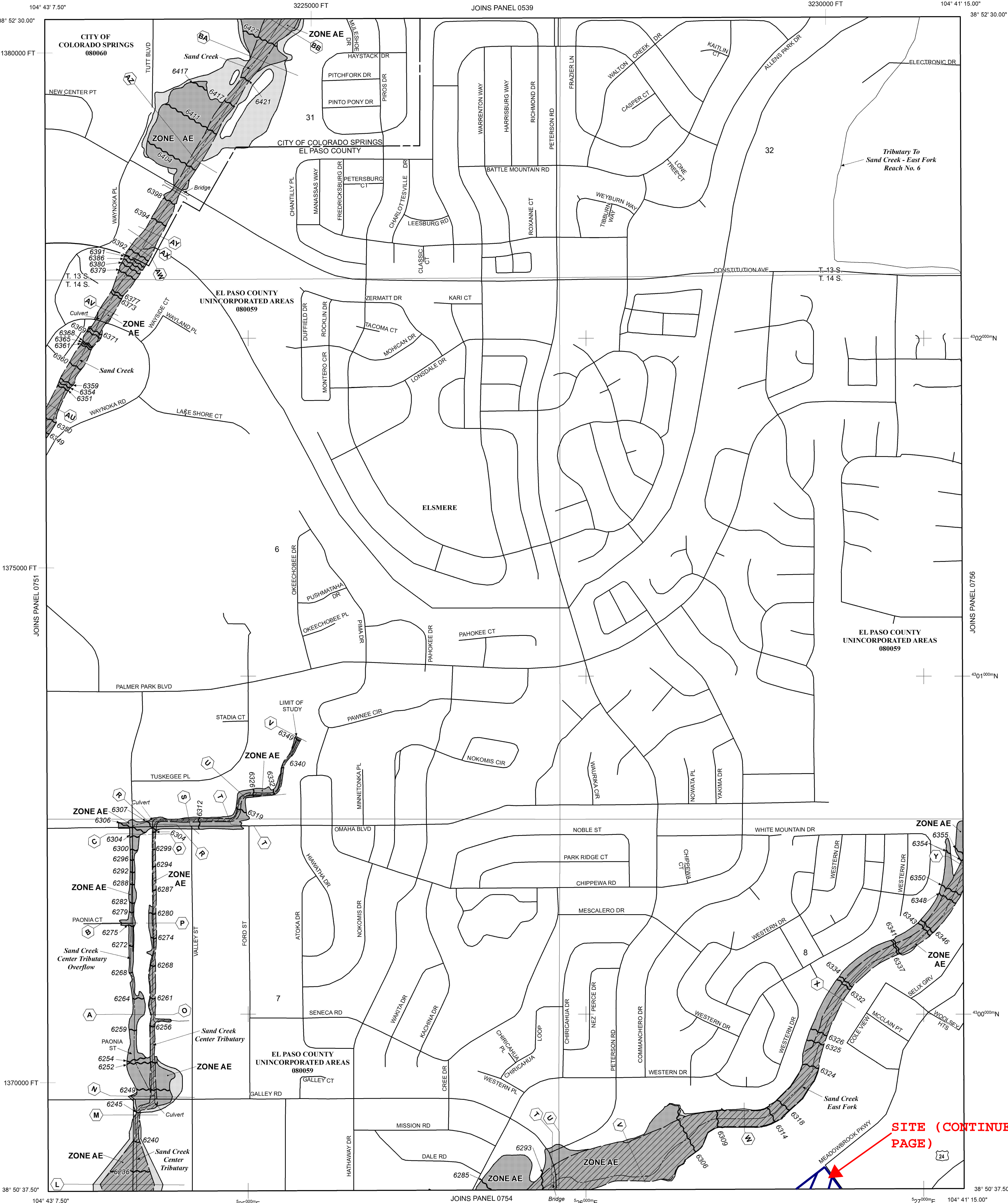
Panel Location Map



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.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST, AND TOWNSHIP 14 SOUTH, RANGE 65 WEST.

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 equalled 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 identified. 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.
Base Flood Elevation line and value; elevation in feet* (EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*

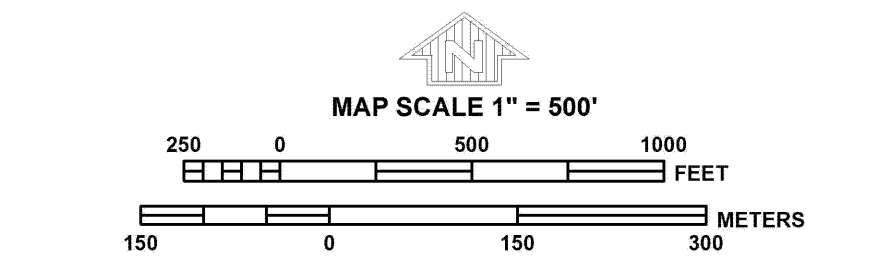
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Cross section line
Transect line
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
1000-meter Universal Transverse Mercator grid ticks, zone 13
5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
Bench mark (see explanation in Notes to Users section of this FIRM panel)
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.



PANEL 0752G

FIRM

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

PANEL 752 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

| CONTAINS: | COMMUNITY | NUMBER | PANEL | SUFFIX |
|-----------|---------------------------|--------|-------|--------|
| | COLORADO SPRINGS, CITY OF | 08060 | 0752 | G |
| | EL PASO COUNTY | 08059 | 0752 | G |

Notice: This map was released on 05/15/2020 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
08041C0752G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOTES TO USERS

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NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
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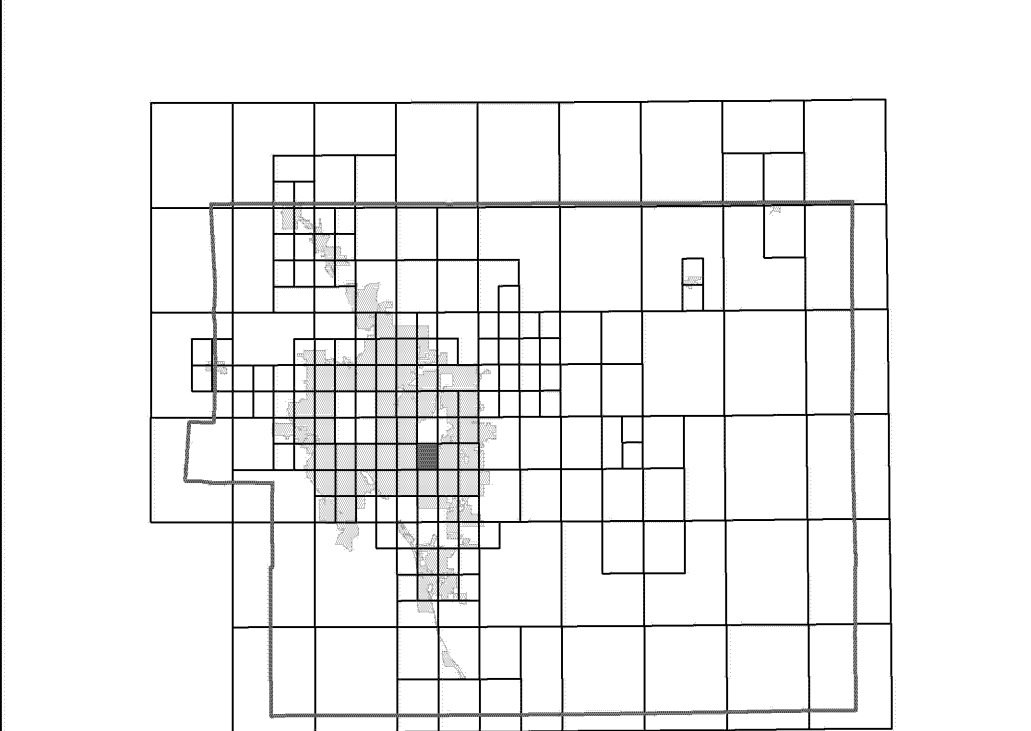
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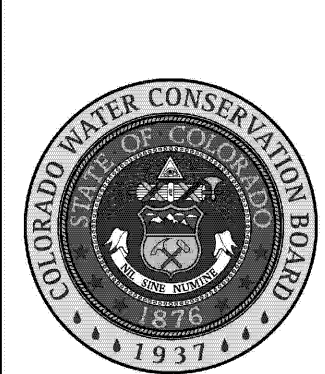
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| El Paso County Vertical Datum Offset Table | |
|---|----------------------------|
| Flooding Source | Vertical Datum Offset (ft) |
| REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION | |

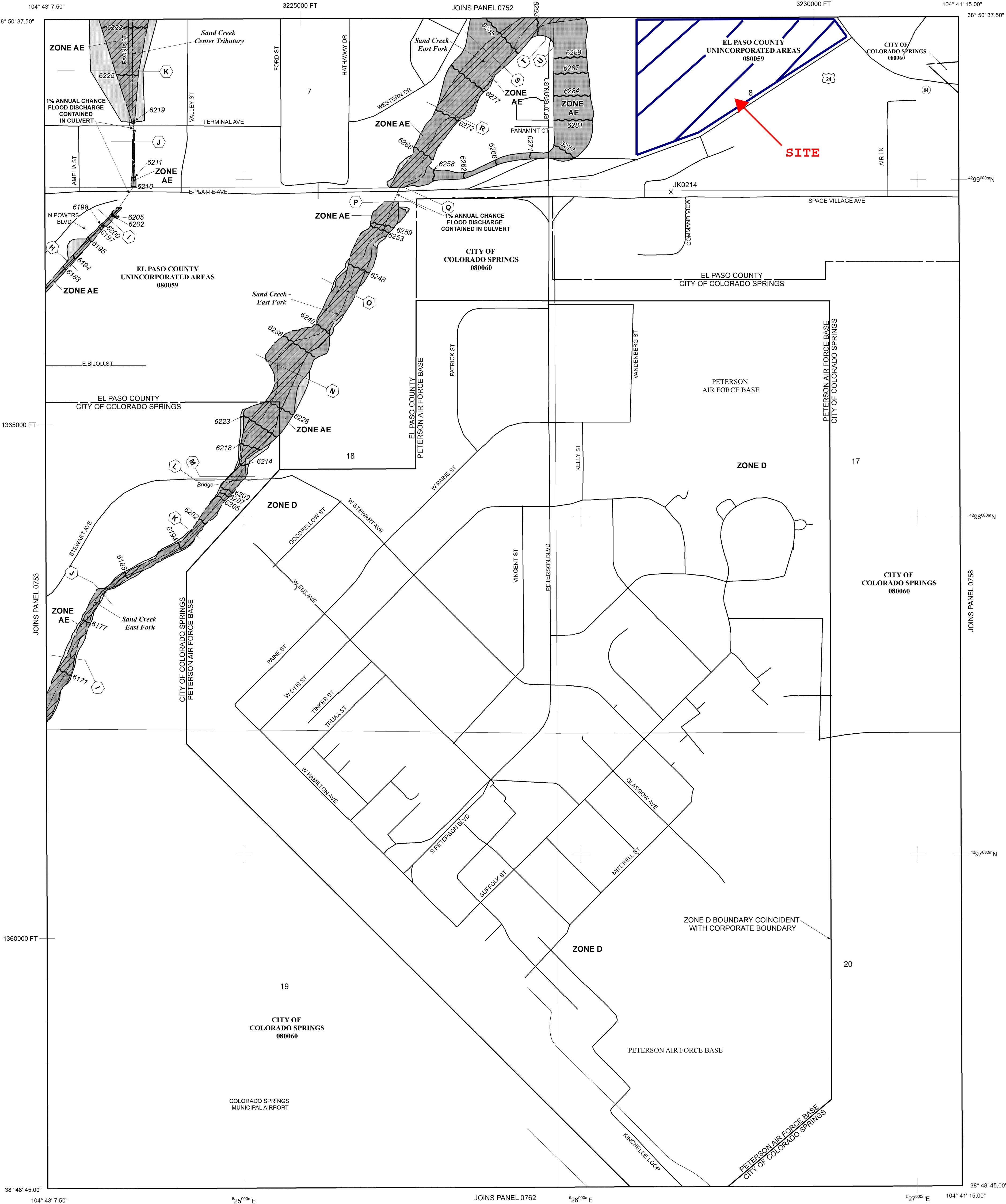
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NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 65 WEST.

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 equalled 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.
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)

Cross section line
Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

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



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 | 08060 | 0754 | G |
| EL PASO COUNTY | 08059 | 0754 | G |

Notice: This map was reissued on 05/15/2020 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

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Historic Area Runoff Coefficient Summary)

| | | | <i>STREETS / DEVELOPED</i> | | | <i>OVERLAND / DEVELOPED</i> | | | <i>WEIGHTED</i> | |
|------------------------|----------------------------|-------------------------------|-----------------------------------|----------------------|------------------------|------------------------------------|----------------------|------------------------|------------------------|------------------------|
| BASIN | TOTAL AREA (SF) | TOTAL AREA (Acres) | AREA (Acres) | C₅ | C₁₀₀ | AREA (Acres) | C₅ | C₁₀₀ | C₅ | C₁₀₀ |
| <i>C</i> | 256383.3 | 5.89 | 0.00 | 0.90 | 0.96 | 5.89 | 0.08 | 0.35 | <i>0.08</i> | <i>0.35</i> |
| <i>A</i> | 561176.6 | 12.88 | 0.00 | 0.90 | 0.96 | 12.88 | 0.08 | 0.35 | <i>0.08</i> | <i>0.35</i> |
| <i>B</i> | 593693.4 | 13.63 | 0.00 | 0.90 | 0.96 | 13.63 | 0.08 | 0.35 | <i>0.08</i> | <i>0.35</i> |
| <i>OS-1</i> | 55560.16 | 1.28 | 1.28 | 0.90 | 0.96 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>OS-2</i> | 216993.7 | 4.98 | 2.49 | 0.90 | 0.96 | 2.49 | 0.08 | 0.35 | <i>0.49</i> | <i>0.66</i> |
| <i>EX-A2***</i> | | 0.59 | 0.59 | 0.90 | 0.96 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>OS-A**</i> | | 1.29 | 1.29 | 0.62 | 0.72 | 0.00 | 0.08 | 0.35 | <i>0.62</i> | <i>0.72</i> |
| <i>E2*</i> | | 3.86 | 3.86 | 0.80 | 0.90 | 0.00 | 0.08 | 0.35 | <i>0.80</i> | <i>0.90</i> |

*FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2

***FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Historic Area Drainage Summary)

| From Area Runoff Coefficient Summary | | | | OVERLAND | | | | STREET / CHANNEL FLOW | | | | Time of Travel (T_t) | | INTENSITY ^ | | TOTAL FLOWS | |
|--------------------------------------|-----------------------|--------------------|------------------|----------------|--------|--------|----------------|-----------------------|-------|----------|----------------|--------------------------|-------|----------------|------------------|----------------|------------------|
| BASIN | AREA TOTAL (Acres) | C ₅ | C ₁₀₀ | C ₅ | Length | Height | T _C | Length | Slope | Velocity | T _t | TOTAL | CHECK | I ₅ | I ₁₀₀ | Q ₅ | Q ₁₀₀ |
| | | From DCM Table 5-1 | | | (ft) | (ft) | (min) | (ft) | (%) | (fps) | (min) | (min) | (min) | (in/hr) | (in/hr) | (c.f.s.) | (c.f.s.) |
| C | 5.89 | 0.08 | 0.35 | 0.08 | 300 | 9 | 22.2 | 500 | 2.0% | 1.0 | 8.4 | 30.6 | 14.4 | 2.5 | 4.1 | 1.2 | 8.5 |
| A | 12.88 | 0.08 | 0.35 | 0.08 | 300 | 13 | 19.7 | 1350 | 1.6% | 0.9 | 25.2 | 44.8 | 19.2 | 1.9 | 3.2 | 1.9 | 14.2 |
| B | 13.63 | 0.08 | 0.35 | 0.08 | 300 | 11 | 20.8 | 750 | 1.7% | 0.9 | 13.7 | 34.5 | 15.8 | 2.3 | 3.8 | 2.5 | 18.2 |
| OS-1 | 1.28 | 0.90 | 0.96 | 0.90 | 100 | 3 | 2.5 | 490 | 2.2% | 3.0 | 2.8 | 5.3 | 13.3 | 5.1 | 8.5 | 5.8 | 10.5 |
| OS-2 | 4.98 | 0.49 | 0.66 | 0.49 | 85 | 8 | 4.8 | 1165 | 1.8% | 2.0 | 9.6 | 14.5 | 16.9 | 3.6 | 6.0 | 8.7 | 19.6 |
| EX-A2*** | 0.59 | 0.90 | 0.96 | 0.90 | 10 | 0.2 | 0.9 | 916 | 1.9% | 2.7 | 5.6 | 6.5 | 15.1 | 4.8 | 8.0 | 2.5 | 4.5 |
| OS-A** | 1.29 | 0.62 | 0.72 | 0.62 | 40 | 0.8 | 4.4 | 1310 | 1.9% | 2.8 | 7.9 | 12.3 | 17.5 | 3.8 | 6.4 | 3.1 | 6.0 |
| E2* | 3.86 | 0.80 | 0.90 | 0.80 | 50 | 1 | 3.0 | 400 | 1.3% | 2.3 | 2.9 | 6.0 | 12.5 | 4.9 | 8.2 | 15.1 | 28.6 |

^ Intensity equations assume a minimum travel time of 5 minutes.

*VALUES DERIVED USING DATA FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**VALUES DERIVED USING DATA FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2 PAGE 31

***VALUES DERIVED USING DATA FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Calculated by: CVW

Date: 2/23/2021

Checked by: DLM

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Historic Basin Routing Summary)

| From Area Runoff Coefficient Summary | | | | OVERLAND | | | | PIPE / CHANNEL FLOW | | | | Time of Travel (T _t) | | INTENSITY * | | TOTAL FLOWS | | COMMENTS |
|--------------------------------------|----------------------|-----------------|-------------------|-----------------------------------|----------------|----------------|-------------------------|---------------------|--------------|-------------------|-------------------------|----------------------------------|---------------------------|-----------------------------|----------------------------|------------------------------|--|----------|
| DESIGN POINT | CONTRIBUTING BASINS | CA ₅ | CA ₁₀₀ | C ₅ | Length (ft) | Height (ft) | T _C (min) | Length (ft) | Slope (%) | Velocity (fps) | T _t (min) | TOTAL (min) | I ₅ (in/hr) | I ₁₀₀ (in/hr) | Q ₅ (c.f.s.) | Q ₁₀₀ (c.f.s.) | | |
| | | | | | | | | | | | | | | | | | | |
| 1 | E2 EX-A2 | 3.09 | 3.47 | | | | 6.0 | 916 | 1.9% | 2.7 | 5.6 | 11.6 | 3.9 | 6.6 | 14.2 | 26.5 | EXISTING 10' CDOT TYPE R AT GRADE INLET | |
| | | 0.53 | 0.57 | | | | | | | | | | | | | | | |
| | | 3.62 | 4.04 | Tc for E2 Used | | | | | | | | | | | | | | |
| 2 | OS-A | 0.80 | 0.93 | | | | | | | | | 12.3 | 3.8 | 6.4 | 3.1 | 6.0 | EXISTING 10' CDOT TYPE R AT GRADE INLET | |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | | |
| 3 | OS-1 FB-DP1 | 1.15 | 1.22 | | | | 11.6 | 150 | 1.0% | 2.0 | 1.3 | 12.8 | 3.8 | 6.3 | 9.8 | 22.5 | END OF PAVEMENT | |
| | | 1.47 | 2.35 | | | | | | | | | | | | | | | |
| | | 2.62 | 3.57 | Tc for DP1 Used | | | | | | | | | | | | | | |
| 4 | A FB-INDP5 DP3 | 1.03 | 4.51 | | | | 12.8 | 1470 | 1.6% | 0.9 | 28.0 | 40.8 | 2.0 | 3.4 | 7.4 | 27.7 | ADJACENT PARCEL (LOT 1) | |
| | | 0.00 | 0.10 | | | | | | | | | | | | | | | |
| | | 2.62 | 3.57 | | | | | | | | | | | | | | | |
| | | 3.65 | 8.19 | Tc for DP3 Used | | | | | | | | | | | | | | |
| 5 | B | 1.09 | 4.77 | | | | | | | | | 34.5 | 2.3 | 3.8 | 8.3 | 18.2 | ADJACENT PARCEL (LOT 2) | |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | | |
| 6 | C | 0.47 | 2.06 | | | | | | | | | 30.6 | 2.5 | 4.1 | 1.2 | 8.5 | DISCHARGE TO CDOT ROW | |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | | |
| 7 | OS2 DP6 | 2.44 | 3.26 | | | | | | | | | 14.5 | 3.6 | 6.0 | 10.4 | 31.9 | BARROW DITCH SW CORNER OF SITE/CDOT ROW | |
| | | 0.47 | 2.06 | | | | | | | | | | | | | | | |
| | | 2.91 | 5.32 | Tc for OS2 Used | | | | | | | | | | | | | | |

Calculated by: CVW
Date: 2/23/2021
Checked by: DLM

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Existing Area Runoff Coefficient Summary)

| | | | <i>STREETS / DEVELOPED</i> | | | <i>OVERLAND / DEVELOPED</i> | | | <i>WEIGHTED</i> | |
|------------------------|----------------------------|-------------------------------|-----------------------------------|----------------------|------------------------|------------------------------------|----------------------|------------------------|------------------------|------------------------|
| BASIN | TOTAL AREA (SF) | TOTAL AREA (Acres) | AREA (Acres) | C₅ | C₁₀₀ | AREA (Acres) | C₅ | C₁₀₀ | C₅ | C₁₀₀ |
| <i>C</i> | 173960 | 3.99 | 0.00 | 0.90 | 0.96 | 5.89 | 0.08 | 0.35 | <i>0.08</i> | <i>0.35</i> |
| <i>A</i> | 480166.8 | 11.02 | 0.00 | 0.90 | 0.96 | 11.02 | 0.08 | 0.35 | <i>0.08</i> | <i>0.35</i> |
| <i>B</i> | 754121.6 | 17.31 | 0.00 | 0.90 | 0.96 | 17.31 | 0.08 | 0.35 | <i>0.08</i> | <i>0.35</i> |
| <i>OS-1</i> | 55560.16 | 1.28 | 1.28 | 0.90 | 0.96 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>OS-2</i> | 216993.7 | 4.98 | 2.49 | 0.90 | 0.96 | 2.49 | 0.08 | 0.35 | <i>0.49</i> | <i>0.66</i> |
| <i>EX-A2***</i> | | 0.59 | 0.59 | 0.90 | 0.96 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>OS-A**</i> | | 1.29 | 1.29 | 0.62 | 0.72 | 0.00 | 0.08 | 0.35 | <i>0.62</i> | <i>0.72</i> |
| <i>E2*</i> | | 3.86 | 3.86 | 0.80 | 0.90 | 0.00 | 0.08 | 0.35 | <i>0.80</i> | <i>0.90</i> |

*FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**FROM TO FDR MEADOWBROOK CROSSING FILING 1 AND FILING 2

***FROM FDR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Existing Area Drainage Summary)

| From Area Runoff Coefficient Summary | | | | OVERLAND | | | | STREET / CHANNEL FLOW | | | | Time of Travel (T_t) | | INTENSITY ^ | | TOTAL FLOWS | |
|--------------------------------------|-----------------------|--------------------|------------------|----------------|--------|--------|----------------|-----------------------|-------|----------|----------------|--------------------------|-------|----------------|------------------|----------------|------------------|
| BASIN | AREA TOTAL (Acres) | C ₅ | C ₁₀₀ | C ₅ | Length | Height | T _C | Length | Slope | Velocity | T _t | TOTAL | CHECK | I ₅ | I ₁₀₀ | Q ₅ | Q ₁₀₀ |
| | | From DCM Table 5-1 | | | (ft) | (ft) | (min) | (ft) | (%) | (fps) | (min) | (min) | (min) | (in/hr) | (in/hr) | (c.f.s.) | (c.f.s.) |
| C | 3.99 | 0.08 | 0.35 | 0.08 | 120 | 2.8 | 15.3 | 555 | 1.5% | 0.9 | 10.6 | 25.9 | 13.8 | 2.7 | 4.5 | 0.9 | 6.3 |
| A | 11.02 | 0.08 | 0.35 | 0.08 | 165 | 8 | 13.8 | 1730 | 1.3% | 0.8 | 36.3 | 50.1 | 20.5 | 1.7 | 2.9 | 1.5 | 11.1 |
| B | 17.31 | 0.08 | 0.35 | 0.08 | 300 | 3 | 30.9 | 1390 | 1.2% | 0.8 | 29.7 | 60.6 | 19.4 | 1.4 | 2.4 | 2.0 | 14.5 |
| OS-1 | 1.28 | 0.90 | 0.96 | 0.90 | 100 | 3 | 2.5 | 490 | 2.2% | 3.0 | 2.8 | 5.3 | 13.3 | 5.1 | 8.5 | 5.8 | 10.5 |
| OS-2 | 4.98 | 0.49 | 0.66 | 0.49 | 85 | 8 | 4.8 | 1165 | 1.8% | 2.0 | 9.6 | 14.5 | 16.9 | 3.6 | 6.0 | 8.7 | 19.6 |
| EX-A2*** | 0.59 | 0.90 | 0.96 | 0.90 | 10 | 0.2 | 0.9 | 916 | 1.9% | 2.7 | 5.6 | 6.5 | 15.1 | 4.8 | 8.0 | 2.5 | 4.5 |
| OS-A** | 1.29 | 0.62 | 0.72 | 0.62 | 40 | 0.8 | 4.4 | 1310 | 1.9% | 2.8 | 7.9 | 12.3 | 17.5 | 3.8 | 6.4 | 3.1 | 6.0 |
| E2* | 3.86 | 0.80 | 0.90 | 0.80 | 50 | 1 | 3.0 | 400 | 1.3% | 2.3 | 2.9 | 6.0 | 12.5 | 4.9 | 8.2 | 15.1 | 28.6 |

^ Intensity equations assume a minimum travel time of 5 minutes.

*VALUES DERIVED USING DATA FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**VALUES DERIVED USING DATA FROM FDR FOR MEADOWBROOK CROSSING FILING 1 AND FILING 2 PAGE 31

***VALUES DERIVED USING DATA FROM FDR FOR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

Calculated by: CVW

Date: 2/23/2021

Checked by: DLM

Crossroads Mixed Use
PRELIMINARY DRAINAGE REPORT
(Existing Basin Routing Summary)

| From Area Runoff Coefficient Summary | | | | OVERLAND | | | | PIPE / CHANNEL FLOW | | | | Time of Travel (T _t) | | INTENSITY * | | TOTAL FLOWS | | COMMENTS |
|--------------------------------------|---------------------|-----------------|-------------------|-----------------------------------|----------------|----------------|-------------------------|---------------------|--------------|-------------------|-------------------------|----------------------------------|---------------------------|-----------------------------|----------------------------|------------------------------|--|----------|
| DESIGN POINT | CONTRIBUTING BASINS | CA ₅ | CA ₁₀₀ | C _s | Length (ft) | Height (ft) | T _C (min) | Length (ft) | Slope (%) | Velocity (fps) | T _t (min) | TOTAL (min) | I ₅ (in/hr) | I ₁₀₀ (in/hr) | Q ₅ (c.f.s.) | Q ₁₀₀ (c.f.s.) | | |
| | | | | | | | | | | | | | | | | | | |
| 1 | E2 EX-A2 | 3.09 | 3.47 | | | | 6.0 | 916 | 1.9% | 2.7 | 5.6 | 11.6 | 3.9 | 6.6 | 14.2 | 26.5 | EXISTING 10' CDOT TYPE R AT GRADE INLET | |
| | | 0.53 | 0.57 | | | | | | | | | | | | | | | |
| | | 3.62 | 4.04 | Tc for E2 Used | | | | | | | | | | | | | | |
| 2 | OS-A | 0.80 | 0.93 | | | | | | | | | 12.3 | 3.8 | 6.4 | 3.1 | 6.0 | EXISTING 10' CDOT TYPE R AT GRADE INLET | |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | | |
| 3 | OS-1 FB-DP1 | 1.15 | 1.22 | | | | 11.6 | 150 | 1.0% | 2.0 | 1.3 | 12.8 | 3.8 | 6.3 | 9.8 | 22.5 | END OF PAVEMENT | |
| | | 1.47 | 2.35 | | | | | | | | | | | | | | | |
| | | 2.62 | 3.57 | Tc for DP1 Used | | | | | | | | | | | | | | |
| 4 | A FB-DP2 DP3 | 0.88 | 3.86 | | | | 12.8 | 1470 | 1.6% | 0.9 | 28.0 | 40.8 | 2.0 | 3.4 | 7.1 | 25.5 | ADJACENT PARCEL (LOT 1) | |
| | | 0.00 | 0.10 | | | | | | | | | | | | | | | |
| | | 2.62 | 3.57 | | | | | | | | | | | | | | | |
| | | 3.50 | 7.54 | Tc for DP3 Used | | | | | | | | | | | | | | |
| 5 | B | 1.38 | 6.06 | | | | | | | | | 60.6 | 1.4 | 2.4 | 5.0 | 14.5 | ADJACENT PARCEL (LOT 2) | |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | | |
| 6 | C | 0.32 | 1.40 | | | | | | | | | 25.9 | 2.7 | 4.5 | 0.9 | 6.3 | DISCHARGE TO CDOT ROW | |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | | |
| 7 | OS2 DP6 | 2.44 | 3.26 | | | | | | | | | 14.5 | 3.6 | 6.0 | 9.9 | 28.0 | BARROW DITCH SW CORNER OF SITE/CDOT ROW | |
| | | 0.32 | 1.40 | | | | | | | | | | | | | | | |
| | | 2.76 | 4.66 | Tc for OS2 Used | | | | | | | | | | | | | | |

Calculated by: CVW
Date: #####
Checked by: DLM

CROSSROADS MIXED USE
PRELIMINARY DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)

| | | | <i>STREETS / COMMERC.</i> | | | <i>MULTI-FAMILY/PARKLAND</i> | | | <i>OVERLAND / UNDEVELOPED</i> | | | <i>WEIGHTED</i> | |
|------------------------|-----------------------|-----------------------|---------------------------|----------------|------------------|------------------------------|----------------|------------------|-------------------------------|----------------|------------------|-----------------|------------------|
| BASIN | TOTAL AREA (Sq Ft) | TOTAL AREA (Acres) | AREA (Acres) | C ₅ | C ₁₀₀ | AREA (Acres) | C ₅ | C ₁₀₀ | AREA (Acres) | C ₅ | C ₁₀₀ | C ₅ | C ₁₀₀ |
| PROPOSED BASINS | | | | | | | | | | | | | |
| <i>OS-A**</i> | | 1.29 | 1.29 | 0.62 | 0.72 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.62</i> | <i>0.72</i> |
| <i>E2*</i> | | 3.86 | 3.86 | 0.80 | 0.90 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.80</i> | <i>0.90</i> |
| <i>EX-A2***</i> | | 0.59 | 0.59 | 0.90 | 0.96 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>OS-1</i> | <i>60793.3017</i> | 1.40 | 1.40 | 0.90 | 0.96 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>OS-2</i> | <i>216993.7096</i> | 4.98 | 2.49 | 0.90 | 0.96 | 0.00 | 0.49 | 0.62 | 2.49 | 0.08 | 0.35 | <i>0.49</i> | <i>0.66</i> |
| <i>A</i> | <i>72967.0787</i> | 1.68 | 1.68 | 0.90 | 0.96 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>B</i> | <i>65021.9778</i> | 1.49 | 1.49 | 0.90 | 0.96 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>C</i> | <i>200631.5748</i> | 4.61 | 4.46 | 0.81 | 0.88 | 0.00 | 0.49 | 0.62 | 0.15 | 0.08 | 0.35 | <i>0.79</i> | <i>0.86</i> |
| <i>D</i> | <i>96773.7602</i> | 2.22 | 2.22 | 0.81 | 0.88 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.81</i> | <i>0.88</i> |
| <i>E</i> | <i>118133.5827</i> | 2.71 | 0.48 | 0.90 | 0.96 | 2.23 | 0.81 | 0.88 | 0.00 | 0.08 | 0.35 | <i>0.83</i> | <i>0.89</i> |
| <i>F</i> | <i>112036.6061</i> | 2.57 | 2.57 | 0.81 | 0.88 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.81</i> | <i>0.88</i> |
| <i>G</i> | <i>40937.4999</i> | 0.94 | 0.94 | 0.90 | 0.96 | 0.00 | 0.49 | 0.62 | 0.00 | 0.08 | 0.35 | <i>0.90</i> | <i>0.96</i> |
| <i>H</i> | <i>482081.5171</i> | 11.07 | 0.00 | 0.90 | 0.96 | 11.07 | 0.54 | 0.66 | 0.00 | 0.08 | 0.35 | <i>0.54</i> | <i>0.66</i> |
| <i>I</i> | <i>69600.2016</i> | 1.60 | 0.00 | 0.90 | 0.96 | 1.60 | 0.54 | 0.66 | 0.00 | 0.08 | 0.35 | <i>0.54</i> | <i>0.66</i> |
| <i>J</i> | <i>139924.2472</i> | 3.21 | 0.00 | 0.90 | 0.96 | 3.21 | 0.16 | 0.41 | 0.00 | 0.08 | 0.35 | <i>0.16</i> | <i>0.41</i> |

CROSSROADS MIXED USE PRELIMINARY DRAINAGE REPORT (Area Drainage Summary)

| From Area Runoff Coefficient Summary | | | | OVERLAND | | | | STREET / CHANNEL FLOW | | | | Time of Travel (T _t) | | INTENSITY # | | TOTAL FLOWS | |
|---------------------------------------|--------------------------|----------------|------------------|----------------|----------------|----------------|-------------------------|-----------------------|--------------|-------------------|-------------------------|----------------------------------|----------------|---------------------------|-----------------------------|----------------------------|------------------------------|
| BASIN | AREA TOTAL (Acres) | C ₅ | C ₁₀₀ | C ₅ | Length (ft) | Height (ft) | T _C (min) | Length (ft) | Slope (%) | Velocity (fps) | T _t (min) | TOTAL (min) | CHECK (min) | I ₅ (in/hr) | I ₁₀₀ (in/hr) | Q ₅ (c.f.s.) | Q ₁₀₀ (c.f.s.) |
| <i>Proposed Area Drainage Summary</i> | | | | | | | | | | | | | | | | | |
| OS-A** | 1.29 | 0.62 | 0.72 | 0.62 | 40 | 0.8 | 4.4 | 1310 | 1.9% | 2.8 | 7.9 | 12.3 | 17.5 | 3.8 | 6.4 | 3.1 | 6.0 |
| E2* | 3.86 | 0.80 | 0.90 | 0.80 | 50 | 1 | 3.0 | 400 | 1.3% | 2.3 | 2.9 | 6.0 | 12.5 | 4.9 | 8.2 | 15.1 | 28.6 |
| EX-A2*** | 0.59 | 0.90 | 0.96 | 0.90 | 10 | 0.2 | 0.9 | 916 | 1.9% | 2.7 | 5.6 | 6.5 | 15.1 | 4.8 | 8.0 | 2.5 | 4.5 |
| OS-1 | 1.40 | 0.90 | 0.96 | 0.90 | 100 | 3 | 2.5 | 490 | 2.2% | 3.0 | 2.7 | 5.2 | 13.3 | 5.1 | 8.6 | 6.4 | 11.5 |
| OS-2 | 4.98 | 0.49 | 0.66 | 0.49 | 85 | 8 | 4.8 | 1165 | 1.8% | 2.0 | 9.6 | 14.5 | 16.9 | 3.6 | 6.0 | 8.7 | 19.6 |
| A | 1.68 | 0.90 | 0.96 | 0.90 | 30 | 0.6 | 1.6 | 1325 | 0.7% | 1.7 | 7.3 | 8.9 | 17.5 | 4.3 | 7.2 | 6.5 | 11.6 |
| B | 1.49 | 0.90 | 0.96 | 0.90 | 25 | 0.5 | 1.4 | 1335 | 0.7% | 1.7 | 7.3 | 8.8 | 17.6 | 4.3 | 7.3 | 5.8 | 10.4 |
| C | 4.61 | 0.79 | 0.86 | 0.79 | 50 | 1 | 3.2 | 260 | 1.5% | 2.4 | 1.4 | 5.0 | 11.7 | 5.2 | 8.7 | 18.7 | 34.5 |
| D | 2.22 | 0.81 | 0.88 | 0.81 | 50 | 1 | 2.9 | 200 | 1.5% | 2.4 | 1.1 | 5.0 | 11.4 | 5.2 | 8.7 | 9.3 | 17.0 |
| E | 2.71 | 0.83 | 0.89 | 0.83 | 60 | 1.2 | 3.0 | 700 | 1.0% | 2.0 | 3.8 | 6.9 | 14.2 | 4.7 | 7.9 | 10.5 | 19.1 |
| F | 2.57 | 0.81 | 0.88 | 0.81 | 50 | 0.8 | 3.2 | 300 | 1.3% | 2.3 | 1.6 | 5.0 | 11.9 | 5.2 | 8.7 | 10.8 | 19.6 |
| G | 0.94 | 0.90 | 0.96 | 0.90 | 50 | 1 | 2.0 | 500 | 1.0% | 2.0 | 2.7 | 5.0 | 13.1 | 5.2 | 8.7 | 4.4 | 7.8 |
| H | 11.07 | 0.54 | 0.66 | 0.54 | 50 | 1 | 5.7 | 500 | 1.5% | 2.4 | 2.7 | 8.4 | 13.1 | 4.4 | 7.4 | 26.2 | 53.8 |
| I | 1.60 | 0.54 | 0.66 | 0.54 | 50 | 1 | 5.7 | 500 | 1.5% | 2.4 | 2.7 | 8.4 | 13.1 | 4.4 | 7.4 | 3.8 | 7.8 |
| J | 3.21 | 0.16 | 0.41 | 0.16 | 50 | 2 | 7.6 | 0 | 0.0% | 0.0 | 0.0 | 7.6 | 10.3 | 4.5 | 7.6 | 2.3 | 10.0 |

Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: DLM

Date: 2/21/2021

Checked by: VAS

*VALUES DERIVED USING DATA FROM FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2

**VALUES DERIVED USING DATA FROM FDR MEADOWBROOK CROSSING FILING 1 AND FILING 2 PAGE 31

***VALUES DERIVED USING DATA FROM FDR LOT 1 24/94 BUSINESS PARK FILING NO. 1 ON PLATTE AVENUE AND MEADOWBROOK PARKWAY

CROSSROADS MIXED USE PRELIMINARY DRAINAGE REPORT (Basin Routing Summary)

| From Area Runoff Coefficient Summary | | | | OVERLAND | | | | PIPE / CHANNEL FLOW | | | | Time of Travel (T _t) | INTENSITY * | | TOTAL FLOWS | | COMMENTS |
|---|----------------------|-----------------|-------------------|-----------------------------------|----------------|----------------|-------------------------|---------------------|--------------|-------------------|-------------------------|----------------------------------|---------------------------|-----------------------------|----------------------------|------------------------------|---|
| DESIGN POINT | CONTRIBUTING BASINS | CA ₅ | CA ₁₀₀ | C ₅ | Length (ft) | Height (ft) | T _C (min) | Length (ft) | Slope (%) | Velocity (fps) | T _t (min) | TOTAL (min) | I ₅ (in/hr) | I ₁₀₀ (in/hr) | Q ₅ (c.f.s.) | Q ₁₀₀ (c.f.s.) | |
| PROPOSED DRAINAGE BASIN ROUTING SUMMARY | | | | | | | | | | | | | | | | | |
| 1 | E2, EX-A2 | 3.62 | 4.04 | | | | 6.0 | 916 | 1.9% | 2.7 | 5.6 | 11.6 | 3.9 | 6.6 | 14.2 | 26.5 | Existing 10' CDOT Type R At-Grade Inlet (Public) |
| | | | | Tc for E2 Used | | | | | | | | | | | | | |
| 2 | OS-A | 0.80 | 0.93 | | | | | | | | | 12.3 | 3.8 | 6.4 | 3.1 | 6.0 | Existing 10' CDOT Type R At-Grade Inlet (Public) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 3 | OS-1, FB-DP1 | 2.73 | 3.69 | | | | 11.6 | 150 | 1.0% | 2.0 | 1.3 | 12.8 | 3.8 | 6.3 | 10.2 | 23.3 | Proposed 10' CDOT Type R At-Grade Inlet (Public) |
| | | | | Tc for DP1 Used | | | | | | | | | | | | | |
| 4 | A, FB-DP2 | 1.51 | 1.71 | | | | | | | | | 8.9 | 4.3 | 7.2 | 6.5 | 19.1 | Proposed 10' CDOT Type R Sump Inlet (Public) |
| | (100 YR SPLIT FLOWS) | | 3.57 | Tc for Basin A used | | | | | | | | | | | | | |
| | | | 2.64 | | | | | | | | | | | | | | |
| 5 | B, FB-DP3 | 2.29 | 3.57 | | | | | | | | | 8.9 | 4.3 | 7.2 | 9.9 | 19.1 | Proposed 10' CDOT Type R Sump Inlet (Public) |
| | (100YR SPLIT FLOWS) | | 1.71 | Tc for Basin A Used | | | | | | | | | | | | | |
| | | | 2.64 | | | | | | | | | | | | | | |
| 6 | C | 3.62 | 3.98 | | | | | | | | | 5.0 | 5.2 | 8.7 | 18.7 | 34.5 | Proposed 30" RCP or PP Storm Sewer (Private) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 7 | D | 1.80 | 1.96 | | | | | | | | | 5.0 | 5.2 | 8.7 | 9.3 | 17.0 | Proposed 24" RCP or PP Storm Sewer (Private) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 8 | 1/2 E | 1.12 | 1.21 | | | | | | | | | 6.9 | 4.7 | 7.9 | 5.2 | 9.5 | Proposed 10' CDOT Type R At-Grate Inlet (Private) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 9 | 1/2 E | 1.12 | 1.21 | | | | | | | | | 6.9 | 4.7 | 7.9 | 5.2 | 9.5 | Proposed 10' CDOT Type R At-Grade Inlet (Private) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 10 | 1/2 G | 0.42 | 0.45 | | | | | | | | | 6.9 | 4.7 | 7.9 | 2.0 | 8.8 | Proposed 10' CDOT Type R Sump Inlet (Private) |
| | (100 YR SPLIT FLOWS) | | 0.67 | Tc for Basin E Used | | | | | | | | | | | | | |
| | | | 1.12 | | | | | | | | | | | | | | |
| 11 | 1/2 G FB-DP8/9 | 0.61 | 0.45 | | | | | | | | | 6.9 | 4.7 | 7.9 | 2.9 | 8.8 | Proposed 10' CDOT Type R Sump Inlet (Private) |
| | (100 YR SPLIT FLOWS) | | 0.67 | Tc for Basin E Used | | | | | | | | | | | | | |
| | | | 1.12 | | | | | | | | | | | | | | |
| 12 | F | 2.08 | 2.26 | | | | | | | | | 5.0 | 5.2 | 8.7 | 10.8 | 19.6 | Proposed 30" RCP or PP Storm Sewer (Private) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 13 | H | 5.98 | 7.30 | | | | | | | | | 8.4 | 4.4 | 7.4 | 26.2 | 53.8 | Proposed 36" RCP or PP Storm Sewer (Private) |
| | | | | See Area Drainage Sheet for Input | | | | | | | | | | | | | |
| 14 | I | 0.86 | 1.05 | | | | | | | | | 8.4 | 4.4 | 7.4 | 3.8 | 7.8 | Proposed Grasslined Swale (Private) |
| | | | | Tc for Basin E Used | | | | | | | | | | | | | |
| 15 | J, DP14, PR17, PR 18 | 21.74 | 27.15 | | | | | | | | | 8.4 | 4.4 | 7.4 | 95.3 | 199.8 | Full Spectrum Extended Detention Basin (Private) |
| | | | | Tc for Basin H Used | | | | | | | | | | | | | |
| 16 | POND OUTFALL OS-2 | 2.78 | 4.61 | | | | | | | | | 14.5 | 3.6 | 6.0 | 9.9 | 27.7 | HISTORIC FLOW IN CDOT BARROW DITCH Q5= 10.4 CFS, Q100 = 31.9 CFS PER HISTORIC DRAINAGE ANALYSIS |
| | | | | Tc for Basin OS-2 Used | | | | | | | | | | | | | |

Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: DLM
Date: 2/24/2021
Checked by: VAS

CROSSROADS MIXED USE
PRELIMINARY DRAINAGE CALCULATIONS
(Storm Sewer Routing Summary)

| PIPE RUN | Contributing Pipes/Design Points | Equivalent CA ₅ | Equivalent CA ₁₀₀ | Maximum T _c | Intensity* | | Flow | | PIPE SIZE |
|-------------|-------------------------------------|-------------------------------|---------------------------------|---------------------------|----------------|------------------|----------------|------------------|-----------|
| | | | | | I ₅ | I ₁₀₀ | Q ₅ | Q ₁₀₀ | |
| 1 | INLET 3 | 1.78 | 1.55 | 12.8 | 3.8 | 6.3 | 6.7 | 9.8 | 18" SD |
| 2 | INLET 4 | 1.51 | 2.64 | 8.9 | 4.3 | 7.2 | 6.5 | 19.1 | 24" SD |
| 3 | PR2, INLET 5 | 3.79 | 5.28 | 8.9 | 4.3 | 7.2 | 16.4 | 38.2 | 36" SD |
| 4 | DP6 | 3.62 | 3.98 | 5.0 | 5.2 | 8.7 | 18.7 | 34.5 | 36" SD |
| 5 | PR4 | 3.62 | 3.98 | 5.0 | 5.2 | 8.7 | 18.7 | 34.5 | 36" SD |
| 6 | PR5 | 3.62 | 3.98 | 5.0 | 5.2 | 8.7 | 18.7 | 34.5 | 36" SD |
| 7 | DP7 | 1.80 | 1.96 | 5.0 | 5.2 | 8.7 | 9.3 | 17.0 | 24" SD |
| 8 | PR7, INLET 6 | 2.82 | 2.83 | 6.9 | 4.7 | 7.9 | 13.2 | 22.3 | 24" SD |
| 9 | PR8, INLET 7 | 3.85 | 3.71 | 6.9 | 4.7 | 7.9 | 18.0 | 29.2 | 30" SD |
| 10 | PR6, PR9 | 7.47 | 7.68 | 6.9 | 4.7 | 7.9 | 35.0 | 60.5 | 36" SD |
| 11 | PR10 | 7.47 | 7.68 | 6.9 | 4.7 | 7.9 | 35.0 | 60.5 | 36" SD |
| 12 | INLET 8 | 0.42 | 1.12 | 6.9 | 4.7 | 7.9 | 2.0 | 8.8 | 18" SD |
| 13 | INLET 9 | 0.61 | 1.12 | 6.9 | 4.7 | 7.9 | 2.9 | 8.8 | 18" SD |
| 14 | PR11, PR12, PR13 | 8.51 | 9.93 | 6.9 | 4.7 | 7.9 | 39.9 | 78.1 | 42" SD |
| 15 | DP12 | 2.08 | 2.26 | 5.0 | 5.2 | 8.7 | 10.8 | 19.6 | 24" SD |
| 16 | PR14, PR15 | 10.59 | 12.19 | 6.9 | 4.7 | 7.9 | 49.7 | 96.0 | 42" SD |
| 17 | PR16 | 10.59 | 12.19 | 6.9 | 4.7 | 7.9 | 49.7 | 96.0 | 42" SD |
| 18 | PR3, DP13 | 9.77 | 12.58 | 8.9 | 4.3 | 7.2 | 42.1 | 91.1 | 42" SD |
| 19 | POND OUTFALL | PER | MHFD | WKSHT | | | 1.2 | 8.2 | 18" SD |

* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point

EX - Existing Design Point

FB- Flow By from Design Point

INT- Intercepted Flow from Design Point

Calculated by: DLM

Date: 2/24/2021

Checked by: VAS

| <i>Weighted Percent Imperviousness of WQ Pond 1</i> | | | | |
|---|---------------------|----------------------|-------------------------|--------------------|
| <i>Contributing Basins</i> | <i>Area (Acres)</i> | <i>C_s</i> | <i>Impervious % (I)</i> | <i>(Acres)*(I)</i> |
| <i>A</i> | 1.68 | 0.90 | 100 | 167.51 |
| <i>B</i> | 1.49 | 0.90 | 100 | 149.27 |
| <i>C</i> | 4.61 | 0.79 | 93 | 428.35 |
| <i>D</i> | 2.22 | 0.81 | 95 | 211.05 |
| <i>E</i> | 2.71 | 0.83 | 96 | 260.35 |
| <i>F</i> | 2.57 | 0.81 | 95 | 244.34 |
| <i>G</i> | 0.94 | 0.90 | 100 | 93.98 |
| <i>H</i> | 11.07 | 0.54 | 75 | 830.03 |
| <i>I</i> | 1.60 | 0.54 | 75 | 119.84 |
| <i>J</i> | 3.21 | 0.16 | 7 | 22.49 |
| <i>Totals</i> | <i>32.10</i> | | | <i>2527.20</i> |
| <i>Imperviousness of WQ Pond 1</i> | <i>78.7</i> | <i>%</i> | | |

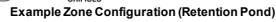
HYDRAULIC CALCULATIONS

NOTICE: Staff is only providing cursory review of the hydraulic calculations with the preliminary plan. Detailed review will be conducted with the Final Drainage Report.

NOTED

MHFD-Detention, Version 4.03 (May 2020)

Basin ID:

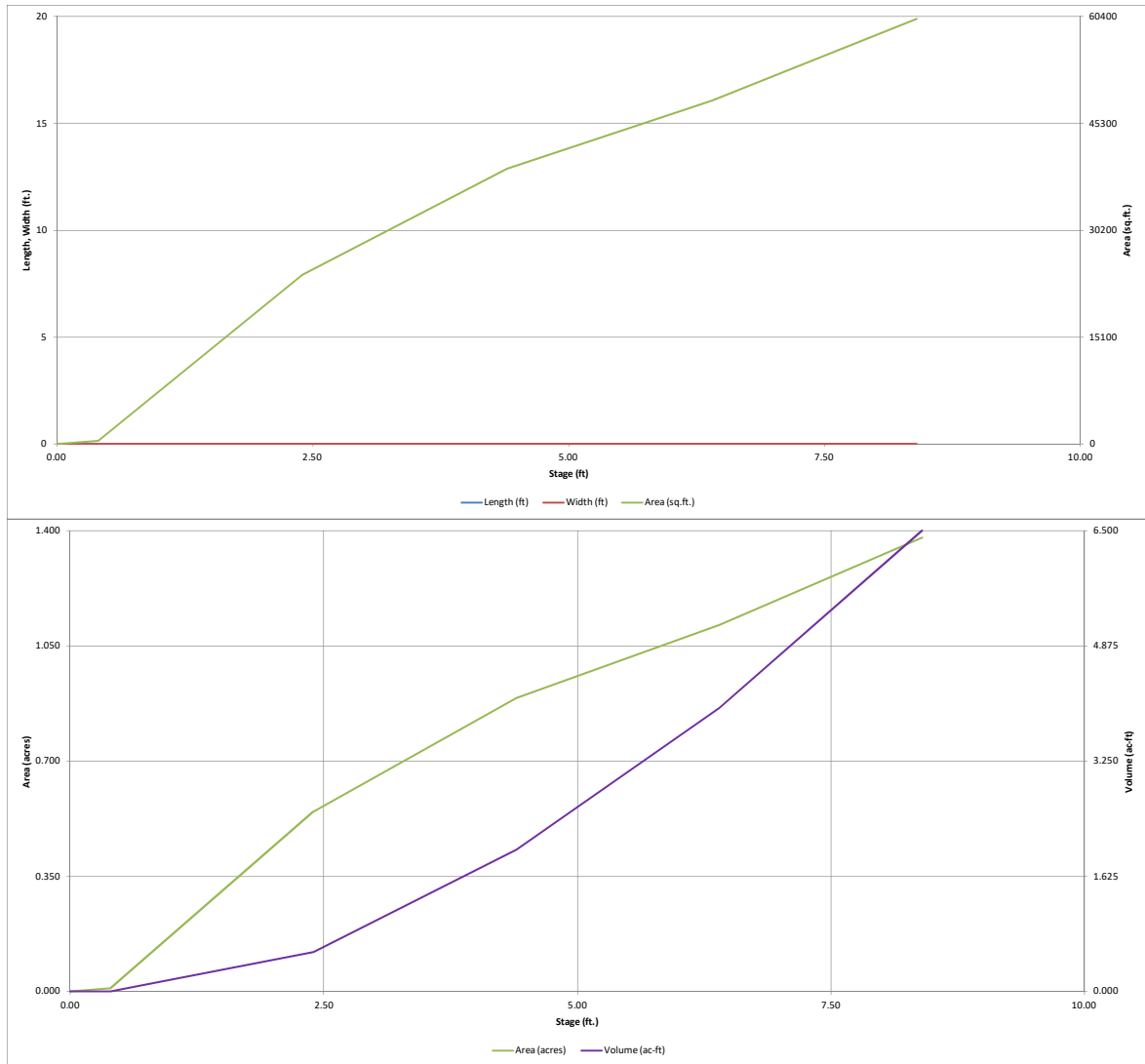


| | |
|------|-----------|
| | acre-feet |
| | acre-feet |
| 1.19 | inches |
| 1.50 | inches |
| 1.75 | inches |
| 2.00 | inches |
| 2.25 | inches |
| 2.52 | inches |
| | inches |

6287.6

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

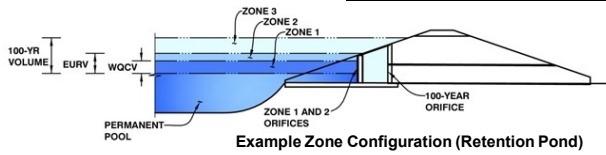


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project:

Basin ID:



Example Zone Configuration (Retention Pond)

| | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type |
|-------------------|----------------------|--------------------------|----------------------|
| Zone 1 (WQCV) | 2.91 | 0.857 | Orifice Plate |
| Zone 2 (EURV) | 5.76 | 2.449 | Orifice Plate |
| Zone 3 (100-year) | 7.03 | 1.424 | Weir&Pipe (Restrict) |
| Total (all zones) | | 4.729 | |

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 = ft²
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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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 | 1.92 | 3.84 | | | | | |
| Orifice Area (sq. inches) | 4.66 | 4.66 | 12.20 | | | | | |

| | 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)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = ft²
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

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).

| | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|-------|-------|--------|--------|-----------------|-----------------|----------------|----------------|----------|
| Design Storm Return Period = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.14 |
| One-Hour Rainfall Depth (in) = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.14 |
| CUHP Runoff Volume (acre-ft) = | 0.857 | 3.306 | 2.394 | 3.107 | 3.679 | 4.353 | 5.011 | 5.779 | 7.477 |
| Inflow Hydrograph Volume (acre-ft) = | N/A | N/A | 2.394 | 3.107 | 3.679 | 4.353 | 5.011 | 5.779 | 7.477 |
| CUHP Predevelopment Peak Q (cfs) = | N/A | N/A | 0.2 | 0.3 | 0.4 | 4.0 | 8.1 | 13.5 | 24.8 |
| OPTIONAL Override Predevelopment Peak Q (cfs) = | N/A | N/A | | | | | | | |
| Predevelopment Unit Peak Flow, q (cfs/acre) = | N/A | N/A | 0.00 | 0.01 | 0.01 | 0.13 | 0.25 | 0.42 | 0.77 |
| Peak Inflow Q (cfs) = | N/A | N/A | 33.0 | 42.4 | 48.3 | 61.1 | 70.9 | 82.7 | 107.3 |
| Peak Outflow Q (cfs) = | 0.4 | 1.2 | 1.0 | 1.2 | 1.3 | 4.2 | 7.9 | 8.2 | 32.3 |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 3.7 | 2.9 | 1.0 | 1.0 | 0.6 | 1.3 |
| Structure Controlling Flow = | Plate | Plate | Plate | Plate | Overflow Weir 1 | Overflow Weir 1 | Outlet Plate 1 | Outlet Plate 1 | Spillway |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | 0.0 | 0.3 | 0.7 | 0.8 | 0.8 |
| 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) = | 38 | 72 | 66 | 72 | 76 | 77 | 77 | 76 | 73 |
| Time to Drain 99% of Inflow Volume (hours) = | 40 | 77 | 69 | 77 | 81 | 84 | 84 | 84 | 83 |
| Maximum Ponding Depth (ft) = | 2.91 | 5.76 | 4.67 | 5.38 | 5.91 | 6.38 | 6.69 | 7.19 | 7.70 |
| Area at Maximum Ponding Depth (acres) = | 0.64 | 1.04 | 0.92 | 1.00 | 1.06 | 1.11 | 1.15 | 1.22 | 1.29 |
| Maximum Volume Stored (acre-ft) = | 0.861 | 3.315 | 2.244 | 2.917 | 3.462 | 3.971 | 4.322 | 4.914 | 5.552 |

**DARIN DISCUSSION WITH GILBERT
LAFORECE;
MOST EFFICIENT SOLUTION OBTAINED**

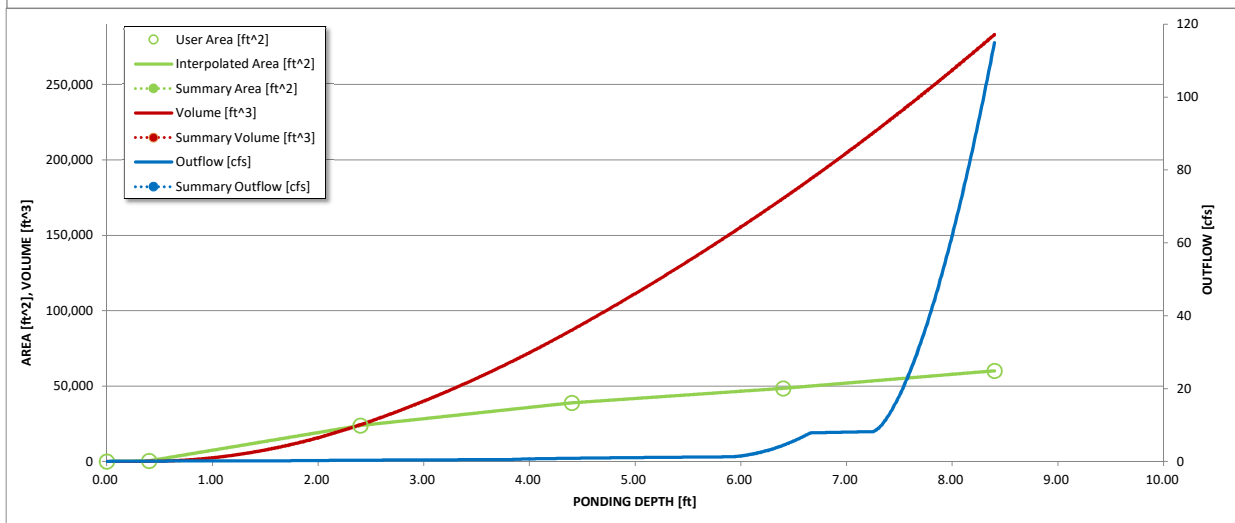
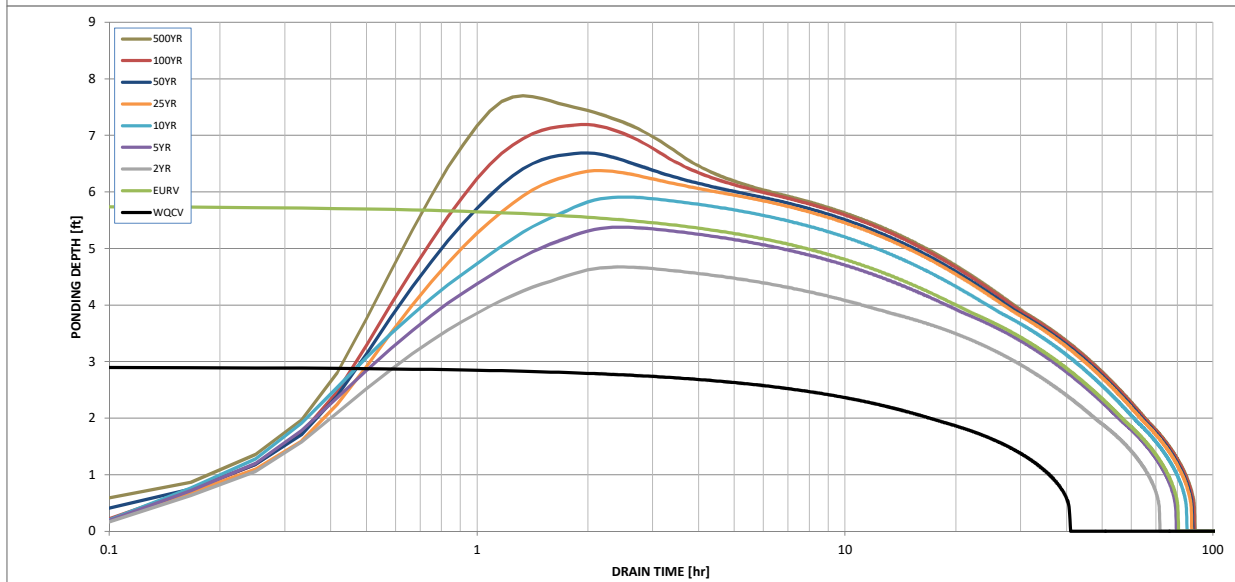
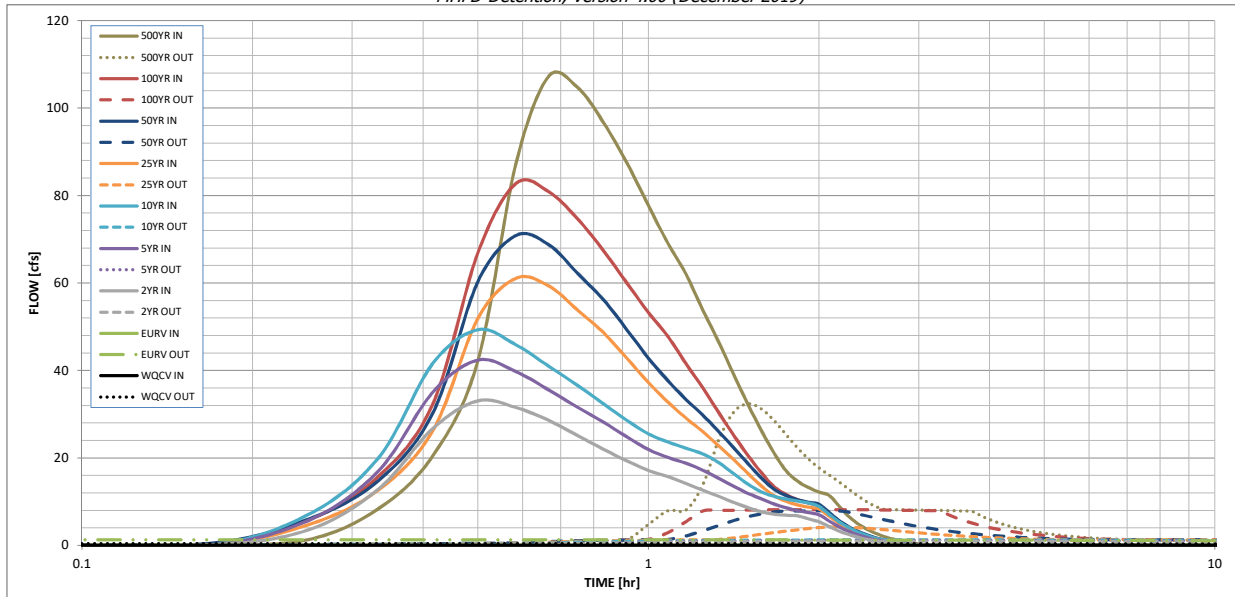
MHFD Prelim Pond Sizing -DLM.xlsm, Outlet Structure

Revise. Must be at or below
predevelopment.
Unresolved.

2/24/2021, 7:02 AM

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.00 (December 2019)



| 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 | 0.39 | 0.04 | 1.24 |
| | 0:15:00 | 0.00 | 0.00 | 3.44 | 5.59 | 6.92 | 4.65 | 5.86 | 5.67 | 8.32 |
| | 0:20:00 | 0.00 | 0.00 | 12.78 | 16.91 | 19.91 | 12.60 | 14.73 | 15.68 | 20.52 |
| | 0:25:00 | 0.00 | 0.00 | 26.73 | 35.08 | 41.65 | 26.31 | 30.33 | 32.40 | 42.15 |
| | 0:30:00 | 0.00 | 0.00 | 33.01 | 42.36 | 49.32 | 51.87 | 60.30 | 66.84 | 87.16 |
| | 0:35:00 | 0.00 | 0.00 | 31.50 | 39.75 | 45.90 | 61.06 | 70.86 | 82.69 | 107.26 |
| | 0:40:00 | 0.00 | 0.00 | 28.56 | 35.55 | 40.98 | 59.34 | 68.80 | 80.85 | 104.71 |
| | 0:45:00 | 0.00 | 0.00 | 25.08 | 31.57 | 36.59 | 53.77 | 62.23 | 74.62 | 96.69 |
| | 0:50:00 | 0.00 | 0.00 | 21.95 | 28.17 | 32.36 | 48.63 | 56.17 | 67.37 | 87.45 |
| | 0:55:00 | 0.00 | 0.00 | 19.27 | 24.80 | 28.59 | 42.77 | 49.30 | 59.91 | 77.73 |
| | 1:00:00 | 0.00 | 0.00 | 17.09 | 21.92 | 25.50 | 37.24 | 42.84 | 53.26 | 69.04 |
| | 1:05:00 | 0.00 | 0.00 | 15.69 | 20.09 | 23.63 | 32.75 | 37.62 | 47.72 | 61.90 |
| | 1:10:00 | 0.00 | 0.00 | 14.09 | 18.74 | 22.22 | 29.04 | 33.31 | 41.43 | 53.62 |
| | 1:15:00 | 0.00 | 0.00 | 12.53 | 17.12 | 20.86 | 25.93 | 29.66 | 35.88 | 46.28 |
| | 1:20:00 | 0.00 | 0.00 | 11.15 | 15.26 | 18.89 | 22.66 | 25.87 | 30.24 | 38.88 |
| | 1:25:00 | 0.00 | 0.00 | 9.80 | 13.45 | 16.32 | 19.52 | 22.23 | 25.05 | 32.12 |
| | 1:30:00 | 0.00 | 0.00 | 8.57 | 11.86 | 14.01 | 16.40 | 18.64 | 20.55 | 26.27 |
| | 1:35:00 | 0.00 | 0.00 | 7.62 | 10.63 | 12.22 | 13.58 | 15.38 | 16.61 | 21.13 |
| | 1:40:00 | 0.00 | 0.00 | 7.10 | 9.45 | 11.20 | 11.35 | 12.81 | 13.45 | 17.04 |
| | 1:45:00 | 0.00 | 0.00 | 6.86 | 8.58 | 10.58 | 10.07 | 11.35 | 11.63 | 14.70 |
| | 1:50:00 | 0.00 | 0.00 | 6.71 | 7.96 | 10.14 | 9.25 | 10.42 | 10.49 | 13.20 |
| | 1:55:00 | 0.00 | 0.00 | 6.04 | 7.49 | 9.66 | 8.72 | 9.82 | 9.70 | 12.18 |
| | 2:00:00 | 0.00 | 0.00 | 5.37 | 6.98 | 8.92 | 8.33 | 9.38 | 9.14 | 11.44 |
| | 2:05:00 | 0.00 | 0.00 | 4.28 | 5.60 | 7.14 | 6.72 | 7.56 | 7.26 | 9.07 |
| | 2:10:00 | 0.00 | 0.00 | 3.28 | 4.28 | 5.46 | 5.11 | 5.75 | 5.44 | 6.78 |
| | 2:15:00 | 0.00 | 0.00 | 2.52 | 3.28 | 4.17 | 3.89 | 4.37 | 4.10 | 5.10 |
| | 2:20:00 | 0.00 | 0.00 | 1.92 | 2.49 | 3.15 | 2.95 | 3.31 | 3.11 | 3.87 |
| | 2:25:00 | 0.00 | 0.00 | 1.45 | 1.87 | 2.35 | 2.22 | 2.49 | 2.34 | 2.91 |
| | 2:30:00 | 0.00 | 0.00 | 1.08 | 1.37 | 1.74 | 1.64 | 1.84 | 1.75 | 2.17 |
| | 2:35:00 | 0.00 | 0.00 | 0.79 | 0.99 | 1.28 | 1.20 | 1.34 | 1.29 | 1.60 |
| | 2:40:00 | 0.00 | 0.00 | 0.57 | 0.72 | 0.95 | 0.90 | 1.01 | 0.96 | 1.20 |
| | 2:45:00 | 0.00 | 0.00 | 0.39 | 0.50 | 0.67 | 0.64 | 0.72 | 0.69 | 0.85 |
| | 2:50:00 | 0.00 | 0.00 | 0.24 | 0.33 | 0.43 | 0.43 | 0.48 | 0.46 | 0.57 |
| | 2:55:00 | 0.00 | 0.00 | 0.13 | 0.20 | 0.25 | 0.26 | 0.29 | 0.28 | 0.34 |
| | 3:00:00 | 0.00 | 0.00 | 0.06 | 0.10 | 0.12 | 0.13 | 0.14 | 0.14 | 0.17 |
| | 3:05:00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.04 | 0.04 | 0.05 | 0.05 | 0.06 |
| | 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 4.03 (May 2020)

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.

[illegible]

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

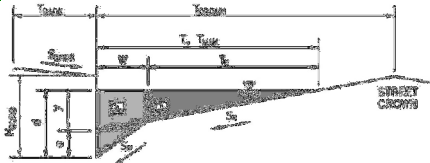
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use Existing Inlets

Inlet ID:

INLET 1

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 14.0$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 26.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_0 = 0.010$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 20.0 | 26.0 | ft |
| $d_{MAX} =$ | 6.0 | 12.0 | inches |

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐☐

check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

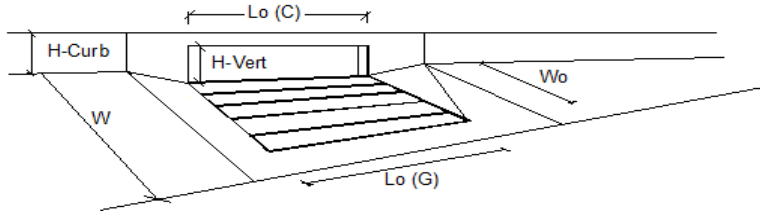
| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | 13.8 | 32.7 | cfs |

MAJOR STORM Allowable Capacity is based on Spread Criterion

WARNING: MINOR STORM max. allowable capacity is less 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'**

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



| Design Information (Input) | | MINOR | | MAJOR | |
|---|--------------------------|---------------|--------------------------|-------|--------|
| Type of Inlet | CDOT Type R Curb Opening | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | | a_{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | | N_o = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | | L_o = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | | W_o = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | | C_r-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | | C_r-C = | 0.10 | 0.10 | |
| Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR STORM | | | | | |
| Total Inlet Interception Capacity | | Q = | 8.4 | 11.1 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | | Q_b = | 5.8 | 15.4 | cfs |
| Capture Percentage = Q_i/Q_o = | | C% = | 59 | 42 | % |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

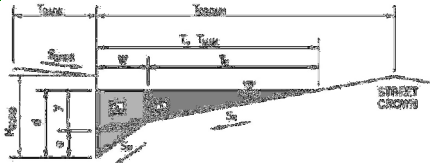
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Crossroads Mixed Use Existing Inlets

Inlet ID:

INLET 2

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 14.0$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 26.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.010$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 20.0 | 26.0 | ft |
| $d_{MAX} =$ | 6.0 | 12.0 | inches |

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐☐

check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion**MAJOR STORM Allowable Capacity is based on Spread Criterion**

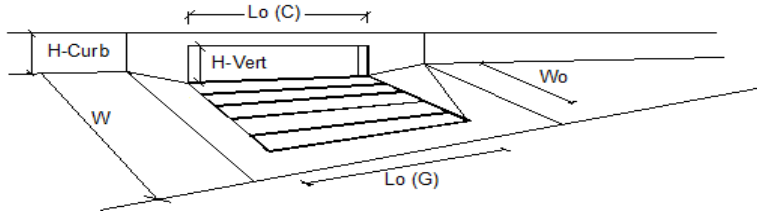
| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | 13.8 | 32.7 | cfs |

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'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018



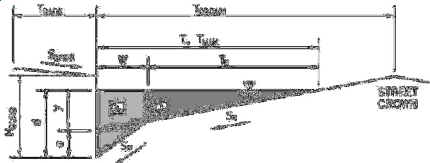
| Design Information (Input) | | MINOR | | MAJOR | |
|---|--------------------------|---------------|--------------------------|-------|--------|
| Type of Inlet | CDOT Type R Curb Opening | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | | a_{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | | N_o = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | | L_o = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | | W_o = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | | C_r-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | | C_r-C = | 0.10 | 0.10 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity | | MINOR | | MAJOR | |
| Total Inlet Interception Capacity | | Q = | 3.1 | 5.3 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | | Q_b = | 0.0 | 0.7 | cfs |
| Capture Percentage = Q_i/Q_c = | | C% = | 100 | 88 | % |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Crossroads Mixed Use

Inlet ID: Inlet 3

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 27.0$ ft

Gutter Width

 $W = 1.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.005$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 22.8 | 27.0 | ft |
| $d_{MAX} =$ | 6.0 | 12.0 | inches |

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☐ check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion

| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | 13.8 | 24.4 | cfs |

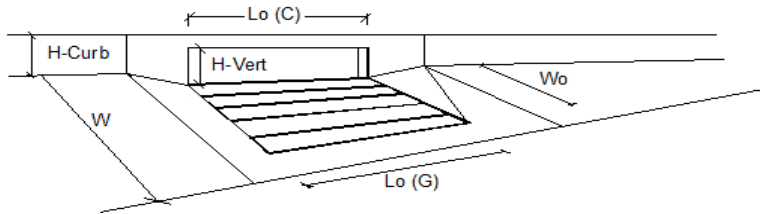
MAJOR STORM Allowable Capacity is based on Spread Criterion

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'

INLET ON A CONTINUOUS GRADE

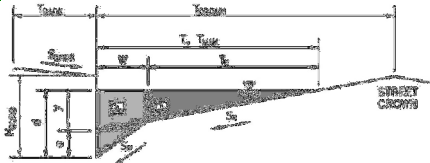
Version 4.06 Released August 2018



| Design Information (Input) | MINOR | MAJOR | |
|---|--------------------------|-------|--------|
| Type of Inlet | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | 0.10 | 0.10 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity | | | |
| Total Inlet Interception Capacity | 6.7 | 9.8 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | 3.5 | 13.5 | cfs |
| Capture Percentage = Q_i/Q_o = | 65 | 42 | % |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Crossroads Mixed Use**Inlet ID: **Inlet 4****Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 26.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 20.8 | 26.0 | ft |
| $d_{MAX} =$ | 6.0 | 12.0 | inches |

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

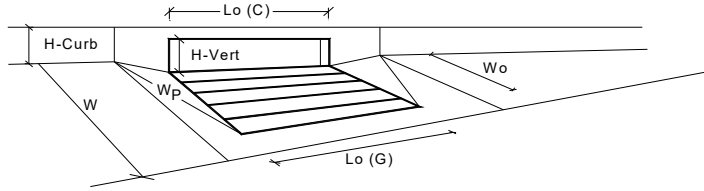
Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | SUMP | SUMP | cfs |

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)

Type of Inlet CDOT Type R Curb Opening

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

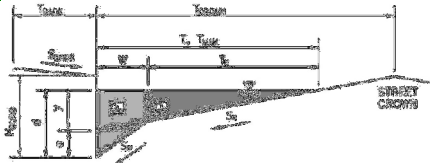
Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

| | MINOR | MAJOR | |
|-----------------------|--------------------------|-------|---|
| Type = | CDOT Type R Curb Opening | | |
| a_{local} = | 3.00 | 3.00 | inches |
| No = | 1 | 1 | |
| Ponding Depth = | 6.0 | 12.0 | inches |
| | MINOR | MAJOR | <input checked="" type="checkbox"/> Override Depths |
| $L_o (G)$ = | N/A | N/A | feet |
| W_o = | N/A | N/A | feet |
| A_{ratio} = | N/A | N/A | |
| $C_r (G)$ = | N/A | N/A | |
| $C_w (G)$ = | N/A | N/A | |
| $C_o (G)$ = | N/A | N/A | |
| | MINOR | MAJOR | |
| $L_o (C)$ = | 15.00 | 15.00 | feet |
| H_{vert} = | 6.00 | 6.00 | inches |
| H_{throat} = | 6.00 | 6.00 | inches |
| Theta = | 63.40 | 63.40 | degrees |
| W_p = | 2.00 | 2.00 | feet |
| $C_r (C)$ = | 0.10 | 0.10 | |
| $C_w (C)$ = | 3.60 | 3.60 | |
| $C_o (C)$ = | 0.67 | 0.67 | |
| | MINOR | MAJOR | |
| d_{Grate} = | N/A | N/A | ft |
| d_{Curb} = | 0.33 | 0.83 | ft |
| $RF_{Combination}$ = | 0.57 | 1.00 | |
| RF_{Curb} = | 0.79 | 1.00 | |
| RF_{Grate} = | N/A | N/A | |
| | MINOR | MAJOR | |
| Q_a = | 9.7 | 39.1 | cfs |
| $Q_{PEAK REQUIRED}$ = | 6.5 | 19.1 | cfs |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Crossroads Mixed Use**Inlet ID: **Inlet 5****Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion**MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 7.5$ ft $S_{BACK} = 0.020$ ft/ft $n_{BACK} = 0.020$ $H_{CURB} = 6.00$ inches $T_{CROWN} = 26.0$ ft $W = 2.00$ ft $S_X = 0.020$ ft/ft $S_W = 0.083$ ft/ft $S_o = 0.000$ ft/ft $n_{STREET} = 0.016$

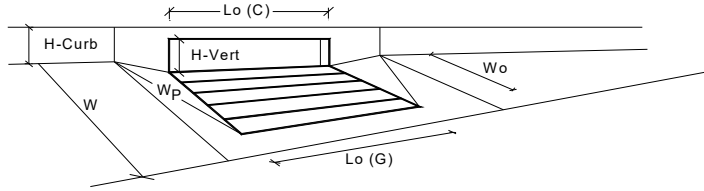
| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 20.8 | 26.0 | ft |
| $d_{MAX} =$ | 6.0 | 12.0 | inches |



| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | SUMP | SUMP | cfs |

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)

Type of Inlet =

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

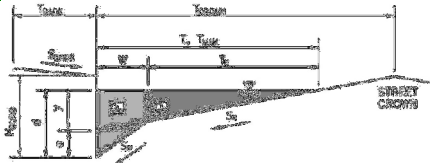
| | MINOR | MAJOR | |
|-----------------------|--------------------------|-------|---|
| Type = | CDOT Type R Curb Opening | | |
| a_{local} = | 3.00 | 3.00 | inches |
| No = | 1 | 1 | |
| Ponding Depth = | 6.0 | 12.0 | inches |
| | MINOR | MAJOR | <input checked="" type="checkbox"/> Override Depths |
| $L_o (G)$ = | N/A | N/A | feet |
| W_o = | N/A | N/A | feet |
| A_{ratio} = | N/A | N/A | |
| $C_r (G)$ = | N/A | N/A | |
| $C_w (G)$ = | N/A | N/A | |
| $C_o (G)$ = | N/A | N/A | |
| | MINOR | MAJOR | |
| $L_o (C)$ = | 15.00 | 15.00 | feet |
| H_{vert} = | 6.00 | 6.00 | inches |
| H_{throat} = | 6.00 | 6.00 | inches |
| Theta = | 63.40 | 63.40 | degrees |
| W_p = | 2.00 | 2.00 | feet |
| $C_r (C)$ = | 0.10 | 0.10 | |
| $C_w (C)$ = | 3.60 | 3.60 | |
| $C_o (C)$ = | 0.67 | 0.67 | |
| | MINOR | MAJOR | |
| d_{Grate} = | N/A | N/A | ft |
| d_{Curb} = | 0.34 | 0.83 | ft |
| $RF_{Combination}$ = | 0.57 | 1.00 | |
| RF_{Curb} = | 0.79 | 1.00 | |
| RF_{Grate} = | N/A | N/A | |
| | MINOR | MAJOR | |
| Q_a = | 9.9 | 39.1 | cfs |
| $Q_{PEAK REQUIRED}$ = | 9.9 | 19.1 | cfs |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Crossroads Mixed Use

Inlet ID: Inlet 6

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 14.5$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.020$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|----|
| $T_{MAX} =$ | 14.0 | 14.0 | ft |

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $d_{MAX} =$ | 4.4 | 12.0 | inches |

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☐ check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion

| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | 6.4 | 9.6 | cfs |

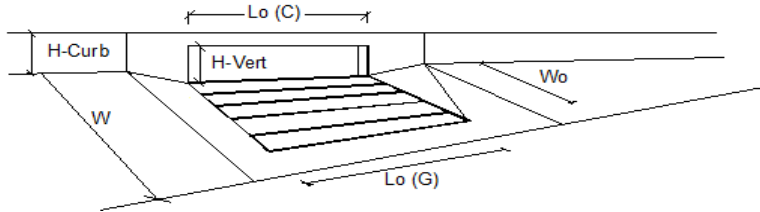
MAJOR STORM Allowable Capacity is based on Spread Criterion

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'

INLET ON A CONTINUOUS GRADE

Version 4.06 Released August 2018

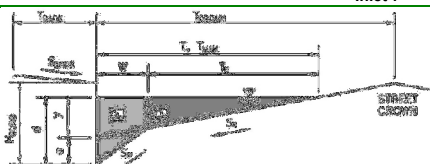


| Design Information (Input) | MINOR | MAJOR | |
|---|--------------------------|-------|---------|
| Type of Inlet | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | | | |
| Total Number of Units in the Inlet (Grate or Curb Opening) | | | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | | | |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | | | |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | | | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | | | |
| Street Hydraulics: OK - Q < Allowable Street Capacity | | | |
| Total Inlet Interception Capacity | Q = | 4.8 | 6.9 cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.4 | 2.6 cfs |
| Capture Percentage = Q _i /Q _c = | C% = | 93 | 73 % |

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Crossroads Mixed Use

Inlet 7



Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line
Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

| | | |
|--------------|-------|----|
| $T_{BACK} =$ | 7.5 | ft |
| $S_{BACK} =$ | 0.020 | ft |
| $n_{BACK} =$ | 0.020 | |

| | | | |
|--------------|---|-------|--------|
| H_{CURB} | = | 6.00 | inches |
| T_{CROWN} | = | 14.0 | ft |
| W | = | 2.00 | ft |
| S_x | = | 0.020 | ft/ft |
| S_w | = | 0.083 | ft/ft |
| S_o | = | 0.010 | ft/ft |
| n_{STREET} | = | 0.016 | |

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (leave blank for no)

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| T_{MAX} = | 14.0 | 14.0 | ft |
| d_{MAX} = | 4.4 | 12.0 | inches |

check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

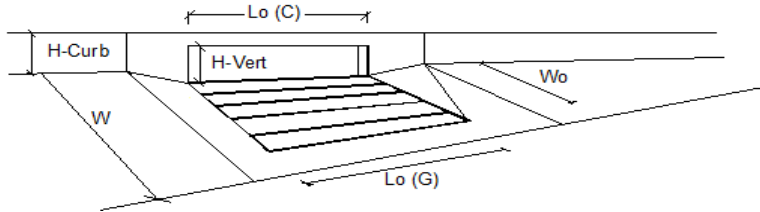
| | Minor Storm | Major Storm |
|---------------|-------------|-------------|
| $Q_{allow} =$ | 4.6 | 6.8 cfs |

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

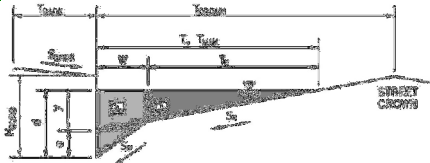
Version 4.06 Released August 2018



| Design Information (Input) | | MINOR | | MAJOR | |
|---|--------------------------|---------------|--------------------------|-------|--------|
| Type of Inlet | CDOT Type R Curb Opening | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | | a_{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | | N_o = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | | L_o = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | | W_o = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | | C_r-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | | C_r-C = | 0.10 | 0.10 | |
| Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM | | | | | |
| Total Inlet Interception Capacity | | Q = | 4.8 | 6.9 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | | Q_b = | 0.4 | 2.6 | cfs |
| Capture Percentage = Q_i/Q_o = | | $C\%$ = | 92 | 72 | % |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Crossroads Mixed Use**Inlet ID: **Inlet 8****Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion**MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 7.5$ ft $S_{BACK} = 0.020$ ft/ft $n_{BACK} = 0.020$ $H_{CURB} = 6.00$ inches $T_{CROWN} = 14.0$ ft $W = 2.00$ ft $S_X = 0.020$ ft/ft $S_W = 0.083$ ft/ft $S_O = 0.000$ ft/ft $n_{STREET} = 0.016$

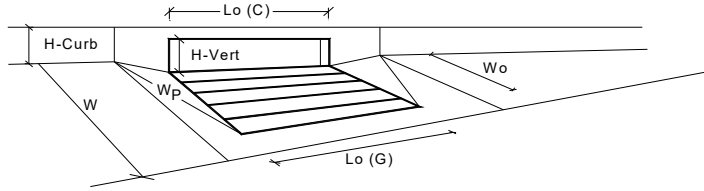
| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 14.0 | 14.0 | ft |
| $d_{MAX} =$ | 4.4 | 12.0 | inches |



| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | SUMP | SUMP | cfs |

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)

Type of Inlet CDOT Type R Curb Opening

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

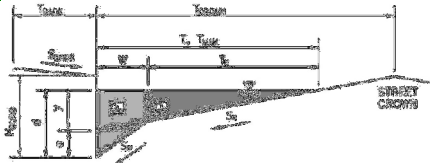
Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

| | MINOR | MAJOR | |
|-----------------------|--------------------------|-------|---|
| Type = | CDOT Type R Curb Opening | | |
| a_{local} = | 3.00 | 3.00 | inches |
| No = | 1 | 1 | |
| Ponding Depth = | 4.4 | 8.0 | inches |
| | MINOR | MAJOR | <input checked="" type="checkbox"/> Override Depths |
| $L_o (G)$ = | N/A | N/A | feet |
| W_o = | N/A | N/A | feet |
| A_{ratio} = | N/A | N/A | |
| $C_r (G)$ = | N/A | N/A | |
| $C_w (G)$ = | N/A | N/A | |
| $C_o (G)$ = | N/A | N/A | |
| | MINOR | MAJOR | |
| $L_o (C)$ = | 10.00 | 10.00 | feet |
| H_{vert} = | 6.00 | 6.00 | inches |
| H_{throat} = | 6.00 | 6.00 | inches |
| Theta = | 63.40 | 63.40 | degrees |
| W_p = | 2.00 | 2.00 | feet |
| $C_r (C)$ = | 0.10 | 0.10 | |
| $C_w (C)$ = | 3.60 | 3.60 | |
| $C_o (C)$ = | 0.67 | 0.67 | |
| | MINOR | MAJOR | |
| d_{Grate} = | N/A | N/A | ft |
| d_{Curb} = | 0.20 | 0.50 | ft |
| $RF_{Combination}$ = | 0.41 | 0.75 | |
| RF_{Curb} = | 0.82 | 1.00 | |
| RF_{Grate} = | N/A | N/A | |
| | MINOR | MAJOR | |
| Q_a = | 3.3 | 16.3 | cfs |
| $Q_{PEAK REQUIRED}$ = | 2.0 | 8.8 | cfs |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Crossroads Mixed Use**Inlet ID: **Inlet 9****Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 7.5$ ft

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

 $S_{BACK} = 0.020$ ft/ft

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

 $n_{BACK} = 0.020$

Height of Curb at Gutter Flow Line

 $H_{CURB} = 6.00$ inches

Distance from Curb Face to Street Crown

 $T_{CROWN} = 14.0$ ft

Gutter Width

 $W = 2.00$ ft

Street Transverse Slope

 $S_X = 0.020$ ft/ft

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

 $S_W = 0.083$ ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_O = 0.000$ ft/ft

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

 $n_{STREET} = 0.016$

Max. Allowable Spread for Minor & Major Storm

| | Minor Storm | Major Storm | |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 14.0 | 14.0 | ft |
| $d_{MAX} =$ | 4.4 | 12.0 | inches |

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

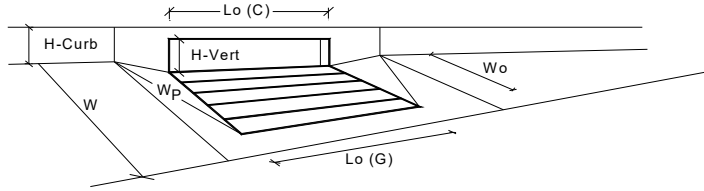
**MINOR STORM Allowable Capacity is based on Depth Criterion**

| | Minor Storm | Major Storm | |
|---------------|-------------|-------------|-----|
| $Q_{allow} =$ | SUMP | SUMP | cfs |

MAJOR STORM Allowable Capacity is based on Depth Criterion

INLET IN A SUMP OR SAG LOCATION

Version 4.06 Released August 2018



Design Information (Input)

Type of Inlet CDOT Type R Curb Opening

Local Depression (additional to continuous gutter depression 'a' from above)

Number of Unit Inlets (Grate or Curb Opening)

Water Depth at Flowline (outside of local depression)

Grate Information

Length of a Unit Grate

Width of a Unit Grate

Area Opening Ratio for a Grate (typical values 0.15-0.90)

Clogging Factor for a Single Grate (typical value 0.50 - 0.70)

Grate Weir Coefficient (typical value 2.15 - 3.60)

Grate Orifice Coefficient (typical value 0.60 - 0.80)

Curb Opening Information

Length of a Unit Curb Opening

Height of Vertical Curb Opening in Inches

Height of Curb Orifice Throat in Inches

Angle of Throat (see USDCM Figure ST-5)

Side Width for Depression Pan (typically the gutter width of 2 feet)

Clogging Factor for a Single Curb Opening (typical value 0.10)

Curb Opening Weir Coefficient (typical value 2.3-3.7)

Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth

Depth for Curb Opening Weir Equation

Combination Inlet Performance Reduction Factor for Long Inlets

Curb Opening Performance Reduction Factor for Long Inlets

Grated Inlet Performance Reduction Factor for Long Inlets

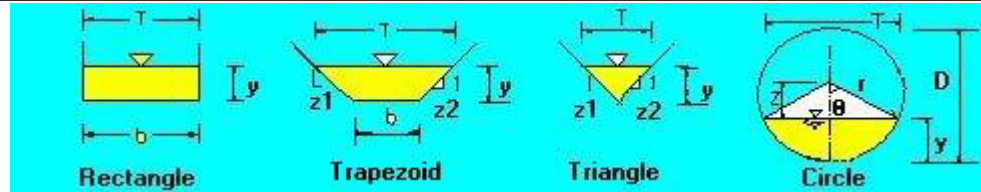
Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

| | MINOR | MAJOR | |
|-----------------------|--------------------------|-------|---|
| Type = | CDOT Type R Curb Opening | | |
| a_{local} = | 3.00 | 3.00 | inches |
| No = | 1 | 1 | |
| Ponding Depth = | 4.4 | 8.0 | inches |
| | MINOR | MAJOR | <input checked="" type="checkbox"/> Override Depths |
| $L_o (G)$ = | N/A | N/A | feet |
| W_o = | N/A | N/A | feet |
| A_{ratio} = | N/A | N/A | |
| $C_r (G)$ = | N/A | N/A | |
| $C_w (G)$ = | N/A | N/A | |
| $C_o (G)$ = | N/A | N/A | |
| | MINOR | MAJOR | |
| $L_o (C)$ = | 10.00 | 10.00 | feet |
| H_{vert} = | 6.00 | 6.00 | inches |
| H_{throat} = | 6.00 | 6.00 | inches |
| Theta = | 63.40 | 63.40 | degrees |
| W_p = | 2.00 | 2.00 | feet |
| $C_r (C)$ = | 0.10 | 0.10 | |
| $C_w (C)$ = | 3.60 | 3.60 | |
| $C_o (C)$ = | 0.67 | 0.67 | |
| | MINOR | MAJOR | |
| d_{Grate} = | N/A | N/A | ft |
| d_{Curb} = | 0.20 | 0.50 | ft |
| $RF_{Combination}$ = | 0.41 | 0.75 | |
| RF_{Curb} = | 0.82 | 1.00 | |
| RF_{Grate} = | N/A | N/A | |
| | MINOR | MAJOR | |
| Q_a = | 3.3 | 16.3 | cfs |
| $Q_{PEAK REQUIRED}$ = | 2.9 | 8.8 | cfs |

SECTION A: CDOT Barrow Ditch

Select Channel Type: Trapezoid ▼



Depth from Q ▼

Select unit system: Feet(ft) ▼

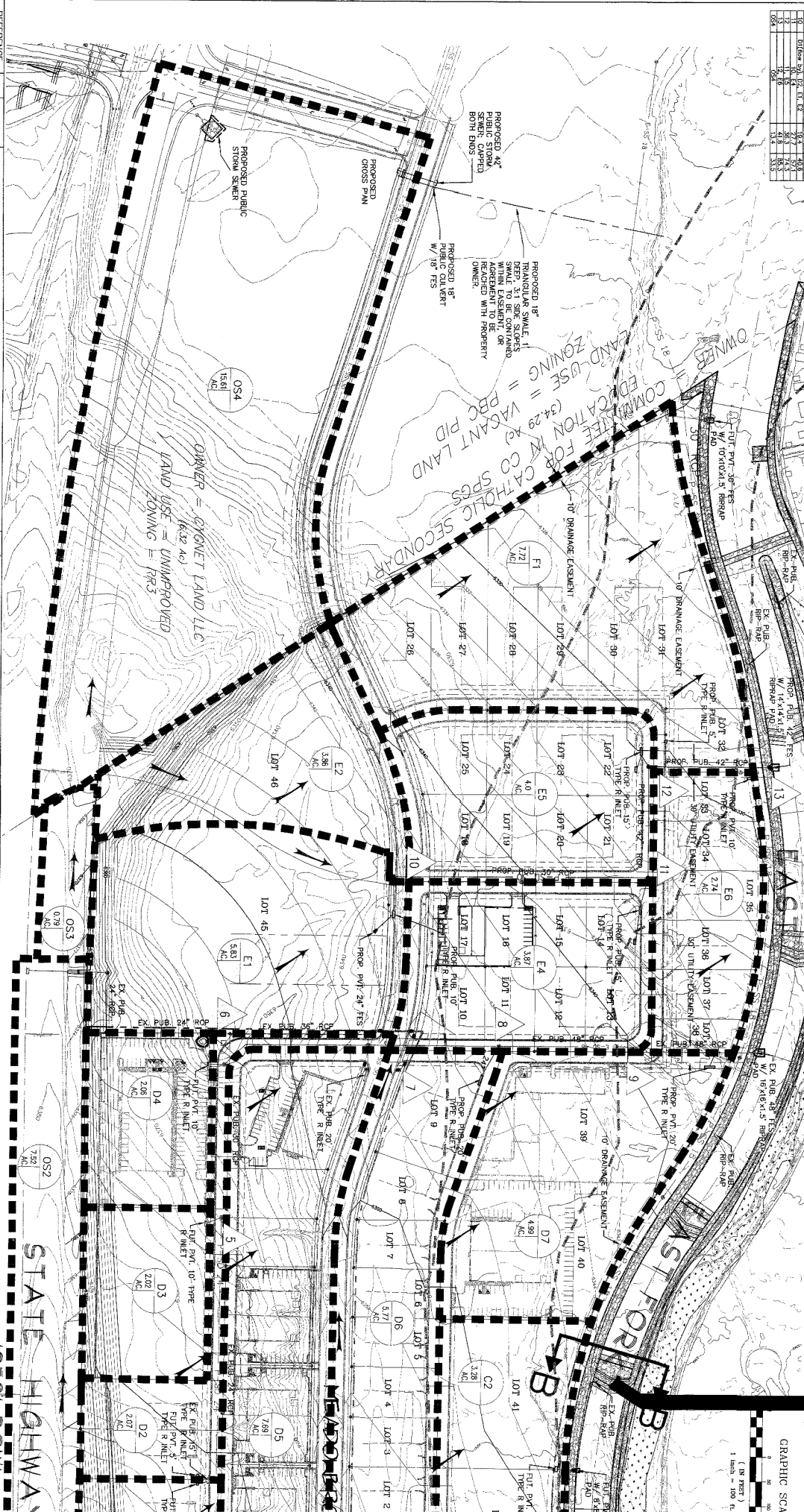
| | | |
|--|---------------------------------|--------------------------------|
| Channel slope: .018 ft/ft | Water depth(y): 0.76 ft | Bottom width(b) 5 ft |
| Flow velocity 3.535 ft/s | LeftSlope (Z1): 4 to 1 (H:V) | RightSlope (Z2): 10 to 1 (H:V) |
| Flow discharge 27.7 ft ³ /s | Input n value 0.035 or select n | |
| Calculate! | Status: Calculation finished | Reset |
| Wetted perimeter 15.76 ft | Flow area 7.84 ft ² | Top width(T) 15.63 ft |
| Specific energy 0.95 ft | Froude number 0.88 | Flow status Subcritical flow |
| Critical depth 0.72 ft | Critical slope 0.0225 ft/ft | Velocity head 0.19 ft |

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BACKGROUND

| NO. | DATE | DESCRIPTION |
|-----|------------|-------------|
| 1 | 01/15/2008 | PRELIMINARY |
| 2 | 02/15/2008 | REVISED |
| 3 | 03/15/2008 | REVISED |
| 4 | 04/15/2008 | REVISED |
| 5 | 05/15/2008 | REVISED |
| 6 | 06/15/2008 | REVISED |
| 7 | 07/15/2008 | REVISED |
| 8 | 08/15/2008 | REVISED |
| 9 | 09/15/2008 | REVISED |
| 10 | 10/15/2008 | REVISED |
| 11 | 11/15/2008 | REVISED |
| 12 | 12/15/2008 | REVISED |
| 13 | 01/15/2009 | REVISED |
| 14 | 02/15/2009 | REVISED |
| 15 | 03/15/2009 | REVISED |
| 16 | 04/15/2009 | REVISED |
| 17 | 05/15/2009 | REVISED |
| 18 | 06/15/2009 | REVISED |
| 19 | 07/15/2009 | REVISED |
| 20 | 08/15/2009 | REVISED |
| 21 | 09/15/2009 | REVISED |
| 22 | 10/15/2009 | REVISED |
| 23 | 11/15/2009 | REVISED |
| 24 | 12/15/2009 | REVISED |
| 25 | 01/15/2010 | REVISED |
| 26 | 02/15/2010 | REVISED |
| 27 | 03/15/2010 | REVISED |
| 28 | 04/15/2010 | REVISED |
| 29 | 05/15/2010 | REVISED |
| 30 | 06/15/2010 | REVISED |
| 31 | 07/15/2010 | REVISED |
| 32 | 08/15/2010 | REVISED |
| 33 | 09/15/2010 | REVISED |
| 34 | 10/15/2010 | REVISED |
| 35 | 11/15/2010 | REVISED |
| 36 | 12/15/2010 | REVISED |
| 37 | 01/15/2011 | REVISED |
| 38 | 02/15/2011 | REVISED |
| 39 | 03/15/2011 | REVISED |
| 40 | 04/15/2011 | REVISED |
| 41 | 05/15/2011 | REVISED |
| 42 | 06/15/2011 | REVISED |
| 43 | 07/15/2011 | REVISED |
| 44 | 08/15/2011 | REVISED |
| 45 | 09/15/2011 | REVISED |
| 46 | 10/15/2011 | REVISED |
| 47 | 11/15/2011 | REVISED |
| 48 | 12/15/2011 | REVISED |
| 49 | 01/15/2012 | REVISED |
| 50 | 02/15/2012 | REVISED |
| 51 | 03/15/2012 | REVISED |
| 52 | 04/15/2012 | REVISED |
| 53 | 05/15/2012 | REVISED |
| 54 | 06/15/2012 | REVISED |
| 55 | 07/15/2012 | REVISED |
| 56 | 08/15/2012 | REVISED |
| 57 | 09/15/2012 | REVISED |
| 58 | 10/15/2012 | REVISED |
| 59 | 11/15/2012 | REVISED |
| 60 | 12/15/2012 | REVISED |
| 61 | 01/15/2013 | REVISED |
| 62 | 02/15/2013 | REVISED |
| 63 | 03/15/2013 | REVISED |
| 64 | 04/15/2013 | REVISED |
| 65 | 05/15/2013 | REVISED |
| 66 | 06/15/2013 | REVISED |
| 67 | 07/15/2013 | REVISED |
| 68 | 08/15/2013 | REVISED |
| 69 | 09/15/2013 | REVISED |
| 70 | 10/15/2013 | REVISED |
| 71 | 11/15/2013 | REVISED |
| 72 | 12/15/2013 | REVISED |
| 73 | 01/15/2014 | REVISED |
| 74 | 02/15/2014 | REVISED |
| 75 | 03/15/2014 | REVISED |
| 76 | 04/15/2014 | REVISED |
| 77 | 05/15/2014 | REVISED |
| 78 | 06/15/2014 | REVISED |
| 79 | 07/15/2014 | REVISED |
| 80 | 08/15/2014 | REVISED |
| 81 | 09/15/2014 | REVISED |
| 82 | 10/15/2014 | REVISED |
| 83 | 11/15/2014 | REVISED |
| 84 | 12/15/2014 | REVISED |
| 85 | 01/15/2015 | REVISED |
| 86 | 02/15/2015 | REVISED |
| 87 | 03/15/2015 | REVISED |
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| 90 | 06/15/2015 | REVISED |
| 91 | 07/15/2015 | REVISED |
| 92 | 08/15/2015 | REVISED |
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| 95 | 11/15/2015 | REVISED |
| 96 | 12/15/2015 | REVISED |
| 97 | 01/15/2016 | REVISED |
| 98 | 02/15/2016 | REVISED |
| 99 | 03/15/2016 | REVISED |
| 100 | 04/15/2016 | REVISED |

DRAINAGE PLAN CLAREMONT BUSINESS PARK FILING NO. 2



| REFERENCE | | SUBDIVIDER | | FOR AND ON BEHALF OF | |
|---------------|---------------|---------------|----------------|----------------------|---------------|
| 1. SHEET NO. | 2. SHEET NO. | 3. SHEET NO. | 4. SHEET NO. | 5. SHEET NO. | 6. SHEET NO. |
| 7. SHEET NO. | 8. SHEET NO. | 9. SHEET NO. | 10. SHEET NO. | 11. SHEET NO. | 12. SHEET NO. |
| 13. SHEET NO. | 14. SHEET NO. | 15. SHEET NO. | 16. SHEET NO. | 17. SHEET NO. | 18. SHEET NO. |
| 19. SHEET NO. | 20. SHEET NO. | 21. SHEET NO. | 22. SHEET NO. | 23. SHEET NO. | 24. SHEET NO. |
| 25. SHEET NO. | 26. SHEET NO. | 27. SHEET NO. | 28. SHEET NO. | 29. SHEET NO. | 30. SHEET NO. |
| 31. SHEET NO. | 32. SHEET NO. | 33. SHEET NO. | 34. SHEET NO. | 35. SHEET NO. | 36. SHEET NO. |
| 37. SHEET NO. | 38. SHEET NO. | 39. SHEET NO. | 40. SHEET NO. | 41. SHEET NO. | 42. SHEET NO. |
| 43. SHEET NO. | 44. SHEET NO. | 45. SHEET NO. | 46. SHEET NO. | 47. SHEET NO. | 48. SHEET NO. |
| 49. SHEET NO. | 50. SHEET NO. | 51. SHEET NO. | 52. SHEET NO. | 53. SHEET NO. | 54. SHEET NO. |
| 55. SHEET NO. | 56. SHEET NO. | 57. SHEET NO. | 58. SHEET NO. | 59. SHEET NO. | 60. SHEET NO. |
| 61. SHEET NO. | 62. SHEET NO. | 63. SHEET NO. | 64. SHEET NO. | 65. SHEET NO. | 66. SHEET NO. |
| 67. SHEET NO. | 68. SHEET NO. | 69. SHEET NO. | 70. SHEET NO. | 71. SHEET NO. | 72. SHEET NO. |
| 73. SHEET NO. | 74. SHEET NO. | 75. SHEET NO. | 76. SHEET NO. | 77. SHEET NO. | 78. SHEET NO. |
| 79. SHEET NO. | 80. SHEET NO. | 81. SHEET NO. | 82. SHEET NO. | 83. SHEET NO. | 84. SHEET NO. |
| 85. SHEET NO. | 86. SHEET NO. | 87. SHEET NO. | 88. SHEET NO. | 89. SHEET NO. | 90. SHEET NO. |
| 91. SHEET NO. | 92. SHEET NO. | 93. SHEET NO. | 94. SHEET NO. | 95. SHEET NO. | 96. SHEET NO. |
| 97. SHEET NO. | 98. SHEET NO. | 99. SHEET NO. | 100. SHEET NO. | | |



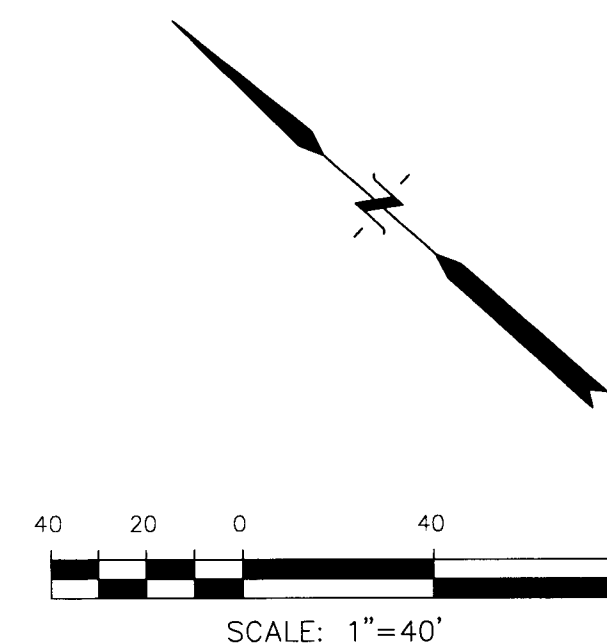
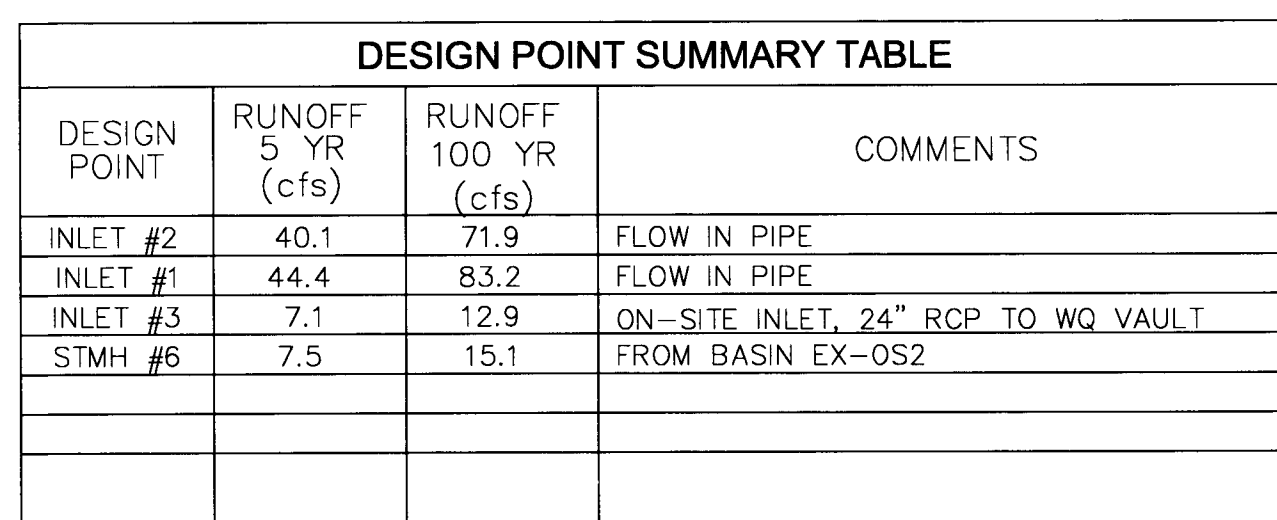
Matrix Design Group, Inc.
Integrated Design Solutions 2415 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0288


CLAREMONT BUSINESS PARK
FINAL DRAINAGE PLAN
MASTER DEVELOPMENT DRAINAGE PLAN
FINAL DRAINAGE PLAN
FILING NO. 2

FEMA 100 YEAR FLOODPLAIN

5-year flow (1/2 Street)
6.00% = 34.0cfs (max)
2.00% = 28.3cfs
1.20% = 21.9cfs
0.80% = 17.9cfs

100-year flow (1/2 Street)
6.00% = 235.2cfs
2.00% = 166.3cfs
1.20% = 128.8cfs
0.80% = 105.2cfs



| | | |
|--|--|--|
| TOTAL SHEETS: | | 2 |
| SHEET NUMBER | | 2 |
| PROJECT NO. | | 319.001 |
| DATE: | | JULY 2016 |
| PROPOSED STORM SEWER PLAN LOT 1 OF 24/94 BUSINESS PARK Meadowbrook Pkwy, EL PASO COUNTY, CO | | |
| DRAWN: LAB, 9/9/15 DESIGNED: LAB, 9/9/15 CHECKED: RLS, 9/9/15 | | |
| CORE ENGINEERING GROUP  15004 1ST AVENUE S. BURNSVILLE, MN 55306 TEL: 612-891-8600 CONTACT: RICHARD L. SCHINDLER, P.E. EMAIL: Rich@cegi.com | | PREPARED FOR: Circle K Stores, Inc. 1195 South Bellline Road, Suite 160 CORPPELL TEXAS 75019 (940) 453-0015 COLORADO SPRINGS, COLORADO |
| NO. DESCRIPTION DATE | | PROJECT: 24/94 BUSINESS PARK Meadowbrook Parkway & Platte Avenue COLORADO SPRINGS, COLORADO |

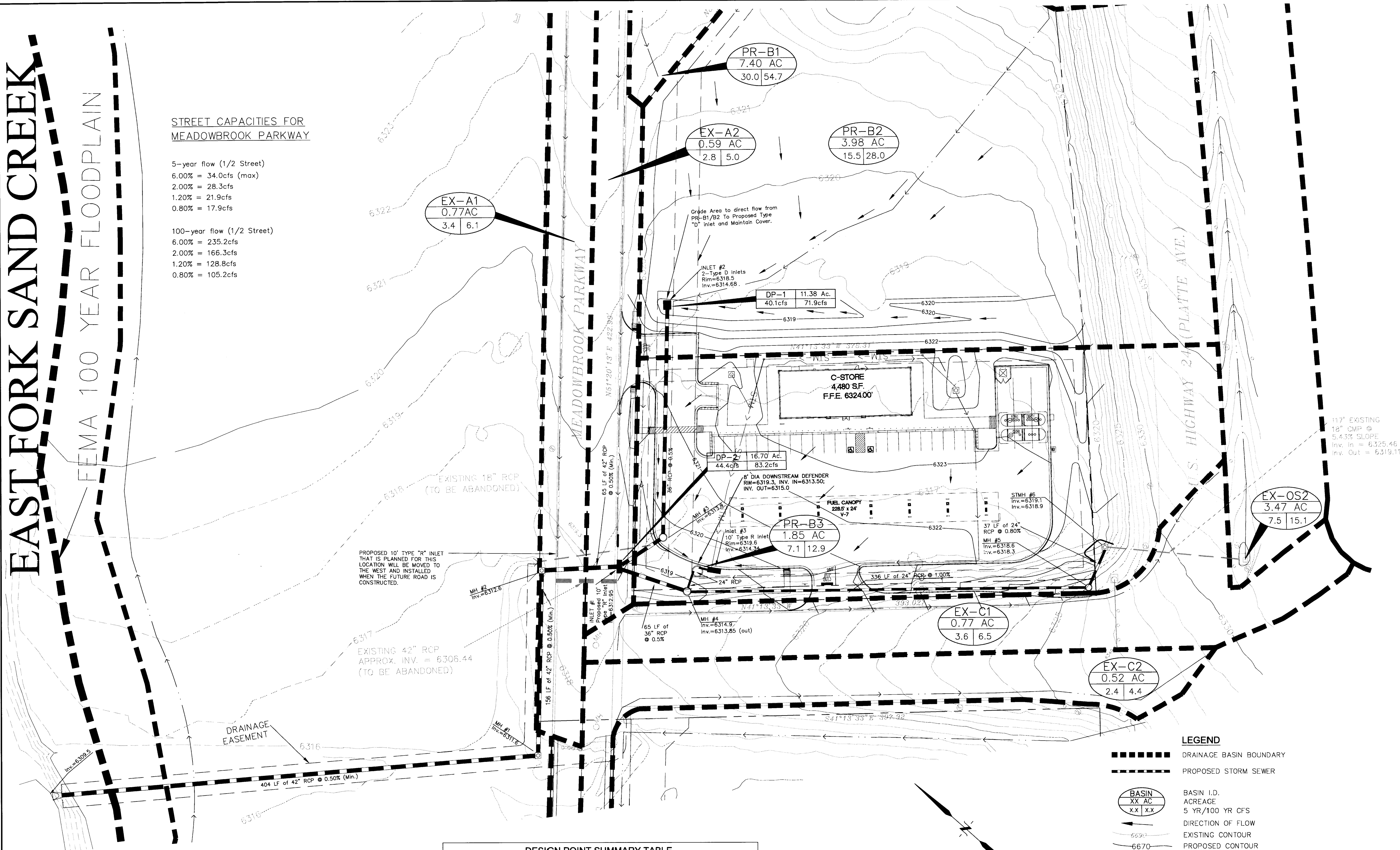
EASTFORK SAND CREEK

FEMA 100 YEAR FLOODPLAIN

STREET CAPACITIES FOR MEADOWBROOK PARKWAY

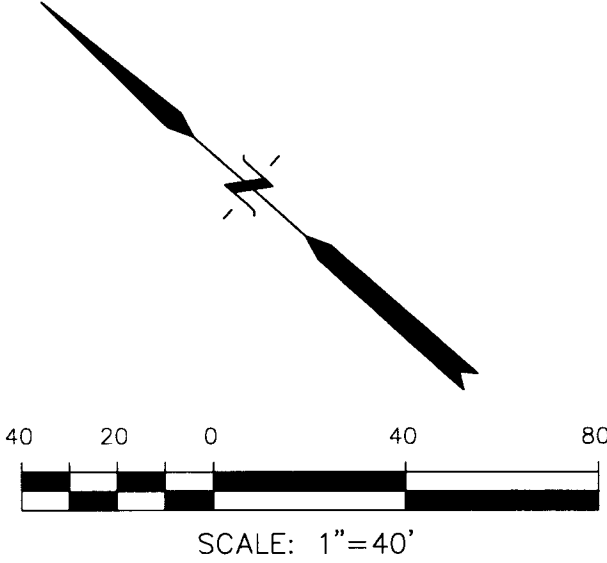
5-year flow (1/2 Street)
6.00% = 34.0cfs (max)
2.00% = 28.3cfs
1.20% = 21.9cfs
0.80% = 17.9cfs


100-year flow (1/2 Street)
6.00% = 235.2cfs
2.00% = 166.3cfs
1.20% = 128.8cfs
0.80% = 105.2cfs



| DESIGN POINT SUMMARY TABLE | | | |
|----------------------------|-------------------|---------------------|------------------------------------|
| DESIGN POINT | RUNOFF 5 YR (cfs) | RUNOFF 100 YR (cfs) | COMMENTS |
| DP-1 | 40.1 | 71.9 | FLOW IN PIPE |
| DP-2 | 44.4 | 83.2 | FLOW IN PIPE |
| INLET #3 | 7.1 | 12.9 | ON-SITE INLET, 24" RCP TO WQ VAULT |
| STMH #6 | 7.5 | 15.1 | FROM BASIN EX-OS2 |
| | | | |
| | | | |
| | | | |

- LEGEND**
- DRAINAGE BASIN BOUNDARY
 - PROPOSED STORM SEWER
 - BASIN I.D. XX AC
 - 5 YR/100 YR CFS x.x | x.x
 - DIRECTION OF FLOW
 - EXISTING CONTOUR
 - PROPOSED CONTOUR
 - HIGH POINT
 - LOW POINT
 - GRADE BREAK
 - TOP BACK OF CURB
 - FLOWLINE
 - TIME OF CONCENTRATION





CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 763-255-0000
FAX: 763-255-0001
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@cegi.com

DATE: _____

DESCRIPTION: _____

NO. _____

PREPARED FOR: Circle K Stores, Inc.
1199 Bankers Building, Suite 160
COPPELL, TEXAS 75019
(940) 453-0015
CONTACT: Tim Peters

PROJECT: 24/94 BUSINESS PARK
Meadowbrook Parkway & Platte Avenue
COLORADO SPRINGS, COLORADO

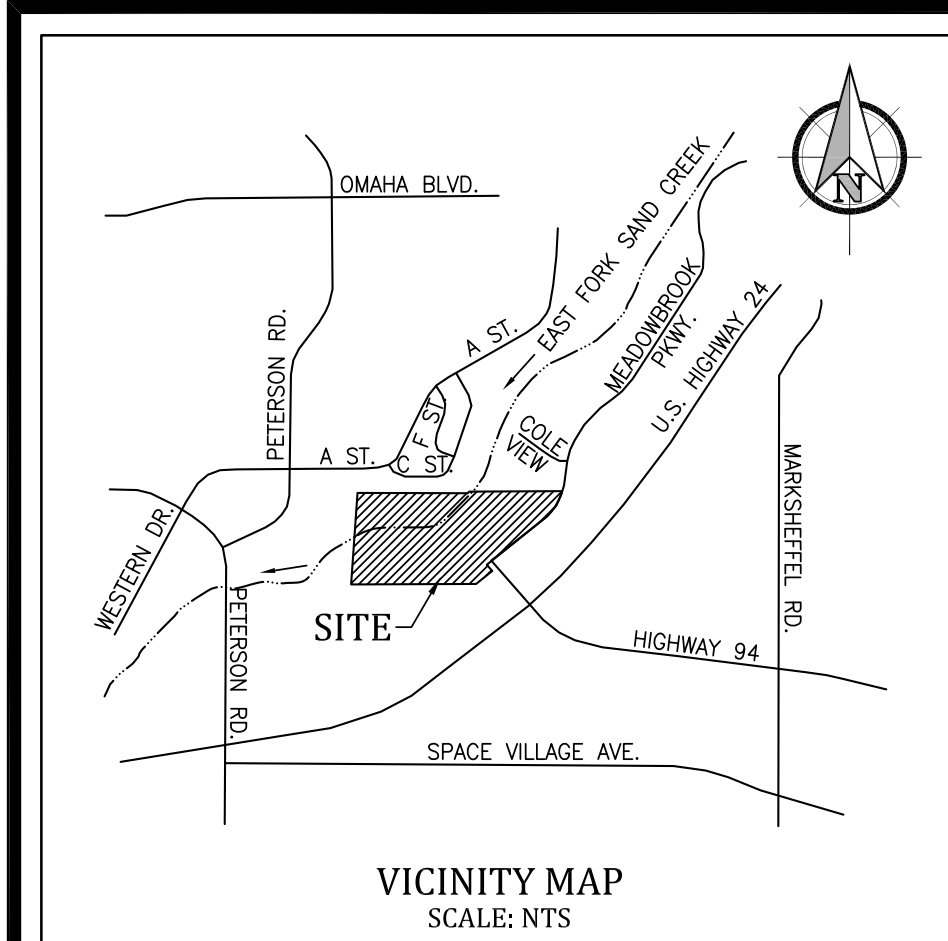
DRAWN: LAB, 9/9/15
DESIGNED: LAB, 9/9/15
CHECKED: RLS, 9/10/15

DATE: JULY, 2016

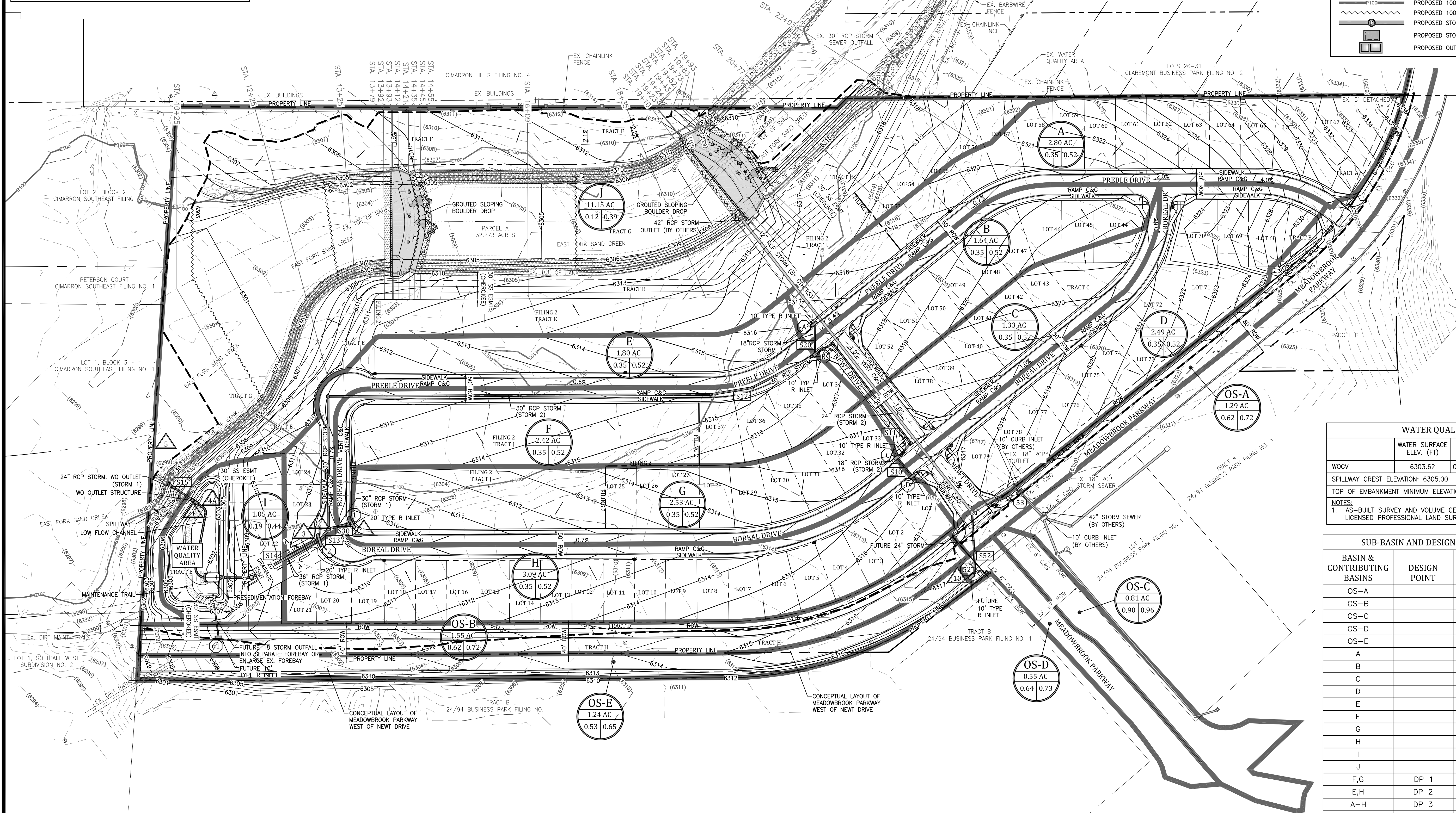
PROJECT NO. 319.001

SHEET NUMBER 1

TOTAL SHEETS: 2



VICINITY MAP
SCALE: NTS



LEGEND

DESIGN POINT
STORMWATER EMERGENCY OVERFLOW PATH
R.O.W. / PROPERTY LINE
EXISTING EASEMENT
EXISTING STORM SEWER
EXISTING CONTOURS
PROPOSED CONTOURS
EXISTING FLOW DIRECTION AND SLOPE
PROPOSED FLOW DIRECTION AND SLOPE
PROPOSED CURB AND GUTTER
EXISTING 100 YEAR FLOODPLAIN
PROPOSED 100 YEAR BASE FLOOD ELEVATION LINE
PROPOSED STORM SEWER PIPE AND MANHOLE
PROPOSED STORM CURB INLET
PROPOSED OUTLET STRUCTURE

DESIGN POINT
STORMWATER EMERGENCY OVERFLOW PATH
R.O.W. / PROPERTY LINE
EXISTING EASEMENT
EXISTING STORM SEWER
EXISTING CONTOURS
PROPOSED CONTOURS
EXISTING FLOW DIRECTION AND SLOPE
PROPOSED FLOW DIRECTION AND SLOPE
PROPOSED CURB AND GUTTER
EXISTING 100 YEAR FLOODPLAIN
PROPOSED 100 YEAR BASE FLOOD ELEVATION LINE
PROPOSED STORM SEWER PIPE AND MANHOLE
PROPOSED STORM CURB INLET
PROPOSED OUTLET STRUCTURE

| WATER QUALITY BASIN | | | | |
|---|--------------------------|-------------------------|--------------|-------------------------|
| | WATER SURFACE ELEV. (FT) | REQUIRED STORAGE VOLUME | RELEASE RATE | PROVIDED STORAGE VOLUME |
| WQCV | 6303.62 | 0.36 AC-FT | | |
| SPILLWAY CREST ELEVATION: 6305.00 | | | | |
| TOP OF EMBANKMENT MINIMUM ELEVATION: 6306.50 | | | | |
| NOTES: 1. AS-BUILT SURVEY AND VOLUME CERTIFICATION REQUIRED BY A LICENSED PROFESSIONAL LAND SURVEYOR, SEE GRADING NOTES. | | | | |

| SUB-BASIN AND DESIGN POINT DISCHARGES | | | |
|---------------------------------------|--------------|-----------|-------------|
| BASIN & CONTRIBUTING BASINS | DESIGN POINT | 5-YR FLOW | 100-YR FLOW |
| OS-A | | 3.0 cfs | 5.9 cfs |
| OS-B | | 3.5 cfs | 6.9 cfs |
| OS-C | | 3.8 cfs | 6.7 cfs |
| OS-D | | 1.8 cfs | 3.4 cfs |
| OS-E | | 2.4 cfs | 5.0 cfs |
| A | | 3.4 cfs | 8.6 cfs |
| B | | 2.1 cfs | 5.3 cfs |
| C | | 1.8 cfs | 4.4 cfs |
| D | | 3.1 cfs | 7.9 cfs |
| E | | 2.2 cfs | 5.4 cfs |
| F | | 2.9 cfs | 7.3 cfs |
| G | | 3.1 cfs | 7.7 cfs |
| H | | 3.7 cfs | 9.3 cfs |
| I | | 0.8 cfs | 3.1 cfs |
| J | | 4.1 cfs | 23.4 cfs |
| F,G | DP 1 | 5.9 cfs | 15.0 cfs |
| E,H | DP 2 | 5.8 cfs | 14.6 cfs |
| A-H | DP 3 | 19.2 cfs | 48.4 cfs |
| A-I | DP 4 | 19.6 cfs | 50.2 cfs |
| A-I, OSB | DP 4A | 22.1 cfs | 55.1 cfs |
| A-J, OSB | DP 5 | 26.3 cfs | 77.7 cfs |
| OSC, OSD | DP 10 | 5.5 cfs | 10.1 cfs |

Kiowa
Engineering Corporation
7175 West Jefferson Avenue, Suite 1300
Lakewood, Colorado 80235
(303) 692-0369

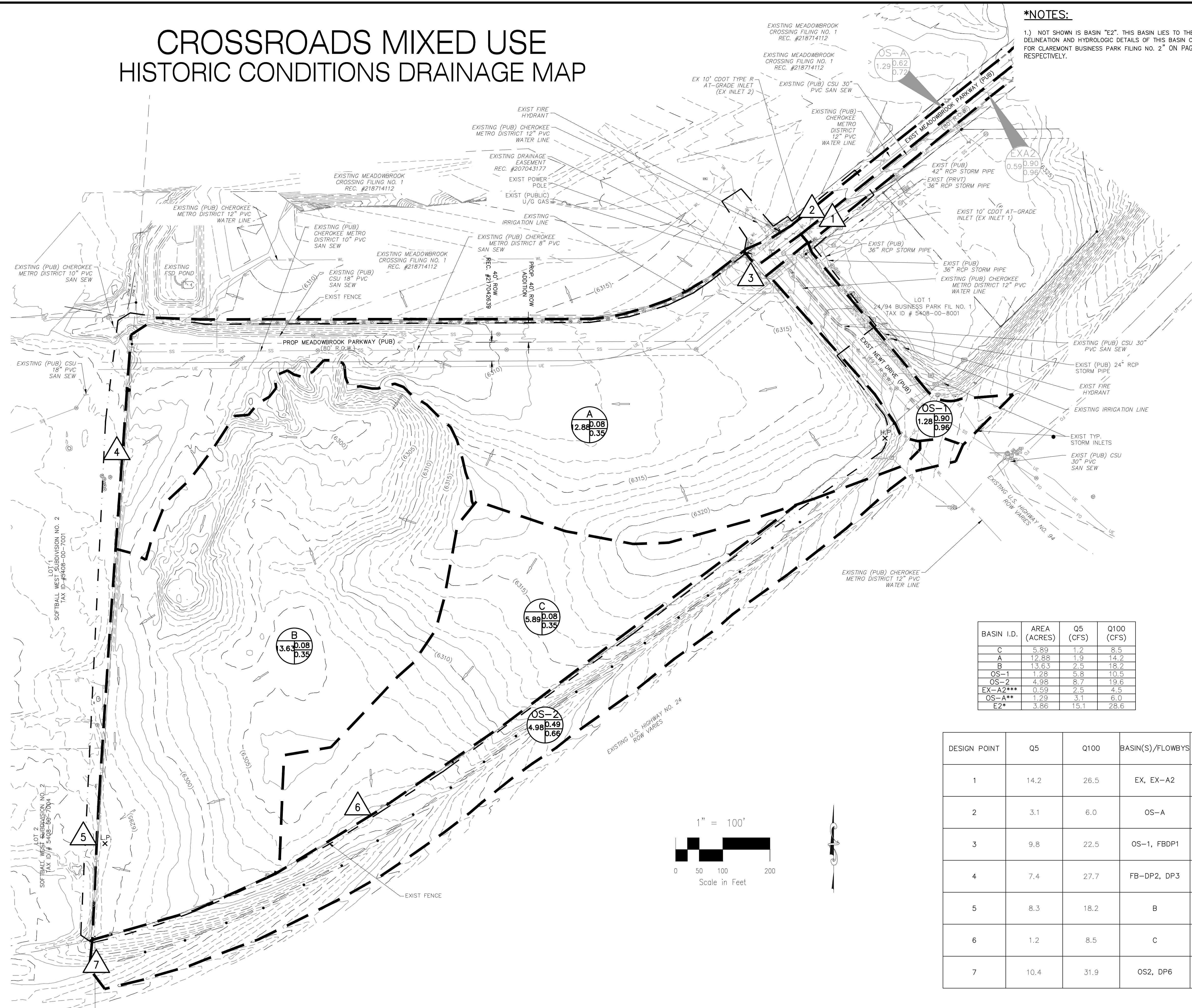
**MEADOWBROOK SUBDIVISION
PRELIMINARY/FINAL DRAINAGE REPORT
DRAINAGE PLAN - PROPOSED CONDITION
EL PASO COUNTY, COLORADO**

Project No.: 16039
Date: July 25, 2017
Design: ELS
Drawn: ELS
Check: MWE
Revisions:

B

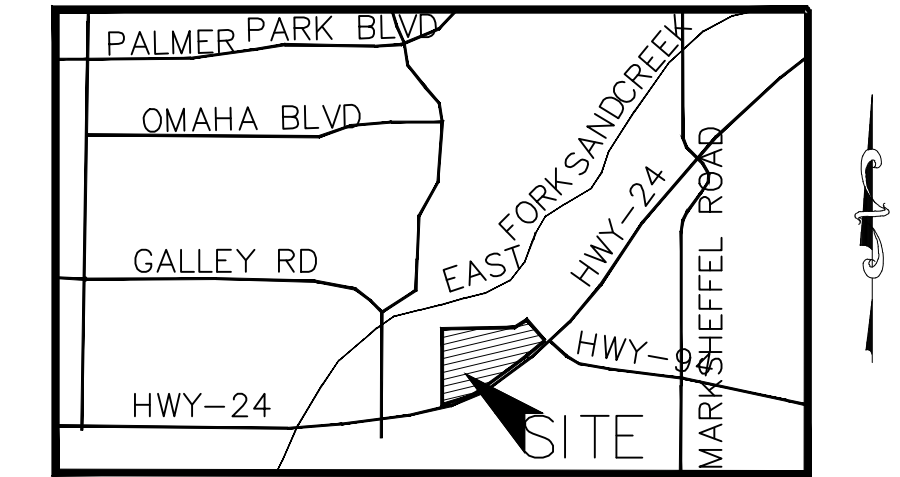
DRAINAGE MAPS

CROSSROADS MIXED USE HISTORIC CONDITIONS DRAINAGE MAP



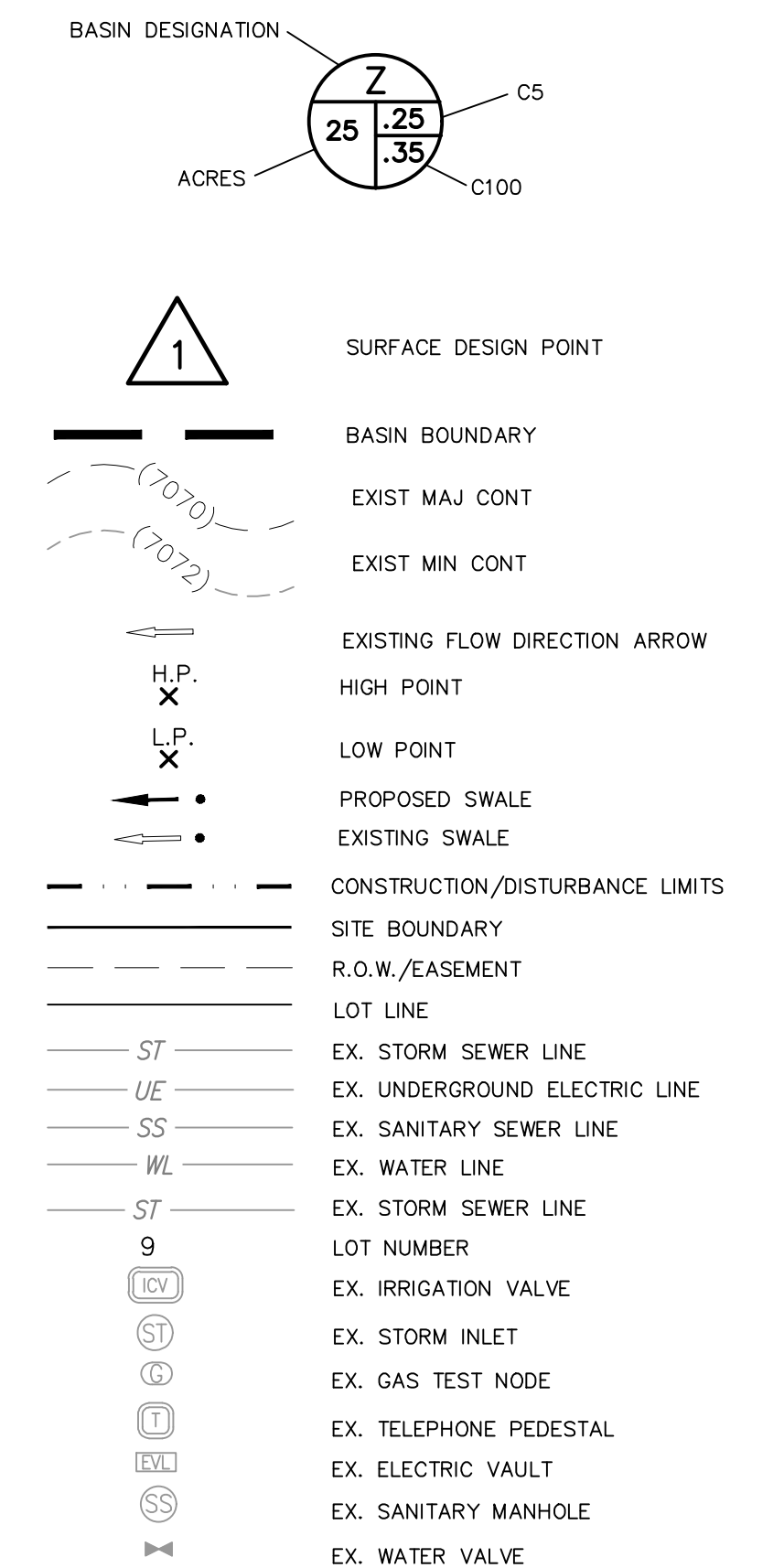
*NOTES:

1.) NOT SHOWN IS BASIN "E2". THIS BASIN LIES TO THE EAST OF BASIN "EX-A2".
 DELINEATION AND HYDROLOGIC DETAILS OF THIS BASIN CAN BE FOUND IN THE "FDR
 FOR CLAREMONT BUSINESS PARK FILING NO. 2" ON PAGES 39 AND 41,
 RESPECTIVELY.



VICINITY MAP
N.T.S.

LEGEND



| BASIN I.D. | AREA (ACRES) | Q5 (CFS) | Q100 (CFS) |
|------------|-----------------|-------------|---------------|
| C | 5.89 | 1.2 | 8.5 |
| A | 12.88 | 1.9 | 14.2 |
| B | 13.63 | 2.5 | 18.2 |
| OS-1 | 1.28 | 5.8 | 10.5 |
| OS-2 | 4.98 | 8.7 | 19.6 |
| EX-A2*** | 0.59 | 2.5 | 4.5 |
| OS-A** | 1.29 | 3.1 | 6.0 |
| E2* | 3.86 | 15.1 | 28.6 |

| DESIGN POINT | Q5 | Q100 | BASIN(S)/FLOWBYS | OUTFALL |
|--------------|------|------|------------------|--|
| 1 | 14.2 | 26.5 | EX, EX-A2 | EXIST 10' CDOT TYPED PAVEMENT AT GRADE INLET |
| 2 | 3.1 | 6.0 | OS-A | EXIST 10' CDOT TYPED PAVEMENT AT GRADE INLET |
| 3 | 9.8 | 22.5 | OS-1, FBDP1 | END OF PAVEMENT |
| 4 | 7.4 | 27.7 | FB-DP2, DP3 | DISCHARGE TO ADJACENT PARCEL (LOT 1) |
| 5 | 8.3 | 18.2 | B | DISCHARGE TO ADJACENT PARCEL (LOT2) |
| 6 | 1.2 | 8.5 | C | DISCHARGE TO CDOT ROW |
| 7 | 10.4 | 31.9 | OS2, DP6 | CDOT BARROW DITCH |

HISTORIC DRAINAGE MAP
CROSSROADS MIXED USE
JOB NO. 18-003
DATE PREPARED: FEBRUARY 23, 2021
DATE REVISED:

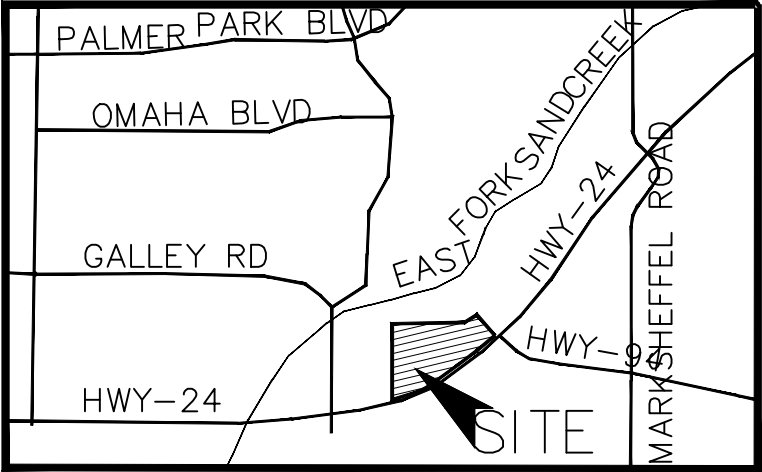


212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CROSSROADS MIXED USE EXISTING CONDITIONS DRAINAGE MAP

*NOTES:

1.) NOT SHOWN IS BASIN "E2". THIS BASIN LIES TO THE EAST OF BASIN "EX-A2". DELINEATION AND HYDROLOGIC DETAILS OF THIS BASIN CAN BE FOUND IN THE "FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2" ON PAGES 39 AND 41, RESPECTIVELY.



VICINITY MAP N.T.S.

LEGEND

- BASIN DESIGNATION
- ACRES
- 1
- 25
- 1.25
- 0.35
- C5
- C100
- 1
- SURFACE DESIGN POINT
- BASIN BOUNDARY
- EXIST MAJ CONT
- EXIST MIN CONT
- EXISTING FLOW DIRECTION ARROW
- H.P.
- X
- L.P.
- X
- PROPOSED SWALE
- EXISTING SWALE
- CONSTRUCTION/DISTURBANCE LIMITS
- SITE BOUNDARY
- R.O.W./EASEMENT
- LOT LINE
- ST
- EX. STORM SEWER LINE
- UE
- EX. UNDERGROUND ELECTRIC LINE
- SS
- EX. SANITARY SEWER LINE
- WL
- EX. WATER LINE
- ST
- EX. STORM SEWER LINE
- 9
- LOT NUMBER
- ICV
- EX. IRRIGATION VALVE
- ST
- EX. STORM INLET
- Q
- EX. GAS TEST NODE
- T
- EX. TELEPHONE PEDESTAL
- EV
- EX. ELECTRIC VAULT
- SS
- EX. SANITARY MANHOLE
- W
- EX. WATER VALVE

| BASIN I.D. | AREA (ACRES) | Q5 (CFS) | Q100 (CFS) |
|------------|--------------|----------|------------|
| C | 3.99 | 0.9 | 6.3 |
| A | 11.02 | 1.5 | 11.1 |
| B | 17.31 | 2.0 | 14.5 |
| OS-1 | 1.28 | 5.8 | 10.5 |
| OS-2 | 4.98 | 8.7 | 19.6 |
| EX-A2** | 0.59 | 2.5 | 4.5 |
| OS-A** | 1.29 | 3.1 | 6.0 |
| E2* | 3.86 | 15.1 | 28.6 |

| DESIGN POINT | Q5 | Q100 | BASIN(S)/FLOWBYS | OUTFALL |
|--------------|------|------|------------------|--------------------------------------|
| 1 | 14.2 | 26.5 | E2, EX-A2 | EXIST 10' CDOT TYPE R AT GRADE INLET |
| 2 | 3.1 | 6.0 | OS-A | EXIST 10' CDOT TYPE R AT GRADE INLET |
| 3 | 9.8 | 22.5 | OS-1, FB-DP1 | END OF PAVEMENT |
| 4 | 7.1 | 25.5 | A, FB-DP2, DP3 | DISCHARGE TO ADJACENT PARCEL (LOT 1) |
| 5 | 5.0 | 14.5 | B | DISCHARGE TO ADJACENT PARCEL (LOT 2) |
| 6 | 0.9 | 6.3 | C | DISCHARGE TO CDOT ROW |
| 7 | 9.9 | 28.0 | OS2, DP6 | CDOT BARROW DITCH |

EXISTING DRAINAGE MAP
CROSSROADS MIXED USE
JOB NO. 18-003
DATE PREPARED: FEBRUARY 23, 2021
DATE REVISED:

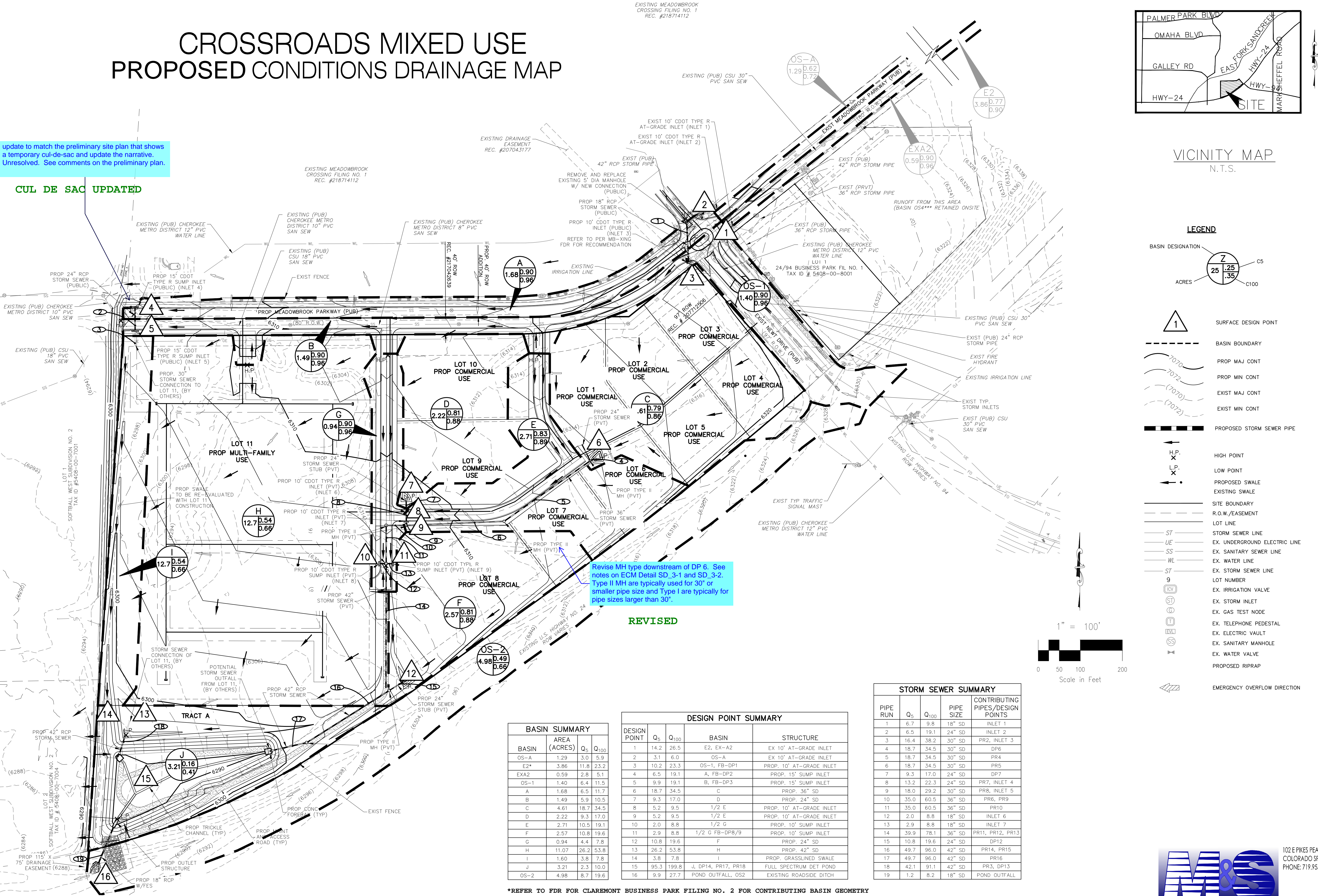


212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CROSSROADS MIXED USE PROPOSED CONDITIONS DRAINAGE MAP

update to match the preliminary site plan that shows a temporary cul-de-sac and update the narrative. Unresolved. See comments on the preliminary plan.

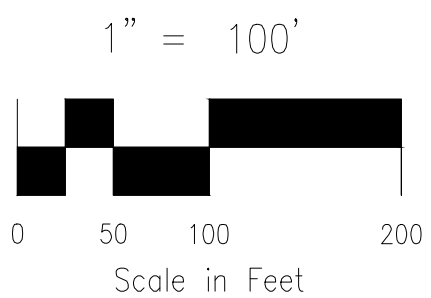
CUL DE SAC UPDATED



VICINITY MAP
N.T.S.

LEGEND

- BASIN DESIGNATION
- ACRES
- 1
- SURFACE DESIGN POINT
- BASIN BOUNDARY
- PROF MAJ CONT
- PROF MIN CONT
- EXIST MAJ CONT
- EXIST MIN CONT
- PROPOSED STORM SEWER PIPE
- H.P.
- L.P.
- PROPOSED SWALE
- EXISTING SWALE
- SITE BOUNDARY
- R.O.W./EASEMENT
- LOT LINE
- ST
- EX. UNDERGROUND ELECTRIC LINE
- SS
- EX. SANITARY SEWER LINE
- WL
- EX. WATER LINE
- ST
- EX. STORM SEWER LINE
- 9
- EX. IRRIGATION VALVE
- ST
- EX. STORM INLET
- GS
- EX. GAS TEST NODE
- TEL
- EX. TELEPHONE PEDESTAL
- EV
- EX. ELECTRIC VAULT
- SM
- EX. SANITARY MANHOLE
- WV
- EX. WATER VALVE
- PROPOSED RIPRAP
- EMERGENCY OVERFLOW DIRECTION



| BASIN SUMMARY | | | | |
|---------------|--------------|----------------|------------------|--|
| BASIN | AREA (ACRES) | Q _s | Q ₁₀₀ | |
| OS-A | 1.29 | 3.0 | 5.9 | |
| E2* | 3.86 | 11.8 | 23.2 | |
| EXA2 | 0.59 | 2.8 | 5.1 | |
| OS-1 | 1.40 | 6.4 | 11.5 | |
| A | 1.68 | 6.5 | 11.7 | |
| B | 1.49 | 5.9 | 10.5 | |
| C | 4.61 | 18.7 | 34.5 | |
| D | 2.22 | 9.3 | 17.0 | |
| E | 2.71 | 10.5 | 19.1 | |
| F | 2.57 | 10.8 | 19.6 | |
| G | 0.94 | 4.4 | 7.8 | |
| H | 11.07 | 26.2 | 53.8 | |
| I | 1.60 | 3.8 | 7.8 | |
| J | 3.21 | 2.3 | 10.0 | |
| OS-2 | 4.98 | 8.7 | 19.6 | |

| DESIGN POINT SUMMARY | | | |
|----------------------|----------------|------------------|---------------------|
| DESIGN POINT | Q _s | Q ₁₀₀ | STRUCTURE |
| 1 | 14.2 | 26.5 | E2, EX-A2 |
| 2 | 3.1 | 6.0 | OS-A |
| 3 | 10.2 | 23.3 | OS-1, FB-DP1 |
| 4 | 6.5 | 19.1 | A, FB-DP2 |
| 5 | 9.9 | 19.1 | B, FB-DP3 |
| 6 | 18.7 | 34.5 | C |
| 7 | 9.3 | 17.0 | D |
| 8 | 5.2 | 9.5 | 1/2 E |
| 9 | 5.2 | 9.5 | 1/2 E |
| 10 | 2.0 | 8.8 | 1/2 G |
| 11 | 2.9 | 8.8 | 1/2 G FB-DP8/9 |
| 12 | 10.8 | 19.6 | F |
| 13 | 26.2 | 53.8 | H |
| 14 | 3.8 | 7.8 | I |
| 15 | 95.3 | 199.8 | J, DP14, PR17, PR18 |
| 16 | 9.9 | 27.7 | POND OUTFALL, OS2 |

| STORM SEWER SUMMARY | | | |
|---------------------|----------------|------------------|----------------------------------|
| PIPE RUN | Q _s | Q ₁₀₀ | CONTRIBUTING PIPES/DESIGN POINTS |
| 1 | 6.7 | 9.8 | 18" SD |
| 2 | 6.5 | 19.1 | 24" SD |
| 3 | 16.4 | 38.2 | 30" SD |
| 4 | 18.7 | 34.5 | 30" SD |
| 5 | 18.7 | 34.5 | 30" SD |
| 6 | 18.7 | 34.5 | 30" SD |
| 7 | 9.3 | 17.0 | 24" SD |
| 8 | 13.2 | 22.3 | 24" SD |
| 9 | 18.0 | 29.2 | 30" SD |
| 10 | 35.0 | 60.5 | 36" SD |
| 11 | 35.0 | 60.5 | 36" SD |
| 12 | 2.0 | 8.8 | 18" SD |
| 13 | 2.9 | 8.8 | 18" SD |
| 14 | 39.9 | 78.1 | 36" SD |
| 15 | 10.8 | 19.6 | 24" SD |
| 16 | 49.7 | 96.0 | 42" SD |
| 17 | 49.7 | 96.0 | 42" SD |
| 18 | 42.1 | 91.1 | 42" SD |
| 19 | 1.2 | 8.2 | 18" SD |

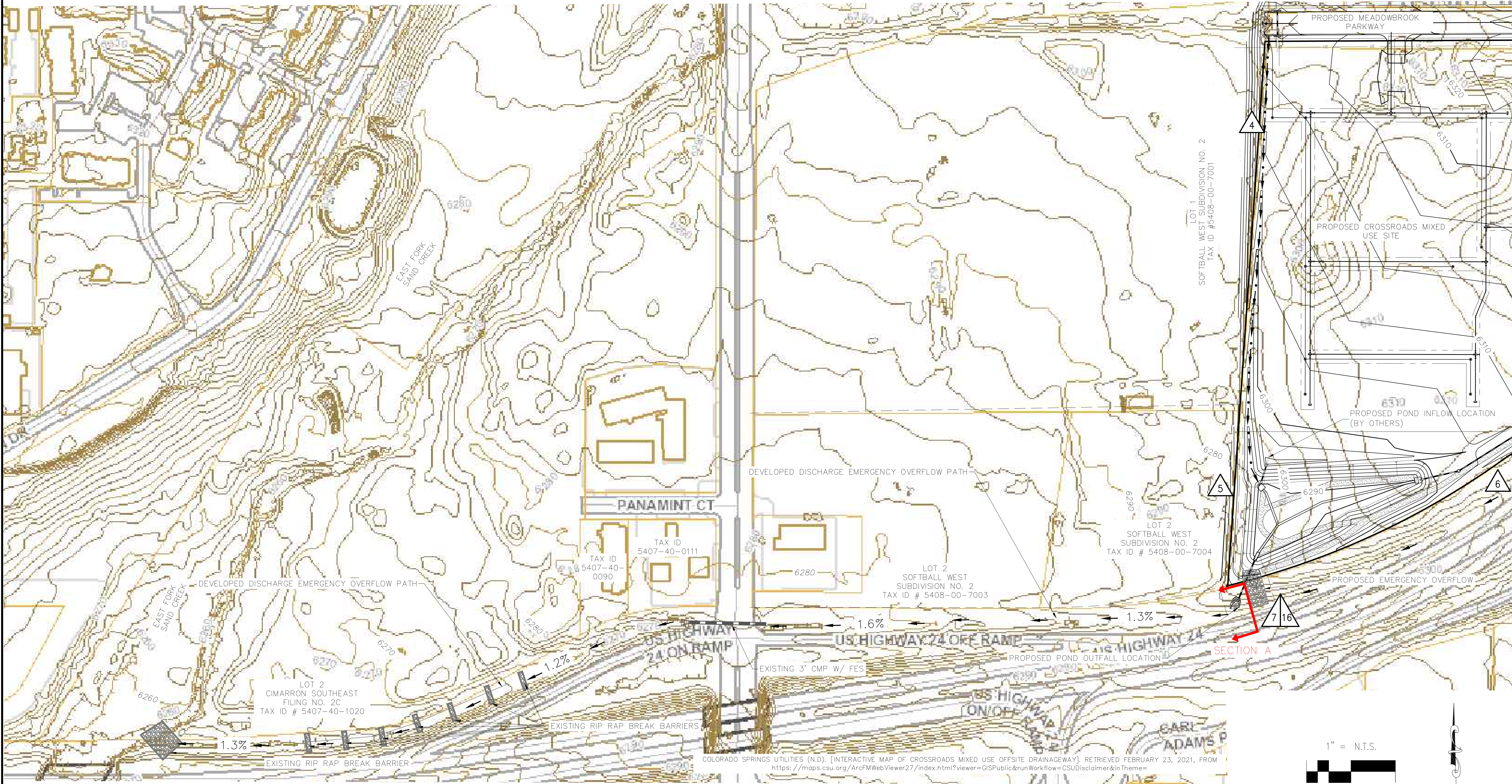
*REFER TO FDR FOR CLAREMONT BUSINESS PARK FILING NO. 2 FOR CONTRIBUTING BASIN GEOMETRY



102 E PIKES PEAK AVE, SUITE 500
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CROSSROADS MIXED USE

DRAINAGEWAY EXHIBIT
FEBRUARY 2021



COLORADO SPRINGS UTILITIES (N.D.). [INTERACTIVE MAP OF CROSSROADS MIXED USE OFFSITE DRAINAGEWAY]. RETRIEVED FEBRUARY 23, 2021, FROM <https://maps.csu.org/ArcFWWebViewer27/index.html?viewer=GISPublic&runWorkflow=CSUDisclaimer&inTheme=>

1" = N.T.S.
0 N.T.S.
Scale in Feet

LEGEND

- SURFACE DESIGN POINT
- SITE BOUNDARY
- EXISTING RIP RAP BARRIERS
- PROPOSED CONTOUR
- EXISTING CONTOUR
- PROPOSED WATER FITTING
- EXISTING FLOW ARROW
- EXISTING DITCH SLOPE
- EXISTING STORM SEWER AND FES
- PROPOSED STORM SEWER
- R.O.W./EASEMENT
- PROPOSED SWALE
- PROPOSED SANITARY SEWER MANHOLE
- PROPOSED SEWER LINE
- PROPOSED WATER LINE
- PROPOSED EMERGENCY OVERFLOW DIRECTION

HISTORIC DESIGN POINT SUMMARY

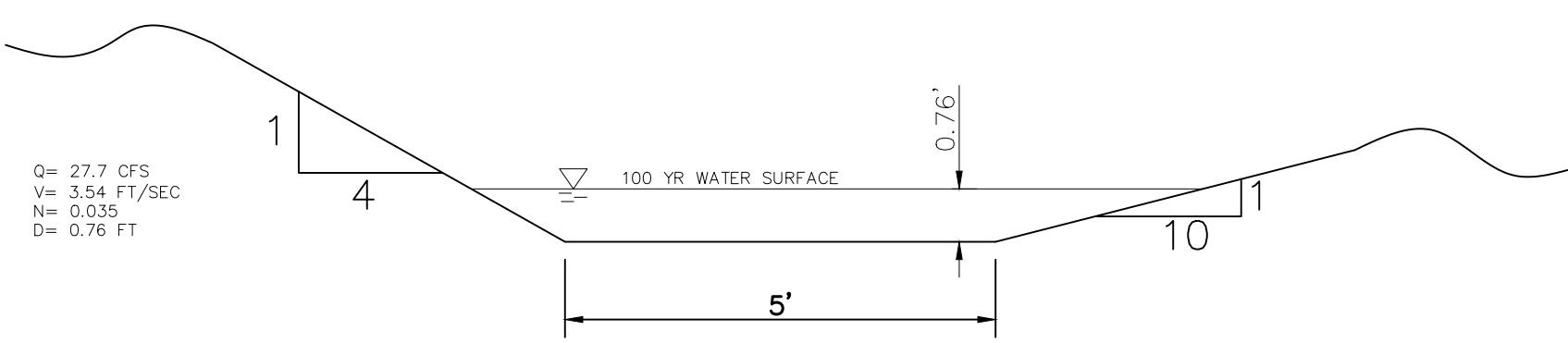
| DESIGN POINT | Q5 (CFS) | Q100 (CFS) |
|--------------|----------|------------|
| 4 | 7.4 | 27.7 |
| 5 | 8.3 | 18.2 |
| 6 | 1.2 | 8.5 |
| 7 | 10.4 | 31.9 |

PROPOSED DESIGN POINT SUMMARY

| DESIGN POINT | Q5 (CFS) | Q100 (CFS) |
|--------------|----------|------------|
| 4 | 0.0 | 0.0 |
| 5 | 0.0 | 0.0 |
| 6 | 0.0 | 0.0 |
| 16 | 9.9 | 27.7 |

NOTES:

1.) REFER TO DRAINAGE MAPS IN PRELIMINARY DRAINAGE REPORT FOR CROSSROADS MIXED USE FOR DETAILED ON SITE FLOWS AS WELL AS HYDROLOGIC AND HYDRAULIC ANALYSES CORRESPONDING TO CHANGES FROM HISTORIC AND EXISTING CONDITIONS



PCD FILING NO: SP-20-011

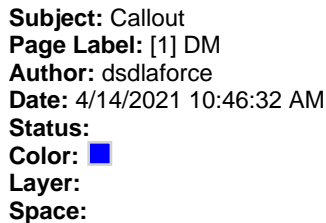


212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485


dsdlaforce (17)


Meadowbrook. Runoff within this from **DP2**. A proposed 10' sump d flows from leaving the roadway 9.1 (split 100 yr flows with DP5)

identify the flow-by flow rate.




Revise MH type downstream of DP 6. See notes on ECM Detail SD_3-1 and SD_3-2. Type II MH are typically used for 30" or smaller pipe size and Type I are typically for pipe sizes larger than 30".

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Page Label: 14
Author: dsdlaforce
Date: 4/14/2021 10:47:30 AM
Status:
Color: 
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Subject: Line
Page Label: 14
Author: dsdlaforce
Date: 4/14/2021 10:47:40 AM
Status:
Color: 
Layer:
Space:


Point 12
"consists of 2.57 acres of commercial lots (lot 8 and portion of boundary of the site. A private 24" storm drain (PR15 and Q100=19.6 cfs at DP12 in the 5 and 100 years return period would undergird to the main line. **Pipe Runs 16 and 17** would runoff to the concrete forebay located within the east pond at peak flows rates of 50.4 cfs (5 year) and 100.0 cfs (100 year)." **Delete duplicate**

Point 12
"consists of 2.57 acres of commercial lots (lot 8 and portion of boundary of the site. A private 24" storm drain (PR15 and Q100=19.6 cfs at DP12 in the 5 and 100 years return period would undergird to the main line. **Pipe Runs 16 and 17** would runoff to the concrete forebay located within the east pond at peak flows rates of 50.4 cfs (5 year) and 100.0 cfs (100 year)." **Delete duplicate**

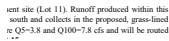
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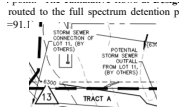
ints 14 ← Include a narrative regarding the swale and lot 11 site plan


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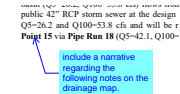
Include a narrative regarding the swale and lot 11 site plan




Subject: Image
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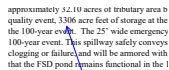
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Page Label: 14
Author: dsdlaforce
Date: 4/14/2021 10:53:25 AM
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include a narrative regarding the following notes on the drainage map.



Subject: Cloud+
Page Label: 15
Author: dsdlaforce
Date: 4/14/2021 11:28:32 AM
Status:
Color: 
Layer:
Space:


This should be under DP3



Subject: Callout
Page Label: 15
Author: dsdlaforce
Date: 4/14/2021 11:34:10 AM
Status:
Color: 
Layer:
Space:

update. Missing decimal point.



Subject: Image
Page Label: 17
Author: dsdlaforce
Date: 4/14/2021 11:47:49 AM
Status:
Color: 
Layer:
Space:

for the purposes of creating commercial lots as
cesses are being constructed. The site will be gra

revise to 2021

HYDRAULIC CALCULATIONS

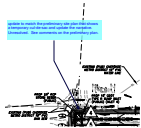
NOTICE: Staff is only providing cursory review of the hydraulic calculations with the preliminary plan. Detailed review will be conducted with the Final Drainage Report.

NOTICE: Staff is only providing cursory review of the hydraulic calculations with the preliminary plan. Detailed review will be conducted with the Final Drainage Report.

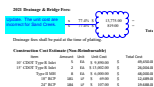


Revise. Must be at or below
predevelopment.
Unresolved.

Revise. Must be at or below predevelopment.
Unresolved.



update to match the preliminary site plan that shows a temporary cul-de-sac and update the narrative.
Unresolved. See comments on the preliminary plan.



Update. The unit cost are incorrect for Sand Creek.